The geometric or spatial representation of political objects has been widely utilized by political analysts. Such structural representation of data is brought about by assuming that the relationships among political objects are in some way related to aspects of geometry. For example, the similarity between two political phenomena is often represented by the distance between two points or the angle between two vectors. Prior to World War II psychometricians laid the foundation for the spatial analysis of data with their research on the construction of attitude scales. As psychometricians developed new theories about the structure underlying data and new techniques to analyze such data, the spatial analysis of political phenomena gained wider acceptance among political scientists.

While psychometricians laid much of the foundation for the spatial analysis of political phenomena, two other academic traditions have had a distinct influence: the theoretic spatial tradition and the empirical spatial. The theoreitcal tradition, which was originally developed out of theories on the optimum location of markets, can be traced back to the work of Hotteling.[1] Hotteling indicated how a uniform distribution of voters along a unidimensional continuum implied the ideological convergence of two political parties. Downs extended Hotteling's model to include non-uniform distributions, multi-party systems, and proportional voting systems.[2] Other work in this tradition include Garvey's analysis of elastic demands; Tullock, Davis and Hinnick's extension to the multi-dimensional case; and a series of pieces by Davis, Hinnich and Ordershook.[3]

The empirical approach is a relatively recent development.

It was not until 1966 that Converse used individual level data to spatially represent a set of political parties.[4] Weisberg and Rusk used SRC thermometer scales to spatially represent the similarity among presidential candidates.[5] Daalder and Rusk represented both parties and legislators in the Dutch political system.[6] Most recently, Aldrich and McKelvey utilized SRC data to analyze the relationship between issues and electoral behavior in spatial terms.[7]

Falling directly into none of these three traditions but relevant to all three is Stoke's critique of formal spatial theory.[8] The basis of Stoke's criticisms revolves around the rigidity of most spatial analyses. In particular he criticizes the axioms of uni-dimensionality, fixed structure, ordered dimensions, and common references. To date most of Stoke's concerns have not been tested empirically. Much of the failure to test these axioms involves the lack of appropriate data.

Rather than confine this discussion to the criticisms suggested by Stokes it is possible to view the difficulties in traditional spatial analyses of political behavior in terms of two fundamental problems: the use of aggregate versus disaggregate data; and the use of internal versus external analysis of preference data. The choice of internal versus external analysis of preference data involves the trading off of additional data collection against the additional information provided by similarities data. While the external analysis of preference data requires additional data collection, it is clearly preferable. The analysis of preference data alone is likely to confuse differences in perception with differences in the evaluation process. External analysis allows

the investigator to gather information on the salience of perceptual dimensions as the analysis proceeds from the perceptual space to the evaluative space.

While most spatial analyses are undertaken on the aggregate level, there are numerous difficulties in assuming that everyone is evaluating political phenomena in a like manner. Recent developments in psychometrics can allow the researcher to examine individual differences in the evaluation process.[9] It is now possible to examine empirically if individuals respond in terms of negative or positive ideal point; if dimensions are used differentially in the evaluation process; and if individuals are even responding in terms of the same dimensions. While some aggregation is likely to be used, individual difference scaling makes it possible to correlate individual or subgroup differences in the evaluation process with differences in other characteristics such as social class, race, and personality traits. Moreover, if individual difference scaling of preference data is used in combination with individual difference scaling of similarities data, differences in preferences would not be confounded with differences in perception because the respondents would already be in subgroups shown to be homogenous in perception.

Both in political science and in other disciplines there is a vast literature indicating that there is perceptual distortion on the part of individuals' views of the world. It is also likely that all individuals do <u>not</u> evaluate the political world in terms of the same criteria. The literature in political science which utilizes spatial analysis has not attempted such an individual approach to the study of individual choice. At the same time, an understanding

of individual choice behavior requires an understanding of systematic variations in the evaluation process.

Election studies have used a variety of question formats to aid in the study of presidential elections. Recent studies have relied upon 7-point opinion and perception scales and thermometer scales. While these scales have value, other measures are necessary to address the problems discussed above. The problems in traditional measures are particularily apparent in that they restrict the analysts to internal analysis of candidate preferences. Thermometer scales do not allow one, therefore, to distinguish between differences in perception from differences in the evaluation process.

