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CHAPTER 5

Toward a Sociometric Theory of Representation: Representing Individuals Enmeshed in a Social Network*

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Most concepts of political representation are based upon the idea that individuals have attitudes that should be mirrored by their representatives or, more globally, that the electorate has collective preferences that should be mirrored by the collective preferences of the "representative" body (see Pitkin, 1967; Lijphart and Grofman, 1984; cf. Grofman, 1982a, 1982b). Pool and Kochen suggested that the social accessibility of representatives is a crucial and long-neglected aspect of representation. In observing the American Congress, they said, "Congress is the place which is quickly reached by messages conveying the feelings and moods of citizens in all walks of life . . . it is a national communication center where public reactions are transformed into public opinion." They suggested that the Congress should and does function as a forum where various opinions, grievances, etc., may be channeled to be shared and debated.

The ability of a legislature to effectively function as a communication center depends upon the extent to which it is "in touch" with the population it is

supposed to represent (cf. Fenno, 1978). Pool and Kochen conjectured that American congressional representatives are generally within a short interpersonal reach of all of the citizens of the United States; specifically, they suggested that every citizen is "connected" to some congressional representative via some chain of interpersonal relationships including, at most, two intermediaries. We propose to elaborate upon this conjecture, and begin to build a theory of sociometric representation based upon the approach to representation that is implicit in their discussion.

Specifically, we suggest that sociometric representation requires that, for each citizen, there should be at least one individual representative who is in a position to receive information from that citizen via informal interpersonal channels. This means that there should be a short chain of personal relationships that leads from each citizen to some member of the legislature. It follows that the system of representation that will most efficiently provide sociometric representation, i.e., provide short chains from all citizens with the smallest number of representatives (or shorter chains if the number of representatives is fixed), will depend upon the structure of relations that is present in the society to be represented.

In the following sections, we consider: (1) some formalization of the concept of sociometric representation, (2) the relationship between social structure and efficient mechanisms of providing sociometric representations, and (3) directions for future research on the effectiveness of current systems of representation and possible alternative systems.

SOME FORMALIZATION OF SOCIOMETRIC REPRESENTATION

By representing a social network of personal relationships as a graph, we may define the *social distance* between any pair of individuals as the length of the shortest chain of personal relations that connects the two individuals. In graph theory, a subset of nodes in a graph composes a *k-cover* for the graph, if for every node, i, in the graph, there exists some node, j, in the subset that is within a distance of k from i. Specifically, a 1-cover is a subset such that everyone in the set is tied to someone in the 1-cover (Harary, Norman, and Cartwright, 1965). It would be desirable for a set of representatives to be a 1-cover for a society. For example, Nelson Polsby, while serving as a member of the nominating committee of the American Political Science Association, proposed that the Executive Council of the APSA be chosen so that every member of the APSA knows at least one member of the Executive Council (Polsby, personal communication, April 1986); such a council would form a 1-cover for the Association's membership.

Unfortunately, finding a 1-cover is not always practical; a 1-cover may require a very large number of representatives. The size of a minimal 1-cover depends most obviously on the density of social interconnection. The denser the

communication ties, ceteris paribus, the fewer will be the number of individuals needed to constitute a 1-cover. In addition, the pattern of ties is also relevant. Consider the following situation:

$$A \leftrightarrow B \leftrightarrow C \leftrightarrow D \leftrightarrow E \leftrightarrow F \leftrightarrow G$$

In this situation, the minimal 1-cover has three members (e.g., ADG or BEG), nearly half of the members of the "society." A 1-cover for such a chain generally requires about ⅓ of the set, i.e., requires a very large number of links if the group is large. However, groups are usually not so poorly connected. An opposite extreme is represented by a "star" pattern, where everyone is connected to one member, who alone constitutes a 1-cover for the group.

In general, we would expect a society to fall between these extremes. Obviously, all things being equal, the more ties among the members, the smaller the necessary 1-cover. For a given number of ties, it can be seen that the 1-cover will be smaller if the ties are concentrated on a single or few nodes.

In American society, it is obvious that there is no small set of individuals who constitute a 1-cover. Rather than have a very large legislature, we settle for more indirect representation. Although there is some loss of responsiveness in the longer chains of interpersonal connections, the longer chains do carry important information to legislators. In Canada, Erickson (1975) has shown that 2-step paths are viable communication channels from citizens to their members of parliament—individuals can and do use an intermediary to reach a legislator. Although Erickson finds that longer chains are not used for meeting a legislator, we believe that such chains do serve as routes for diffusion of information. While individuals tend not to go through a friend of a friend to meet their legislator, they may talk to their friends who talk to their friends who talk to the legislator— in this way, a representative may receive information about constituents who are as far away as three steps. It seems reasonable to expect that these longer chains generally do not carry much pressure or specific personal information, but frequently and effectively carry aggregate information concerning sentiments and preferences of a constituency.

