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Portland as a Divided City: Geographical Voting Patterns on Ballot Measures in the November 1990 Elections

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A significant and challenging topic for contemporary geography is an understanding of how the social construction of space both reflects social forces and at the same time structures those forces. This thesis is a case study of how political and social attitudes, measured as an outcome of votes for different issues, reflect the

social organization of space in Multnomah County, Oregon. It employs an areal-structural (ecological) approach. Using eleven different issues voted upon in the general elections of November, 1990, it analyzes relationships between ballot items and socioeconomic characteristics of the electorate for small geographic areas in the county. The 1990 election was selected to permit a minimum possible temporal gap in the comparative analysis data with returns from the 1990 census of population.

Using a technique from the field of Geographic Information Systems (GIS), "block group" census divisions were "overlayed" with voting precinct boundaries. This permitted identification of clusters or proportions of block groups falling within each precinct. Factor analysis, correlation analysis, and cluster analysis were used to identify relationships among the measures themselves, to establish associations between the measures and socioeconomic data from the census, and to characterize spatial patterns of voting.

The following conclusions emerge:

(1) Factor analysis confirms that voting patterns for the eleven issues can be aggregated into two basic trends: "westside vs. eastside" and "inner city vs. periphery".

(2) Cluster analysis shows that neighboring precincts have common voting patterns that create distinctive geographic regions. A new GIS method was developed to permit quantification of the geographic component of cluster analysis.

(3) Correlation analysis of census and electoral data at the precinct level indicates high correlations of voting patterns with two socioeconomic dimensions: status (education, income, occupation) and position in the life cycle (age, marital

status, family size). Such analysis was permitted by new GIS capabilities that allow the use of less aggregated block group data.

(4) Cluster analysis of residuals shows a significant geographic patterning that suggests the existence of a "neighborhood effect" in Multnomah County, although confirmation requires further analysis.

PORTLAND AS A DIVIDED CITY: GEOGRAPHICAL VOTING PATTERNS ON BALLOT MEASURES IN THE NOVEMBER 1990 ELECTIONS

by

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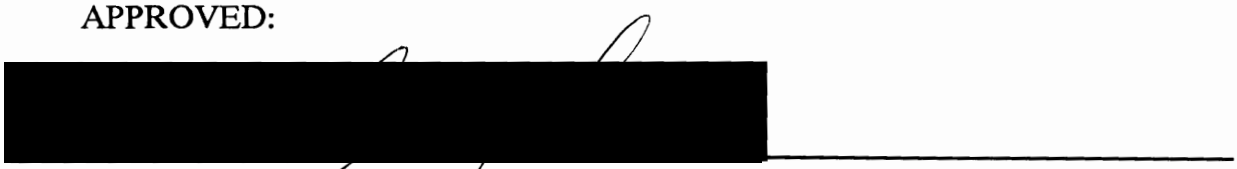

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CHAPTER I

THEORETICAL BACKGROUND

INTRODUCTION

> The locality can be examined as a realm in which political and social life has its own trajectory....All events, however large in a global sense, are ultimately transformed into a local issue....In turn, the locality determines the options for individuals to create collectives, to exert political pressure, and to recreate themselves, both individually and as groups (Kirby, 1989, p. 216).

Understanding how the social construction of space both reflects societal forces and at the same time structures those forces is important and challenging to contemporary geography. Nowhere is this more apparent than in the construction of political attitudes. Voting behavior historically has been known for its strong spatial patterning, which usually correlates with dominant social and economic variables. However the geography of voting is not the simple expression of social and economic characteristics. Geographic relations in cities can well reflect significant underlying social differences within society, even as they shape and reproduce those relationships (Hodge and Staeheli, 1992).

Studies at the urban scale have been a major growth area in political geography, rivaling electoral geography as the spearhead of the sub-discipline's

resurgence.

In my thesis, I attempt to show the extent to which political and social attitudes, measured as an outcome of votes for different issues, reflect the spatial organization of Multnomah County social space. More specifically, the purpose has been to understand the relationships between ballot items and socioeconomic characteristics of the electorate. It also shows the spatial distribution and the distribution within the social space of voting patterns in Multnomah County for the eleven different issues voted upon in the general elections in November, 1990, using an areal-structural approach.

The focus of this thesis is predominantly empirical. This does not mean that the thesis is devoid of theory. Chapter I is devoted to a theoretical discussion. Subsequently, the body of the study is directed towards illustrating and exemplifying some of the methods used in electoral geography. It is a case-study dealing with contextual and spatial influences on voting behavior based particularly upon aggregate/quantitative research methods (Chapter II).

The areal basis for the case-study is Multnomah County and the city of Portland, Oregon. The data are the results of votes in eleven issues during the general elections of November, 1990. Recent developments in Geographical Information Systems (GIS) make it possible to use more geographically detailed analysis of voting behavior by precincts and to compare the outcome of the votes with data of the 1990 Census by census block groups. Previous researchers were forced to use less detailed analysis – usually full census tracts with more aggregated data.

The study links census data to the results of the votes for the eleven issues that were on the ballot in November, 1990.

The analysis itself can be divided into the following parts:

1) interrelationships between the outcome of votes for the eleven measures;

2) geographical distribution of these votes in Multnomah County;

3) factor analysis of votes, which helps to identify recurring commonalities in geographical voting patterns;

4) cluster analysis of votes, which helps to define geographical areas in Multnomah County with the recurring voting patterns;

5) an experimental method for quantification of the geographical clustering;

6) census data recalculated by precincts, using GIS capabilities;

7) links between census and voting data established through correlation analysis which find socioeconomic and life-style variables with the correlation coefficients;

8) calculations and further cluster analysis of residuals between voting outcomes and socioeconomic data in an attempt to estimate or at least to find evidence of the "neighborhood effect"; and, finally,

9) comparison of existing neighborhood boundaries with clusters of votes, as well as with clusters of residuals between votes and census data, in an attempt to determine possible relationships between existing neighborhoods and voting behavior of the population of Portland.

However, the results of the last test appeared to be inconclusive showing the

weak side of the suggested model.

ELECTORAL GEOGRAPHY AS A SPECIFIC PART OF POLITICAL GEOGRAPHY

Political geography has been defined as "the science of political areas" (Hartshorne, 1935, p. 804), "the study of geographical area and political process" (Ackerman, et al., 1965, p. 32), "the spatial analysis of political phenomena" (Kasperson and Minghi, 1969, p. xi), a set of "locational approaches to power and conflict" (Cox, Reynolds and Rokkan, 1974), and simply "political studies from spatial perspectives" (Burnett and Taylor, 1981).

Since the classic study by Krebheil (1916), the spatial analysis of voting has been the dominant focus of behavioral research in political geography. During the post-war period, when general interest in political geography tended to stagnate or decline, the study of electoral geography has expanded greatly (Muir, 1974).

Long recognized as a subfield of political geography, electoral geography has, in the views of some geographers, little in common either theoretically or methodologically with the rest of the field (Reynolds, Knight, 1989). To some researchers, electoral geography is an integral part of the discipline; to others it seems to be a discipline in its own right; and still others would assert that electoral geography is the very core and substance of political geography (Cox, 1968a). It has also been suggested that electoral geography belongs more to the realm of sociology

than political geography (Crone, 1967).

Electoral geography, or the systematic spatial analysis of elections, has a long intellectual history. The mapping of voting statistics has provided important insights into the operation of modern politics (Shelley, Johnston, Taylor, 1990). The study of electoral results has long been prominent in political geography, where attention has been focused on such issues as geographic reasons that prompt a government to select a given electoral method or electoral boundaries, geographic factors that contribute to electoral patterns, and reasons why governments seek to change electoral procedures (Prescott, 1969). This kind of research, which is descriptive and largely ideographic, has dominated the geographer's concern with elections until recently.

Quantitative electoral geography was a major growth area in political geography in the 1970s. It can justifiably claim to have made an important contribution to the modern resurgence of the subdiscipline. Certainly, one of the important reasons underlying the growth of interest in electoral geography concerns the ready availability of statistical electoral data. Election statistics provide material for a variety of analyses, and among studies particularly significant to political geography are those which focus on direct spatial causes and implications of electoral behavior. By the early 1980s, considerable progress had been made concerning relationships between the spatial distribution of voters and the spatial organization of the electorate (Morrill, 1981; O'Loughlin, 1982; and O'Loughlin and Taylor, 1982). Unlike other growth areas of the recent past, electoral geography has gone from

strength to strength as new techniques and methodologies have been applied to old problems (Taylor, 1985).

Recently, there has developed interest in analysis of voting patterns themselves, rather than the systems through which votes are cast. This interest in voting behavior has taken two forms: the areal-structural (or ecological) approach and the behavioral (or process-oriented) approach (McPhail, 1974).

The areal-structural approach in electoral geography

In the more traditional areal-structural approach, electoral geographers explained voting patterns according to a simple plan (Prescott, 1972). They made the basic assumption that people voted according to what they perceive to be their best interests, and these perceptions and choices were related to the sociological, economic, or ethnic characteristics of electorates. Geographers then explored characteristics of voters that might give clues to the nature of their self-interest. Areal variations in social and economic class, religion, nationality, and race were among prime factors considered. Using these methods, political geographers explained the foundations of voting patterns for whole countries or large regions, and sometimes for even smaller spatial units, such as electoral and census divisions. In addition they claimed to be able to predict how patterns would change as the franchise altered or as migration occurred. However, such an approach reveals nothing about factors that motivate an individual vote, although it is usually possible, with care, to draw some general inferences (Walmsley and Lewis, 1984).

The behavioral approach in electoral geography

The behavioral approach was suggested by a new school of electoral geographers represented by Cox (1968b, 1969), and Archer and Reynolds (1969). They consider the ecological approach to have two main defects. First, the correlation of aggregate data such as votes and economic status does not allow any difference or prediction to be made about individual behavior. Second, they called this method to be not distinctively geographical. Such perceived defects led these geographers, and others, to recommend an approach that focuses on spatial processes, such as contagion, or contextual influences. The behavioral approach looks at how individuals come to acquire and evaluate political information. Particular attention is paid to the tendency for political information to circulate within formal and informal social groups. These studies frequently use survey data and emphasize the process underlying a voting decision to the point where electoral outcome of those decisions is virtually ignored (Walmsley and Lewis, 1984). Usually, survey methods are preferable when examining the contextual effect. However, a few objections to their use persist. First, because of the prohibitive cost and time involved in such surveys, voters sampled are necessarily from a local population. Second, there is undoubtedly some contextual influence present in survey data (O'Loughlin, 1981; Taylor and Johnston, 1979). Prescott (1972) has argued that geographers have not wished to make conclusions about individual behavior. They have been much more concerned with aggregate behavior in discrete regions.

The analysis of areal-structural voting data is, and will continue to be, a highly useful dimension of electoral research. Electoral studies distinguish the general distribution of support within a study area. Such studies are rich in historical perspective. Since this approach focuses upon constituencies, results have immediate relevance to the distribution of other types of political phenomena and to the functioning of the political system (Kasperson, 1969).

The traditional hypothesis regarding voting behavior is that individuals cast their ballots in order to maximize their self-interest. On many local referenda this ought to be evident from a cost-benefit analysis, calculating the economic return voters will get if they vote for a certain proposal that, if carried, will mean greater expenditure by them in property taxes (Taylor and Johnston, 1979). In analyses of a large number of referenda, Wilson and Banfield (1964) found that only part of this self-interest hypothesis was valid: renters were indeed more generally in favor of spending referenda than were homeowners, but a greater percentage of high-income homeowners were likely to vote 'yes' than were their middle-income counterparts. This unexpected pattern, Wilson and Banfield pointed out, could be the result of the low marginal utility of dollars to high-income people, but the latter did not vote for spending on all issues. Their analysis showed that it was the upper-income groups who were most likely to vote for certain spending programs because these were in the public interest, even if relatively expensive to them personally.

One of the important theories in voting behavior is so-called "public choice" theory, which has been developed by political scientists. Public choice theory

concerns such matters as voting behavior, representation, party politics, and bureaucratic decision-making. The basic behavioral postulate employed is that political man is an 'egoistic, rational, utility maximizer' (Mueller, 1979). An essential aspect of the appeal of the public choice framework is that it offers an ingredient essential to the systematic investigation of the relationship between political processes and the geographical landscape. Empirical patterns derived from application of public choice theory merit attention. They are relevant in two ways. First, there is the possibility of empirically testing propositions involving the "rational man" hypothesis of the public choice paradigm within a geographical context. Second, there is the possibility of using public choice constructs to illuminate existing observations regarding political-geographical patterns (Archer, 1981). Urban scale research intended to test public choice precepts in a geographical context was done by Archer and Reynolds (1976). They examined a bond referendum to test the rational voter hypothesis and found considerable empirical support. From a geographical point of view, their findings indicated that voter self-interest can be a statistically viable hypothesis in interpreting geographical patterns of electoral behavior. From a public choice standpoint, consideration of the setting, which involved explicit publicity about the geographical pattern of expected benefit incidence, eliminated ambiguities often present in empirical test of the rational voter model.

THE CONCEPT OF NEIGHBORHOOD EFFECT

Political socialization theory has been one of the major growth areas in political science. It has come to be seen as a key process promoting stability of a political system. However, attempts to develop a universal theory of political socialization have been unsuccessful (Renshon, 1977). Political socialization does not consist of universal processes but involves particular processes operating in concrete social situations. It is the experiences of individuals within their specific localities which provide the context and raw material for socialization. For some geographers this aspect of electoral geography represents their unique contribution to voting studies, since it involves particular spatial influences on voting distinct from socioeconomic explanations offered by political scientists and political sociologists (Taylor, 1985, 1989).

Working in the context of the studies of electoral cleavages, students of spatial variations in support for various political parties (as far as these studies were done mostly for party-based elections), using spatially aggregated (often called ecological) data, expect to identify correlations between aspects of the socioeconomic characteristics of an area's population and the level of support for particular parties. Such correlations have almost invariably been found (Johnston, Forrest, 1985). This suggests that the geography of voting is basically a function of the economic and social geography of a territory. However, these studies show something more: that estimating the number of votes for a party in an area requires more than merely

summing the number of votes in each socioeconomic category multiplied by the probabilities associated with the likelihood of their voting for that party. In general, the degree of support for a party is usually greater than predicted where its electoral base is strong, and less than predicted where that base is weak (Miller, 1977).

The implication of this finding, which can be verified by a study of regression coefficients associated with the correlations, is that there are spatial variations in the propensity of members of a particular group to support a certain party.

Such spatial variations in the propensity to support a particular party are examples of a general phenomenon widely observed in many areas of social behavior, known as the "structural effect". According to this concept, people are influenced in their behavior not only by their 'objective situation' within society but also by the social milieu in which they interact. The greater the difference between the norms of a person's social group and those of his or her local milieu, the greater the likelihood that the person will abandon the former and adopt the latter, according to the theory underlying the concept of structural effect (Johnston, Forrest, 1985).

The main source of the hypothesized neighborhood effect in the spatial science literature was a review by Cox (1969) on "The Voting Decision in a Spatial Context". He identified the spatial clustering of voters for particular parties or candidates and suggested, following Hagerstrand's (1967) classic work on diffusion, that such spatial regularities convey a strong suggestion of spatial contagion. From this he assumed the existence of such contagion and presented his work as providing a valid account of it. He portrayed individual voting behavior as influenced by the information and

cues dominant in the voter's area of residence, and he suggested that this could be accounted for by relating the voting decision of individuals at their location in an information-flow network (Johnston, 1986).

The neighborhood effect is the most studied geographical influence in voting, especially party voting. The neighborhood effect postulates the following process: for any individual in an election campaign there are two sources of information: the general information from the mass media available to everybody and the particular information derived from local contacts. The latter will be biased to the extent that the individual lives in a partisan area. Hence, general information will go through a partisan filter in the voting decision-making process. The result will be that all classes living in working-class areas will be more likely to vote for the 'natural' party of the area and all classes living in middle-class areas will be more likely to vote for the 'natural party' of that area (Taylor, 1989).

However, debates concerning the neighborhood effect go on unabated. In one exchange, Johnston (1987) and McAllister (1987) produced contrary findings for recent British elections: Johnston provided evidence for locational influences on party voting levels; McAllister, using a different type of analysis, showed that location variables are not required to explain party voting variations. This debate can be portrayed as an inter-disciplinary dispute, with geographers developing models where location is important (for example, Johnston) and political scientists preferring to concentrate on political variables that are nation-wide in their effects (McAllister,).

