Ideology, Party, and Voting in the U.S. Congress, 1959-1980

KEITH T. POOLE
Carnegie-Mellon University

R. STEVEN DANIELS
University of Nebraska-Lincoln

Current methods of roll-call analysis have practical as well as theoretical shortcomings. We propose here a method based on a spatial theory of voting that overcomes these problems. We apply metric multidimensional unfolding to interest-group ratings of members of Congress in order to obtain a Euclidean spatial configuration of congressmen. Each roll-call vote is then mapped into the configuration of members in a way consistent with spatial theory. Based on 190,000 ratings issued from 1959 to 1980, our empirical analysis demonstrates that a single liberal-conservative dimension accounts for more than 80% of the variance in the ratings. A second dimension, associated with party unity, accounts for 7% of the variance. Approximately 86% of all roll-call voting for the 22 years of our study is consistent with a simple one-dimensional spatial model. The votes that best fit the liberal-conservative dimension are drawn from the government management, social welfare, and foreign policy areas. The votes that best fit the two-dimensional configurations are drawn from the agricultural area.

The United States Congress is the most widely studied legislative institution in the world. The literature written on the structure, procedures, social norms, policymaking processes, voting positions, and other elements of the congressional environment would fill a large library, with the most shelf space undoubtedly taken up by studies of congressional voting. Since Orrin Libby (1897) first issued a call for the study of congressional voting, political scientists, social psychologists, historians, sociologists, and even economists have responded with an ever-increasing flow of research.

Creating a geometrical representation of the legislators or the roll calls is an approach that has been used for some time to study congressional voting (e.g., Rice, 1924). The legislators and roll calls are represented as points in a space where the distances between the points are related to measures of association between the legislators and roll calls. Typically, these measures of association (e.g., Yule's Q, ϕ, ϕ/ϕ_{max}) are analyzed by factor analysis, cluster analysis or multidimensional scaling in order to produce the spatial representation of legislators or roll calls. The results of a properly designed factor analysis may also be used to select votes for a Guttman scaling. Representative works are MacRae (1958), Weisberg (1968), Clausen (1973), and Hoadley (1980).

This approach is fraught with practical and theoretical difficulties. Practically, the use of such techniques is very cumbersome. The researcher must select the roll calls and legislators, decide how to handle missing data and item directions, choose the appropriate measure of association, and choose a response model (either dominance or proximity) (Weisberg, 1968, p. 233). Performing a factor analysis or a multidimensional scaling of a 100 by 100 or a 435 by 435 matrix of associations is a formidable and expensive undertaking. Working with subsets of legislators or subsets of votes (a vote-by-vote matrix of associations) and then overlapping the subsets is possible but is a clumsy and time-consuming procedure.

In addition to these serious practical limitations, this general methodology suffers from an important theoretical limitation. Suppose that an ideological space exists and that legislators and the yea-and-nay alternatives on each parliamentary notion can be represented as points in this space. Furthermore, assume that the legislators have single-peaked utility functions over the space and vote for the alternative closest to them. Morrison (1972) has shown that, given this model, these scaling techniques are unlikely to recover the true positions of the legislators in a legislator-by-legislator analysis. The input to these techniques are measures of association based on the proportion of disagreement between pairs of legislators. What Morrison showed was that the proportion of disagreement depends upon the distance between the pair of legislators, the angle they form with the (arbitrary) origin of the space, and the distribution of the policy outcomes associated with the roll-call votes. Because the scaling methods described above treat the associations only as measures of distance (multidimensional scaling) or only as measures of angles (factor analysis), distortion in the recovery of the space is unavoidable.

We propose here a new method of roll-call analysis which overcomes these difficulties and enables a researcher to engage in cross-chamber comparisons of both legislators and roll calls within a year and between years. Our method is an extension of that developed by Poole (1981, 1984). In a nutshell, we use multidimensional unfolding on interest-group ratings of legislators (in accordance with a spatial model developed in the next section) to obtain a spatial configuration of the legislators. We then map the roll-call votes into the legislator configuration using a simple spatial model of voting.

A Spatial Model of Interest-Group Ratings

Interest groups are close observers of congressional voting, and each year many of them publish ratings of the members of Congress. To rate a member of Congress, an interest group normally chooses between 10 and 40 votes for each house of Congress from the total set of roll calls taken during the particular session under study. These votes are chosen for their relevance to the group's interests, and the rating is determined by calculating the ratio of "correct" to total (correct plus incorrect) votes. (Some groups treat absences as "incorrect.") Each rating thus represents the legislator's percentage agreement with the stated positions of the group.[1]

There are two basic types of rating interest groups—general and specific. The general interest groups (e.g., the Americans for Democratic Action) construct their ratings from a broad range of issues, whereas the specific groups focus on a narrow range of issues (e.g., the Child Welfare League of America concentrates on issues related to the health and welfare of children). The positions that a general group takes on a wide range of issues are very likely to be systematically related (what Converse (1964) called "constrained"). A group that opposes CETA, OSHA, and busing is likely to favor work requirements for welfare recipients and a U.S. military buildup. Consequently, an interest group's positions on a range of issues are largely determined by the group's positions on a small number of underlying evaluative dimensions. The issue-specific groups can also be viewed within the same framework. Single-issue groups are usually the most committed of the interest groups; they tend to attract more ideologically motivated members. Although their focus is normally on a single issue, their beliefs frequently carry into other issue areas as well. Then, by this argument, the overall rating by both a general or a specific group is a measure of how close in spatial terms the member of Con-

[1]We were able to obtain ratings for the following groups for the years indicated: American Civil Liberties Union (ACLU), 1979-1980; American Conservative Union (ACU), 1971, 1972, 1974-1980; Americans for Constitutional Action (ACA), 1959-1980; Americans for Democratic Action (ADA), 1960-1961, 1963-1980; American Farm Bureau Federation (AFBF), 1978-1980; American Federation of Government Employees (AFGE), 1973-1977; American Federation of State, County and Municipal Employees (AFSCME), 1973, 1975-1980; American Federation of Teachers (AFT), 1975-1980; American Security Council (ASC), 1969-1980; Bread for the World (BFW), 1979-1980; Building and Construction Trades Department AFL-CIO (BCTD), 1979-1980; Chamber of Commerce of the United States (CCUS), 1975-1980; Child Welfare League of America (CWLA), 1976-1977, 1979-1980; Christian Voice (CV), 1979; Coalition for a New Foreign and Military Policy (CFNFMP), 1977-1980; Committee for the Survival of a Free Congress (CFSC), ratings on all issues, economic issues, defense and social issues, 1979-1980; Committee on Political Education of the AFL-CIO (COPE), 1959-1980; Common Cause (CCS), 1978-1980; Congress Watch by Nader's Public Citizen (CW), 1975-1980; Conservative Coalition Support Scores (CC), 1959-1980; Consumer Federation of America (CFA), 1971-1980; Friends' Committee on National Legislation (FCNL), 1977-1980; League of Conservation Voters (LCV), 1971-1977, 1979-1980; League of Women Voters (LWV), 1971-1975, 1977-1980; Lower Federal Spending Support (LFS), 1959; Larger Federal Role Support Score (LFR), 1959-1968; Liberty Lobby (LL), 1961-1969, 1973, 1975, 1977; National Alliance of Senior Citizens (NASC), 1977, 1979-1980; National Council of Senior Citizens (NCSC), 1977-1980; National Education Association (NEA), 1969-1979; National Farmers' Organization (NFO), 1973, 1975-1980; National Farmers' Union (NFU), 1961-1965, 1969-1980; National Federation of Independent Business (NFIB), 1977-1980; National Women's Political Caucus (NWPC), 1979; New Republic (NREP), 1961-1974; National Taxpayers' Union (NTU), 1971, 1973-1980; Presidential Support Scores—Eisenhower, Kennedy, Johnson, Nixon, Ford, Carter, 1959-1980; Ripon Society (RIPON), 1969-1978; Citizens for a Sane World (SANE), 1973-1978; Taxation with Representation (TWR), 1977-1978; United Auto Workers (UAW), 1969-1980; United Mine Workers (UMW), 1979-1980. Whenever possible we tried correcting the ratings to remove absences. Some groups, mainly liberal ones such as the ADA, count absences as negative votes. We found that correcting for the absences made almost no difference in the unfolding results.

gress is to the interest group on the evaluative dimensions.

Along the lines of the spatial model of party competition, we assume that each issue can be represented as a dimension, and each interest group and member of Congress has a most preferred position on each issue which is the ideal point of the group or member on that issue dimension. Let m be the number of issues and let z_{jk} denote the jth ($j = 1, \ldots, q$ where q is the number of interest groups) interest group's position on the kth issue. Then the m ideal points can be denoted as the vector:

$$z_j = \begin{vmatrix} z_{j1} \\ \cdot \\ \cdot \\ \cdot \\ z_{jm} \end{vmatrix}$$

Similarly, the vector

$$x_i = \begin{vmatrix} x_{i1} \\ \cdot \\ \cdot \\ \cdot \\ x_{im} \end{vmatrix}$$

represents the ith ($i = 1, \ldots, p$ where p is the number of members of Congress) member's ideal points on the m issues. The Euclidean distance between the jth interest group and the ith member is

$$d(x_i, z_j) = d_{ij} = \left[\sum_{k=1}^{m} (x_{ik} - z_{jk})^2 \right]^{1/2}$$

If no error is present and there exists s common evaluative dimensions, $s < m$, then there are vectors $\tilde{z}_j$ and $\tilde{x}_i$ of length s such that

$$d_{ij} = \left[\sum_{k=1}^{m} (x_{ik} - z_{jk})^2 \right]^{1/2}$$
$$= \left[\sum_{k=1}^{s} (\tilde{x}_{ik} - \tilde{z}_{jk})^2 \right]^{1/2};$$

that is, each of the m-issue dimensions is a linear combination of the s evaluative dimensions. Or, put another way, all the ideal points lie on an s-dimensional hyperplane (the evaluative, or what Ordeshook (1976) refers to as the "basic" space) through the m-space of issues.

We assume that each roll-call vote has two outcomes, one corresponding to yea and one corresponding to nay; that is, let

$$\psi_{yl} = \begin{vmatrix} \psi_{yl_1} \\ \cdot \\ \cdot \\ \cdot \\ \psi_{yl_m} \end{vmatrix} \qquad \psi_{nl} = \begin{vmatrix} \psi_{nl_1} \\ \cdot \\ \cdot \\ \cdot \\ \psi_{nl_m} \end{vmatrix}$$

be the vectors of the outcome positions, respectively, where $l = 1, \ldots t$ indexes the roll calls and t is the number of roll calls. Normally, most of the entries in ψ_{yl} and ψ_{nl} are zeroes because a roll-call vote usually touches only on a small number of issues. If each of the m-issue dimensions is a linear combination of the s evaluative dimensions, then there are vectors $\tilde{\psi}_{yl}$ and $\tilde{\psi}_{nl}$ which are the projections of ψ_{yl} and ψ_{nl}, respectively, onto the basic space.

By this model, the interest groups select roll-call votes with outcome locations near their ideal points in the basic space to construct their ratings. We assume that the legislators have symmetric single-peaked utility functions and will vote for the outcome nearest them in the space. Consequently, setting aside perceptual error, the number of correct votes is monotonic with the distance between the interest group and the member of Congress. To see this, inspect Figure 1. The top part of Figure 1 displays the utility function for one hypothetical interest group near the end of a single evaluative dimension. The horizontal dotted line represents the utility threshold for the interest group. Consider a given set of votes with outcomes that can be represented as positions in this one-dimensional basic space. Then, for any roll call, the interest group will include the vote in its ratings only if there is an outcome in the interval $[O_1,O_2]$. Suppose that the number of roll calls is substantial and that there are a large number of outcomes in $[O_1,O_2]$, with the opposite or "anti" choices for $[O_1,O_2]$ falling in $[O_5,O_6]$. (The distance between pairs of outcomes need not be the same across roll calls.) Assuming no perceptual error, legislators located in the interval $[O_1,O_3]$ would all receive rating scores of 100. (O_3 is the midpoint of O_1 and O_5, and O_4 is the midpoint of O_2 and O_6.) Legislators to the right of O_3, however, will receive scores of less than 100 because they will be closer to some outcomes in $[O_5,O_6]$. The closer a legislator comes to O_4, the lower his or her rating. Legislators to the right of O_4 all receive scores of 0 because, for each roll call used by the interest group, they are closer to the anti outcome. The lower part of Figure 1 shows the rating issued by the interest group as a function of the position of a legislator in $[O_1,O_6)$.