This discussion should give some intuition as to the problem of sociometric representation. Now, we suggest that efficient systems of representation will reflect the social structure of society.

ALTERNATE FORMS OF SOCIOMETRIC REPRESENTATION

The American system of representation is based upon geographic representation; each district elects a representative. In a society where personal relationships have important geographic interconnections, such a system is likely to produce sociometric representation with relatively short chains; each person is likely to

have a local connection to someone else with a local connection to any well-connected representative.

Pool and Kochen presented a "thought exercise" to consider the longest chains that might be necessary in modern American society. They suggested that even a hermit (whether in the Okefenokee swamps or the Northwest woods) would know some merchant from whom to buy at least a few otherwise unavailable products. That merchant might not know a congressional representative him/herself, but with all of the people who deal with a merchant, at least one of them is likely to know a congressional representative. Thus, Pool and Kochen conclude that even a hermit is likely to be connected to a congressional representative by a chain with only two intermediaries, i.e., a 3-step chain. This argument suggests that most Americans probably have chains of 3 steps or less to a congressional representative, but this is not inevitable for all societies.

In strictly segregated societies, locale may not link up even physically proximate groups. For example, one might have several socially and economically independent tribes who cannot be reasonably represented by a single representative. Economic stratification may also create impasses where some groups have no short routes to others. Analogously, language barriers may be critical.

Other forms of representation may do the job more efficiently than a geographically based system or may be used to supplement geographic representation. The French system of representing estates was one system designed to reflect social stratification. It was assumed that members of each estate would have access to (geographically proximate) representatives of their own estate, but not necessarily to representatives of other estates. Proportional representation systems usually emphasize ideological representation; but since parties often have socio-economic and religious bases, each party's representatives sociometrically link with distinct socio-economic or religious groupings.

It is an empirical issue whether American society might be better sociometrically represented by some system other than geographic representation. Consider another "thought experiment." America is a society that relies heavily upon medicine; since most people have direct contact with a physician, any body that sociometrically represents physicians, e.g., the Council of the American Medical Association, may sociometrically represent everyone in the society rather well. America is also a "religious" society where most people know at least one member of the clergy of some religion. A small set consisting of senior clergy from the major religions is likely to contain at least one member reachable by any cleric in at most a few steps.

This focus on institutional ties suggests one way to find a sociometrically representative body. One can look for a set of individuals for whom it is easy to find a small 1-cover, and who, jointly, directly connect to everyone in the society. By finding a cover for such a group (in the above examples, clerics or physicians), we can cover the society at one further remove. Organizations with a clear hierarchical structure, built from smaller units which jointly encompass

the entire society, provide a "natural" way to build covers; by simply picking the set of individuals at some level in the hierarchy, we ensure hierarchically structured linkages to everyone. The Communist Party organization in Eastern Europe is structured to be representative in this way; everyone knows some party member, and party members are organized so that the top party organization is relatively directly sociometrically connected to the bottom. The same is true for international as well as most national church organizations.

What method of selection of representatives will yield the most efficient sociometric representation varies depending upon the social structure. The effectiveness of any given mode of representation for some society is an empirical issue. Among the important questions that can be asked are: What is the minimum size of the representative body needed to provide a k-cover for the society? For a given legislative size, what is the maximum number of citizens that any legislature could cover with no more than k-steps? For a given legislature, what is its actual (minimum) social distance to the electorate, and how does that compare to the theoretical minimum?

We have made use of the idea of social distance from a voter to the legislature. The distance from any given voter is simply the distance to the legislator who is closest to the voter. A k-cover minimizes the maximum distance from any member of the set V of voters to the set L of legislators, by ensuring that no voter is further than k steps away. There are other ways we might measure representation. For example, for a fixed number of representatives, one can seek to minimize the *average* distance to citizens rather than to minimize the maximum distance (cf. Chamberlin and Courant, 1978). Another approach would be to make use of "effective" distance, where effective distance takes account in some fashion of the fact that the shortest communication chain may not be used.