The problem with the neighborhood effect has always been that it is difficult

to measure. One approach was to treat the neighborhood effect as a residual after socioeconomic variables had been accounted for. This approach was adopted by O'Loughlin (1981) in a comprehensive and rigorous statistical evaluation of the neighborhood effect. A wide range of socioeconomic variables were regressed against voting returns in each city, and residuals from the analysis were mapped. An autocorrelation analysis of these residuals showed very significant 'clustering' in all cases. This indicates that the variation in voting not explained by the socioeconomic variables is not spatially random. From this it is inferred that some form of neighborhood effect is operating in addition to the socioeconomic determinants of voting.

Johnston (1979) has devised another method of inferring neighborhood effects. If a national voter transition matrix is applied separately to each individual constituency's initial election results, an estimate of a new voting pattern is produced which assumes every constituency changes in exactly the same way as the country as a whole. This predicted voting pattern can be compared to the actual voting pattern in a second election. Differences between the actual and predicted are direct measures of how each constituency differs from the national trend. As such, these differences can be used to evaluate the neighborhood effect.

VOTING ON PROPOSITIONS (REFERENDA)

Among the most interesting of all elections to geographers are those involving

initiatives and referenda. American state constitutions and city charters often contain provisions by which legislators or the general public can place specific issues on election ballots for voter approval. During the Progressive Era of the twentieth century many states and municipalities enacted statutory or constitutional provisions permitting the use of initiatives, referenda, and recall of elected officials. An initiative is an issue placed on the ballot by petition from the general public. A referendum is one placed on the election ballot by an elected legislative body (Archer, Shelley, 1986).

However, research on voting in referenda has had a rather episodic history, with two identifiable cycles of intense interest (Sharp, 1988). One was a burst of analytical activity in the early 1960s out of which the 'alienated voter' model of local referendum voting emerged (Horton and Thompson, 1962; Pinard, 1963; McDill, Ridley, 1962; Stone, 1965). This model, together with Banfield and Wilson's (1963) 'ethos' theory analysis of social-class differences in local voting, dominated discussions of local referendum voting in the 1960s. In the 1970s attention was given to school-finance referenda (Alexander and Bass, 1974; Giles et al.,1976; Hall and Piele, 1976) - an interest prompted by the 'crisis' of increased taxpayer rejection of school-financing issues nationwide (Boss, 1976).

Cataldo and Holm (1983) identify the following five explanations of local voting:

(1) a 'rational self-interest' explanation positing that individuals vote consistent with their assessment of economic gains and losses accruing to them

from a proposal;

(2) a 'socioeconomic status' explanation - essentially that portion of the Banfield and Wilson (1963) ethos theory that stipulates a greater propensity for upper-status individuals (or areas) to support local expenditure proposals;

(3) a 'political attitudes' explanation, positing that general attitudes toward government, as well as more specific attitudes about political issues and institutions, can account for patterns of voting;

(4) a 'taxpayer revolt' explanation that links local voting decisions to broader perceptions that taxes are too high and that government should be reined; and

(5) a 'community conflict' explanation positing that major social cleavages in the community, such as those along racial or religious lines, condition many local issues, leading to bloc voting when referendum issues polarize the community along these enduring fault lines.

Among these explanations, the first ('rational self-interest') might be the most important since it includes a broader scope than all the others. It is based on the assumption that people will vote to support that party which most closely meets the voter's own interests. Because of its more specific nature, issue voting (in which the contest has become closely associated with a particular problem) shows more clearly how the voter uses the vote to meet his own needs or preferences. Political economists suggest that voting is a means by which the individual is able to increase his expected utility. Also, if self-interest is a prime motivational force underlying

voting behavior, the value of issue voting is that governments will gain a reasonably accurate assessment of attitudes to specific problems. For geographers, the important part is that the attitudes voters have towards particular issues will vary spatially where the issue imposes 'costs' and/or 'benefits' that themselves vary spatially. These spatial differences in voting reflect the use of the vote to protect self-interests or the interests of the voter's community (Muir and Paddison, 1981).

More recently, analysis of intra-metropolitan variations in voting patterns on major public issues was done by Sharp (1987), Guest et al (1988), Greenberg and Amer (1989), and Hodge and Staeheli (1992). Sharp's (1987) research analyzes the response by voters in Kansas City to two tax-and-spend type propositions and to a fluoridation proposal. The author used predictor variables representing socioeconomic status explanation, the model of alienated voting, the 'taxpayer-revolt' explanation, and community cleavage explanations. The results highlight the explanatory importance of racial cleavages, and provide a contingency perspective on the significance of the socioeconomic status explanation.

In the research by Guest et al (1988), the authors in a case study of the Seattle metropolitan region argued that residential segregation by type of industrial affiliation is an important determinant of community culture. The unit of analysis was census tract. Communities with high employment in service activities are especially characterized by support of the so called 'Pluralistic Culture', involving high tolerance of minorities and support for open and responsive government. These communities are also less supportive of the 'Rights of Business' than other parts of the metropolis.

Industrial affiliation is more important than class, ethnic, or mobility factors in explaining variations in 'Pluralistic Culture'; it is less important than other predictors in interpreting support for 'Rights of Business'.

Greenberg and Amer (1989) studied voter support for the $100 million New Jersey hazardous waste bond issue in 1981. The minor civil division (town, city, borough) was the unit of analysis. Analysis showed that support increased with the presence of minority populations, socioeconomic status, urbanization, young families, and a history of support for the Democratic party - variables that previously have been identified as associated with support for environmental programs (Sears, 1980; Elazar, 1984). In addition, communities closer to hazardous waste sites strongly supported the bond issue. Nearly all of these communities also stood to benefit from a companion water supply bond issue. Opposition to the bond issue was centered in southwest and northwest New Jersey - that is, in rural, relatively poor, and white communities far from hazardous waste sites which were fearful of losing abundant local water supplies because of the water bond issue. Thus, while the strong general statewide support suggests the vote was a symbol for a cleaner environment, intra-state variations suggest that most voters considered their personal benefits and costs before casting ballots.

A recent study by Hodge and Staeheli (1992) was done for the Seattle metropolitan area. It sought to describe and explain geographic patterns of support for basic dimensions of urban electoral behavior. Sixty-two ballots were reduced to two major electoral dimensions, one partisan, and one issue-oriented, which had very

strong geographic identity. Findings indicated that partisan responses are governed by position in both the sphere of production and sphere of consumption. Issue politics, on the other hand, were affected most strongly by position in the sphere of production, even though they often included what appeared to be consumption-oriented ballots. Location within the metropolitan region is implied in the ways consumption and production relations were joined within individuals and in the political cultures of the central city and suburbs.

CHAPTER II

METHODOLOGY

The State of Oregon has a long populist tradition of voting directly on numerous non-partisan political issues, rather than relying on the "wisdom" of political elites. State and local laws facilitate submission of issues to "the people". Oregon is one of 22 states that permit the initiative process, and employment of the initiative process has been substantial.

Multnomah County is important in Oregon, since more than 20 percent of the state's population lives within it. Besides that it is Oregon's longest, most diverse county with well defined neighborhoods. Based on considerations expressed in the first part of the thesis, the decision was made to use the areal-structural method for the analysis of voting behavior. Because of the selected method, elections close to a census year were selected to minimize the temporal gap between dates when data was collected. Voting precincts were chosen for areal divisions. The decision was made to focus on precinct voting on eleven different issues submitted in the November 1990 general election. The turnout for that election was high — reaching 77 percent. Other elections are not included, primarily because they are not very close to the census year, turnouts were generally small relative to the general election, and some precinct boundaries changed.

In Multnomah County, voting is conducted in more than 460 electoral precincts. Data from 440 electoral precincts were used for the statistical analysis. For other omitted precincts, the number of votes cast was less than 100 people.

The election selected permits linkage to 1990 census data. Using ARC/INFO®[1] "intersect", procedure the county's block groups were "overlayed" with the voting precinct boundaries that were obtained in 1990. This permitted identification of the cluster of block groups, or proportions of block groups, that fall within each precinct. A necessary assumption for boundaries that do not match is that the population is evenly distributed within census blocks. In brief, the GIS technique used for the allocation can be described by the following:

1. All of the 1990 precincts in Multnomah County were identified. The precinct boundaries were on a computer map produced by the Portland Metropolitan Service District (Metro), Portland's regional planning organization.

2. Using the computer, I overlaid a map of census block centroids for Multnomah County precincts and totaled the block population for each precinct.

3. Using the computer I overlaid the intersected map, defined in "2" above with a map of census block groups. I assumed that within each block group the incidence of population was even.

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[1] Environmental Systems Research Institute, Inc., PC ARC/INFO®, Ver. 3.4D Plus, Redlands, CA, 1993.

4. Knowing the population for each census block, block group, and precinct, the allocation proportion was calculated to assign block group information from the 1990 census to the precincts.

Correlations and cluster analysis were done using SYSTAT®[2]. For correlations, the Pearson correlation matrix was used. For cluster analysis KMEANS class of clustering was used. K-means clustering splits a set of objects into a selected number of groups by maximizing between-cluster variations relative to within-cluster variation (Hartigan, 1975). The data were standardized before analysis. Mapping was done using Atlas Pro®[3].

The choice of independent variables to explain socioeconomic status was difficult. Various measures of socioeconomic status are strongly correlated with each other. In Multnomah County the most likely community cleavage is a result of race-ethnicity or religion. However, religion was excluded from the analysis because the quality of information available on religion was not comparable with the quality of census and election data.

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[2] SYSTAT, Inc., SYSTAT®, Ver. 3, Evanston, IL, 1989.

[3] Strategic Mapping Inc., Atlas Pro: Geographic Data Analysis and Presentation®, Ver. 2.0, Santa Clara, CA, 1992.

CHAPTER III

ANALYSIS

VOTING FOR MEASURES IN MULTNOMAH COUNTY

Eleven ballot measures chosen for study appeared on the election ballot in November 1990. These issues have diverse origins and purposes. Some represent tax measures, while others are the consequences of legislative action or popular initiative. Topics of such ballot measures relate to the rights of specific groups in the society, the role of government in regulating social and institutional life, the nature of taxation, and the means by which the government could be held accountable to its citizens (Guest et al., 1988). While it is not possible to explain fully each issue in the thesis, I have provided the official ballot title and brief synopsis of each in Appendix A. The summary of each issue is provided in TABLE I. The percentage of "*yes*" or "*no*" votes on any issue is based on all persons voting on that specific issue.

All eleven measures can be combined into several groups: Measures 1 and 2 may be characterized in terms of management efficiency; Measures 3, 5, 7 , and 11 - in terms of tax reform; Measures 4 and 6 are environmentally oriented issues;

TABLE I

SUMMARY OF STATE MEASURES ON NOVEMBER 1990 ELECTIONS

	SUMMARY	Percentage of *"yes"/"no"* votes
Measure 1	Grants Metropolitan Service District electors the right to self-governance.	Passed 55/45
Measure 2	Constitutional amendment allows merged school districts to combine tax bases.	Passed 70/30
Measure 3	Repeals tax exemption, grants additional benefit payments for PERS retirees.	Failed: 44/56
Measure 4	Prohibits Trojan operation until nuclear waste, cost, earthquake standards are met.	Failed: 49.9/50.1
Measure 5	State constitutional limit on property taxes for schools, government operations.	Passed: 55/45
Measure 6	Product packaging must meet recycling standards or receive hardship waiver.	Passed: 53/47
Measure 7	Six-county work in lieu of welfare benefits pilot program.	Passed: 57/43
Measure 8	Amends Oregon Constitution to prohibit abortion with three exceptions.	Failed: 27/73
Measure 9	Requires the use of safety belts.	Passed: 61/39
Measure 10	Doctor must give parent notice before minor's abortion.	Failed: 41/59
Measure 11	School choice system, tax credit for education outside public schools.	Failed: 32/68

Measures 8 and 10 are anti-abortion measures. They, along with Measure 9 to some extent, may be seen in terms of personal rights or personal freedoms.

It would be logical to assume high correlation coefficients between passed and defeated measures. Overall in Multnomah County, Measures 1, 2, 5, 6, 7, and 9

passed, and Measures 3, 4, 8, 10, and 11 were defeated. Among defeated measures were two tax exemption and tax credit measures (Measures 3 and 11) which might be characterized in terms of a 'taxpayer revolt', along with Measures 5 and 7, which passed. Also among defeated measures were - Measure 8 and 11, two conservative, anti-abortion proposals. Measure 4 would prohibit nuclear plant operations until ecological, safety, and cost standards are met. Also the anti-business and 'green' Measure 6 (packaging must meet recycling standards) passed. However correlation analysis of votes for the different measures produced unanticipated results (TABLE II).

The correlation coefficients are high and it is possible to make an assumption, that people voted *for* or *against* groups of measures throughout the county (or maybe it was a common predisposition to vote in certain patterns, without the voter seeing the pattern). In other words, if a person voted for Measure 1, he would have very likely voted for Measures 2, 3, 4, 6, and 9 as well, and against Measures 5, 7, 8, 10, and 11, and vice versa. The coefficients are high within selected categories of measures: management efficiency, tax reform, environmental issues, and personal rights. Discrepancy between passed and defeated measures on one hand and measures with the high correlation on the other, shows to some extent the different origin and possible outcome of these proposals. However, the two measures calling for management efficiency passed; measures categorized as tax reform' failed or passed in a way that shows the effect of the 'taxpayer's revolt' described earlier. A split occurred on environmental issues, although the correlation coefficient between

these two measures is very high (.90).

TABLE II

CORRELATION COEFFICIENTS BETWEEN VOTES FOR MEASURES

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
M1	1	.87	.81	.60	-.50	.76	-.45	-.80	.70	-.86	-.60
M2	.87	1	.76	.66	-.33	.66	-.31	-.75	.83	-.83	-.55
M3	.81	.76	1	.48	-.41	.64	-.36	-.72	.68	-.76	-.55
M4	.60	.66	.48	1	-.74	.90	-.78	.58	.19	-.63	-.34
M5	-.50	-.33	-.41	-.74	1	-.75	.79	.46	-.12	.48	.32
M6	.76	.66	.64	.90	-.75	1	-.74	-.72	.42	-.78	-.48
M7	-.45	-.31	-.36	-.78	.79	-.74	1	.52	-.04	.54	.31
M8	-.80	-.75	-.72	-.58	.46	-.72	.52	1	-.61	.96	.69
M9	.70	.83	.68	.19	-.12	.42	-.04	-.61	1	-.66	-.61
M10	-.86	-.83	-.76	-.63	.48	-.78	.54	.96	-.66	1	.67
M11	-.60	-.55	-.55	-.34	.32	-.48	.31	.69	-.61	.67	1

Measure 4, which would prohibit Trojan nuclear plant operations until standards were met, failed in Multnomah County by about 0.1%. Another split was in the 'personal rights' group: although the two anti-abortion measures were overwhelmingly rejected by voters, the automobile 'safety belt' measure passed. However, the 'safety belt' measure also might be seen not as a personal freedom measure, but as a measure more associated with additional spending (higher insurance, more police on the roads, etc.). Either way, its connection with the anti-abortion measures is not definite.

To appreciate the spatial distribution of votes, it is necessary to say a few words about regional divisions in Multnomah County. Portland, historically, for purposes of address identification, has been divided into five large and distinctive regions: Southwest, Northwest, Southeast, Northeast, and North. These divisions are well known to Portlanders by street prefix directions (for example: SW Park Avenue or NE Halsey Street). The Willamette River is the division line between the Westside and the Eastside, and east/west running Burnside Street (approximately in the central part of Portland) was adopted to separate North and South. However, street addresses are not the only difference between these areas. People adopted this regional division for the identification of were they live. There appear to be stereotypes associated with each part of the city. Portlanders usually think about the Westside as an area of upper-middle class neighborhoods, the Downtown with a relatively large student community (Portland State University is located in Downtown). The Eastside is thought to be less homogeneous: small clusters of upper-middle class neighborhoods in the southern parts of the Southeast and the central parts of the Northeast are surrounded by medium- and low-middle class neighborhoods. Some areas in the Northeast and the North traditionally have been seen as a low-income and low-middle class areas and are considered to be sort of "welfare ghettos". These five areas very often are used, especially by the media, as the reference point for different analyses or comparisons.

SPACIAL DISTRIBUTION OF VOTES IN MULTNOMAH COUNTY

The geographical distribution of votes is shown on FIGURES 1 - 11. The general patterns of votes are "west" vs. "east", and very close to that of "south" vs. "north", and "inner city" vs. "periphery". Indeed, in votes for Measure 1 (FIGURE 1), most of the precincts in which people were in favor of the measure are concentrated west of the Willamette River and in the central and western parts of East Portland, while precincts in which people were more likely to oppose the measure are in the eastern part of Multnomah County and in the North Portland. The same in also true for votes for Measure 2 (FIGURE 2), Measure 3 (FIGURE 3), Measure 4 (FIGURE 4), Measure 6 (FIGURE 6) and Measure 9 (FIGURE 9). Votes for Measure 5 (FIGURE 5) assume a different pattern: most precincts where people favored the measure are on the edges of the county, often outside the city limits, while people in Portland voted against the measure. In votes for Measures 7 (FIGURE 7), 8 (FIGURE 8), 10 (FIGURE 10), and 11 (FIGURE 11), most of the precincts where people voted for these measures are located in the eastern and northern parts of the county, versus western and southern parts where people were less likely to vote for these measures.