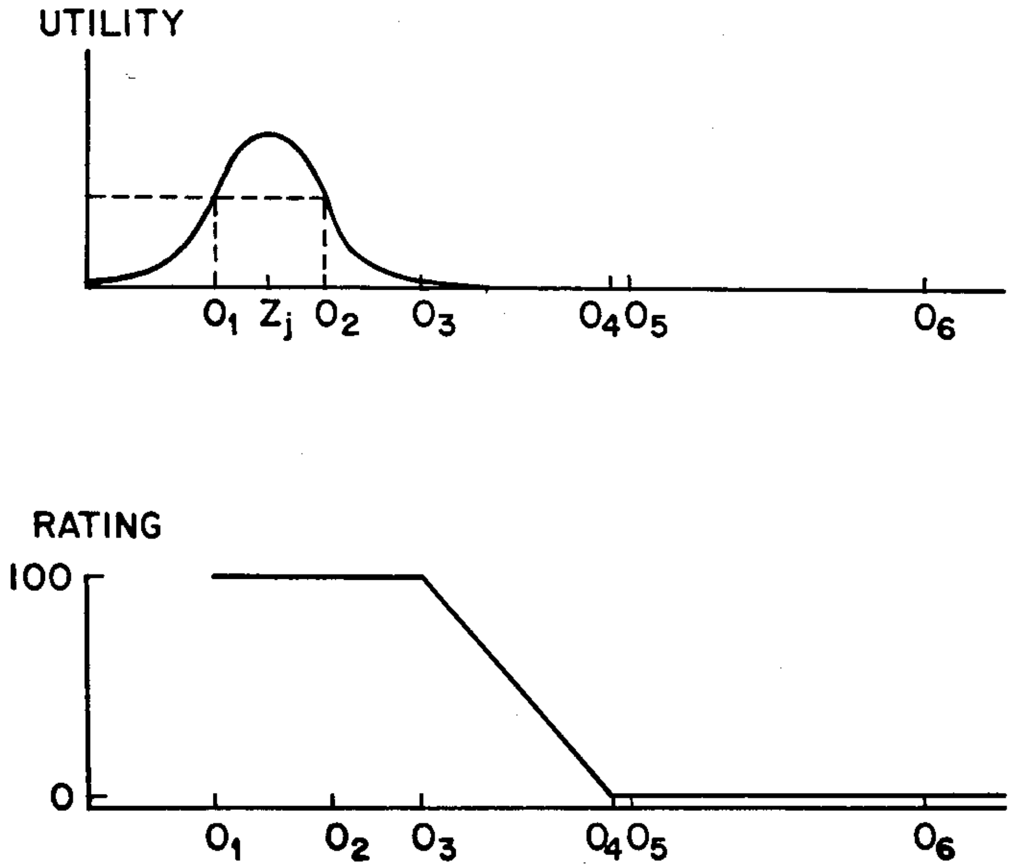
Figure 1 illustrates one of the weaknesses of the interest group ratings, namely, that the ratings are confined to the interval [0,100] when in fact they should be able to assume any value in the interval $(-\infty,100]$. However, this becomes a less serious problem as the number of interest groups increases. When there are multiple groups, the zones of indifference like $[O_1,O_3]$ and $[O_4,O_6]$ get whittled down and the legislators can be uniquely located.[2]

Because the interest groups select roll-call votes with outcome locations near their ideal points in the basic space to construct their ratings, it is appropriate to treat a score of 85 given by an interest group to a senator in the same way as a score of 85 given to a representative. The comparability of the ratings does not rest on the interest groups selecting roll calls from the same issue area(s) in both houses. All that matters is that the groups select votes with outcomes near them in the basic space. A comparability problem could arise if a group chooses roll calls in one house consistent with the spatial model but utilizes nonspatial criteria in the other house. For example, a group could choose votes on food stamps and arms control in the Senate to construct its ratings and on agricultural votes in the House of Representatives. (We show below that votes on food stamps and arms control are highly consistent with the spatial model, whereas agricultural votes generally are not.) In any case, the House and Senate ratings can be analyzed separately as well as together to guard against this problem. Empirically, we find its occurrence to be rare (see below).[3]

[2]Another weakness of the ratings closely related to this one is that it is unclear how many roll calls there has to be for the number to be "substantial"—that is, enough votes in the area of interest of a group with outcomes close enough to be used to construct its ratings. In general, the more votes that are used, the more "accurate" the ratings, that is, the narrower the zones of indifference. This is clearly more of a problem in the earlier years of our analysis than in the later years. However, we believe that the argument we just made applies to this weakness as well; namely, when there are multiple groups, the zones of indifference get whittled down and the legislators can be uniquely located.

[3]A more subtle objection to our model stems from a lack of agenda control in the Congress by the interest groups. Because of this, the number of roll calls that an interest group regards as important may not be very large. As a consequence, the group may have to use some roll calls with outcomes not as close to them as

Figure 1. Rating Example



Because the ratings are measures of closeness or preference, they can be regarded as inverse distances (the higher the rating, the closer a member is to a group) and are therefore suitable for a multidimensional unfolding analysis. In this specific instance, the aim of an unfolding analysis is to locate points representing the legislators and points representing the interest groups in a space of minimal dimensionality such that the Euclidean distances between the two sets of points reproduce the ratings as closely as possible. Formally, let δ_{ij} denote the jth interest group's rating of the ith member of Congress. We convert the ratings to distances by the linear transformation

$$d^*_{ij} = (100 - \delta_{ij})/50 = d_{ij} + e_{ij} \quad (1)$$

where the error term, e_{ij}, is picking up three effects: 1) perceptual error, 2) idiosyncratic evaluative dimensions, and 3) the substitution of zero for negative ratings. The loss function that we minimize is

$$\mu = \sum_{i=1}^{p} \sum_{j=1}^{q} e^2_{ij}$$

$$= \sum_{i=1}^{p} \sum_{j=1}^{q} \left\{ d^*_{ij} - \left[\sum_{k=1}^{s} (\hat{x}_{ik} - \hat{z}_{jk})^2 \right]^{1/2} \right\}^2. \quad (2)$$

they would like. If the set of available roll calls of interest in one chamber were restricted in this way, then this could systematically bias the group's ratings.

We don't think this is a serious problem. First of all, in recent years more than 500 roll calls were taken each year in both houses. Literally dozens of votes are cast on most issues of concern to the interest groups, so they have a lot to choose from. Secondly, most groups use a variety of issues to construct their ratings, and if some issue has only roll calls with outcomes distant from them there are plenty of other issues with closer outcome points to choose from. Third, even those groups that we label as specific use a variety of subjects in their issue area of interest. For example, the National Women's Political Caucus uses abortion, child care, the ERA, and other related roll calls to construct its ratings. Finally, when a group is very narrowly focused (e.g., the Child Welfare League of America), if an insufficient number of roll calls is taken or the outcome points are distant from the group, it is quite likely that the group will choose not to issue ratings. The CWLA did not issue ratings in 1978 because not enough votes were taken in Congress on child nutrition and child health care that year. They told us this in a letter when we asked for their ratings that year.

We think that these arguments also apply to the case when the Democrats control the agenda in one house and the Republicans control the agenda in the opposite house. The mix of issues being voted on did not change markedly when the Republicans took control of the Senate in 1981. What changed was which party won most of the roll calls.

Poole (1982, 1984) has developed a method of metric multidimensional unfolding which finds estimates of the member and group locations—$\hat{x}_i$ and $\hat{z}_j$—that minimize μ. If the e_{ij} are assumed to be independently and normally distributed with constant variance, then the $\hat{x}_i$ and $\hat{z}_j$ will be maximum likelihood estimators using this method of unfolding.[4]

Because the interest groups publish ratings every year, time can be regarded as a dimension in the spatial model. With time as a dimension, we introduce the possibility that legislators and interest groups may change their spatial positions from year to year. In order to study these movements, we must place the configurations in a common metric or frame of reference.

The configurations recovered from the ratings are unique up to a selection of origin and a rigid rotation. Techniques have been developed by psychometricians for finding a common origin and rotation for a pair of configurations (it is known as the "orthogonal Procrustes" problem: Schonemann, 1966; Schonemann & Carroll, 1970); and for a set of configurations (Kristof & Wingersky, 1971; Berge, 1977). These techniques are not entirely satisfactory for our purposes here. Each year the interest groups issuing ratings and the membership of the House and Senate change. Some legislators serve for only two years, some for 10, and a few were in the Congress for the entire 22-year period covered by our study. Furthermore, some legislators served several years, were defeated and left Congress for some period, and were later elected again. Consequently, we must fit together a set of configurations in which any particular pair of configurations may have many points that are not in common.

Complicating matters further, we must allow for slight contractions or expansions of the space from year to year owing to the changing mix of interest groups that issue ratings. If the number of groups issuing ratings is small and divided into two camps located at opposite ends of the space from each other with most of the legislators falling between the two camps, then "zones of indifference," which we spoke of in connection with Figure 1, may not get whittled down to the extent

[4]Monte Carlo work with the unidimensional version of the unfolding technique has shown it to be very robust when the normal distribution, constant variance assumptions are violated. The procedure does equally well with error generated in accordance with models based on the log normal distribution, the noncentral chi-square distribution, and the normal distribution with the variance as a function of the true distances. See Poole (1984). The noncentral chi-square distribution can be used to model the truncation in the ratings.

that they would be if there were more groups. This has the effect of slightly compressing the configuration of legislators.

Accordingly, the model we estimate is:

$$X_o = [\xi W' + Jp_t c']_o + E_o \quad (3)$$

where X_o is the p_t by 22-×-s matrix. (p_t is the total number of legislators serving in the 22-year period of our study.) For one-dimensional configurations, X_o would be p_t by 22; for two-dimensional configurations, p_t by 44; and so on. ξ is the p_t-by-s matrix of average or "target" coordinates of the legislators in the basic space, W is a 22-by-s matrix of weights, c is a vector of constants of length 22 × s, Jp_t is a p_t-length vector of ones, and E_o is a p_t-by-22-by-s matrix of error terms. The subscript o indicates that there is missing data. The estimate of ξ, $\hat{\xi}$, can be thought of as the best-fitting average set of coordinates. In effect, the 22 configurations are squeezed together as tightly as possible when they are transformed by $\hat{W}$ and $\hat{c}$, and the mean configuration around which they are squeezed or targeted is $\hat{\xi}$. Details of the estimation and extensive Monte Carlo analysis can be found in Poole (1983).[5]

The W and c are used to correct the configurations to remove the effects we discussed above. This allows us to study individual change over time. (It does not affect the configurations individually because only linear transformations are applied.) However, this corrective procedure cannot pick up an across-the-board shift of all legislators and interest groups over time. For example, we find below that the primary dimension recovered from the ratings is liberalism v. conservatism as it is commonly understood by journalists and political scientists. The definition of what is liberal and conservative on specific issues can change over time. This is certainly true of foreign policy, which has become increasingly partisan, and of civil rights, which was a regional issue at one time, but ceased to be such by the late 1960s (Asher & Weisberg, 1978; Clausen & Van Horn, 1977; Bullock, 1981; Sinclair, 1981).

As a consequence, when we discuss the movement of individual legislators over time we are in effect describing their movement relative to some overall uniform (but unknown) trend. Because the movement of every legislator is relative to an across-the-board shift from year to year, comparisons of legislators over time are unaffected by this problem. In any case, it bears reiteration that this procedure fails to pick up only uniform shifts of all legislators and interest groups. If some shift and others do not, this is picked up.[6]

Analysis of the Ratings

Table 1 displays the unfolding results for the combined House and Senate ratings for the 22 years of the study. The measure of fit displayed is the squared Pearson correlation coefficient between the actual interest group ratings and the ratings produced by the recovered configuration from the unfolding. Because the unfolding technique is a metric one, the r-squares, unlike the stress values from non-metric techniques (which only strive to reproduce a weak ordering of the data), are literally the percentage variance explained of the actual ratings.

On the average, one dimension explains approximately 81% of the variance of the 190,000 ratings issued during the 22-year period (mean r^2 = .812). This first dimension is a liberal-conservative left-right continuum (Poole, 1981; see also Kritzer, 1978).[7] The addition of a second and third dimension adds little to the explanatory power of the model. The second dimension adds only 6.1% to the 22-year average, whereas the third dimension adds only 1.4%. However, these figures do hide some significant differences across selected years. Overall, the second dimension is clearly political party. However, the strength of the dimension varies from year to year. It is strongest for the years 1959 to 1960 where it explains an average of 20.4% of the variance.

The nature of the primary dimension can be better delineated by examining the distribution of members in a single year. Figure 2 shows the distribution of the members of Congress across the liberal-conservative dimension in 1979, whereas Figure 3 shows the distribution of the members across the liberal-conservative and the party dimensions.

[5]Available upon request.

[6]The overall uniform trend does not have to be linear or monotonic. For example, the uniform shift could accelerate over time then decelerate and reverse direction.