I would suggest, therefore, that thermometer scales be replaced by a measure of candidate similarity and a measure of preferences. Depending upon time constraints and the results of pre-testing, preference data could be obtained through a direct ranking of presidential candidates or through a series of paired comparison questions. For a number of reasons I would opt for the paired comparison questions of the following format:

> I would like to know your preferences among presidential candidates in a series of hypothetical presidential races. In each case I will name two candidates and I would like you to state which you would prefer to be president.

The acceptable response categories for each of the questions would be candidate_____, candidate_____, or indifferent. The paired comparison questions could then be used in subsequent analysis to obtain a complete rank ordering of presidential candidates. I do not think time or fatique would be a serious factor in that with 12 candidates only 64 comparisons need to be made. I have personally tested this procedure with students and encountered little difficulty.

Preference discrimination is also likely to be more accurate with paired comparisons than with the mere ranking procedure. My own experience with strict ranking procedures versus paired comparisons has indicated that errors in the ranking procedure are most likely to occur in the middle of the scale and that paired comparisons allowed me to ascertain these errors. If paired comparisons are determined in pre-testing to be problematic, I would still prefer a strict ranking procedure in lieu of the thermometer scales.

The collection of direct similarities data among the candidates could be handled in a number of different ways. To me it appears that the most efficient manner to collect a similarities data base would be to provide each respondent with a set of direct judgments of similarity by means of a n-dimensional rank order. In this procedure each of the n candidates serves in turn as a reference item. The remaining n-1 candidates are then ranked in terms of increasing similarity to the reference item. The format for such a series of questions would be as follows:

> Here is a list of the major candidates for president of the U.S. I will select a candidate, please select, from those remaining, the candidate that you think is the most similar, in a general way, to the candidate that I name. (After the respondent has answered) Which of the candidates that remain is the most similar to the candidate that I named. (continue this process untill no candidates are left).

A complete rank ordering can be obtained for these similarity measures. Of course, a respondent may not be able to continue after eliminating a few candidates in which case these would all receive the same ranking of similarity. Such a task would yield a conditional proximity matrix that can be scaled immediately or processed into an nXn similarity matrix. An alternate procedure would be to ask a series of n(n-1)/2 tetradic similarity comparisons

for all candidates. No matter what direct similarity procedure is adopted, the collection of this type of data is not especially costly considering the richness of the data collected. Not only would such data provide for individual measures of similarity, but it would also allow the researcher to determine the number of intransitivities in the judgement of similarity.

The richness of the data suggested by the formats discussed above would seem to be well worth their replacement for the thermometer scales. The similarities data could be used to examine intransitivities in the judgement of similarities and individual differences in the perception of similarity. In co-ordination with the present 7-point perception scales, candidate similarities data can lead to a greater understanding of the process of perception and how this affects candidate selection. It may be found that much of the variation among individuals and groups in their evaluation of candidates may actually be the result of inter-individual or inter-group differences in perception.

An understanding of individual or group differences in the evaluation process is dependent upon the collection of appropriate data. While polynomial factor analysis could be used to analyze such individual differences in utility functions, the more widely developed programs to ascertain such differences rely upon external analysis. For reasons already stated, external analysis also provides greater conceptual clarity in the determination of individual differences. It is only when individual differences in the evaluation process are determined and when the reasons for such differences are explained that the spatial analysis of electoral behavior can continue to expand.

The comments in this paper have been necessarily brief. At the same time, it should be evident that the collection of data relating to preferential choice needs to be undertaken with a greater awareness of the various uses to which the data will be applied. Thermometer scales are useful, but to a much lesser extent than the data collection formats suggested in this paper. While preference data and similarities data can generally be used in place of thermometer scales, thermometer scales cannot generally be used in place of similarities and preference data. Similarities and preference data should provide the scholar with rich data to explore the questions of dimensionality, perceptual distortion, intransitivities, and other individual differences in the evalution process.

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