The analysis based on viewing all eleven measures on a one-by-one basis is rather complicated. For the purpose of simplifying it, a principal component analysis was performed using SYSTAT. In such an analysis, principal components are weighted linear composites of observed variables. Common factors are unobserved

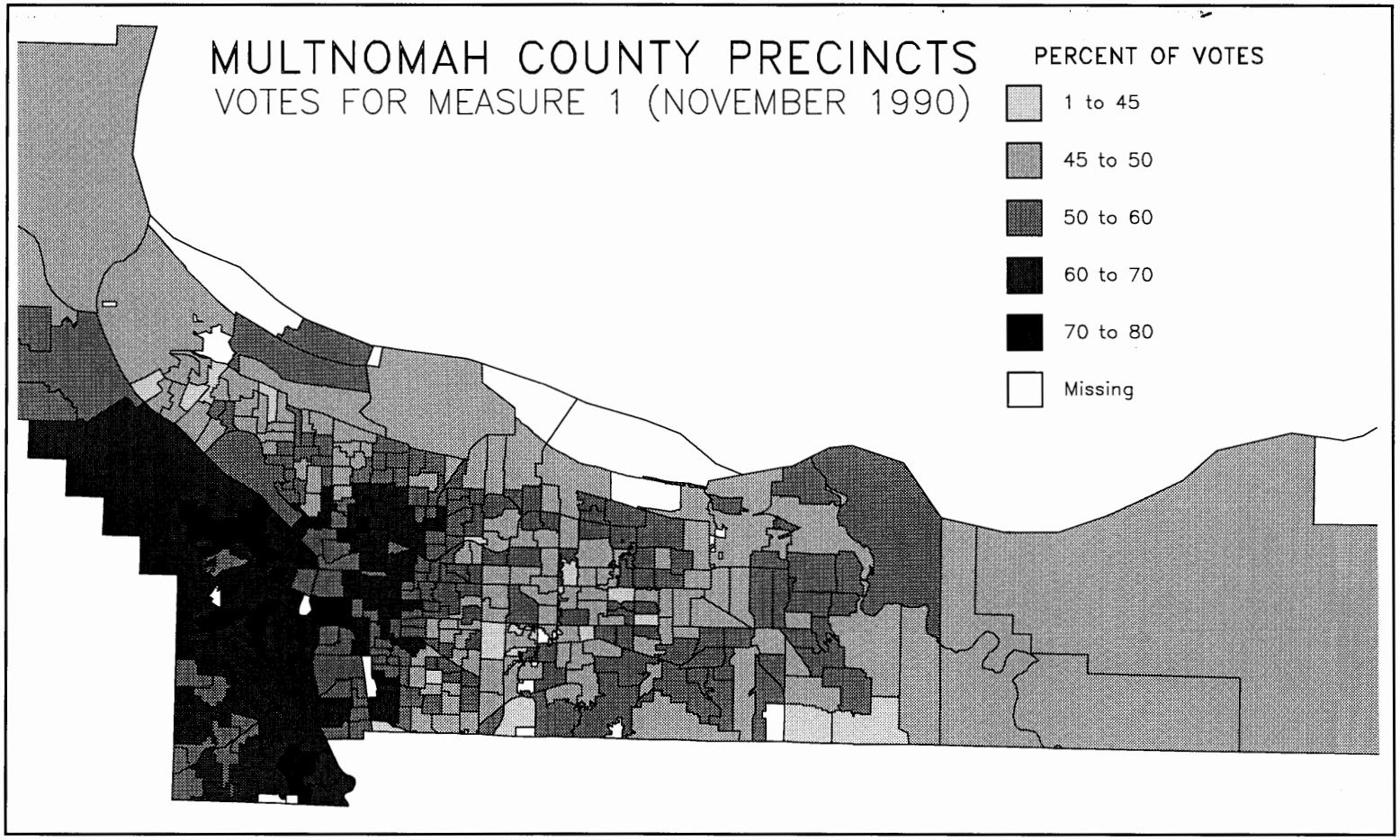

Figure 1. The percentage of votes for Measure 1 on November 1990 Elections. Grants Metropolitan Service District electors the right to self-governance. Passed, (55/45)

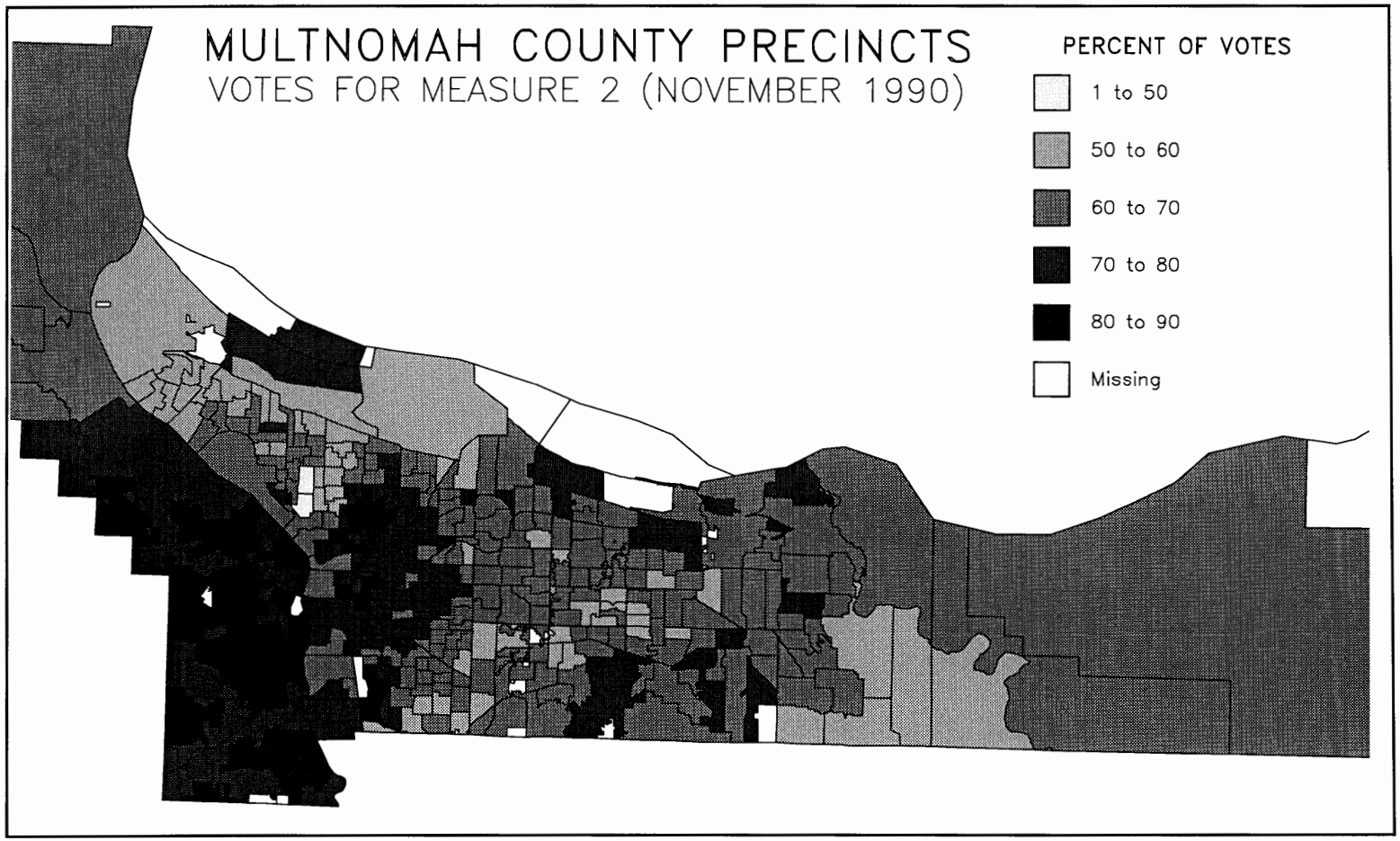

Figure 2. The percentage of votes for Measure 2 on November 1990 Elections. Constitutional amendment allows merged school districts to combine tax bases. Passed, (70/30)

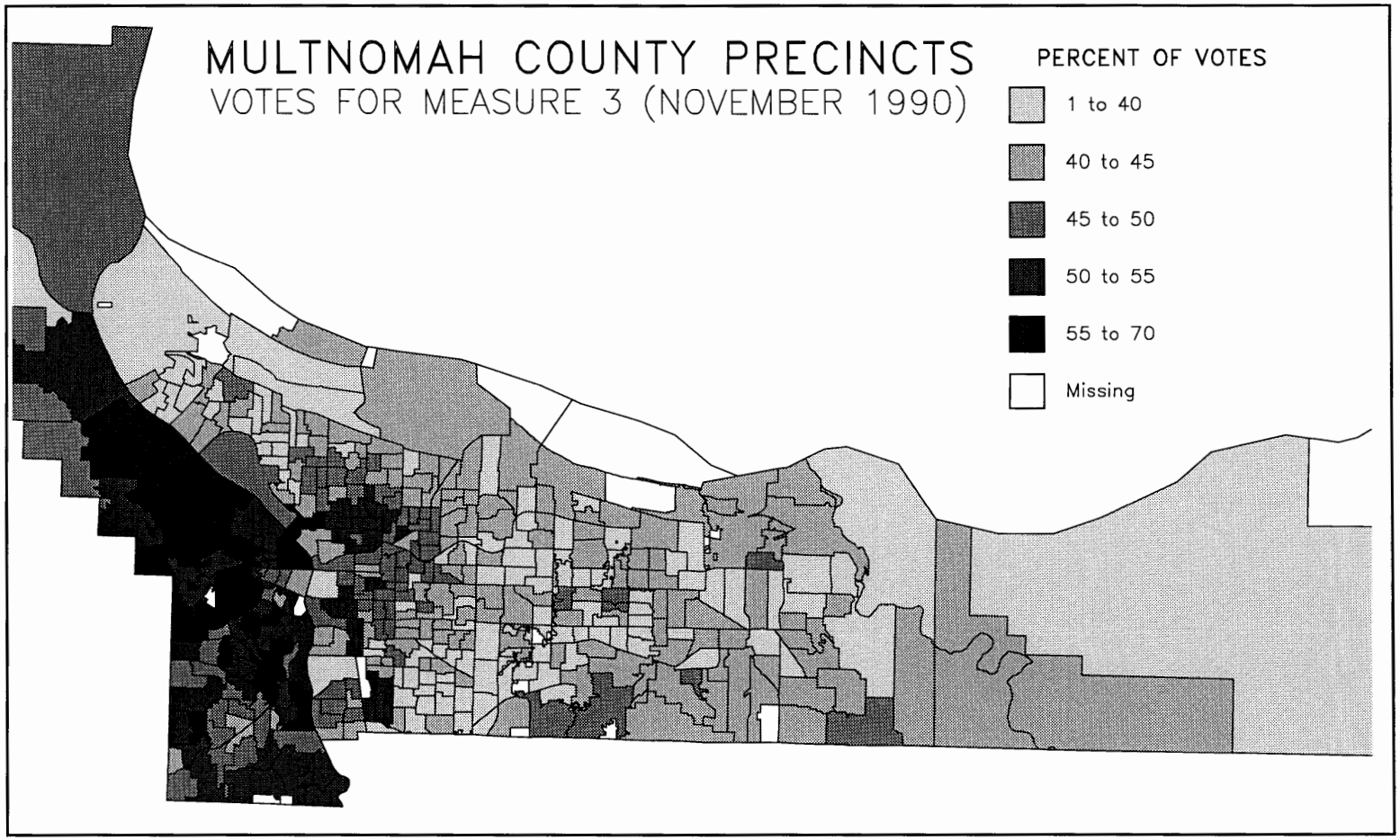

Figure 3. The percentage of votes for Measure 3 on November 1990 Elections. Repeals tax exemption, grants additional benefit payments for PERS retirees. Failed, (44/56)

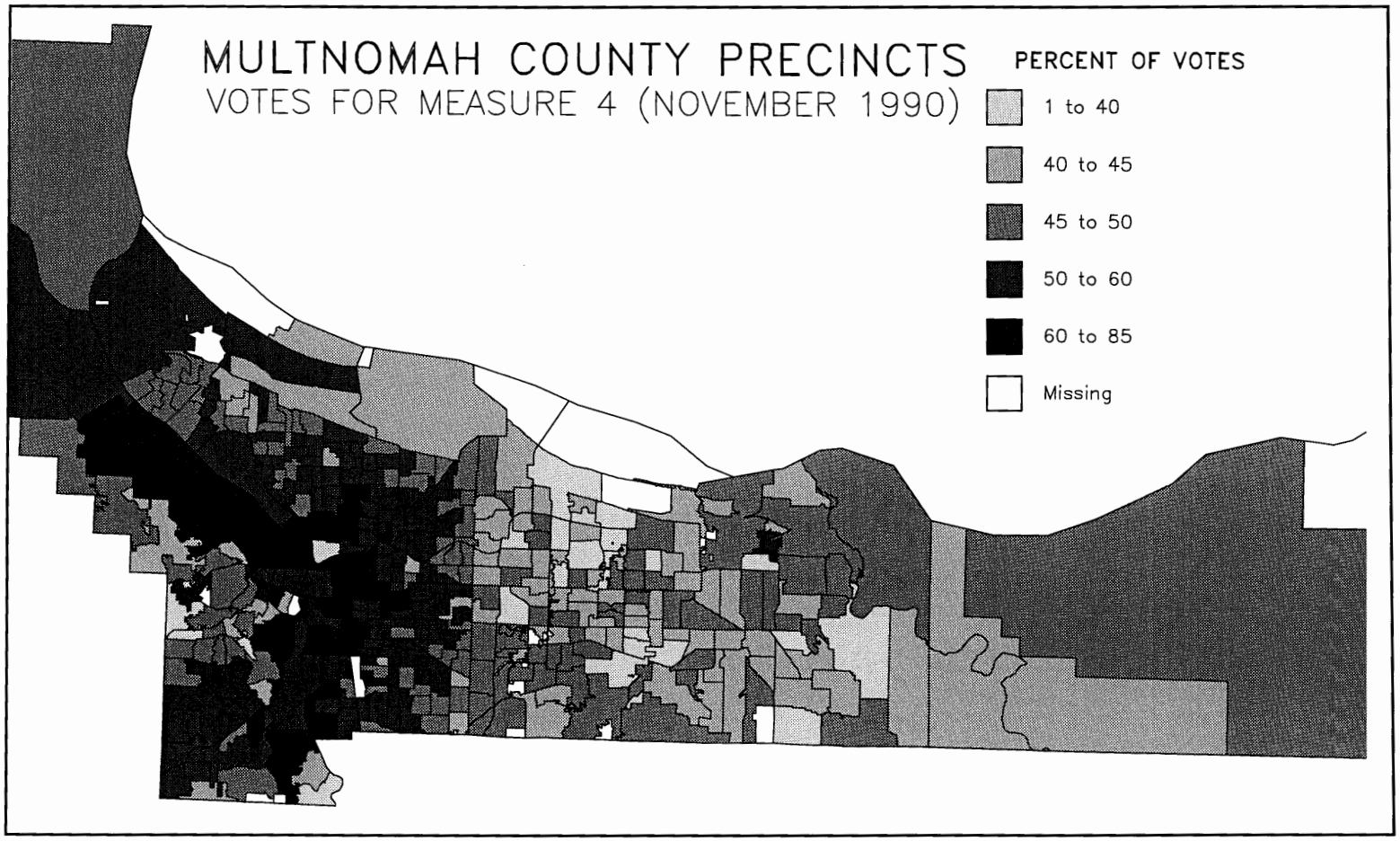

Figure 4. The percentage of votes for Measure 4 on November 1990 Elections. Prohibits Trojan operation until nuclear waste, cost, earthquake standards are met. Failed, (49.9/50.1)