[7]Kritzer (1978) applied factor anaysis to the interest group ratings of the 91st and 93rd House of Representatives and found that a single factor accounted for 81.4% of the variance of the 91st House and 74.6% of the 93rd House. "When one focuses on roll calls which interest groups deem to be salient rather than using the more usual shotgun approach (e.g., Clausen, 1973, or MacRae, 1958), a clear unidimensional structure emerges in House roll-call behavior, and this structure can be interpreted as reflecting a unidimensional ideological structure underlying salient congressional action" (p. 496). Below we show that this conclusion can be extended to almost all roll-call voting.

Table 1. Unfolding Results in Three Dimensions[a]

	Dimension			Interest groups	Senators	Representatives	No. of ratings
	One	Two	Three				
1959	.7451	.8813	.8946	8	100	435	4249
1960	.6040	.8755	.8914	8	100	432	4230
1961	.9043	.9074	.9210	11	100	436	5812
1962	.8904	.9008	.9211	10	100	434	5270
1963	.9168	.9217	.9313	11	100	433	5785
1964	.9173	.9336	.9392	11	100	429	5770
1965	.9383	.9455	.9500	11	100	432	5720
1966	.8987	.9000	.9110	9	100	432	5291
1967	.9114	.9328	.9350	10	100	433	5298
1968	.8647	.8835	.8900	9	100	432	5300
1969	.7609	.8537	.8670	12	100	432	6358
1970	.8075	.8671	.8705	11	100	432	5808
1971	.7987	.8622	.8755	16	100	435	8018
1972	.7641	.8040	.8164	15	99	435	7926
1973	.7528	.8273	.8536	20	100	434	10622
1974	.6978	.8122	.8420	19	100	433	9995
1975	.7814	.8590	.8790	23	100	434	12256
1976	.7810	.8520	.8620	22	100	433	11509
1977	.7730	.8470	.8700	30	100	434	15883
1978	.7590	.8410	.8610	26	100	434	13845
1979	.8167	.8529	.8722	37	100	435	19339
1980	.7701	.8258	.8360	28	100	436	14965

[a]All entries are r^2. The number of senators and representatives fluctuates from year to year because of seat vacancies.

Figure 2.

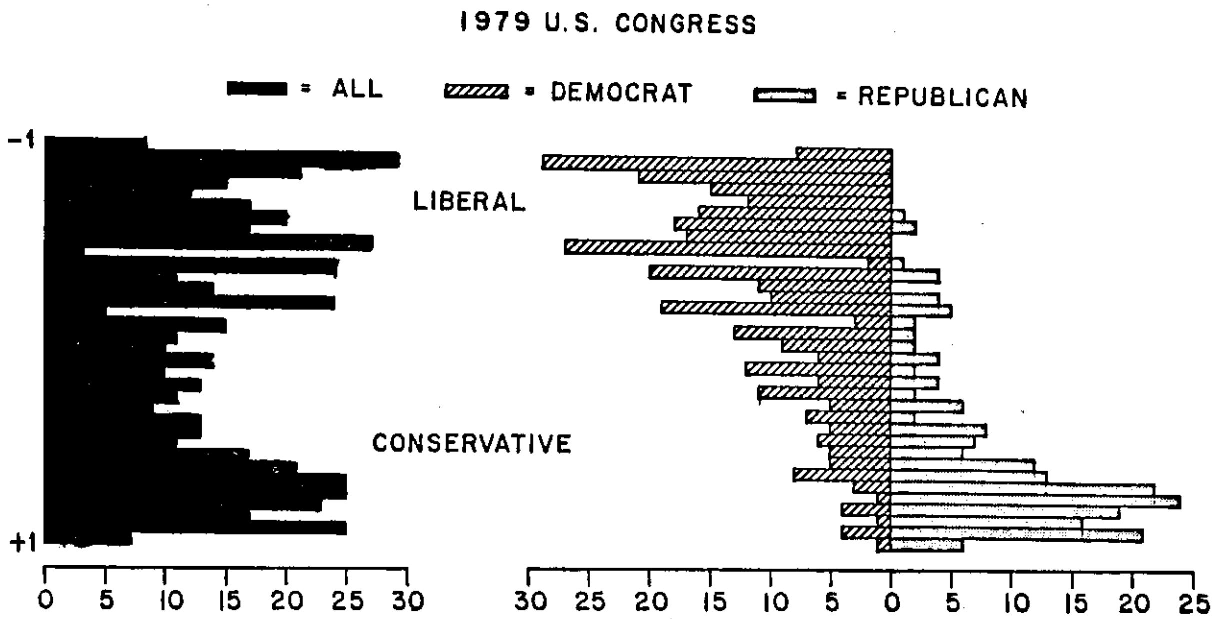


Figure 3. 1979 U.S. Congress

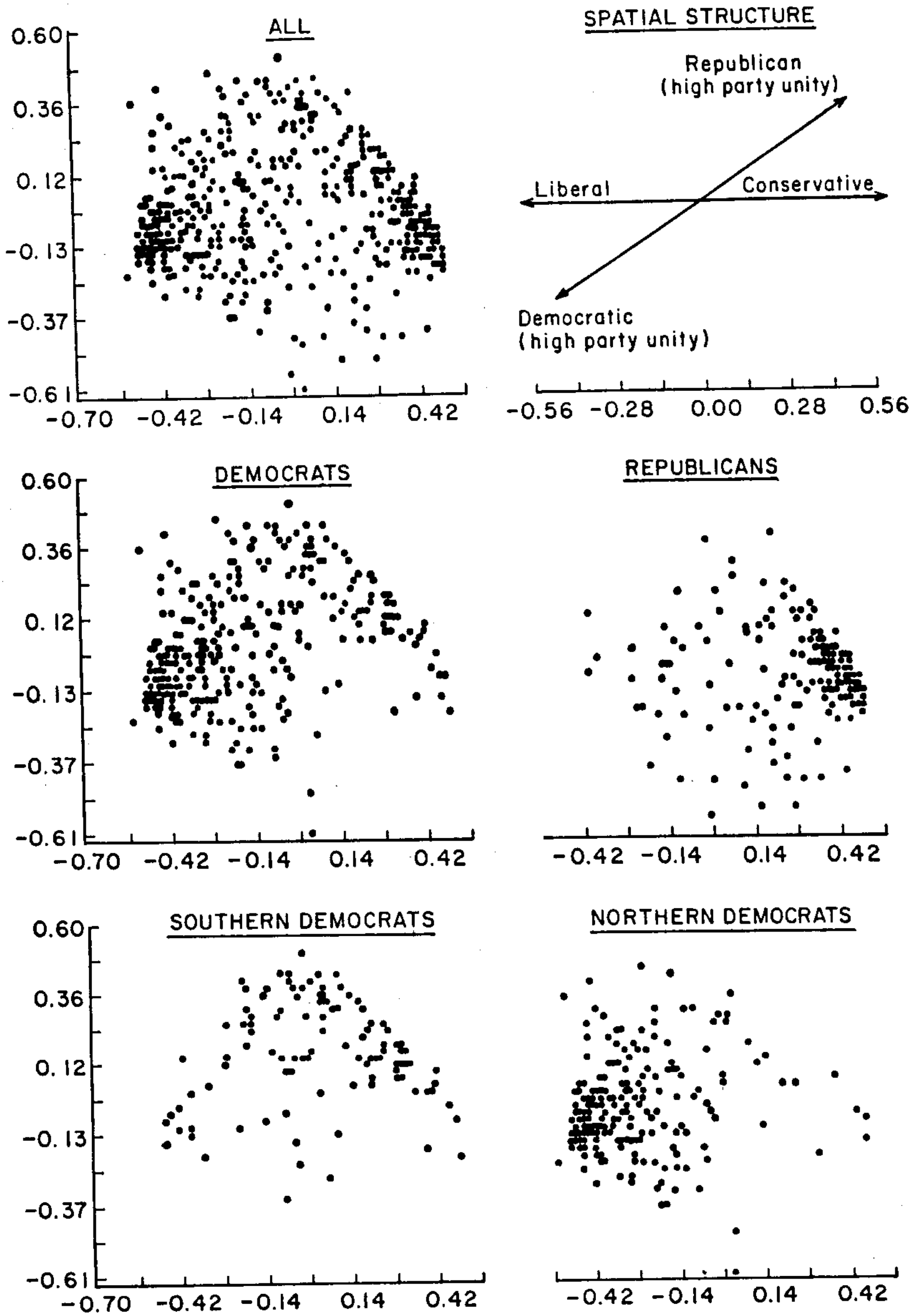


Table 2. Comparability of the Senate and House Interest Group Ratings

	House		Senate	
	1 dimension	2 dimensions	1 dimension	2 dimensions
1980	.9996[a]	.9938[b]	.9976	.9886
1979	.9994	.9938	.9984	.9898
1978	.9986	.9980	.9974	.9980
1977	.9992	.9878	.9934	.9728
1976	.9932	.9902	.9968	.9884
1975	.9988	.9934	.9926	.9827
1974	.9942	.9870	.9950	.9491
1973	.9960	.9912	.9950	.9577
1972	.9920	.9942	.9980	.9524
1971	.9876	.9972	.9966	.9940
1970	.9934	.9960	.9942	.9860
1969	.9904	.9948	.9876	.9722
1968	.9968	.9720	.8832	.8619
1967	.9988	.9972	.9393	.9029
1966	.9900	.9845	.9633	.9305
1965	.9994	.9892	.9688	.9746
1964	.9996	.9958	.9616	.8686
1963	.9998	.9882	.9962	.9446
1962	.9974	.9968	.9896	.9618
1961	.9992	.9932	.9992	.9681
1960	.8339	.9922	.9417	.9924
1959	.9266	.9928	.9458	.9930

[a] Each entry is the squared Pearson correlation between the unidimensional configurations recovered from the unfoldings of the combined ratings and the ratings of the indicated house of Congress.

[b] For two dimensions each entry is the squared Pearson correlation of the corresponding distances between each of the $p(p-1)/2$ unique pairs of legislators in the configurations.

The histogram on the left of Figure 2 shows the entire Congress; the one on the right separates the Democrats and Republicans. The figure shows a bimodal, ideological dimension. However, there are distinctions between parties: the Democratic party is much less homogeneous than the Republican party. The Republicans are concentrated at center right to far right. The bulk of the Democratic party is concentrated at center left to far left, but substantial numbers of Democrats are located at center right and far right.

In Figure 3, we indicate the approximate two-dimensional structure of the space. As can be seen from the separate plots for the Democrats and Republicans, the party dimension seems to run about 45 degrees off the liberal-conservative dimension. Party unity scores increase with movement along the party dimension as indicated in Figure 3.

To check our assumption that the ratings are comparable between houses, we unfolded the ratings for the Senate and House separately for each year of our study and then compared the resultant one- and two-dimensional coordinates for each house with those recovered from the combined unfoldings. The results are shown in Table 2 which displays the Pearson r-squares between the configurations from the separate unfoldings and the configurations from the combined Senate-House unfoldings.[8]

Table 2 strongly supports our assumption of comparability. Since 1969, the r-squares for both the House and Senate for one dimension are .99 or better. For two dimensions, they are .95 or better. The r-squares for the House tend to be slightly higher than those for the Senate, because there are four times as many Representatives as Senators so that the combined unfolding will more closely resemble the unfolding of only the House members' ratings.

Comparability clearly fails in only two instances—the Senate ratings of 1968 (r-squares of .88 and .86) and the House ratings of 1960 (r-square of .83 for one dimension). In both cases, the number of

[8] The unidimensional r-squares are simply the squared Pearson correlations between the corresponding configurations. For two-dimensional configurations, this is an inappropriate method because of differences in rotation and origin. Instead, we computed the distances between each unique pair of legislators in the corresponding configurations. The r-squares are the squared Pearson correlations between the corresponding vectors of $p(p-1)/2$ distances.

interest groups was small (9 and 8, respectively) so that bias in just two or three groups' ratings will present problems. As the number of interest groups increases, bias, if it exists, becomes much less of a problem. This can be seen in the r-squares for the Senate configurations in Table 2: they tend to be higher in recent years when there are far more interest groups issuing ratings.

Tables 1 and 2 viewed in conjunction show that, empirically, the interest group ratings are highly consistent with the spatial model we outlined in the previous section. On average, an 85 rating given by a group to a senator is the same as an 85 rating given to a representative. That this is true over long periods of time enables us to introduce the dimension of time into the spatial model. In our time series analysis below, we include the 1960 and 1968 configurations for completeness. Their inclusion does not appreciably affect our results. In our opinion, the average positions (see Figure 4) of various groups of representatives and senators in the common scaled metric are reliable, but the positions of the individual legislators in 1960 and 1968 must be regarded with suspicion because of the results shown in Table 2.