For example, one might consider the effective distance between two individuals to be the shortest distance that can be traversed by at least "three" different chains (e.g., two individuals are considered connected at a distance two only if there are at least three different chains of length two connecting them). Alternatively, one might look at the extent to which voters can "access" the communication paths that are implicit in the social network. In particular, how obvious are the communication chains that do exist? There may be several different short chains connecting a particular pair of individuals, but none of these may be evident to the individuals. In fact, by this criterion, geographic representation is at a disadvantage relative to other approaches. If we had a physicianocracy (representation through physicians), then each person would go to his/her physician, who would know how to complete the chain. In contrast, it is less clear how one finds a person who knows one's district representative (party structure helps, but not everyone knows a party activist). The visibility of the shortest routes is an important consideration in evaluating the probable representation that will be provided by any system of representation.

One further consideration might be fairness. While the above discussion

emphasized that everyone should be able to reach some representative by a short path, it did not consider the possibility that some citizens may reach many different representatives by short chains, while other citizens may reach only a single representative by a short route. In addition to seeking a legislature that will not be too distant from any voter, and/or one that will, perhaps, come close to minimizing the average distance to the set of voters, one might also want to reduce variation in the degree of connectedness of the voters to legislators so as to avoid the overrepresentation of some voters.

Of course, the sociometric "overrepresentation" of some voters may be inevitable given the structure in the society at large.[1] Nonetheless, it may be possible to reduce variability. Indeed, geographic-based representation does aid in that end.[2] Most people have short chains to their local representative, and lack short paths to other more geographically distant representatives. In contrast, nongeographic-based modes of representation may have stronger biases in over-representing some citizens in terms of their access to representatives. For example, a system based upon physicians may lead individuals with much illness or with several physicians in their families to be "overrepresented," especially in comparison with either healthy people or people too poor to have much regular contact with the medical system.

FUTURE DIRECTIONS

This essay has suggested that sociometric representation be taken seriously as an important aspect of representation. We would not suggest that it should replace classical notions of representation, but that it should supplement them. A set of socially isolated "representatives" would be unlikely to be optimal, even if they were somehow selected to mirror, in aggregate, the attitudes and socioeconomic

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[1] We have treated personal ties between a representative and his/her constituents as desirable. Note, however, that, in civics textbooks, personal acquaintanceship between legislators and constituents is suspect because it creates the potential for conflict of interest. Indeed, in judicial proceedings, personal acquaintance with parties to the case is reason for a judge to disqualify himself or herself from the case. Thus, for every citizen, there must be some judges who do not know the citizen; otherwise justice is impossible (personal communication, Jonathan Pool, University of Washington, February 10, 1987).

[2] Relevant in this regard is the graph-theoretic idea of a k-basis. A *k-basis* is a k-cover which has the further property that the members of the cover are not k-reachable from one another. To require a k-basis, rather than merely a k-cover, would be to make likely that each representative represented distinct subgroups within the society. If members of a k-basis are from different "cliques," the fact they are not k-reachable from each other suggests that they will not be "bridging" elements sociometrically. Rather, they will be (roughly speaking) members "internal" to a clique. In such a case, we may be trading off reducing variance in the voter connectedness to members of the legislator against greater potential conflicts within the legislature. Presumably, "bridging" elements would have a broader perspective and be amenable to compromises.

characteristics of the broader society. There is every reason to believe that sociometric representation can be achieved in conjunction with forms of representation shaped by other ends, but it is not inevitable, for example, that a legislature which mirrors the society necessarily provides a communication nexus for it. As Pool and Kochen (1978–79) point out, sociometric representation has a rationale and significance of its own and so should be given explicit attention.

Sociometric representation has been neglected since the idea was first proposed some time ago by Harary, Norman, and Cartwright (1965), and more directly, by Pool and Kochen (1978–79). (See, however, Eulau and Kuklinski, 1981, 1982; Eulau, Rothenberg and Kuklinski, 1984; Weatherford, 1983.) Much theoretical and empirical work needs to be done to provide a viable operationalization for sociometric representation. Empirical studies of the connectedness of Congressional representatives will show the strengths and weaknesses of the present U.S. system. Small World studies, of the type initiated by Milgram, are necessary to map out the social landscape that must be represented and to clarify the routes conjectured by Pool and Kochen. Similar work is needed in other societies to provide a comparative basis for generalizing about the nature of sociometric representation. Finally, theoretical work in conjunction with this empirical work should clarify the macro-structural features of social networks, as shaped by institutions and socioeconomic, religious, and other cleavages (cf. Blau, 1977; Feld, 1981), that condition the ways societies might be effectively sociometrically represented.

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