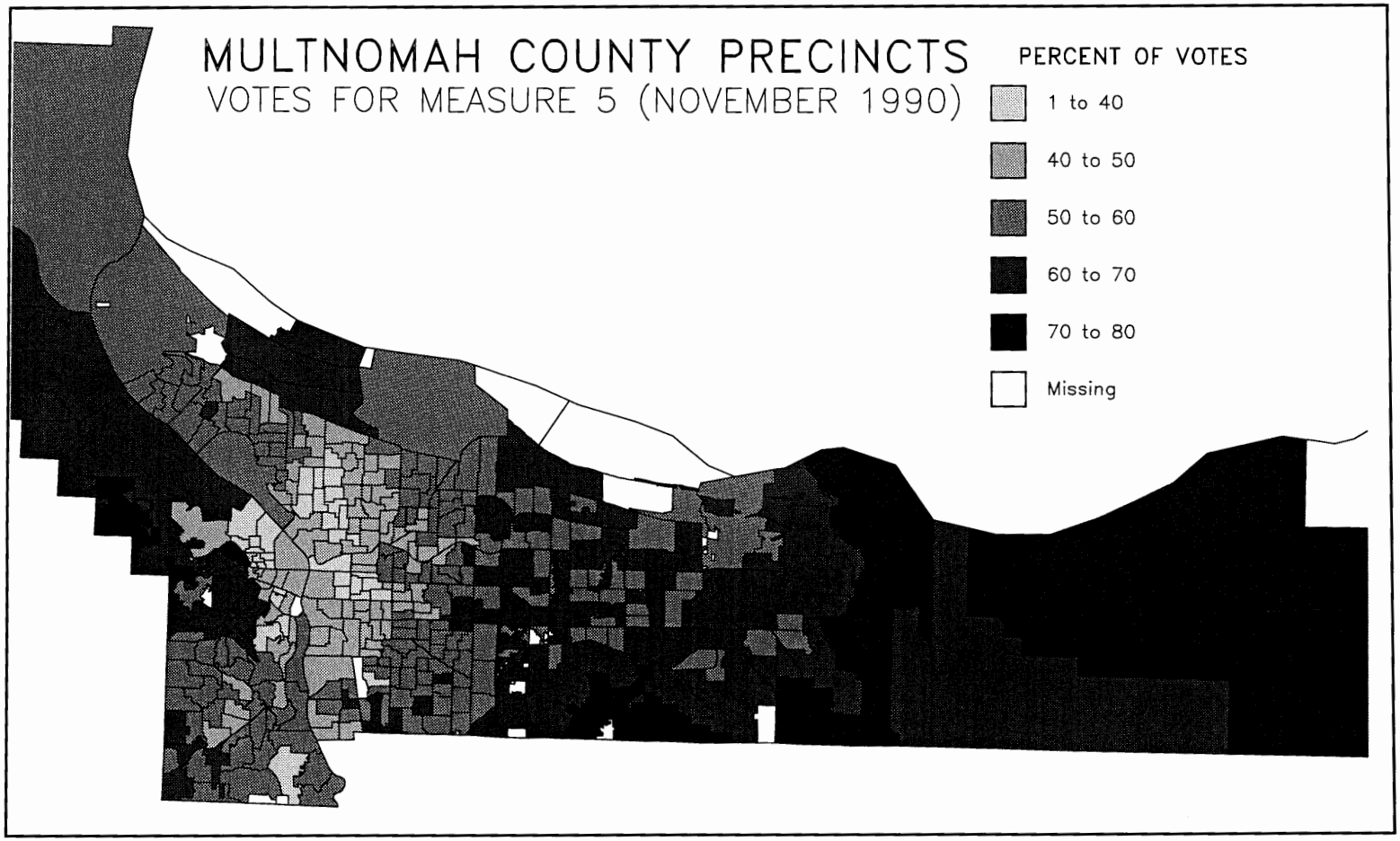

Figure 5. The percentage of votes for Measure 5 on November 1990 Elections. State constitutional limit on property taxes for schools, government operations. Passed, (55/45)

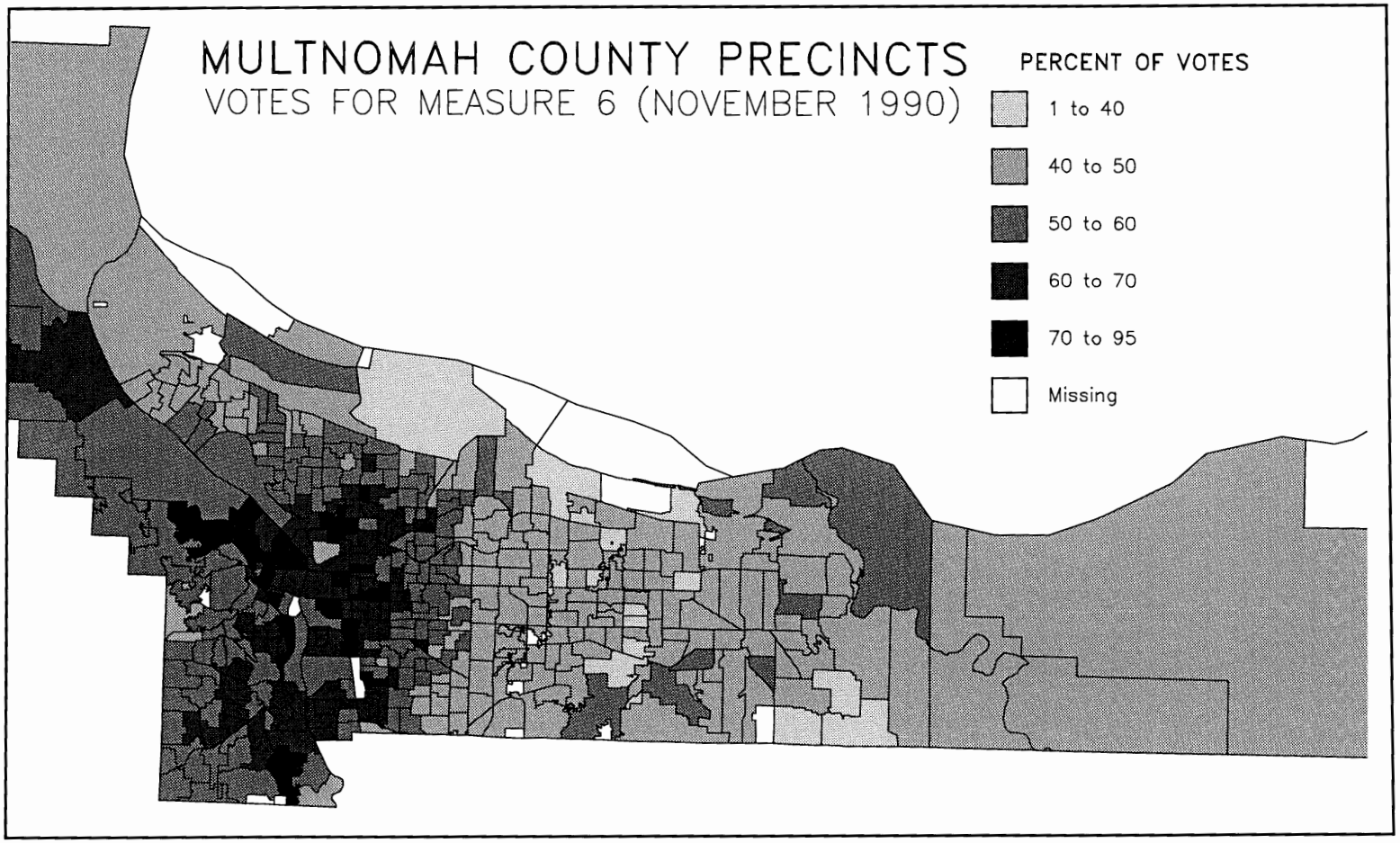

Figure 6. The percentage of votes for Measure 6 on November 1990 Elections. Product packaging must meet recycling standards or receive hardship waiver. Passed, (53/47)

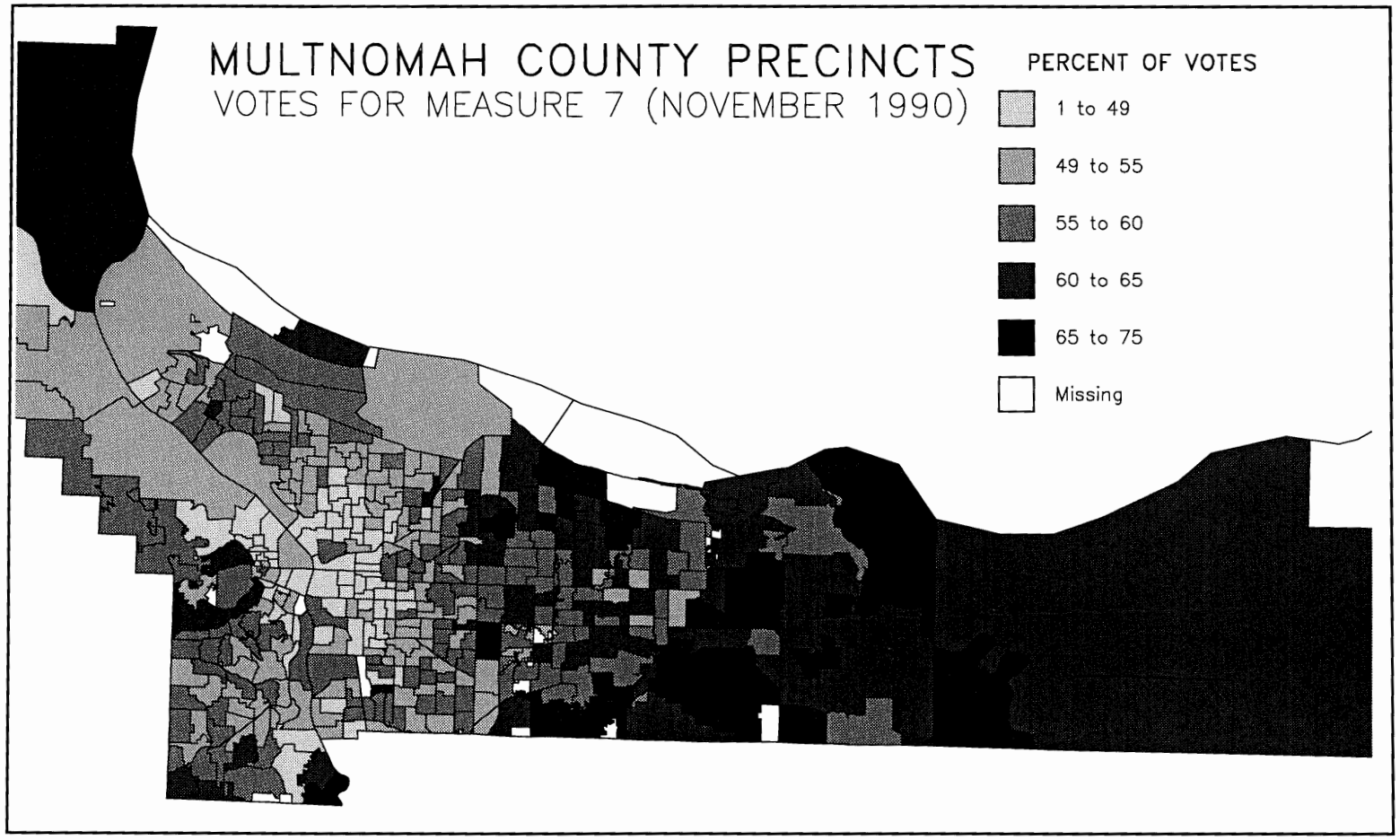

Figure 7. The percentage of votes for Measure 7 on November 1990 Elections. Six-county work in lieu of welfare benefits pilot program. Passed, (57/43)

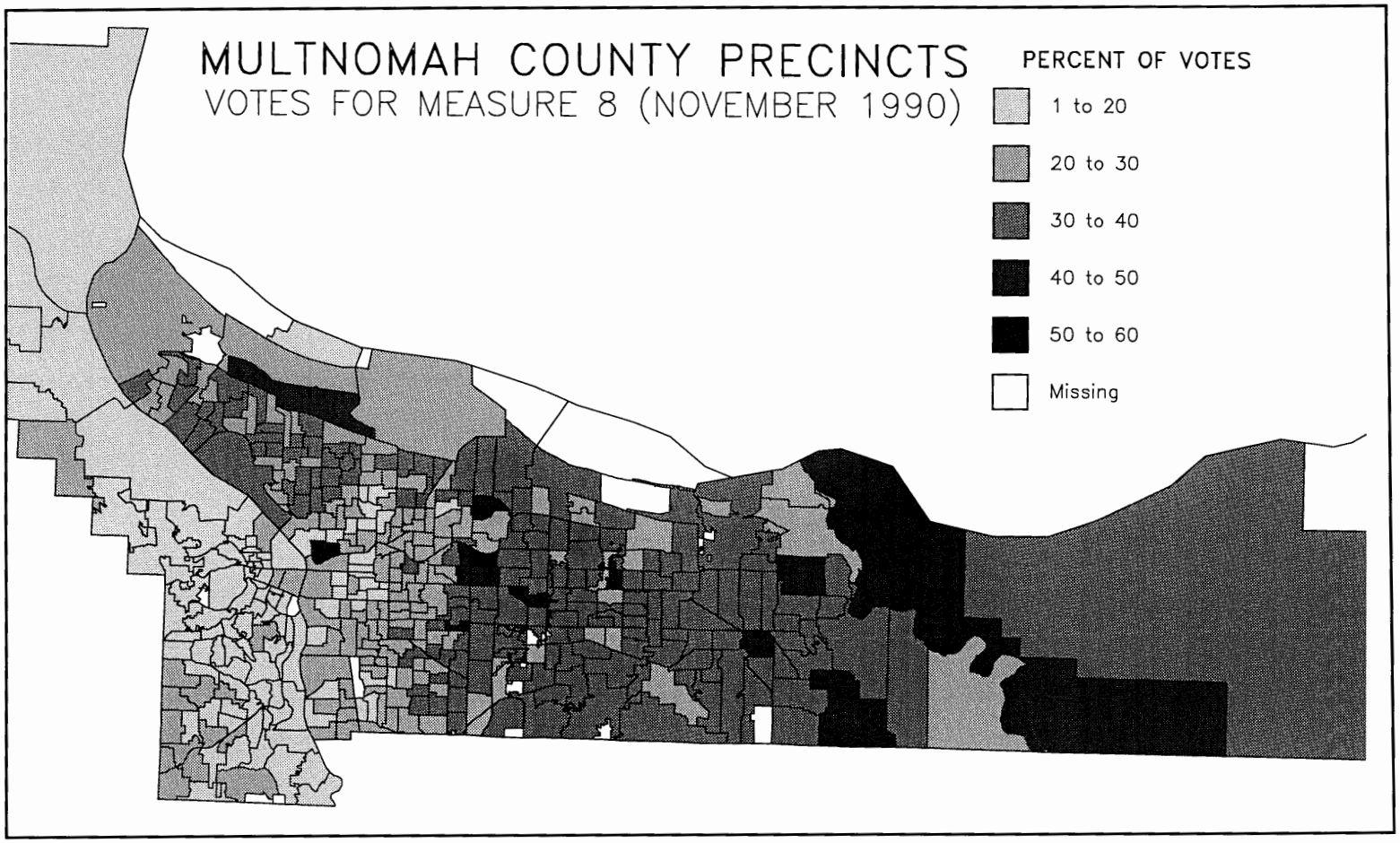

Figure 8. The percentage of votes for Measure 8 on November 1990 Elections. Amends Oregon Constitution to prohibit abortion with three exeptions. Failed, (27/73)