Between 1959 and 1980, 1,426 individuals served in the House and Senate.[9] We applied the model stated in equation (3) to the one- and two-dimensional configurations. To obtain accurate estimates of W and c, we included only those 873 legislators who served six or more years during the period of our study. Accordingly, our X_0 matrices were 873 by 22 and 873 by 44, respectively. The overall fit of the model and the fits for each year are shown in Table 3.

For one dimension, the overall r-square of the model stated in equation (3) is .939. The magnitude of this r-square indicates that the members of Congress are very stable in their location on the liberal-conservative dimension over time. This stability is apparent in the fits for the separate

[9]This number includes duplications—namely, those members of the House of Representatives who later served in the Senate are counted twice. See Table 4.

Table 3. Fit Statistics for Congressional Coordinates

No. of Dimensions	No. Legislators Included	% Missing	Minimum No. of Years	Overall r^2
1	873	47.1	6	.939
2	873	47.1	6	.919

Year	No. Legislators Included	One-Dimension r^2	Two-Dimensions r^2 1st	Two-Dimensions r^2 2nd
1959	368	.888	.945	.715
1960	373	.913	.926	.736
1961	426	.934	.973	.410
1962	434	.928	.962	.367
1963	491	.933	.967	.114
1964	492	.940	.967	.370
1965	479	.952	.966	.159
1966	479	.949	.961	.131
1967	512	.934	.948	.258
1968	511	.897	.929	.127
1969	511	.927	.965	.585
1970	509	.930	.960	.726
1971	511	.933	.953	.754
1972	505	.921	.954	.022
1973	501	.962	.953	.789
1974	500	.937	.954	.613
1975	507	.964	.968	.789
1976	502	.962	.966	.758
1977	427	.965	.965	.752
1978	421	.956	.950	.608
1979	351	.945	.939	.683
1980	352	.942	.935	.624
Overall[a]	873	.939	.919	

[a]For both one and two dimensions, 47.1% were missing. Legislators served a minimum of six years.

years, the lowest of which is .888 for 1959.[10] The high correlation between the adjusted yearly configurations (X_0 corrected by $\hat{W}$ and $\hat{c}$) and the estimated average or target configuration ($\hat{\xi}$) supports the arguments of Clausen (1973), Bullock (1981), and Stone (1977; cited by Kuklinski, 1979) that variations in the voting patterns in Congress arise mainly through generational replacement.

The results for the two-dimensional configurations are of lesser quality. Although the overall r-square of .919 is quite satisfactory, it does not carry the same message of stability as does the one-dimensional r-square.

As Table 1 and Figure 3 demonstrate, the second dimension does not account for much of the variance of the two-dimensional configurations. The yearly fits reflect this. The overall fit is high because the first dimension, which accounts for most of the variation in the configurations, is being estimated very well. This is not true of the second dimension. The pattern of fits for the second dimension is consistent with the unfolding results of Table 1. As we discussed earlier, a second dimension is clearly present in 1959 and 1960, is largely absent from 1961 to 1968, and then reappears from 1969 to 1980. With the exception of 1972, the fits for the second dimension follow the same pattern. Because the second dimension does not account for much of the variance in the ratings and demonstrates the instability shown in Table 3, we will not attempt to use it in our time series analysis. We will use the party dimension when we study roll calls within a year, however, because party is an important consideration in many roll call votes. The party dimension is unstable from year to year largely because the interest groups do not choose many party-line votes to construct their ratings. They choose votes on issues that override considerations of party loyalty. In spatial terms, the interest groups tend to be located near the ends of the liberal-conservative dimension. The second dimension does tend to separate the interest groups somewhat, but not anywhere near the extent that it separates the legislators (Poole, 1981).

Figure 4 shows the mean locations of all senators, representatives, and the two parties and their northern and southern wings for the 22-year period. We applied $\hat{W}$ and $\hat{c}$ to every member for each respective year, so the means shown are for everyone serving and not just those who served at least six years. With the exception of 1960, the Senate as a body is more liberal than the House. (This finding is consistent with the evidence produced by other researchers, for example, Froman (1963, 1967).) The northern Democrats are the most liberal and stable group. The mean location of the northern Democrats hardly moved at all over the 22 years. In contrast, southern Democrats shifted significantly to the right during the years of intense civil rights activity in the Johnson administration (1964-1968). After 1972, however, when civil rights became a less salient issue in the Congress, they shifted back almost to the center of the spectrum, where they had been before 1964.

The congressional Republican party is more homogenous than the congressional Democratic party. In 1959 there were only 10 southern Republicans in Congress. In 1973, this reached a peak of 45 before the Watergate losses in 1974 brought it down to 35. By 1979, southern Republicans had recovered some of their losses and held 41 House and Senate seats. As the number of southern Republicans increased, a gap opened up between northern and southern Republicans. This gap reached its peak in the early 1970s and then declined in the later 1970s. Interestingly, the gap between southern Republicans and southern Democrats was the smallest during the late 1960s, the period of civil rights activism and urban unrest. In fact, the southern Democrats and southern Republicans were closer together than either was to their respective northern counterparts. After 1975, however, the gap between southern Democrats and southern Republicans was nearly as large as that between southern and northern Democrats.

Overall, Congress drifted slightly to the left between 1959 and 1975 (interestingly, the Watergate election of 1974 produced a Congress more liberal than the Congress produced by Lyndon Johnson's 1964 landslide) and after 1976 drifted back to the right, which undoubtedly continued in 1981. The conclusion that Figure 4 points to is that the civil rights, civil disturbance, Vietnam, Watergate era of 1965-1974 was an interruption of normal liberal-conservative patterns. The 1959-1964 and the 1975-1980 periods are quite similar, whereas the 1965-1974 period is unlike either of the other two.

During the 22 years of our study, 38 current or former members of the House were elected to the Senate (see Table 4). The stability of the configurations from year to year suggests that legislators moving from the House to the Senate will

[10]Because only those members serving six or more years were included in the estimation of equation (3), this reduced the number of members included in the analysis from the early and late years. That is, to be included in the 1959 row of Table 3, a member would have had to serve six years beginning in 1959. In contrast, to be included in the 1969 column, a member could have served from 1963-1969 or 1969-1975. Finally, to be included in the 1980 column, a member would have had to serve six years ending in 1980 (the six years do not have to be consecutive).

Table 4. Transitions from the House to the Senate: 1959-1980*

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Abourezk											
Armstrong											
Bass	−0.192	−0.347	−0.567	−0.593	−0.449	−0.439	−0.612*	−0.552			
Baucus											0.196
Beall											
Brewster	−0.246	−0.503	−0.413	−0.360	−0.467*	−0.457	−0.637	−0.563	−0.740	−0.457	
Burdick	−0.650	−0.402*	−0.631	−0.696	−0.435	−0.408	−0.701	−0.467	−0.276	−0.299	−0.523
Cochran											
Cohen											
Culver							−0.559	−0.480	−0.686	−0.678	−0.828
Dole			0.873	0.828	0.829	0.842	0.736	0.738	0.703	0.681	0.585*
Dominick			0.578	0.577	0.627*	0.616	0.543	0.527	0.410	0.357	0.677
Edmondson	−0.524	−0.484	−0.629	−0.627	−0.166*	−0.148					
Edwards							−0.021	0.248	0.107	0.124	0.438
Goodell	0.517	0.699	0.587	0.562	0.633	0.653	0.609	0.534	0.370	−0.404*	−0.651
Griffin	0.588	0.602	0.524	0.422	0.520	0.596	0.399	0.201*	−0.118	−0.302	0.354
Gurney					0.930	0.845	0.788	0.805	0.848	0.941	0.990*
Hathaway							−0.645	−0.736	−0.681	−0.766	−0.723
Heinz											
Inouye	−0.590	−0.681	−0.632	−0.625	−0.564*	−0.607	−0.653	−0.625	−0.585	−0.564	−0.648
Mathias			0.151	−0.015	−0.185	−0.148	−0.064	−0.097	−0.260	−0.258	−0.437*
Matsunaga					−0.647	−0.676	−0.700	−0.745	−0.681	−0.765	−0.674
McClure									0.761	0.718	0.657
McGovern	−0.580	−0.630			−0.664*	−0.721	−0.735	−0.555	−0.763	−0.786	−0.849
Melcher											−0.353
Metcalf	−0.650	−0.625	−0.580*	−0.604	−0.576	−0.633	−0.559	−0.492	−0.764	−0.574	−0.687
Montoya	−0.598	−0.602	−0.499	−0.521	−0.355	−0.340	−0.431*	−0.511	−0.251	−0.250	−0.455
Pressler											
Pryor									0.142	−0.008	−0.061
Riegle									0.148	−0.156	−0.443
Roth									0.561	0.451	0.317
Sarbanes											
Schweiker			0.341	0.267	0.252	0.208	−0.085	−0.079	0.067	−0.222	−0.551*
Scott									0.778	0.806	0.639
Stafford			0.250	0.131	0.252	0.192	0.114	0.168	0.048	−0.262	−0.293
Tsongas											
Tunney							−0.560	−0.499	−0.576	−0.683	−0.799
Weicker											−0.155

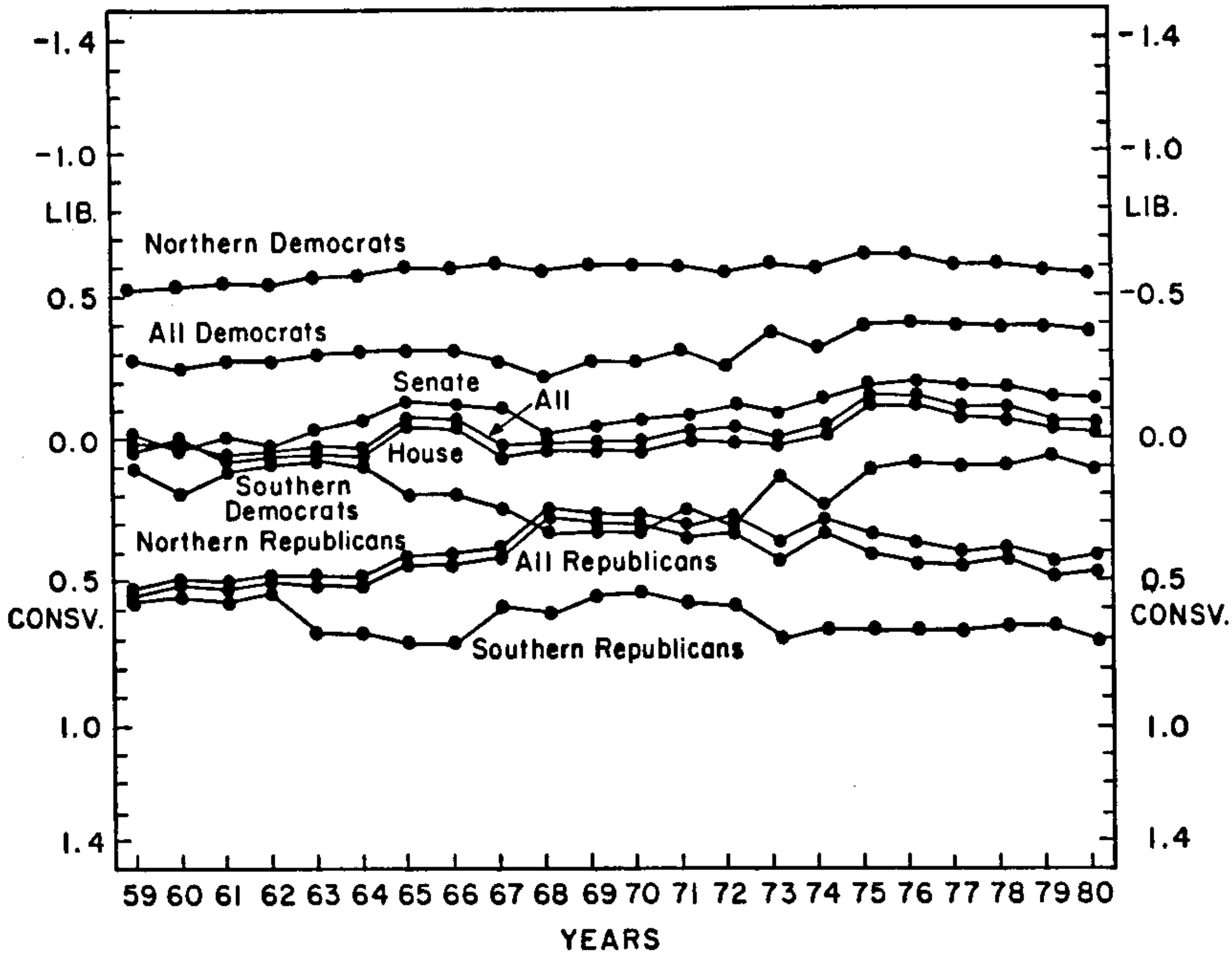
*The first year the individual was in the Senate.