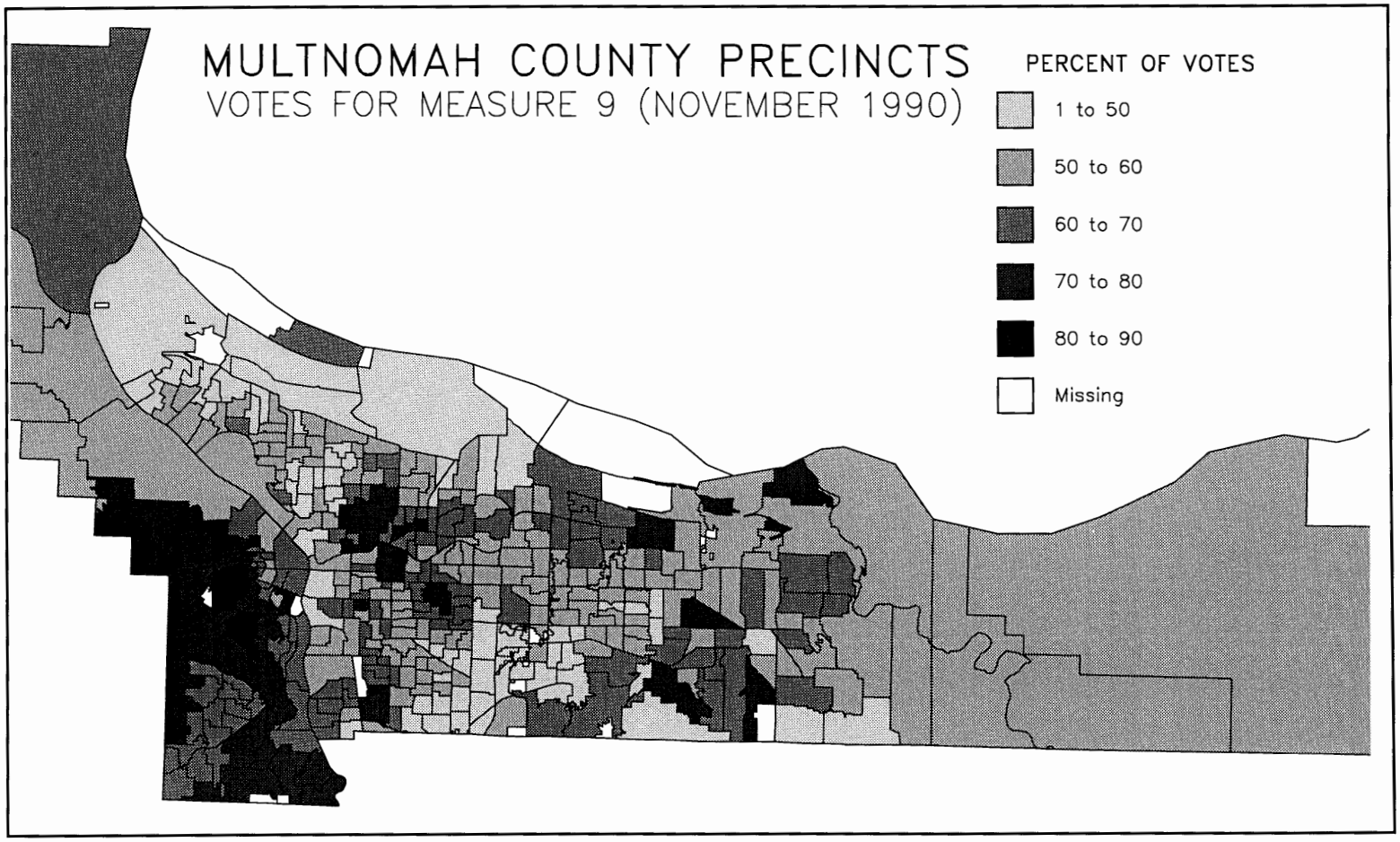

Figure 9. The percentage of votes for Measure 9 on November 1990 Elections. Requires the use of safety belts. Passed, (61/39)

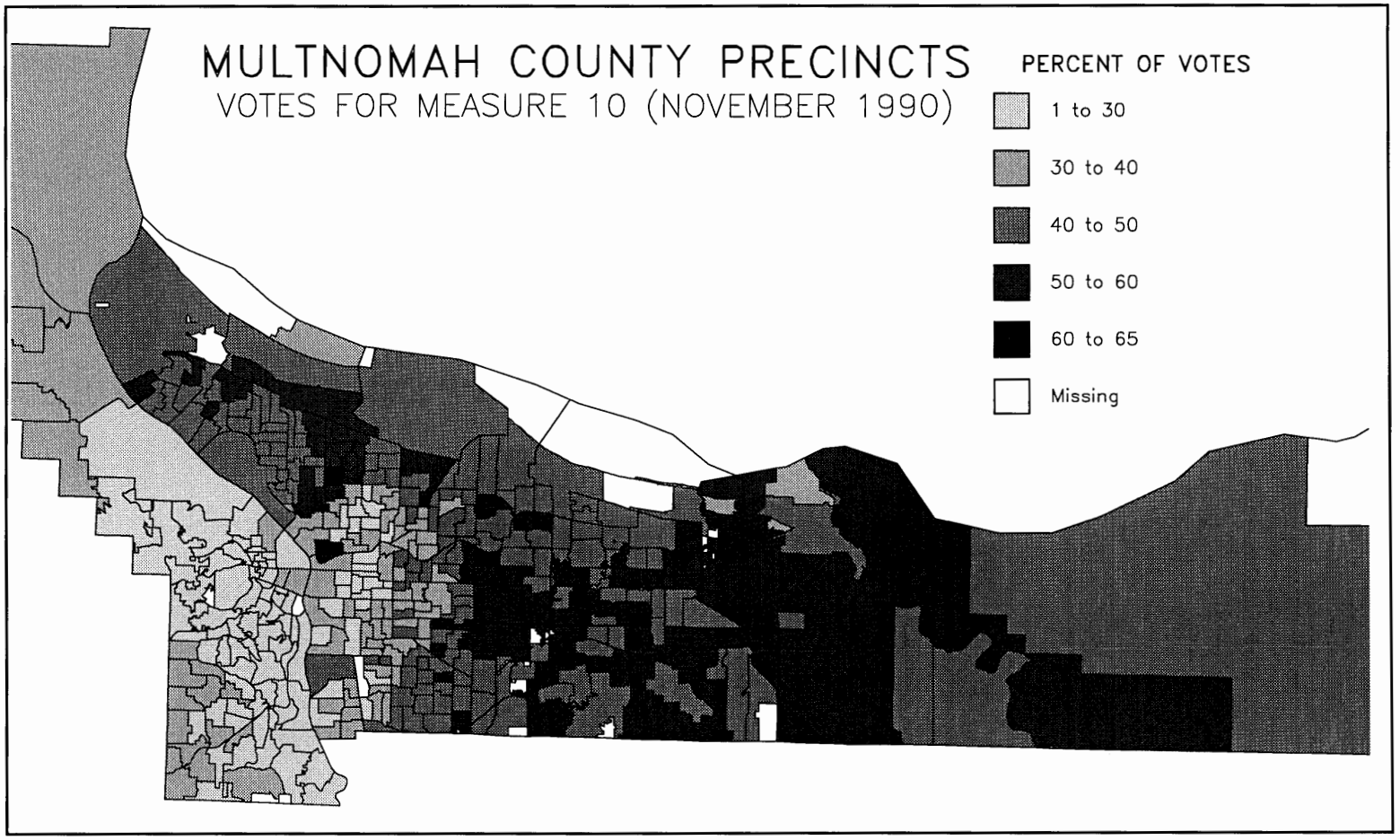

Figure 10. The percentage of votes for Measure 10 on November 1990 Elections. Doctor must give parent notice before minor's abortion. Failed, (41/59)

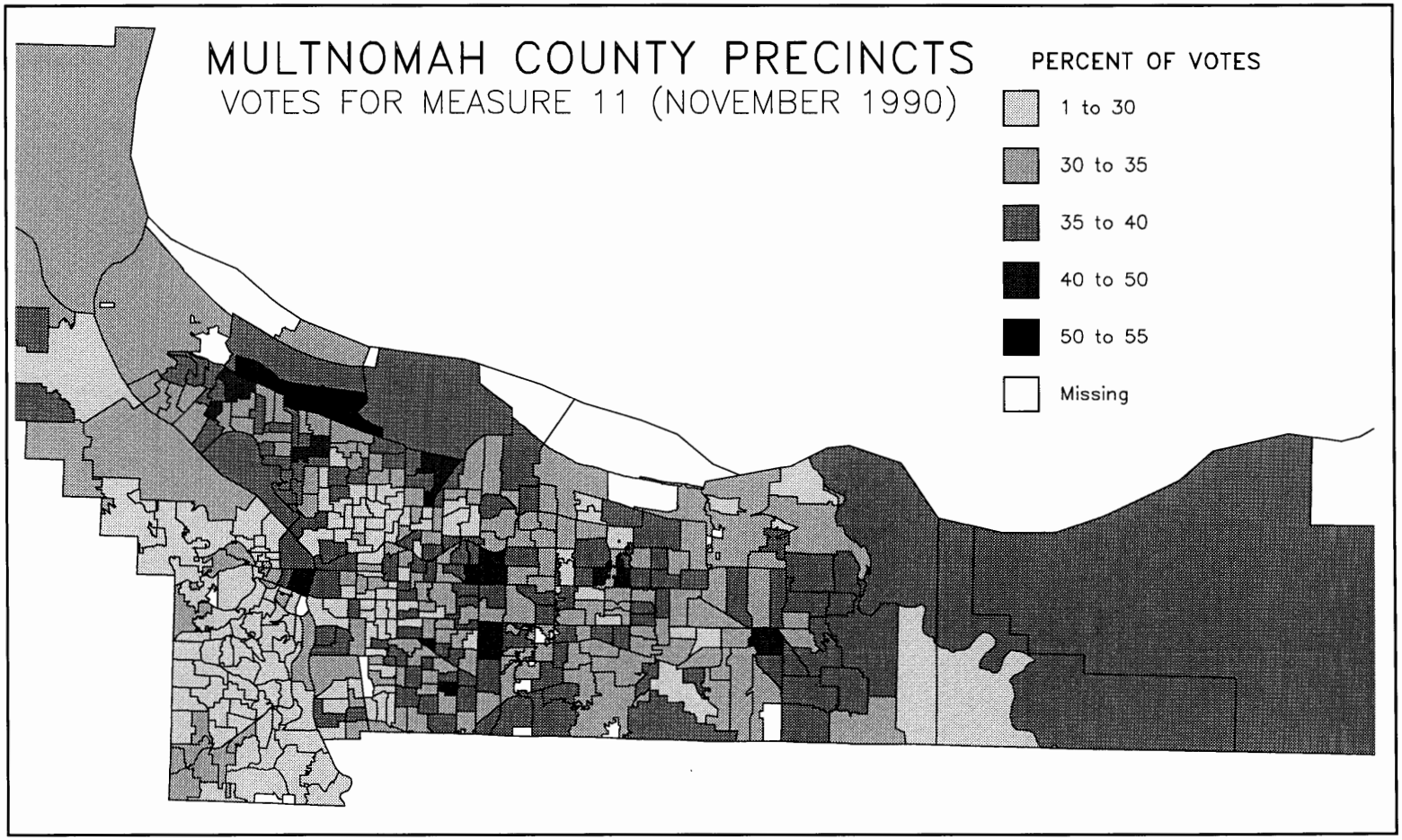

Figure 11. The percentage of votes for Measure 11 on November 1990 Elections. School choice system, tax credit for education outside public schools. Failed, (32/68)

variables that are hypothesized to account for the intercorrelations among observed variables. The principal component analysis showed two distinct dimensions, which are practically the same as those described earlier. Factor loadings for these dimensions are presented in TABLE III.

TABLE III

FACTOR LOADINGS FOR ELECTORAL DIMENSIONS

	FACTOR 1	FACTOR 2	FACTOR 3
Measure 1	.91	.18	.16
Measure 2	.85	.36	.23
Measure 3	.83	.24	.18
Measure 4	.76	-.53	.12
Measure 5	-.65	.61	.03
Measure 6	.89	-.33	.12
Measure 7	-.65	.66	.12
Measure 8	-.90	-.12	.18
Measure 9	.67	.63	.01
Measure 10	-.94	-.13	.07
Measure 11	-.70	-.28	.61
Percent of total variance explained	64.55	17.60	5.23

These three factors account for more than 87% of the variance. The first two factors account for more than 82 %. The correlations between factors are close to zero (+- .001) by definition. That suggests a different origin of these factors and

perhaps different spatial distribution in patterns of support by votes. Indeed, it is clear from maps of the two factors (FIGURE 12 and FIGURE 13) that there is a significant geographic component to patterns of support by the electorate. Factor 1 is definitely the strongest (account for 64.6 % of the variance) and it can be called the socioeconomic factor (later in the thesis I will discuss it). It is first and foremost identified with the "west/east" division in the county. Factor 2 is best characterized by a sharp center/periphery split, it can be called the life-cycle factor. The third factor accounts for only 5% of the variance and might be considered significant only for Measure 11 (school choice system). This factor has no clear spatial component and looks more patchy than localized, however it may relate to specifics about schools (FIGURE 14). The factor analysis confirmed the existence of two dimensions of the spatial distribution of votes which was found earlier. A rather interesting map may be obtained by overlaying Factor 1 and Factor 2 (FIGURE 15). Westsiders are more likely to vote in favor of all measures, the population of the eastern part of the county is also generally supportive of proposals, while people living in the central part of Portland are more likely to reject all measures or have a very mixed reaction. On the other hand, this map can suggest that these patterns reflect a rather complicated socioeconomic structure of the county, defining areas with the specific interests of the population.

In order to prove the thesis of a strong geographical component in the electoral process, cluster analysis was made between votes for all eleven measures. Cluster analysis is a multivariable procedure for detecting natural groupings in data

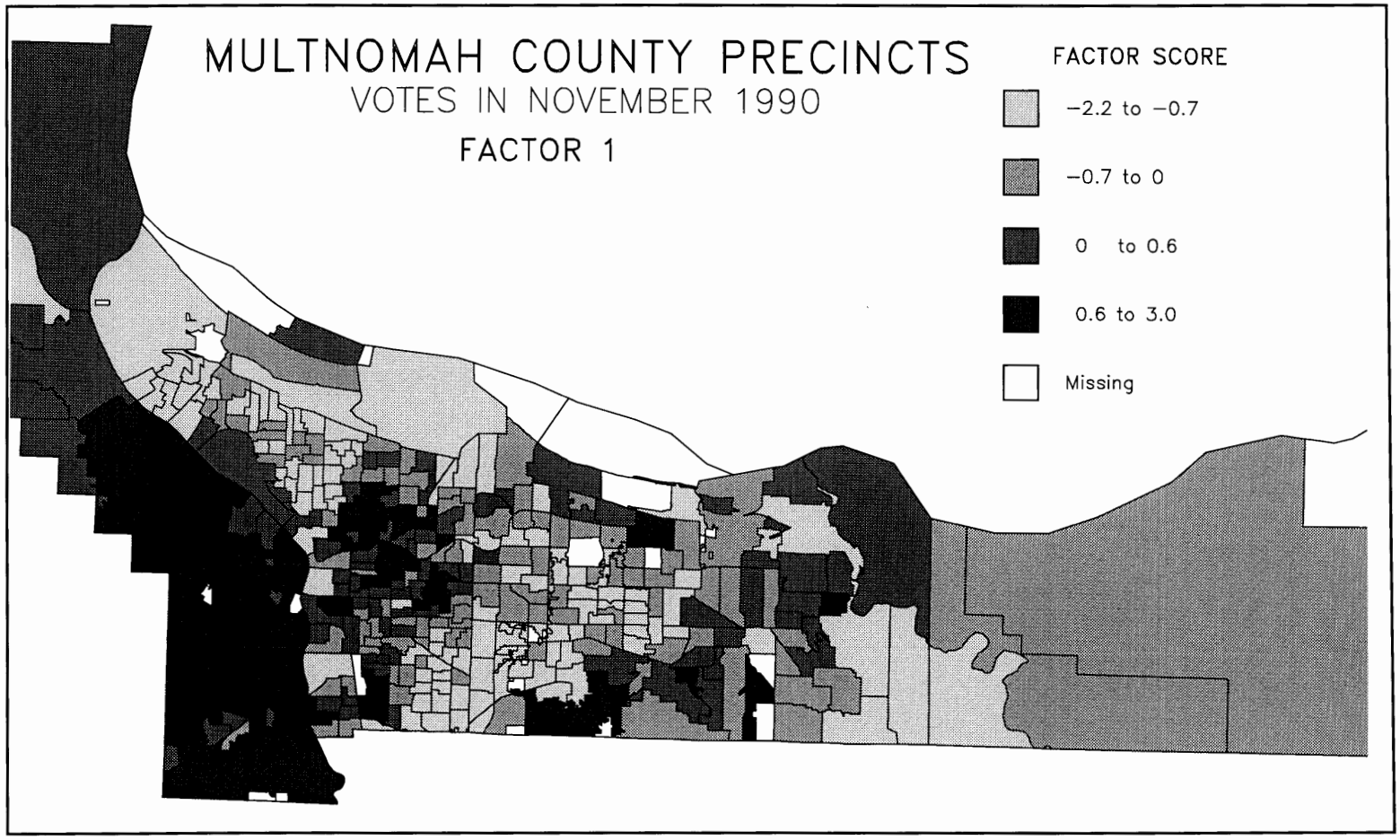

Figure 12. Factor 1 (socioeconomical) scores.

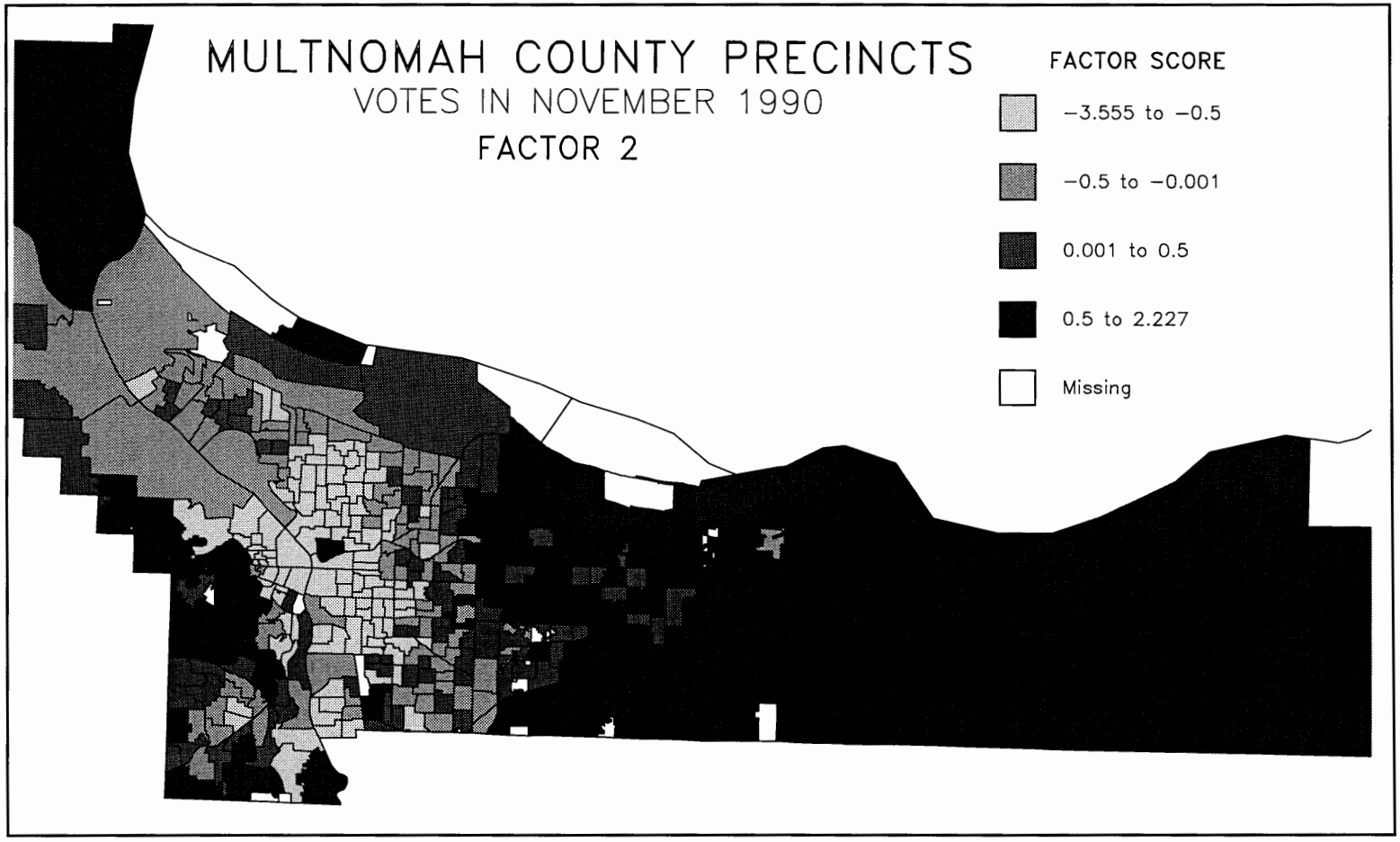

Figure 13. Factor 2 (life-cycle) scores.

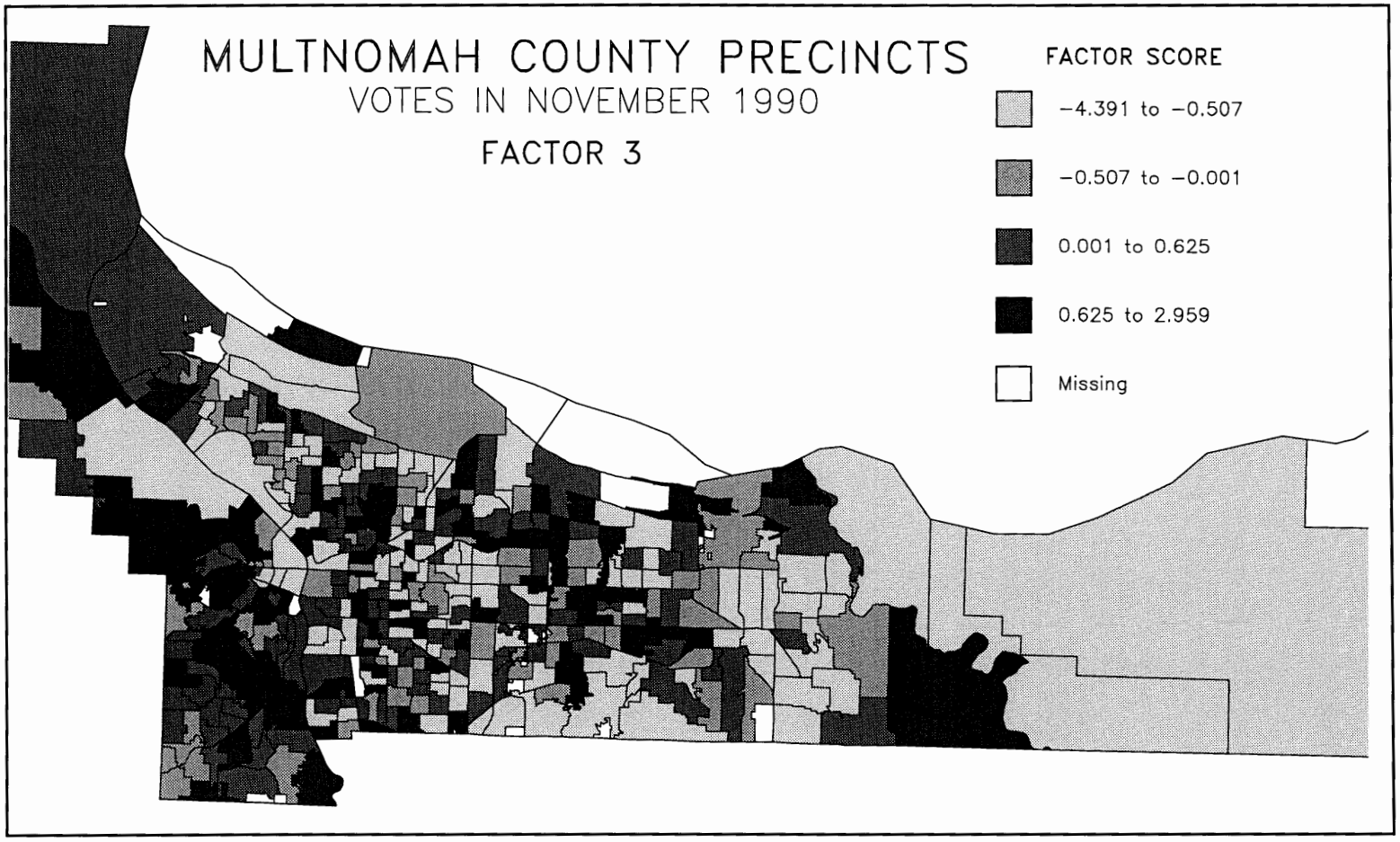

Figure 14. Factor 3 scores.

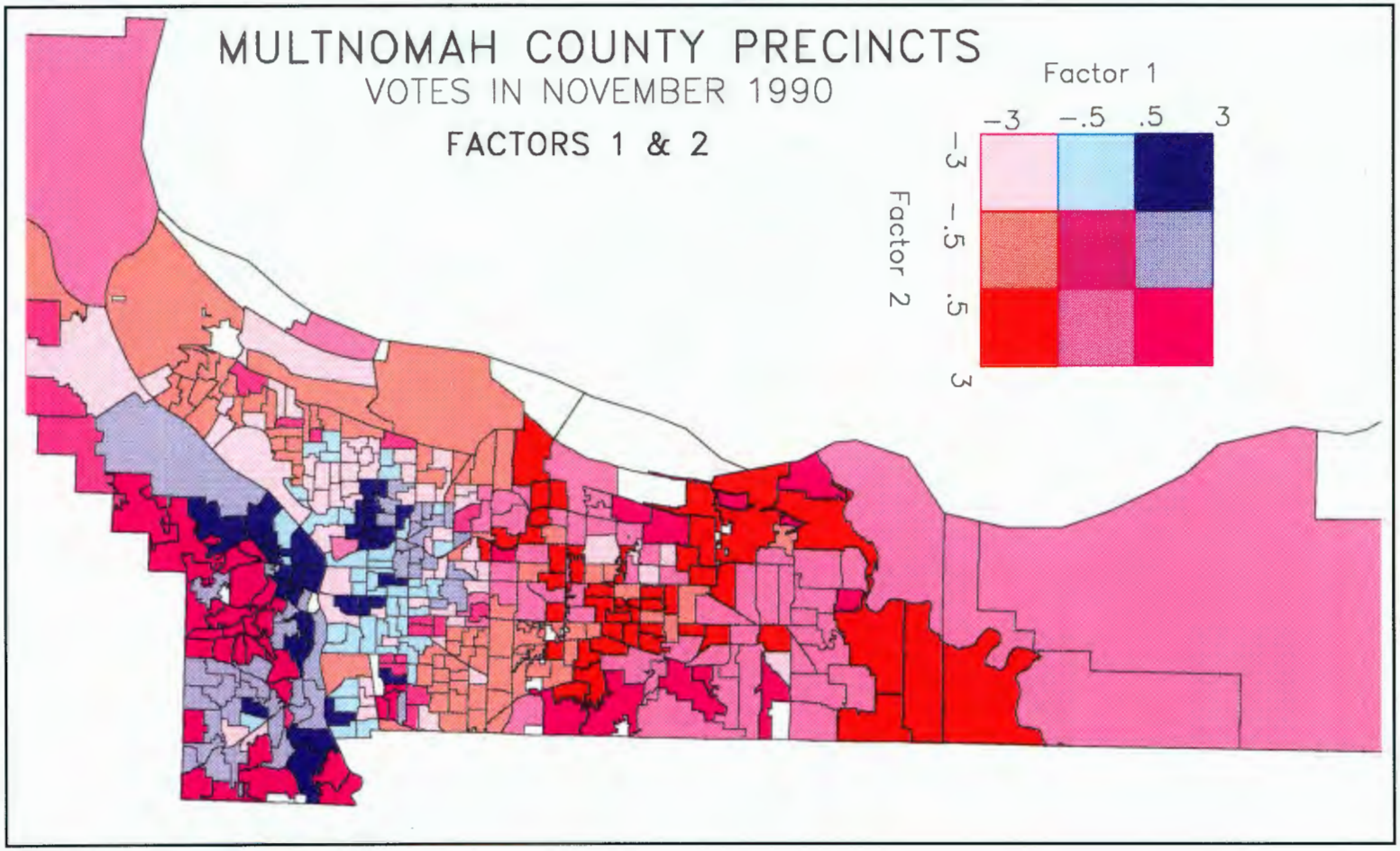

Figure 15. Factor 1 and Factor 2 overlay.

and is used to classify a set of objects into groups. To get non-overlapping clusters, the K-means splitting method was used. The analysis was done for 3, 4, 5, 6, 7, and 20 clusters using SYSTAT®. Spatial distributions of these clusters were mapped using Atlas Pro® software. The results of the analysis clearly shows a geographical component in referenda votes (FIGURES 16-21).

When divided into three clusters (FIGURE 16), precincts in Multnomah County group into three geographical microregions: cluster No. 1 - East & North - from E 70th - E 80th avenues in Portland, towards the north-eastern part of NE Portland, and N Portland; cluster No. 2 - the Westside - not only geographically, as these precincts are not only wealthy neighborhoods but some of them are also a transition zone between the inner city and middle class suburbs; and cluster No. 3 - the Central part of the city on both sides of the Willamette — the so-called inner city.

The cluster analysis indicates that votes for anti-abortion and environmentally oriented measures (like 10 and 6) are better discriminators between precincts than tax reform measures such as 3, 7, 11. Other measures (8, 1, 2, 4, 9, and 5) also discriminate somewhat. The first cluster of precincts has a higher percentage of votes for tax reform and anti-abortion measures (5, 7, 8, 10, and 11) than the second and the third, but lower percentages for management efficiency and environmentally oriented measures (1, 2, 4, and 6). In fact, the maximum values for Measure 6 (recycling standards) in the first cluster are lower than the minimum values for this variable in the third cluster, with some overlay in the second. The summary data for

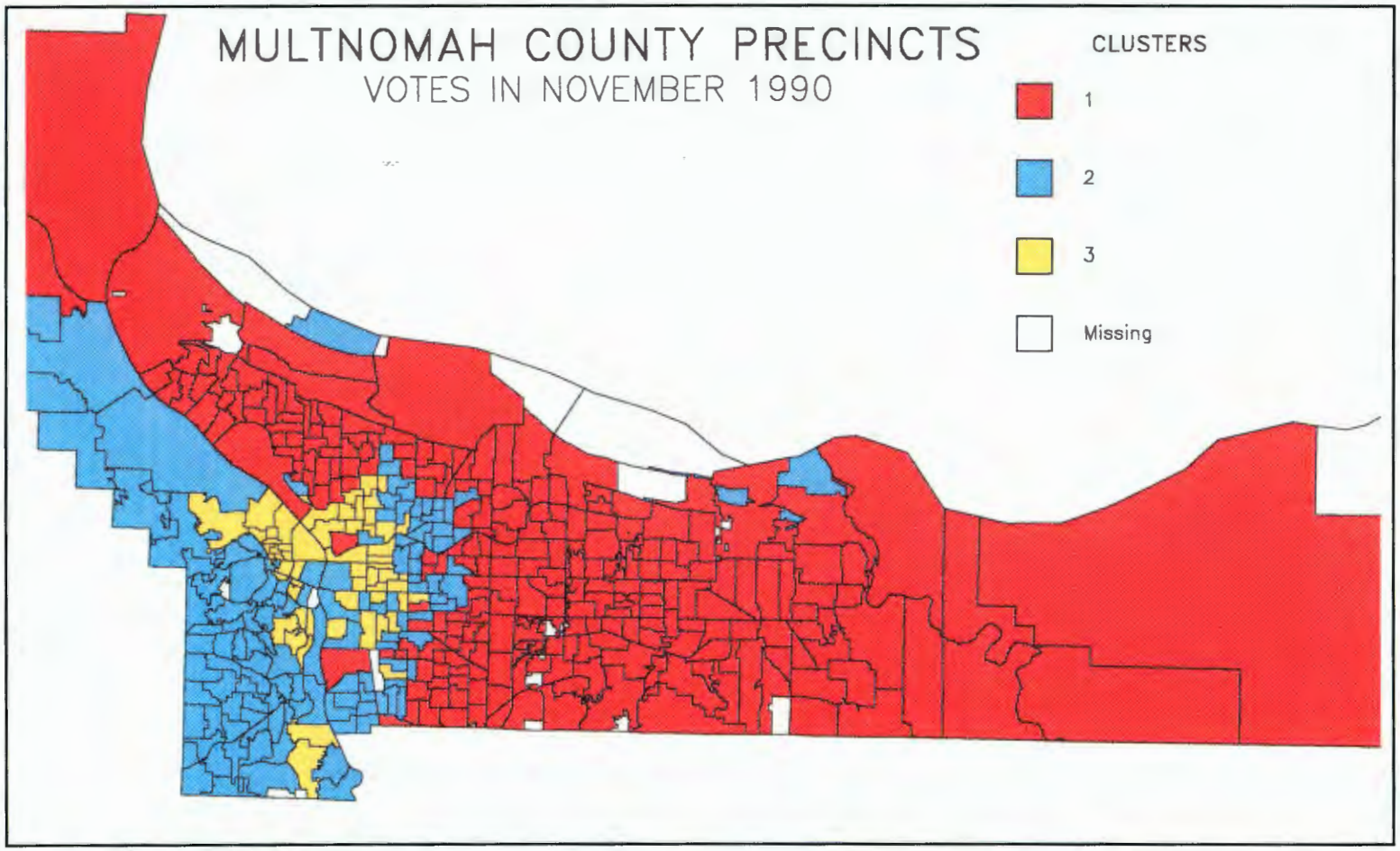

Figure 16. Three clusters of votes for the eleven measures on November 1990 Elections.

four and five clusters is very similar (FIGURES 17-18). There are still very well defined "east" and "west" parts of the county. The main difference appears in the central part, where the transition zone became more complicated, defining Portland's different neighborhoods, such as Downtown, and Alameda, with the specific structure of the population. The main discriminators are still the anti-abortion and environmental measures 10 and 6.