TABLE 4 (continued)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Abourezk		−0.970	−0.640	−0.734*	−0.802	−0.761	−0.804	−0.891	−0.793		
Armstrong				0.799	0.716	0.702	0.856	0.807	0.789	0.804*	0.815
Bass											
Baucus						−0.632	−0.603	−0.468	−0.504	−0.712*	−0.724
Beall	0.300	0.230*	0.200	0.200	0.284	0.099	−0.033	0.131			
Brewster											
Burdick	−0.590	−0.527	−0.712	−0.596	−0.723	−0.485	−0.582	−0.364	−0.530	−0.517	−0.481
Cochran				0.720	0.643	0.565	0.471	0.701	0.727	0.466*	0.634
Cohen				−0.137	−0.242	−0.124	−0.211	−0.026	−0.179	−0.014*	−0.127
Culver	−0.815	−0.950	−0.819	−0.724	−0.677	−0.878*	−0.853	−0.927	−0.901	−0.879	−0.941
Dole	0.572	0.558	0.571	0.507	0.553	0.368	0.582	0.513	0.357	0.395	0.410
Dominick	0.612	0.624	0.535	0.593	0.691						
Edmondson											
Edwards	0.490	−0.038	0.646*								
Goodell	−0.941										
Griffin	0.437	0.248	0.223	0.631	0.443	0.542	0.645	0.609	0.394		
Gurney	0.758	0.609	0.580	0.593	0.821						
Hathaway	−0.836	−0.928	−0.714	−0.783*	−0.861	−0.738	−0.715	−0.881	−0.805		
Heinz		−0.347	−0.613	−0.287	−0.329	−0.312	−0.231	−0.232*	−0.337	−0.288	−0.212
Inouye	−0.823	−0.536	−0.615	−0.631	−0.700	−0.555	−0.470	−0.622	−0.661	−0.577	−0.459
Mathias	−0.535	−0.455	−0.480	−0.462	−0.747	−0.603	−0.512	−0.552	−0.551	−0.700	−0.788
Matsunaga	−0.830	−0.624	−0.452	−0.734	−0.770	−0.692	−0.726	−0.723*	−0.704	−0.658	−0.800
McClure	0.664	0.627	0.632	0.651*	0.930	0.974	0.765	0.802	0.660	0.846	0.784
McGovern	−0.842	−0.768	−0.807	−0.734	−0.826	−0.793	−0.804	−0.882	−0.768	−0.991	−0.881
Melcher	−0.394	−0.609	−0.580	−0.537	−0.328	−0.549	−0.464	−0.435*	−0.421	−0.382	−0.360
Metcalf	−0.813	−0.665	−0.705	−0.617	−0.760	−0.776	−0.804	−0.859			
Montoya	−0.524	−0.417	−0.382	−0.411	−0.236	−0.047	−0.141				
Pressler						−0.072	−0.063	0.357	0.129	0.061*	0.142
Pryor	−0.142	−0.588	−0.446							−0.129	−0.116
Riegle	−0.372	−0.700	−0.836	−0.745	−0.853	−0.761	−0.651	−0.835*	−0.842	−0.934	−0.968
Roth	0.403	0.378*	0.340	0.426	0.361	0.298	0.454	0.525	0.677	0.462	0.542
Sarbanes		−0.686	−0.852	−0.850	−0.887	−0.889	−0.882	−0.959*	−0.877	−0.869	−0.955
Schweiker	−0.501	−0.456	−0.629	−0.569	−0.645	−0.817	−0.732	0.184	0.226	0.351	0.404
Scott	0.719	0.764	0.742	0.936*	1.000	0.835	1.002	0.789	0.771		
Stafford	−0.285	−0.242*	−0.228	−0.299	−0.354	−0.516	−0.374	−0.276	−0.417	−0.441	−0.348
Tsongas						−0.871	−0.859	−0.940	−0.778	−0.864*	−0.880
Tunney	−0.808	−0.770*	−0.839	−0.663	−0.767	−0.542	−0.539				
Weicker	−0.197	0.132*	0.012	0.016	−0.393	−0.325	−0.311	−0.234	−0.465	−0.461	−0.685

*The first year the individual was in the Senate.

Figure 4. Change in Voting Blocs over Time



not alter their spatial position. On the other hand, the Senate is more liberal than the House. Senators represent whole states and must cater to a more diverse constituency (Froman, 1963), which suggests that legislators moving to the Senate will, if they shift at all, shift left.

Table 4 is largely consistent with this interpretation. For the most part, a legislator's first few years in the Senate are spatially very close to his or her last few years in the House. Edmondson (D Okla.) and Edwards (D La.), who shifted abruptly to the right, and Griffin (R Mich.), who shifted sharply to the left over a four-year period, are the exceptions. Other legislators, Mathias (R Md.), Riegle (D Mich.), Weicker (R Conn.), and Stafford (R Vt.), for example, shifted their positions, but over much longer periods of time.

In a class by themselves are Richard Schweiker (R Pa.) and Charles Goodell (R N.Y.). During Schweiker's eight years in the House (1961-1968) he drifted slowly from center-right to center. After his election to the Senate, Schweiker shifted to the center-left and continued to drift left until his selection as Ronald Reagan's running mate in 1976. The trip to the mountain top with Reagan had a profound effect upon Schweiker—it produced the largest single one-year shift in the 22 years of our data. By the time Schweiker retired in 1980, he was slightly to the right of where he was when he began his career in 1961. In contrast, Goodell was much more stable than Schweiker during his years in the House (1959-1967 in our data). He was appointed to the Senate by Governor Nelson Rockefeller in 1968 to serve out the remainder of Robert Kennedy's Senate term. Goodell, who had been a moderately conservative upstate New York congressman, by 1970 had become, in Spiro Agnew's view, a radical liberal. In fact, Agnew's characterization was not all that far off. In 1970 Goodell was more liberal than either Edward Kennedy or George McGovern. Goodell's three-year shift is the largest in our data.

Legislators who served in both the House and the Senate do not of course have a monopoly on long-term spatial movement. One of the most interesting examples is John Anderson (R Ill.), who ran for the presidency as an independent in 1980. Anderson appears to have gone through three phases during his 20-year career in the House. From 1961 to 1966 he was more conservative than Gerald Ford, the Republican minority leader.[11] Between 1967 and 1968, he abruptly shifted to the center of the spectrum where he remained until his presidential campaign of 1979-1980, when he abruptly shifted to center left. That Anderson, a moderate to moderate conservative for the bulk of his career, should attract so much support from liberals in 1980, is eloquent testimony to the depth of the dissatisfaction with President Carter.

In conclusion, it is clear from the discussion above that the interest group ratings are highly structured. On average, a single liberal-conservative dimension accounts for 81% of the variance of the 190,000 interest-group ratings issued from 1959 to 1980. Furthermore, the interest groups and the legislators are very stable on the liberal-conservative dimension over time. We now turn to the question of the usefulness of the one- and two-dimensional spatial configurations of legislators derived from the ratings for roll-call vote analyses.

Analysis of the Roll-Call Votes

The spatial model we described in the second section assumes that each roll-call vote has two outcome locations in the evaluative space. The interest groups and the legislators react to these policy outcomes in different ways. The interest groups are not members of Congress. They can indulge in the luxury of "voting" on only those matters of great importance to them. In spatial terms, the interest groups are free to "vote" on only those roll-calls with outcomes near them in the space; otherwise, they abstain. Legislators have no such freedom. In a real-world voting situation, a member of Congress cannot afford to indulge in the luxury of not voting or abstaining too often. Consequently, we assume that legislators vote for the outcome closest to them in the space, even though in some situations it may be a choice between two distant outcomes. Therefore, in a perfect world, there will be a point (in one dimension) or cutting line (in two dimensions) such that all legislators to the left of the point/line will vote for the "left" outcome and all members to the right of the point/line will vote for the "right" outcome.

Because this cutting point/line construct is inherent in the model of the interest group ratings (and given the success of the spatial model of the ratings), it is practically certain that the roll calls chosen by the interest groups will produce clearly defined cutting points/lines in the legislator configurations. The more interesting question is how well the roll calls not chosen by the interest groups will do. If both sets of roll calls produce equally defined cutting points/lines in the configurations, then this is good evidence that the configurations recovered from the ratings are not biased. By "biased" we mean the following. Suppose the interest groups were all on a hyperplane through the space of the legislators. They would therefore tend to select roll calls with outcomes on the hyperplane to construct their ratings, and this would result in the recovery of a distorted version of the true configuration of legislators.

To locate the cutting point/line for a roll call, we place it within the pattern of yea and nay voting such that it minimizes error relative to an ideal pattern. For example, suppose we are working with a single dimension and we observe:

YYYYY · · · YYYNYY|NNYNYNNN · · · NNNNN

Placing the cutting point as shown minimizes the error with respect to a pattern in which everyone to the left of the cutting point votes yea and everyone to the right votes nay. In this example, three errors are made. For an empirical example, consider Table 5. It displays the members of the Senate in the order of their recovery on the liberal-conservative dimension in 1972 and 1977 along with how they voted on the Jackson amendment to the SALT I treaty in 1972 and how they voted on four SALT related motions in 1977.[12]

[11]Interestingly, George Bush, who served in the House from 1967-1970, was also more conservative than Ford. In 1980, Jesse Helms (one of the most conservative members of Congress), the Moral Majority, and their allies opposed putting Bush on the ticket with President Reagan. Yet during his years in Congress, Bush's voting record was more conservative than ex-President Gerald Ford's—who almost ended up on the ticket.

[12]Jackson (D Wash.) amendment—as amended by voice votes to state that continued modernization of U.S. nuclear forces was required for a prudent nuclear posture but expressing the hope that such actions would become less necessary in the future—Request that any future permanent treaty on offensive nuclear arms "not limit the United States to levels on intercontinental strategic forces inferior to" those of the Soviet Union but be based rather on "the principle of equality"; endorse the maintenance of a vigorous research, development, and modernization program and provide that failure to negotiate a permanent treaty limiting offensive arms would "jeopardize supreme national interests" of the United States and would be grounds for abrogating the U.S.-Soviet treaty limiting defensive nuclear weapons (*1972 CQ Almanac*, p. 62-S, CQ vote

Table 5. Voting on Strategic Arms Limitations Motions

SALT I Treaty (1972) (Jackson Amendment		Related Votes (1977)	Warnke	Warnke	Helms	Church
Muskie	N	Kennedy	Y	Y	N	Y
Kennedy	N	Sarbanes	Y	Y	N	Y
Nelson	N	Metzenbaum	Y	Y	N	Y
Mondale	N	Clark	Y	Y	N	Y
Hart	N	Culver	Y	Y	N	Y
Cranston	N	Pell	Y	Y	N	Y
Hughes	N	Williams	Y	Y	N	Y
Williams	N	Abourezk	Y	Y	Y	N
Harris	N	McGovern	Y	Y	Y	Y
Tunney	N	Hathaway	Y	Y	N	Y
Eagleton	N	Case	Y	Y	N	Y
Case	N	Brooke	Y	Y	N	Y
McGovern	N	Metcalf	Y	Y		
Ribicoff	N	Riegle	Y	Y	N	Y
Hartke	N	Nelson	Y	Y	N	Y
Gravel	N	Haskell	Y	Y	N	Y
Stevenson	N	Anderson	Y	Y	N	Y
Proxmire	N	Javits	Y	Y	N	Y
Humphrey	N	Cranston	Y	Y	N	Y
Bayh	N	Ribicoff	Y	Y	N	Y
Pell	N	Bayh	Y	Y	N	Y
Javits	N	Humphrey	Y	Y	N	Y
Church	N	Muskie	Y	Y	N	Y
Symington	N	Durkin	Y	Y	N	Y
Mansfield	N	Biden	Y	Y	N	Y
Moss	N	Matsunaga	Y	Y	N	Y
Brooke	N	Leahy	Y	Y	N	Y
Burdick	N	Hart	Y	Y	N	Y
Metcalf	N	Jackson	N	Y	N	Y
Pastore	Y	Inouye	Y	Y	N	Y
Schweiker	N	Moynihan	N	Y	N	Y
Inouye	Y	Eagleton	Y	Y	N	Y
Magnuson	Y	Church	Y	Y	N	Y
Percy	Y	Magnuson	N	Y	N	Y
Mathias	N	McIntyre	Y	Y	N	Y
McIntyre	Y	Gravel	Y	Y	N	Y
Hatfield	N	Mathias	Y	Y	N	Y
Montoya	Y	Glenn	Y	Y	N	Y
Randolph	Y	Bumpers	Y	Y	N	Y
Fulbright	N	Stevenson	Y	Y	N	Y
Jackson	Y	Proxmire	Y	Y	N	Y
McGee	Y	Sasser	Y	Y	N	Y
Stafford	N	Melcher	Y	Y	N	Y
Stevens	Y	Huddleston	N	Y	N	Y
Chiles	Y	Burdick	Y	Y	N	Y
Boggs	Y	Ford	Y	Y	N	Y
Pearson	Y	Stafford	Y	Y	N	N
Anderson	Y	Percy	Y	Y	N	N
Hollings	Y	Byrd	Y	Y	N	Y
Byrd	Y	Weicker	N	N		
Bible	Y	Deconcini	Y	Y	N	Y
Bentsen	Y	Heinz	N	Y	N	N
Aiken	N	Randolph	Y	Y	N	Y
Cannon	Y	Hatfield	Y	Y	N	Y
Weicker	N	Chafee	Y	Y	N	Y
Scott	Y	Sparkman	Y	Y	N	Y
Smith	N	Packwood	N	Y	N	N
Packwood	Y	Bentsen	Y	Y	N	Y