Cluster analysis in which the number of clusters was increased to 6 and 7 (FIGURES 19-20) added to the previous findings only one important part of the county - a section of North Portland with a predominantly black population (cluster No. 6). Otherwise, there were no significant changes in patterns. An interesting fact is that even with the number of clusters increased up to twenty (FIGURE 21), the pattern of clustering between neighboring precincts remains.

The conclusion that the maps resulting from cluster analysis show spatial groupings is based on visual inspection. However, while it is possible to visualize spatial patterns for a small number of clusters, it can be difficult to estimate spatial grouping for a large number of clusters (as in the case with twenty clusters). An attempt was made to quantify this. I did not use existing methods of measuring spatial correlation and autocorrelation. Such methods are well known (for example Griffith, 1987 and Orland, 1988). However they are very complicated, and most of them are based on parametric calculations which do not seem to be appropriate, especially in the case of precincts in Multnomah County which are very different in

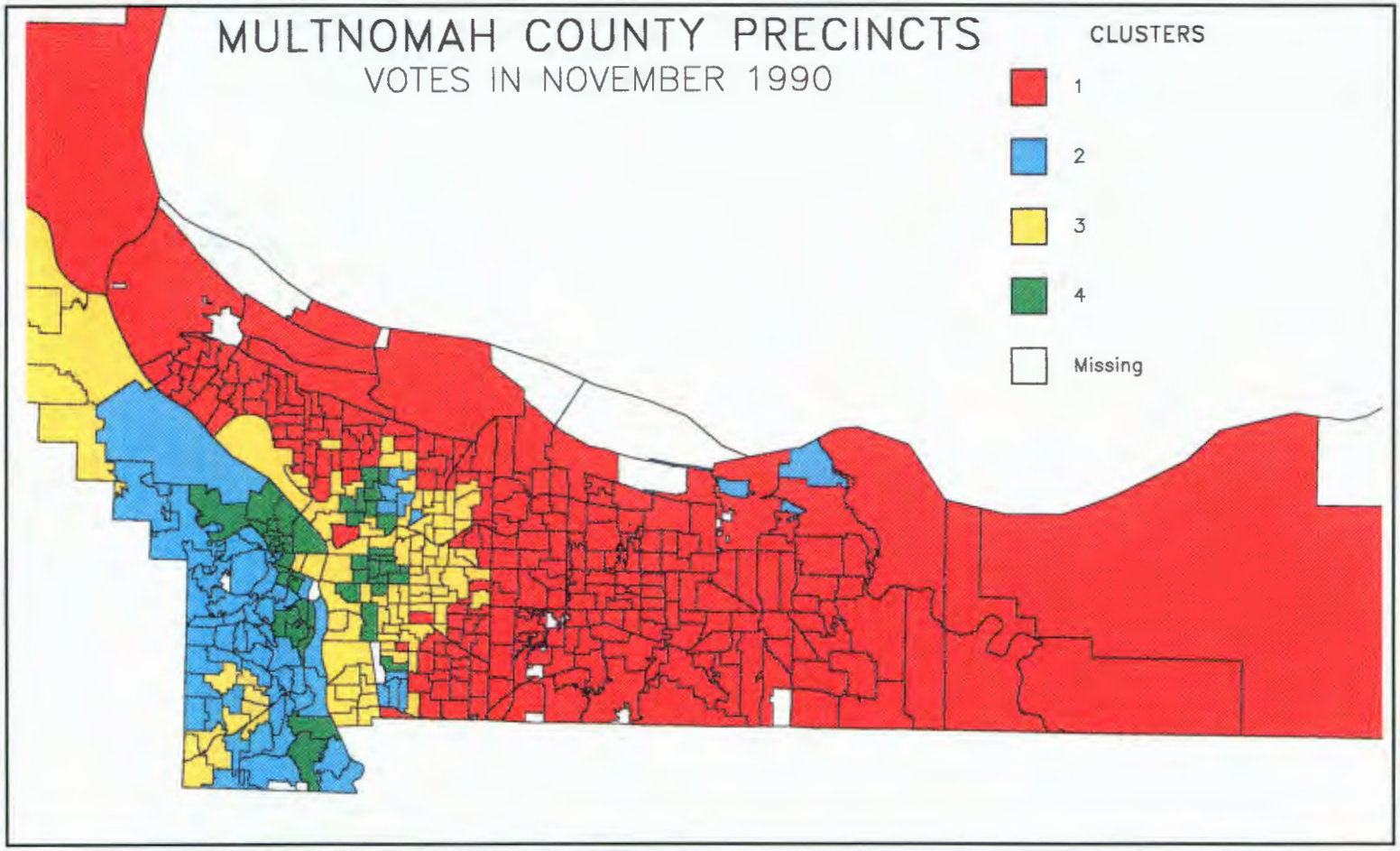

Figure 17. Four clusters of votes for the eleven measures on November 1990 Elections.

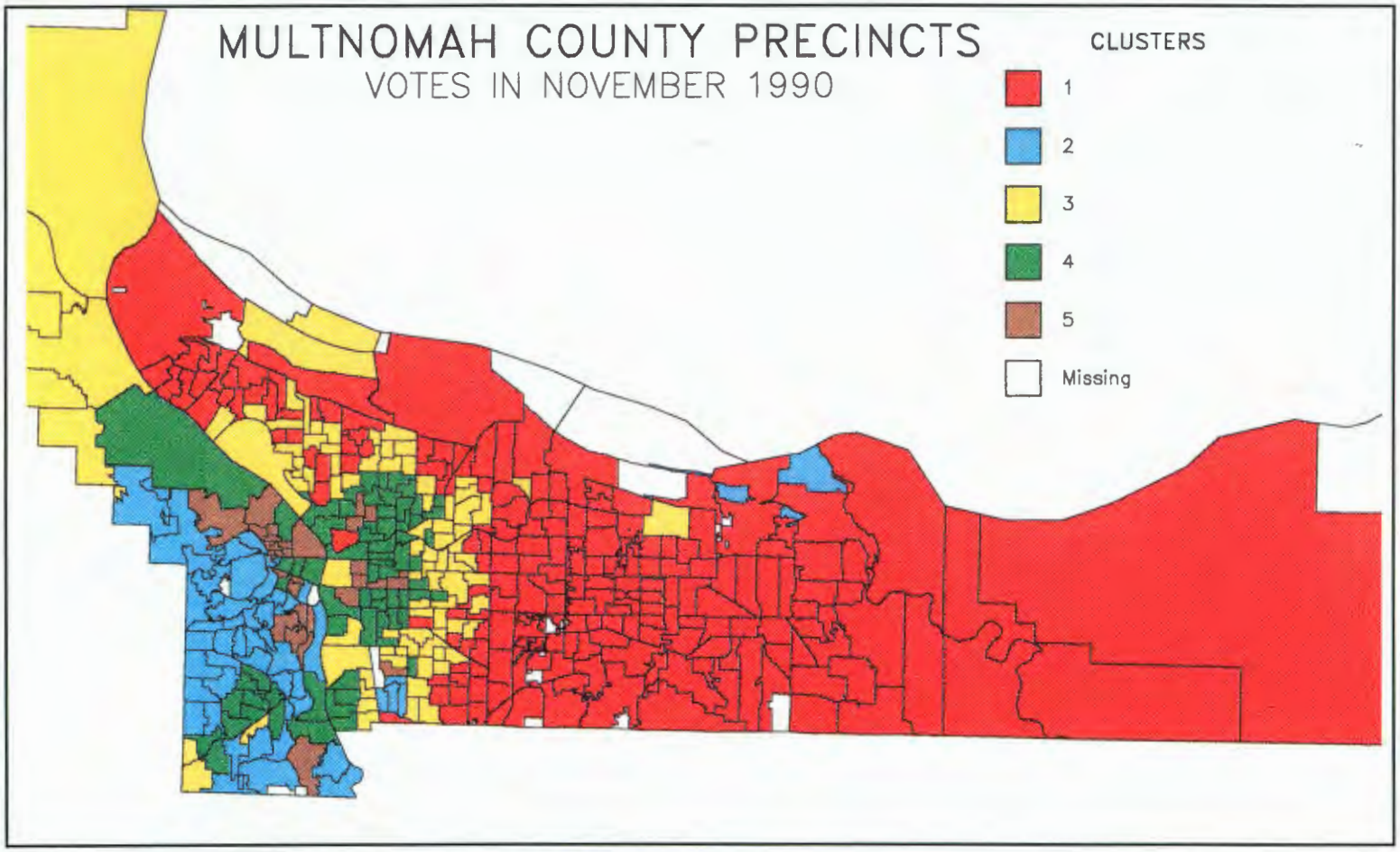

Figure 18. Five clusters of votes for the eleven measures on November 1990 Elections.

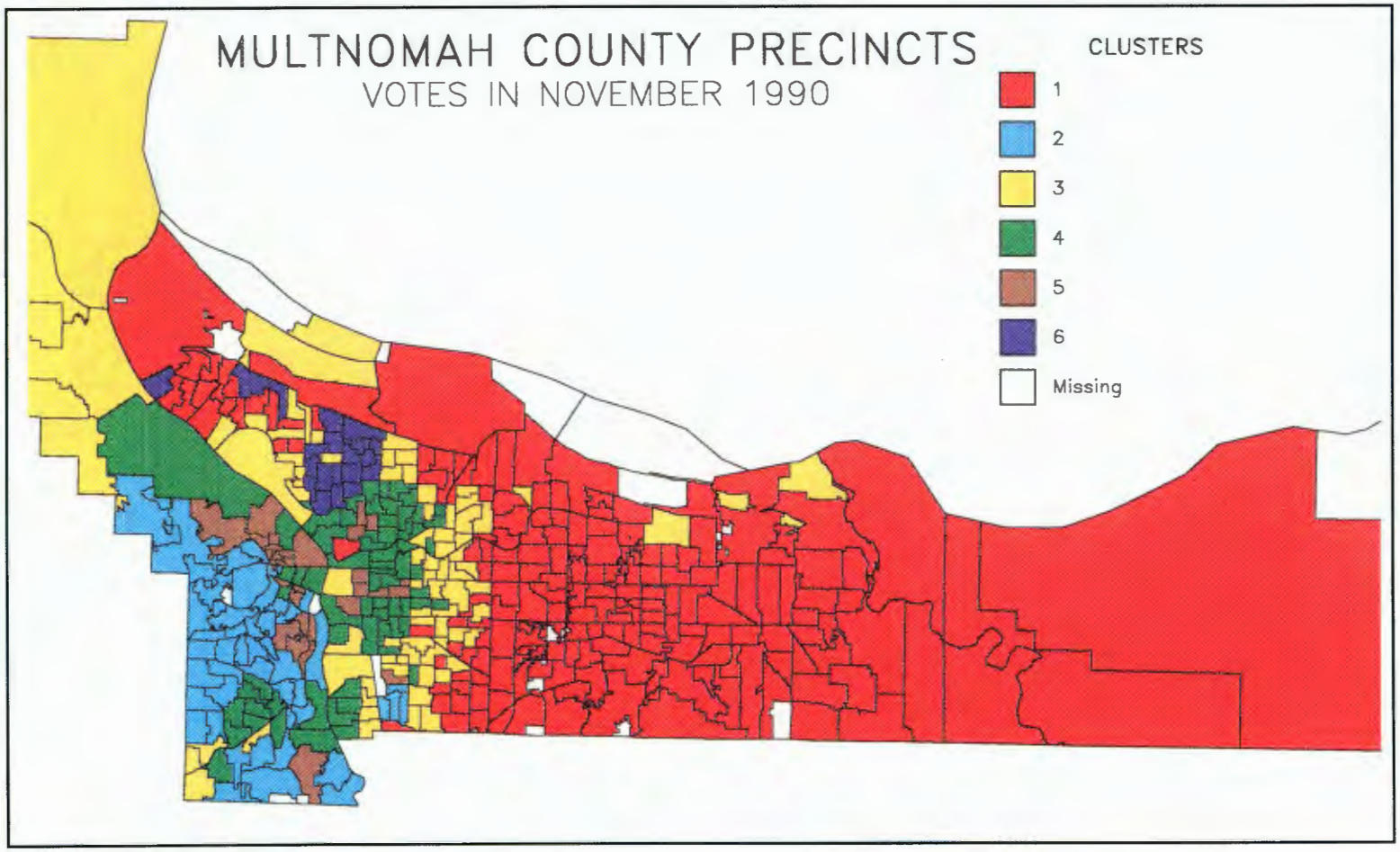

Figure 19. Six clusters of votes for the eleven measures on November 1990 Elections.

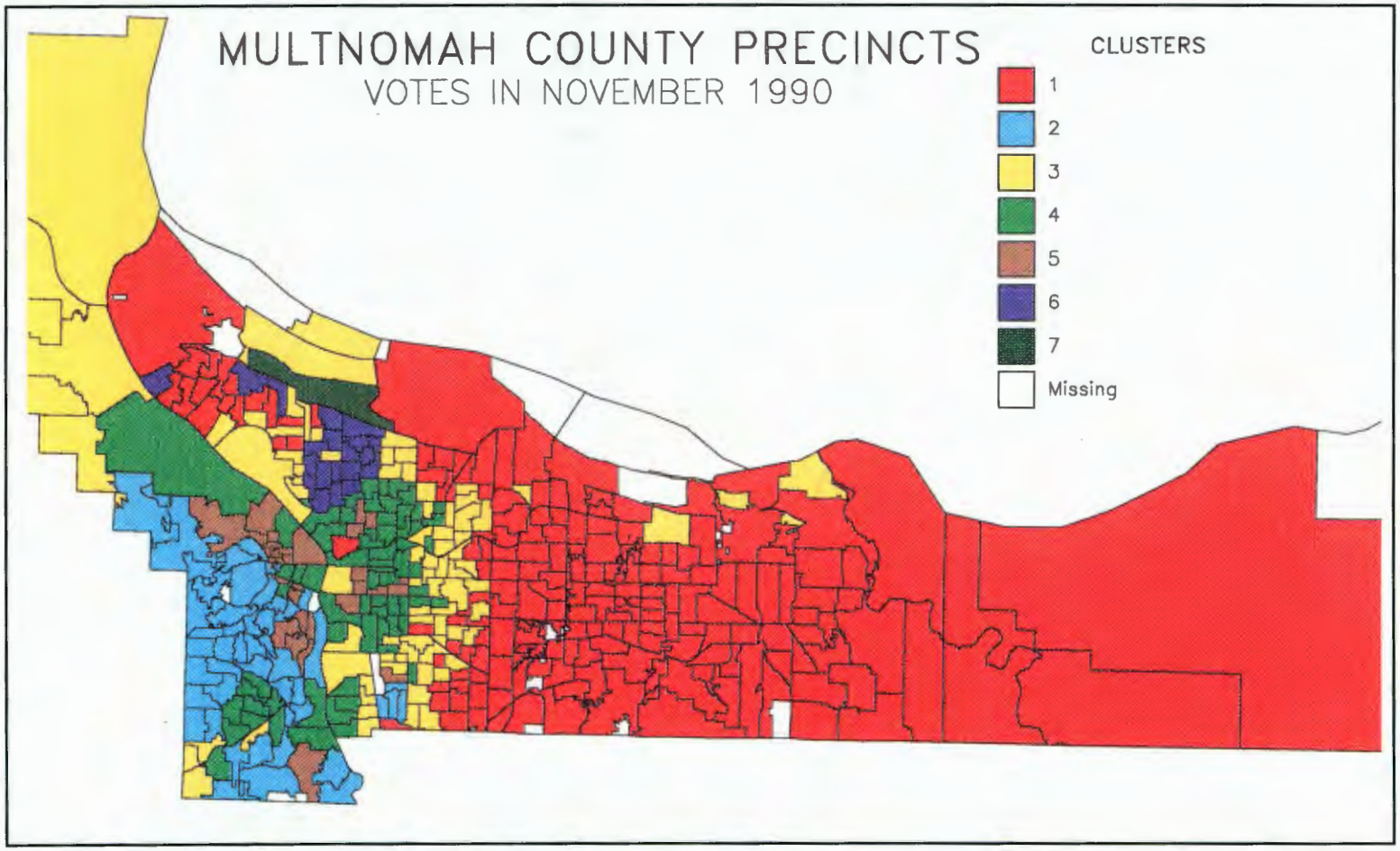

FIGURE 20. Seven clusters of votes for the eleven measures on November 1990 Elections.