TABLE 5 (continued)

SALT I Treaty (1972) (Jackson Amendment)		Related Votes (1977)				
			Warnke	Warnke	Helms	Church
Spong	Y	Hollings	Y	Y	N	Y
Cooper	N	Pearson	Y	Y	N	Y
Saxbe	Y	McClellan	Y	N		
Beall	Y	Stone	N	Y	N	Y
Cook	Y	Cannon	N	Y	N	Y
Griffin		Chiles	N	Y	N	Y
Long	Y	Long	Y	Y	N	Y
Taft	Y	Johnston	Y	Y	N	Y
Roth	Y	Danforth	N	N	N	N
Bellmon	Y	Schweiker	N	N	Y	N
Fong	Y	Talmadge	N	Y	N	N
Gambrell	Y	Stevens	N	Y	N	N
McClellan	Y	Morgan	Y	Y	Y	Y
Miller	Y	Baker	N	N	N	N
Sparkman	Y	Nunn	N	Y	N	Y
Young	Y	Eastland	Y	Y	N	Y
Jordan	Y	Zorinsky	N	N	Y	N
Talmadge	Y	Bellmon	N	N	N	N
Dominick	Y	Young	Y	Y	N	N
Allott	Y	Stennis	N	N	N	Y
Jordan	Y	Dole	N	N	Y	N
Dole	Y	Domenici	N	N	Y	N
Gurney	Y	Thurmond	N	N	Y	N
Baker	Y	Roth	N	Y	N	N
Allen	Y	Lugar	N	N	Y	N
Buckley	Y	Allen	N	N	Y	N
Byrd	Y	Griffin	N	N	Y	N
Edwards	Y	Schmitt	N	N	N	N
Hruska	Y	Byrd	N	N	N	N
Ervin	Y	Bartlett	N	N	Y	N
Bennett	Y	Laxalt	N	N	N	Y
Stennis	Y	Tower	N	N	N	N
Eastland	Y	Hayakawa	N	N	N	Y
Curtis	Y	Hansen	N	N	Y	N
Cotton	Y	Goldwater	N	N	N	N
Brock	Y	Wallop	N	N	Y	N
Tower	Y	Curtis	N	N	Y	N
Thurmond	Y	Scott	N	N	Y	N
Fannin	Y	Hatch	N	N	Y	N
Hansen	Y	McClure	N	N	Y	N
Goldwater	Y	Helms	N	N	Y	N
		Garn	N	N	Y	N
% Predicted	90.1	% Predicted	88.0	93.0	88.7	89.7
2 Party	65.7	2 Party	77.0	81.0	80.4	84.5
3 Party	79.8	3 Party	77.0	81.0	80.4	84.5
Pre 2 Party	.735	Pre 2 & 3	.478	.632	.423	.335
Pre 3 Party	.510					

The cutting lines shown in the table fit well; 90 of 99 senators on the Jackson amendment, 88 and 93 of 100 senators on the two Warnke votes, 86 of 97 senators on the Helms motion, and 87 of 97 senators on the Church motion are consistent with the spatial model. Viewed in isolation, these figures are quite impressive. However, as Weisberg (1978) has pointed out, simply "predicting" that a member will vote with the majority of his or her party (the two-party model) or, better yet, "predicting" that a member will vote with a majority of his or her party where the Democratic party is split into its northern liberal and southern conservative wings (the three-party model), will yield very accurate results. Weisberg found that the two-party model correctly accounted for 82.4% of House votes from 1957-1974; the three-party model correctly accounted for 84.8%. Table 5 shows that the liberal-conservative dimension outperforms both the two- and three-party models on these SALT related votes. As a basis of comparison, in Table 5 we also show lambda, the statistic recommended by Weisberg to measure "predictive" improvement. Lambda measures the proportional reduction in error of one model over another. For example, on the vote to confirm Paul Warnke as director of the Arms Control and Disarmament Agency, the liberal-conservative dimension correctly accounts for 93 of 100 senators, whereas the two- and three-party models correctly account for only 81 senators. The proportional reduction in error (PRE) is, therefore, (93 - 81)/(100 - 81) = .632, or 63.2%. All the lambda values in Table 5 are above .3, which indicates that voting on Strategic Arms Limitation—arguably the most important question of our age—is substantially ideological.[13]

#401). The vote took place on September 14, 1972. Confirmation of President Carter's nomination of Paul C. Warnke to head the U.S. Delegation to the Strategic Arms Limitation Talks (SALT) with the Soviet Union (*1977 CQ Almanac*, p. 8-S, CQ vote #41). Confirmation of President Carter's nomination of Paul C. Warnke to be Director of the Arms Control and Disarmament Agency (ACDA) (*1977 CQ Almanac*, p. 8-S, CQ vote #42). Both Warnke votes were on March 9, 1977. Helms (R N.C.) motion to table, and thus kill, the resolution that would express congressional support for President Carter's decision to adhere to the arms ceilings in the 1972 U.S.-Soviet interim agreement on strategic weapons (SALT I) after that agreement expired on October 3, 1977. Church (D Idaho) motion to table, and thus kill, the McClure (R Idaho) amendment to stipulate that the resolution would not prohibit the United States from development of any nuclear weapon system (*1977 CQ Almanac*, p. 74-D, CQ votes #513 and #514). Both votes took place on October 3, 1977.

[13]Three especially glaring errors in Table 4 are the votes of Abourezk and McGovern on the Helms and Church motions. Their votes, contrary to President Carter's position, are almost certainly due to their pique at President Carter's handling of the natural gas pricing issue. A number of key votes on natural gas (Abourezk had led a filibuster which had been shut off through questionable tactics) took place on October 1 and October 3.

Table 6 shows the percentage of votes cast in the 11 congresses in our study that are consistent with the one- and two-dimensional spatial model, the two-party model, and the three-party model. With the exception of the 88th Senate, in both Houses and all Congresses the one- and two-dimensional spatial models outperform the two- and three-party models for all roll-call votes and for all three categories of nonunanimous votes (minority not less than 5%, 20%, and 40% of the total vote cast, respectively). The three- and two-party lambdas are low in the first three Congresses, but are substantial otherwise. Overall, the party dimension only accounts for an additional 1.5% of House voting and 2.3% of Senate voting. However, on closer votes, the party dimension plays a more important role. On roll calls with at least 40% in the minority, party accounts for an additional 2.6% of House voting and 2.7% of Senate voting. Consistent with the interest-group ratings, the party dimension is strongest for the 86th Congress. The results for the 92nd through 94th Congresses are consistent with Schneider's (1979, p. 147) argument that a single liberal-conservative dimension structured congressional voting during this period.

Table 7 offers some evidence bearing on the bias question we raised above. In the 96th Congress, there is little or no difference between the set of votes chosen by the interest groups and the set not chosen in terms of the percentage of the vote consistent with the three models. This result holds even for the subset of roll calls that are chosen by five or more groups. The roll calls chosen by the interest groups from the 96th Congress are a representative sample of the total set of roll calls.

We put quotation marks around the word predict above because, in reality, none of these models is predicting anything because they are applied ex post. Suppose, however, that a random sample of legislators were polled before a roll call and they reported how they were going to vote. For true predictive purposes, the spatial model is the most parsimonious because only one parameter (the cutting point/line) is estimated from the sample, whereas two and three parameters (the majority preference of each subgrouping) are estimated for the two- and three-party models respectively.[14]

[14]Of course, if you had a true random sample, the best prediction would be the division found in the sam-

Table 6. Consistency of Roll Calls with Spatial and Party Models

Congress	Number Roll Calls	Spatial Model		Party Model		Two Party Lambda		Three Party Lambda	
		1 Dim	2 Dim	Two	Three	1 Dim	2 Dim	1 Dim	2 Dim
HOUSE									
All Votes									
86	180	84.2	88.6	80.9	84.2	.17	.40	.00	.28
87	240	87.7	89.8	84.3	85.9	.22	.35	.13	.28
88	232	88.2	89.3	85.0	86.4	.21	.29	.13	.21
89	394	89.8	90.9	84.6	87.1	.34	.41	.21	.30
90	478	88.5	89.8	83.4	86.0	.30	.39	.17	.27
91	443	87.7	89.6	82.3	85.0	.31	.41	.18	.31
92	649	86.7	88.6	80.7	83.5	.31	.41	.18	.31
93	1078	85.4	87.2	81.0	82.6	.23	.33	.16	.27
94	1273	86.4	87.7	81.3	83.3	.28	.34	.19	.26
95	1540	86.9	88.1	82.7	84.1	.24	.31	.17	.25
96	1284	86.8	88.1	82.9	84.1	.23	.31	.17	.25
Total	7791	86.9	88.4	82.3	84.2	.26	.35	.17	.27
Nonunanimous votes 5% minority									
86	168	82.1	87.2	78.3	82.1	.17	.41	.00	.28
87	225	85.0	87.6	80.9	82.8	.22	.35	.13	.28
88	219	86.1	87.4	82.3	84.0	.22	.29	.13	.21
89	288	86.7	88.1	79.7	83.0	.34	.42	.22	.30
90	411	84.9	86.6	78.2	81.7	.31	.39	.18	.27
91	317	83.7	86.1	76.1	79.9	.32	.42	.19	.31
92	482	82.7	85.2	74.9	78.5	.31	.41	.20	.31
93	850	83.7	84.3	76.5	78.5	.31	.33	.24	.27
94	1003	83.3	84.9	76.9	79.4	.28	.35	.19	.27
95	1107	82.6	84.1	76.8	78.8	.25	.31	.18	.25
96	971	83.3	85.0	78.2	79.8	.23	.31	.17	.25
Total	6041	83.6	85.2	77.4	79.8	.27	.35	.19	.27
Nonunanimous votes 20% minority									
86	138	81.4	86.8	77.0	81.4	.18	.42	.00	.29
87	154	83.7	86.9	79.2	81.6	.22	.37	.12	.29
88	155	85.0	86.4	80.6	82.7	.23	.30	.13	.21
89	230	85.7	87.3	77.7	81.6	.36	.43	.22	.31
90	270	83.3	85.3	74.9	79.5	.33	.42	.18	.28
91	208	80.1	83.2	70.3	75.8	.33	.43	.18	.30
92	369	80.3	83.4	71.0	75.8	.32	.43	.19	.31
93	613	79.9	82.0	72.1	74.9	.28	.36	.20	.28
94	758	81.3	83.1	73.6	76.9	.29	.36	.19	.27
95	813	79.8	81.6	72.7	75.4	.26	.33	.18	.25
96	746	81.3	83.2	75.5	77.5	.24	.32	.17	.25
Total	4454	80.8	83.3	74.0	77.2	.26	.36	.16	.27
Nonunanimous votes 40% minority									
86	57	79.7	85.3	74.7	79.3	.20	.42	.02	.29
87	82	84.6	87.4	81.4	83.8	.18	.33	.05	.22
88	87	86.7	88.3	83.0	84.8	.22	.31	.12	.23
89	105	87.7	89.0	78.4	83.8	.43	.49	.25	.32
90	123	84.4	87.0	76.6	81.6	.34	.44	.15	.29
91	101	78.7	82.5	68.6	75.3	.32	.44	.14	.29
92	187	79.2	82.9	70.9	76.2	.28	.41	.12	.28
93	273	77.9	81.8	71.9	75.3	.21	.35	.11	.26
94	316	80.6	82.5	71.0	77.0	.33	.40	.16	.24
95	375	79.2	81.2	71.4	75.4	.27	.34	.15	.24
96	346	80.7	82.7	74.9	77.3	.23	.31	.15	.25
Total	2052	80.8	83.3	73.5	77.7	.28	.37	.14	.25

TABLE 6 (continued)

Congress	Number Roll Calls	Spatial Model		Party Model		Two Party Lambda		Three Party Lambda	
		1 Dim	2 Dim	Two	Three	1 Dim	2 Dim	1 Dim	2 Dim
SENATE									
All votes									
86	422	84.9	89.6	80.0	83.1	.25	.48	.11	.39
87	428	84.8	87.0	79.3	82.1	.27	.37	.15	.27
88	534	82.5	86.7	77.1	83.0	.24	.42	−.03	.22
89	497	85.5	86.8	77.9	80.9	.35	.41	.24	.31
90	596	83.9	86.6	78.7	81.4	.24	.37	.13	.28
91	666	86.0	88.7	78.5	81.8	.35	.48	.23	.38
92	955	86.3	89.4	79.2	82.4	.34	.49	.22	.40
93	1138	86.1	88.1	79.1	81.3	.34	.43	.26	.36
94	1311	87.1	88.8	78.7	81.4	.39	.47	.31	.40
95	1156	85.1	86.8	77.6	79.6	.34	.41	.27	.35
96	1054	84.2	87.0	79.1	80.7	.25	.38	.19	.33
Total	8807	85.4	87.7	78.6	81.4	.32	.43	.22	.34
Nonunanimous votes 5% minority									
86	358	82.0	87.7	75.9	79.7	.25	.49	.12	.39
87	398	83.6	86.0	75.9	80.7	.27	.37	.15	.27
88	507	81.3	83.6	75.4	81.8	.24	.33	−.03	.10
89	434	83.6	85.0	74.8	78.3	.35	.43	.25	.34
90	487	80.7	83.9	74.2	77.6	.25	.38	.14	.28
91	534	82.9	86.2	73.4	77.5	.36	.48	.24	.38
92	759	83.3	87.0	74.4	78.4	.35	.48	.23	.40
93	949	83.8	86.0	75.4	78.0	.34	.43	.26	.37
94	1106	85.1	87.0	75.2	78.3	.40	.48	.31	.40
95	993	83.2	84.9	74.2	76.6	.35	.42	.28	.36
96	888	81.6	84.8	75.5	77.3	.25	.38	.19	.33
Total	7413	83.3	85.7	75.0	78.2	.33	.43	.23	.34
Nonunanimous votes 20% minority									
86	284	80.5	86.6	73.3	77.5	.27	.50	.13	.40
87	336	83.0	85.4	74.9	79.5	.29	.39	.17	.29
88	437	80.0	82.5	73.6	80.8	.24	.34	−.04	.09
89	361	82.6	84.0	72.6	76.7	.37	.42	.26	.32
90	383	78.6	82.1	70.5	74.8	.27	.38	.15	.29
91	433	81.4	85.0	70.3	75.2	.38	.50	.25	.40
92	612	81.9	86.0	71.2	76.2	.37	.51	.24	.41
93	745	82.1	84.5	72.0	75.3	.36	.45	.27	.37
94	885	83.6	85.7	72.2	76.1	.41	.49	.32	.40
95	805	81.6	83.4	71.3	74.2	.36	.42	.29	.36
96	720	79.6	83.2	72.6	74.9	.26	.39	.19	.33
Total	6001	81.5	84.2	72.1	76.1	.34	.43	.23	.34
Nonunanimous votes 40% minority									
86	123	79.5	85.0	69.5	74.6	.33	.51	.20	.41
87	147	83.5	85.3	74.0	79.8	.37	.44	.18	.27
88	146	78.6	81.7	71.1	78.4	.26	.37	.01	.15
89	140	83.8	85.3	70.1	76.5	.46	.51	.31	.37
90	155	77.3	81.1	67.7	73.4	.30	.42	.15	.29
91	201	81.2	84.9	68.1	74.4	.41	.53	.27	.41
92	285	81.6	86.3	70.5	76.3	.37	.53	.22	.42
93	295	80.2	83.0	69.9	75.0	.34	.43	.21	.32
94	344	82.2	84.2	70.4	77.1	.40	.47	.22	.31
95	303	79.5	81.5	68.1	73.2	.36	.42	.23	.31
96	331	77.4	82.2	71.3	74.5	.21	.38	.12	.30
Total	2470	80.9	83.6	70.0	75.5	.36	.45	.22	.33

Parsimony, however, is not the important difference between the models. The spatial model is based on a simple theory of voting which can incorporate the essential portions of the other two models (strength of party unity and the conservative coalition of Republicans and southern Democrats versus the northern Democrats) within its framework.[15] In our opinion, it is a straightforward model "with versimilitude to the process being studied" (Weisberg, 1978, p. 557).

The House lambdas for all votes in Table 6 are about the same magnitude as those shown by Weisberg (1978, p. 566) for the Matthews and Stimson (1975) simulation which was based on a cue-taking theory. We think the similarity of our results with those of Matthews and Stimson in terms of "prediction" stems from the finding of many researchers that legislators tend to select cue givers on the basis of similarity of policy attitudes (e.g., Kingdon, 1973, p. 76). Legislators are much more likely to share friendships with, seek advice from, and adopt the positions of fellow party members. The probability of common voting increases further if the members share similar views and are from the same state delegation. Norpoth (1976) examined the sources of party cohesion in roll-call voting and found four key elements:

> (1) representatives choose informants from the ranks of their own party groups; (2) representatives as well as informants share policy attitudes; (3) informants reach their own voting decisions on the basis of shared attitudes; and (4) representatives adopt the decisions of their informants as guides for their own behavior. (p. 1171; see also Cherryholmes & Shapiro, 1969, pp. 63-84)

In spatial terms, representatives who choose informants on the basis of shared attitudes or party are quite likely to be close to such informants in the basic space.

The spatial model will not capture other types of cues—for example, voting with the administration, voting with the committee chairman or ranking minority member, voting with the state party delegation when three-fourths of it vote together—as well as it should capture the policy-related cues. A theory of voting that combined the spatial model and the "non-spatial" cues could very well achieve "predictive" rates in excess of 90% and could satisfy the criteria laid down by Weisberg (1978) for an organizing theory of roll-call voting. A proposal along these lines has been made by Daniels (1983).

The Relationship of the Evaluative Dimensions to Various Issue Areas

Table 6 demonstrates that congressional voting in the aggregate is highly consistent with a unidimensional spatial model. However, the percentages in Table 6 are averages; they disguise differences between issue areas. For example, Table 5 suggests that voting on strategic arms limitation is highly ideological. In contrast, as we will show momentarily, voting on agricultural issues is not very consistent with the spatial model.

In order to determine what issues are most closely associated with the liberal-conservative evaluative dimension (we will turn to the party unity dimension momentarily), we sorted all the nonunanimous (minority not less than 10%) votes in the 1959-1978 period by how consistent they were with the dimension and by the five general policy categories identified by Clausen (1973). To measure the degree of fit of a roll call to the dimension, we used the majority lambda for the vote rather than the percentage predicted correctly. For example, suppose the vote is 281 to 149 and the cutting point on the dimension is placed such that 379 or 88.1% are accounted for correctly. The majority lambda or proportional reduction in error is: PRE = (379 - 281)/(430 - 281) = .658. This PRE measure allows us to disregard vote margins in our analysis. The best-fitting votes were designated as those with PRE values of .70 or higher. The results are shown in Table 8.

The votes that are most closely associated with the dimension are drawn primarily from the government management and social welfare policy areas. These two highly related policy areas can be uniquely associated with the policies developed during the New Deal realignment (cf. Clausen, 1973, p. 47; Clausen & Cheney, 1970, p. 141). On average, 69% of the best-fitting roll calls in the Senate and 72.4% of the roll calls in the House

---

ple! This overstates somewhat the case for the spatial model. The legislator configuration used for prediction would have to be estimated from the previous year's roll calls so it would not include new members. Furthermore, even though the legislator configuration is estimated from the previous year's roll calls, from the standpoint of starting the predictive experiment from scratch, it seems fairer to count the legislator locations as parameters along with the cutting points/lines. In recent years when there have been more than 500 roll calls per session, the one-dimensional spatial model would still have fewer parameters.

[15]As Figure 4 shows, southern Democrats are to the right of northern Democrats, and Republicans are to the right of the southern Democrats. The one-dimensional spatial model will therefore not capture votes on which a coalition of northern Democrats and Republicans form. For example, the civil rights votes in the late 1950s and early 1960s fit this pattern (Sinclair, 1981). However, as Figure 3 shows, the two-dimensional spatial model can capture this phenomenon to an extent.

Table 7. Nonunanimous Votes Chosen by Interest Groups for the 96th Congress

		% Cast Spatial		% Cast		Two Party Lambda		Three Party Lambda	
	N	1 Dimension	2 Dimension	Two Party	Three Party	1 Dimension	2 Dimension	1 Dimension	2 Dimension
HOUSE									
Chosen by:									
Interest groups	312	84.3	85.8	78.9	80.2	.26	.33	.21	.28
5 or more interest groups	40	84.4	85.9	78.7	79.9	.27	.34	.27	.30
Not chosen by interest groups	659	83.0	84.7	78.0	79.7	.23	.31	.16	.25
All	971	83.3	85.0	78.2	79.2	.23	.31	.17	.25
SENATE									
Chosen by:									
Interest groups	332	81.3	84.5	74.5	76.3	.27	.41	.21	.35
5 or more interest groups	28	81.3	84.3	74.9	76.3	.26	.38	.21	.34
Not chosen by interest groups	556	81.7	84.9	75.9	77.7	.24	.37	.18	.32
All	888	81.6	84.8	75.5	77.3	.25	.38	.19	.33

Table 8. Distribution of Best-fitting Votes (%)[a]

	Congress										
Policy Area	86	87	88	89	90	91	92	93	94	95	Total
Senate											
Government management	23.1	18.6	21.6	11.0	14.3	6.9	19.1	35.1	51.4	53.4	29.9
Social welfare	74.4	59.3	59.5	76.9	53.6	43.1	18.1	29.7	17.4	25.0	39.1
Agricultural policy	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Civil liberties	0.0	1.7	8.1	7.7	25.0	12.1	14.9	15.3	10.4	8.0	10.4
Foreign policy	0.0	20.3	5.4	3.3	3.6	29.3	43.6	18.0	10.4	12.5	16.3
Miscellaneous	2.6	0.0	5.4	1.1	3.6	8.6	4.3	1.8	10.4	1.1	4.3
N	39	59	37	91	28	58	94	111	144	88	749
House											
Government management	47.1	41.2	33.3	12.3	40.0	16.7	9.8	33.3	66.7	39.6	35.3
Social welfare	41.2	47.1	25.9	47.7	31.4	50.0	51.2	40.0	21.8	32.1	37.1
Agricultural policy	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Civil liberties	11.8	0.0	0.0	10.7	0.0	20.8	12.2	6.7	2.6	11.3	7.5
Foreign policy	0.0	5.9	33.3	12.3	17.1	4.2	22.0	11.1	2.6	15.1	12.2
Miscellaneous	0.0	5.9	7.4	16.9	11.4	8.3	4.9	8.9	5.1	1.9	7.7
N	17	17	27	65	35	24	41	45	78	53	402

[a]PRE > .70.

fall into the government-management and social-welfare categories. The lowest percentage in the House is 59.2% for the 88th Congress, whereas the highest is 88.5% in the 94th Congress. The comparable figures in the Senate are 37.2% for the 92nd Congress and 97.5% in the 86th. All of the House figures and nine of the ten Senate figures are above 50%. The dimension is clearly associated with the controversies surrounding government intervention.

An examination of the content of the two categories reinforces this conclusion. The content of the social welfare domain changes very little over the ten Congresses. The best-fitting votes drawn from the social welfare area in the 86th Congress involved labor relations, public housing, urban renewal, minimum wage legislation, food stamps, aid to education, unemployment compensation, social security, and medical care for the elderly. The votes in the 95th Congress concerned the minimum wage, the Department of Housing and Urban Development appropriations, labor law reform, food stamps, the funding of the Legal Services Corporation, social security, antirecession assistance, appropriations for the Comprehensive Education and Training Act, and unemployment compensation. Given this consistency of content across time, the stability of voting position registered by continuing members that we discussed earlier is not surprising.

The same cannot be said for the government management domain—it shows a dramatic shift in content. The best-fitting votes drawn from this area in the 86th Congress focused on area redevelopment, interest rates on savings bonds, the public debt ceiling, tax reform, and airport construction. By contrast, the 95th Congress was concerned with gas and oil price deregulation, the activities of the Occupational Safety and Health Administration, federal campaign spending, budget balancing, mine safety, community reinvestment, pollution control, strip mining, and general energy policy. Yet, the relative voting positions of the continuing members remained very stable. Clearly, a key source of stability in the legislative system is a tendency to classify new issues in terms of old alignments.[16]

The best-fitting foreign policy votes dealt with controversial treaties, Vietnam, the procurement of weapon systems, aid to both communist and right-wing regimes, and foreign aid under Democratic presidents. Civil liberties votes show a temporal as well as a content change. The best-fitting votes early in the study period involve anti-communism and criminal justice. By the end of the period, civil rights moves into the best-fitting category. Finally, conspicuous by their absence are agricultural policy votes. Only one vote in the House fit the liberal-conservative dimension at a PRE level of .7.

Given the results shown in Table 6, it is not surprising that the addition of the second dimension does not greatly increase the consistency of the votes in the various issue areas with the spatial model. There is, however, one interesting exception—agriculture.

Table 9 lists in the same format as Tables 7 and 8 several representative (in terms of their consistency with the spatial model) issue areas drawn from voting in the House from 1969 to 1980. As we indicated above, agricultural votes are not very consistent with the liberal-conservative dimension. However, the addition of the second dimension has a significant impact, no doubt because a coalition of midwestern Democrats, most southern Democrats, and midwestern Republicans passed much of the agricultural legislation in the 1970s. The spatial structure shown in Figure 3 would capture this to an extent. Even so, the two-dimensional spatial model does not really do much better than the three-party model.

In contrast to agriculture, food stamps are almost purely a liberal-conservative issue. About 90% of the voting is consistent with the dimension. The addition of the second dimension has almost no effect. Finally, voting on the national defense budget and on busing are typical of many other issue areas. In line with Table 6, the second dimension adds about 3% to the fits. Voting on the defense budget is more consistent with the party models than is busing, but the spatial model does very well in both issue areas.[17]

[16]Although the positions of legislators vis-à-vis each other remained relatively stable over time—which implies that new issues get redefined in terms of old alignments—we cannot tell from our technique whether or not changes in the substantive content of the liberal-conservative dimension have produced a uniform shift to the left/right by all legislators and interest groups over time. In any case, even if such a shift occurred, we think that it is of lesser significance than our finding of the power of the existing liberal-conservative alignment to absorb new issues.

[17]Our results are largely consistent with a recent Senate voting study by Smith (1981), who found that, using Clausen's categories, voting in the governmental management and social welfare areas were very ideological from the 86th Congress onward. Civil liberties voting was very ideological after the 90th Congress, and defense and foreign policy voting were moderately ideological after the 91st Congress. The policy area that was decidedly not ideological was agriculture. He concludes that "the similarity of voting alignments did increase during the period, and, as Schneider suggested, the ideological patterning of policy positions became more visible in several policy areas by the 1970s. Simply put,

Table 9. Consistency of Issue Areas with Spatial and Party Models of the House of Representatives

Congress	Number Roll Calls	Spatial Model 1 Dim	Spatial Model 2 Dim	Party Model Two	Party Model Three	Two-Party Lambda 1 Dim	Two-Party Lambda 2 Dim	Three-Party Lambda 1 Dim	Three-Party Lambda 2 Dim
Agriculture									
91	10	67.7	76.8	63.5	69.8	.11	.36	–.07	.23
92	18	72.3	80.9	74.1	78.2	–.07	.26	–.27	.12
93	34	71.3	80.7	73.2	76.6	–.07	.28	–.23	.17
94	25	75.5	78.6	72.9	76.0	.09	.21	–.02	.11
95	41	73.2	77.4	69.9	72.5	.11	.25	.02	.18
96	17	77.7	79.9	73.5	75.8	.16	.24	.08	.17
Food Stamps									
91	3	90.6	91.3	76.3	84.7	.61	.64	.39	.43
92	2	91.2	91.3	78.7	82.5	.59	.59	.50	.50
93	8	87.9	89.4	79.0	81.8	.43	.49	.34	.42
94	6	87.9	88.9	79.7	81.9	.40	.45	.33	.39
95	12	85.9	87.0	78.8	80.9	.33	.39	.26	.32
96	16	90.5	91.4	82.5	82.9	.46	.51	.44	.50
Defense Budget									
91	19	91.3	93.0	80.5	85.1	.56	.64	.42	.53
92	37	88.9	90.4	75.3	80.0	.55	.61	.45	.52
93	63	83.2	85.1	73.9	77.3	.36	.43	.26	.34
94	68	81.7	84.4	73.7	77.2	.30	.41	.20	.32
95	69	83.7	85.7	75.5	78.8	.33	.42	.23	.33
96	59	83.7	86.0	75.2	78.3	.34	.43	.25	.35
Busing–Desegregation									
91	8	89.2	91.2	69.4	78.0	.65	.71	.51	.60
92	18	81.4	83.9	66.5	75.6	.44	.52	.24	.34
93	17	81.4	84.1	65.9	74.1	.46	.53	.28	.39
94	4	79.2	82.2	65.7	71.6	.39	.48	.27	.37
95	6	82.2	83.1	65.4	73.1	.49	.51	.34	.37
96	12	85.2	86.0	72.7	75.6	.46	.49	.39	.43

Conclusion

Our empirical analysis has shown that the liberal-conservative and party evaluative dimensions used by the interest groups to construct their ratings are consistent with much of the roll-call voting in Congress. On average, the liberal-conservative dimension explains 81% of the variance of the ratings and in conjunction with a simple two-outcome spatial theory of voting, successfully accounts for 86.9% of the voting in the House and 85.4% of the voting in the Senate during the period of our study. The addition of the party dimension adds 1.5% and 2.3% respectively to these figures.

senators' policy positions relative to each other were more stable across policy areas in the 1970s, and that stability was paralleled by a greater match between those policy-positions and the standards of evaluation constructed by contemporary ideologue" (p. 794).

The method of roll-call analysis that we used in our empirical analysis has many advantages. The most important advantage is that recovering the spatial configuration of legislators from a multidimensional unfolding of a 535-by-30 matrix of ratings (535 legislators rated by 30 interest groups —e.g., 1977) is much easier than recovering a configuration from a factor analysis of a 100-by-100 or a 435-by-435 matrix of associations. Furthermore, the spatial model of the ratings results in the placement of the members of the House and Senate in a common configuration. We checked the model by separately unfolding the House and Senate ratings for each year. In only two instances were the configurations different enough to cast doubt on the assumption of comparability. Although we have not exploited it here, having the House and Senate members in the same spatial configuration makes cross-chamber comparisons of roll-call voting within and between issue domains possible.

Comparisons across time are also possible with this methodology. As we demonstrated above, the liberal-conservative dimension is very stable over time. However, if the interest groups and the legislators uniformly drifted to the left (or right) over time, this would not be uncovered by the unfolding and matrix-fitting procedures.

Our methodology has the further advantage that it does not require a researcher to make any judgments about what roll calls to include in the analysis (e.g., in the computation of the association measures for a factor analysis) and the item directions associated with roll-calls. In effect, the interest groups do it for the researcher. Because the spatial configuration of legislators is what the interest groups "see" in their evaluative space, the roll calls can be fitted to the configuration and can be compared with one another in terms of the evaluative dimensions of the interest groups. This allows a researcher to sort the roll calls not only by issue area but also by how well they are explained by the perceptual space of the interest groups. Voting on strategic arms, for example, is highly ideological.

Although our evidence suggests that the interest groups select a representative sample of roll calls to construct their ratings, the instability of the second dimension recovered from the ratings points to an inherent limitation of their usefulness in spatial analysis. The interest groups are not dispersed enough over the second dimension for it to be recovered as accurately as the first dimension. This has been a less serious problem in recent years when the number of interest groups issuing ratings has been large. Nevertheless, the estimation of the second dimension must be improved.

The "predictive" success of the spatial model is about the same as the voting model of Matthews and Stimson (1975). We think that the spatial model largely captures party and policy-related cue-taking, which suggests that a voting model that incorporated spatial and nonspatial cue-taking could account for more than 90% of Congressional voting. We hope that what we have done here will help to stimulate the development of such new voting theory.

References

Asher, B., & Weisberg, H. Voting change in Congress: Some dynamic perspective on an evolutionary process. *American Journal of Political Science,* 1978, *22,* 391-425.

Berge, M. F. Ten. Orthogonal Procrustes rotation for two or more matrices. *Psychometrika,* 1977, *42,* 267-276.

Bullock, C. Congressional voting and mobilization of a black electorate in the South. *Journal of Politics,* 1981, *43,* 662-682.

Cherryholmes, C. H., & Shapiro, M. *Representatives and roll-calls.* Indianapolis: Bobbs-Merrill, 1969.

Clausen, A. R. *How congressmen decide: A policy focus.* New York: St. Martin's Press, 1973.

Clausen, A. R., & Cheney, B. A comparative analysis of Senate-House voting on economic and welfare policy, 1953-1964. *American Political Science Review,* 1970, *64,* 138-152.

Clausen, A. R., & Van Horn, C. The congressional response to a decade of change: 1963-1972. *Journal of Politics,* 1977, *39,* 624-666.

Converse, P. The nature of belief systems in mass publics. In D. E. Apter (Ed.). *Ideology and discontent.* New York: Free Press, 1964.

Daniels, R. A multi-level, longitudinal model of congressional voting. Presented at the Annual Meeting of the American Political Science Association, Chicago, Illinois, 1983.

Froman, L. A., Jr. *The congressional process: Strategies, rules and procedures.* Boston: Little, Brown, 1967.

Froman, L. A., Jr. *Congressmen and their constituencies.* Chicago: Rand McNally, 1963.

Hoadley, F. The dimensions of congressional voting, 1971-1978: Some preliminary considerations. Presented at the Annual Meetings of the Midwest Political Science Association, Chicago, Illinois, 1980.

Kingdon, W. *Congressmen's voting decisions.* New York: Harper & Row, 1973.

Kristof, W., & Wingersky, B. Generalization of the orthogonal Procrustes rotation procedure for more than two matrices. *Proceedings of the 79th Annual Conference of the American Psychological Association,* 1971, pp. 89-90.

Kritzer, H. M. Ideology and American political elites. *Public Opinion Quarterly,* 1978, *42,* 484-502.

Kuklinski, J. Representative-constituency linkage: A review article. *Legislative Studies Quarterly,* 1979, *4,* 121-141.

Libby, O. A plea for the study of votes in Congress. *Annual Report of the American Historical Association for 1896* (2 vols.). Washington, D.C.: U.S. Government Printing Office, I, 1897, pp. 323-334.

MacRae, D., Jr. *Dimensions of congressional voting.* Berkeley, Calif.: University of California Press, 1958.

Matthews, D. R., & Stimson, J. *Yeas and nays: Normal decision-making in the U.S. House of Representatives.* New York: Van Nostrand Reinhold, 1975.

Morrison, R. J. A statistical model for legislative roll-call analysis. *Journal of Mathematical Sociology,* 1972, *2,* 235-247.

Norpoth, H. Explaining party cohesion in Congress: The case of shared policy attitudes. *American Political Science Review,* 1976, *70,* 1156-1171.

Ordeshook, P. C. The spatial theory of elections: A review and a critique. In I. Budge, I. Crewe, & D. Farlie, *Party identification and beyond.* New York: Wiley, 1976.

Poole, K. T. Dimension of interest group evaluation of the U.S. Senate, 1969-1978. *American Journal of Political Science,* 1981, *25,* 49-67.

Poole, K. T. Least squares metric, unidimensional unfolding. *Psychometrika,* 1984, *49,* 311-323.

Poole, K. T. Least squares multidimensional unfolding with applications to political data. Presented at the

Annual Meeting of the Midwest Political Science Association, Milwaukee, Wisconsin, 1982.

Poole, K. T. Recovering a basic space from a set of issue scales. Working Paper No. 44-82-83, Graduate School of Industrial Administration, Carnegie-Mellon University, 1983.

Rice, S. A. The political vote as a frequency distribution of opinion. *Journal of American Statistical Association,* 1924, *19,* 70-75.

Schneider, J. E. *Ideological coalitions in Congress.* Westport, Conn.: Greenwood Press, 1979.

Schonemann, P. H. A generalized solution of the orthogonal Procrustes problem. *Psychometrika,* 1966, *31,* 1-10.

Schonemann, P. H., & Carroll, R. M. Fitting one matrix to another under choice of a central dilation and a rigid motion. *Psychometrika,* 1970, *35,* 245-256.

Sinclair, B. Agenda and alignment change: The House of Representatives, 1925-1978. In L. C. Dodd & B. I. Oppenheimer (Eds.), *Congress reconsidered* (2nd ed.). Washington, D.C.: CQ Press, 1981.

Smith, S. The consistency and ideological structure of U.S. Senate voting alignments, 1957-1976. *American Journal of Political Science,* 1981, *25,* 780-795.

Stone, W. J. A panel analysis of representation in Congress: A preliminary report. Presented at the Annual Meeting of the American Political Science Association, 1977.

Weisberg, H. F. Dimensional analysis of legislative roll-calls. Unpublished doctoral dissertation, the University of Michigan, Ann Arbor, Michigan, 1968.

Weisberg, H. F. Evaluating theories of congressional roll-call voting. *American Journal of Political Science,* 1978, *22,* 554-578.