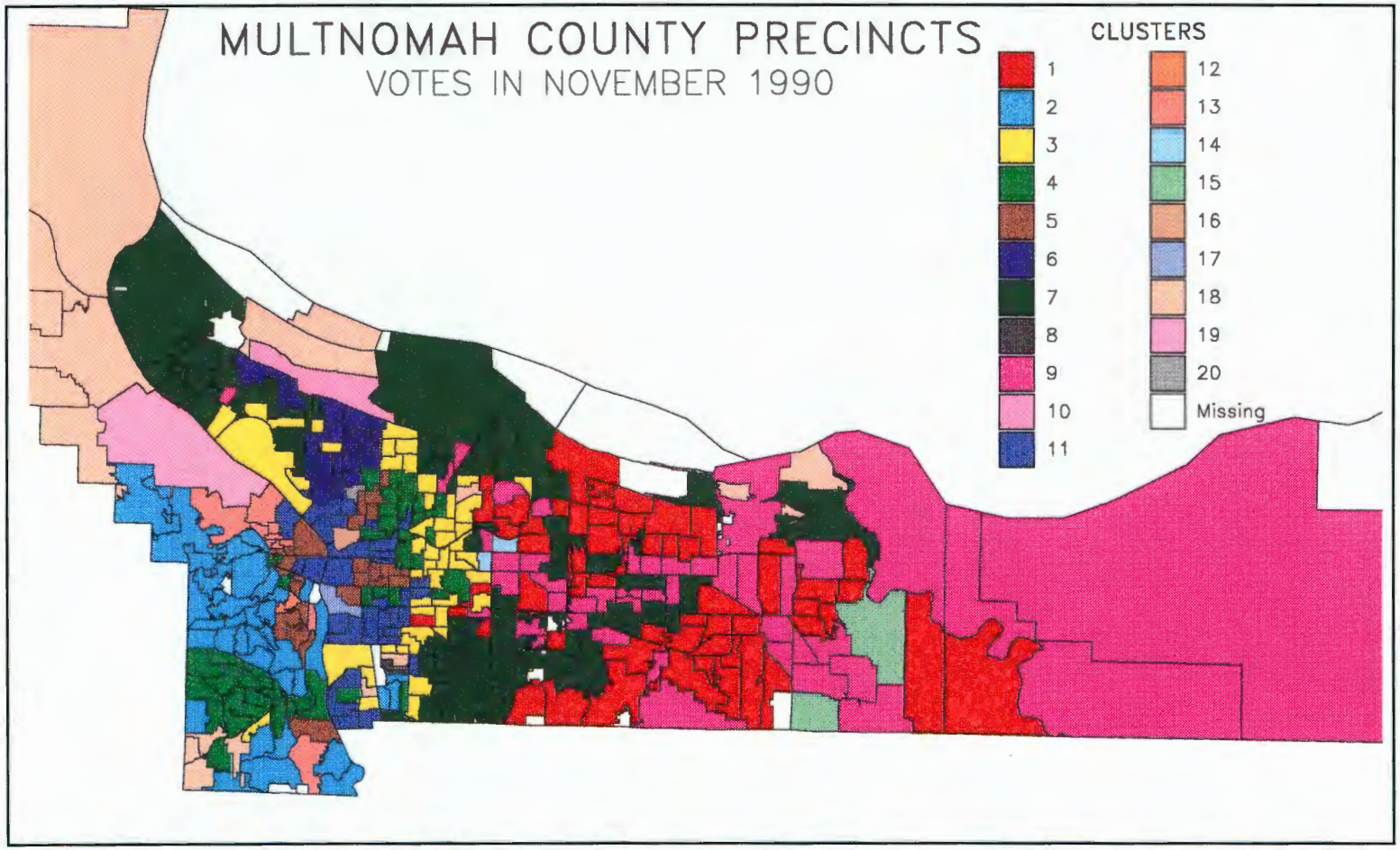

Figure 21. Twenty clusters of votes for the eleven measures on November 1990 Elections.

size and location. Instead, a simpler sort of nearest neighbor analysis was performed[4]. A decision was made to use attributes of left/right polygons for the bounding arcs of ARC/INFO® coverages, i.e. each arc in the coverage is a boundary between different precincts and it has the attribute for the identification number (id) of left and right polygon (precinct). The id of the polygon was calculated by the number of the cluster. For example, if we had three different clusters, all polygons would be numbered as 1, 2, or 3, based on the cluster number. Then, if the id of the left and the right polygons are the same, the arc (boundary) between them would "dissolve" and it would be possible to count all "remained" or "dissolved" arcs. After that, one can compare the count with counts of the randomly "dispersed" id (these counts were calculated as an average of five random tests) and of the optimum clustering for the particular area. Optimum clustering was obtained by dividing the territory into several geographical regions, such as south, north, west, east, southwest, etc. (this was done by selecting boxes on the screen in ARC/INFO® and calculating ids for each polygon inside the box equal the No. of cluster). It also is possible to calculate percentages of arcs that "dissolved" for clusters of measures, as well as for randomly and optimally clustered areas. Scores might be calculated by stretching the scale: putting the percentage of the arcs "dissolved" for a randomly clustered area equal to zero, and for optimal clustering equal to one hundred. This method is very similar to the approach widely used in the remote sensing for enhancing the quality of images. The results of this analysis are shown in TABLE IV. The final high score

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[4] Following the suggestion of Portland State University professor Richard Lycan.

TABLE IV

QUANTIFICATION OF THE GEOGRAPHICAL COMPONENT FOR CLUSTER ANALYSIS OF VOTES FOR THE ELEVEN MEASURES IN MULTNOMAH COUNTY

# OF CLUSTERS	OPTIMAL	ACTUAL	RANDOM
Percent of arcs dissolved			
3	79.48	67.37	23.00
4	76.22	64.57	16.77
5	75.37	57.47	15.50
6	73.46	56.48	11.18
7	72.89	56.33	10.54
20	56.62	39.07	4.39
Final scores			
3	100	78.57	0
4	100	80.36	0
5	100	70.09	0
6	100	72.73	0
7	100	73.44	0
20	100	66.40	0

values confirm the existence of strong spatial groupings, even when the analysis for 20 clusters was performed, substantiating the visual inspection. The advantage of this approach is that it is relatively easy to perform using ARC/INFO® and the results are compatible throughout the given area. However, for wider use in the future this

method needs some comparison with the existing methods, which might be the focus of further research.

One explanation for such spatial groupings may be that households chose to reside in areas where their neighbors share their political and social values.

An east/west split in Portland attitudes is well known, and it has deep historical roots. C. Abbott (1987) noted that this split unifies and divides the metropolitan area. It overlies and mitigates the socioeconomic contrast between central city and suburbs and thereby prevents a degree of social polarization. The cluster analysis appears to agree with this, and shows a wide transition zone between the two very different parts of the county. The other split is also well known in Anglo-American urban geographic literature: center (inner city)/periphery. As mentioned by L. Wirth in 1938, in the residential differentiation of the city, the urban fabric comes to resemble a 'mosaic of social worlds' (Timms, 1975).

The next step is to compare voting patterns with social and economic characteristics of Multnomah County.

Some important features of population in Multnomah county, which are derived from the 1990 census, are shown in TABLES V - VIII. The variables have been selected on the basis of their relevance in terms of the theory of voting behavior (Berelson, Lazarsfeld, and McPhee, 1954; Lipset, 1960; Cox, 1968; Guest, Hodge, Staeheli, 1988) and the availability of data.

These and a number of other variables shown in Appendix B were adopted for correlation analysis between socioeconomic data and percentage of votes for the

TABLE V

NUMBER OF PERSONS BY RACE AND HISPANIC ORIGIN IN MULTNOMAH COUNTY

RACE AND HISPANIC ORIGIN	Number	%
White	508,463	86.99
Black	35,129	6.01
American Indian, Eskimo, Aleut	6,738	1.15
Asian, Pacific Islander	27,391	4.69
Other Race	6,806	1.16
Hispanic Origin	18,368	3.14

TABLE VI

NUMBER OF PERSONS, 18 AND OVER, BY EDUCATIONAL ATTAINMENT IN MULTNOMAH COUNTY

EDUCATIONAL ATTAINMENT	NUMBER	%
Less Than 9th Grade	22,824	5.09
9th to 12th Grade, No Diploma	56,798	12.66
High School Graduate	119,274	26.59
Some College, No Degree	123,848	27.61
Associate Degree	28,850	6.43
Bachelor's Degree	64,863	14.46
Graduate or Professional Degree	32,170	7.17

TABLE VII

NUMBER OF EMPLOYED PERSONS, 16 AND OVER, BY INDUSTRY IN MULTNOMAH COUNTY

INDUSTRY (OCCUPATION)	NUMBER	%
Agriculture, Forestry, Fisheries	5,220	1.78
Mining	323	.11
Construction	15,305	5.23
Manufacturing, Nondurable Goods	15,190	5.19
Manufacturing, Durable Goods	29,662	10.14
Transportation	16,720	5.48
Communications & Other Public Utilities	7,625	2.61
Wholesale Trade	16,720	5.71
Retail Trade	52,546	17.96
Finance, Insurance, and Real Estate	21,435	5.93
Personal Services	9,385	3.21
Entertainment & Recreation Services	4,583	1.57
Health Services	26,603	9.09
Educational Services	21,693	7.41
Other Professional & Related Services	23,857	8.15
Public Administration	9,089	3.11

eleven measures in Multnomah County. Census data was recalculated for precincts instead of census block groups, using the method described above. The correlation matrix is shown in Appendix C.

TABLE VIII

NUMBER OF EMPLOYED PERSONS, 16 AND OVER, BY CLASS OF WORKER IN MULTNOMAH COUNTY

CLASS OF WORKER	NUMBER	%
Private, for Profit Wage and Salary	207,367	70.86
Private, Not-For-Profit Wage and Salary	25,140	8.59
Local Government	18,216	6.22
State Government	9,803	3.35
Federal Government	8,627	2.95
Self-Employed	22,552	7.71
Unpaid Family	941	.32

As indicated in a previous section, correlation coefficients between percentages of votes for different measures are high. The same is true for the set of socioeconomic variables that have a very high correlation with the votes (Appendix C).

Management Efficiency Measures

Measures connected with management efficiency were highly correlated with a high percentage of persons employed in public administration (Measure 1 – .74, Measure 2 – .78), health services (.53 and .49), and other professional and related services (.47 and .57) (TABLE IX). Other important characteristics were :

TABLE IX

CORRELATION COEFFICIENTS BETWEEN MANAGEMENT EFFICIENCY MEASURES AND SOCIOECONOMIC VARIABLES

	Measure 1 – Grants Metropolitan Service District electors right to self-governance.	Measure 2 – Constitutional amendment allows merged school districts to combine tax bases.
Percent of persons employed in public administration.	.74	.78
Percent of persons employed in health services.	.53	.49
Percent of persons employed in other professional and related services.	.47	.57
Educational attainment.	.78	.83
Median family income.	.50	.59
Median value of the owner-occupied housing unit.	.51	.52
Median nonfamily income.	.39	.49
Median household income.	.38	.49
Percent of persons moved from the Northeast.	.54	.46
Family size.	-.53	-.53
Percent of persons employed in construction.	-.62	-.62
Percent of persons employed in manufacturing nondurable goods.	-.52	-.55
Percent of persons employed in agriculture, forestry, and fishery.	-.51	-.52
Percent of persons employed in communications and other public utilities.	-.38	-.46
Factor 1.	.81	.91

educational attainment (.78 and .83); median family income (.50 and .59); median value of owner occupied housing units (.51 and .52); median nonfamily income (.39 and .49); and median household income (.38 and .49). Another variable with a high positive correlation coefficient was (perhaps coincidently) the percentage of persons who moved to Multnomah County from the Northeastern states (.54 and .46).

However, these measures were opposed in precincts with higher percentages of children and larger family size (-.53 and -.53); persons employed in construction (-.62 and -.62); manufacturing nondurable goods (-.52 and -.55); agriculture, forestry, and fishery (-.51 and -.52); and communications and other public utilities (-.38 and -.46). This group also has very correlation with the Factor 1 (socioeconomic) (.81 and .91). This brief analysis of voting for management efficiency measures suggests a major split in attitudes between white collar and blue collar workers in the county.

Environmental Issues

Another group of measures are the environmental issues (although one can also consider them as 'anti-business' proposals) - Measure 4 and Measure 6 (TABLE X). A high positive correlation was found between votes for these measures and the percentage of never married males in precincts (.61 for Measure 4 and .58 for Measure 6); and never married females (.68 and .66). The percentage of never married females is especially important in age categories 25 - 34 years (.55 and .50) and 35 - 44 years (.50 and .49). The percentage of persons 18 years and over in precinct is also important (.38 and .48). Migration is another important variable, as the correlation coefficients are higher in precincts with a larger percentage of people, who have come to Multnomah County during the last five years from the Northeast (.40 and .49) and from the central city of different Metropolitan statistical areas (.49 and .54). Employment is also important, but not to the degree observed for Measures 1 and 2. Coefficients are high for persons employed in health services (.39

TABLE X

CORRELATION COEFFICIENTS BETWEEN ENVIRONMENTAL ISSUES AND SOCIOECONOMIC VARIABLES

	Measure 4 - Prohibits Trojan operations until nuclear waste, cost, earthquake standards are met.	Measure 6 - Product packaging must meet recycling standards or receive hardship waiver.
Percent of never married males.	.61	.58
Percent of never married females.	.68	.66
Percent of never married females 25-34 years.	.55	.50
Percent of never married females 35-44 years.	.50	.49
Percent of persons 18 years and over.	.38	.48
Percent of persons moved from the Northeast.	.40	.49
Percent of persons moved from the central city of different MSA.	.49	.54
Percent of persons employed in health services.	.39	.51
Percent of persons employed in public administration.	.37	.58
Percent of married males.	-.59	-.55
Percent of married females.	-.59	-.54
Percent of persons employed in manufacturing nondurable goods.	-.35	-.45
Factor 2.	-.88	-.79

and .51) and public administration (.37 and .58). The highest negative correlation can be found with the percentage of married males in a precinct (-.59 and -.55), the percentage of married females in a precinct (-.59 and -.54), and the percentage of persons employed in the manufacturing of nondurable goods (-.35 and -.45). The analysis shows that the conflict here might be found not only in the sphere of production but also in a difference in the life cycle stage (which will be discussed later). Correlation coefficients with the Factor 2 are -.88 for Measure 4 and -.79 for

Measure 6. Married people without children are more likely to support environmental issues than other groups. However the color of the collar (economical factor) is also important. This finding contradicts empirical research (Wolfinger and Rosenstone, 1980; Lake, 1983) that people with more education feel a social obligation to vote, and they vote "*yes*" because symbolic concern with protecting the environment is a luxury that occurs after food, shelter and other basic needs are met (Van Liere and Dunlap, 1980). Also it contradicts a Resources for the Future Survey of support for environmental protection programs (Council on Environmental Quality, Department of Energy and Environmental Protection Agency, 1980) that found that 67 percent of Americans earning more than $15,000 a year support environmental protection programs, compared to 52 percent of those with income less than $8,000.

Personal Rights and Freedoms Issues

Measures associated with personal rights and freedoms, includes two anti-abortion measures (Measure 8 and Measure 10) and the 'safety belt' measure (Measure 9) (TABLE XI). The first interesting thing about these groups is that people who voted "*for*" the two anti-abortion measures were likely to reject the 'safety belt' measure, and vice versa, which might be connected with ideas of health and prosperity for individuals as well as for families. Although the variables with the high correlation coefficients for the measures in this group are similar, there are some differences. Income and education become the main discriminators for votes in this

TABLE XI

CORRELATION COEFFICIENTS BETWEEN PERSONAL RIGHTS AND FREEDOMS ISSUES AND SOCIOECONOMIC VARIABLES

	Measure 8 - Amends Oregon Constitution to prohibit abortion with three exceptions.	Measure 10 - Doctor must give parent notice before minor's abortion.	Measure 9 - Requires the use of safety belts.
Educational attainment.	-.73	-.78	.83
Median household income.	-.40	-.41	.66
Median family income.	-.51	-.53	.73
Median nonfamily income.	-.43	-.45	.61
Median value of the owner-occupied housing unit.	-.52	-.53	.62
Percent of persons moved from the Northeast.	-.54	-.57	.32
Percent of persons moved from the central cities of different MSA.	-.52	-.55	.24
Percent of persons employed in public administration.	-.69	-.74	.79
Percent of persons employed in health services.	-.52	-.55	.43
Percent of persons employed in other professional and related services.	-.48	-.50	.64
Number of persons per family.	.56	.59	-.40
Percent of persons employed in agriculture, forestry, and fisheries.	.46	.49	-.55
Percent of persons employed in construction.	.53	.57	-.64
Percent of persons employed in manufacturing nondurable goods.	.51	.56	-.48
Percent of persons employed in communications and other public utilities.	.36	.38	-.53
Factor 1.	-.64	-.72	.87

group. The highest level of opposition to the anti-abortion measures (and support for the 'safety belt' measure for that matter) was in precincts with the highest educational attainment (-.73 for Measure 8, -.78 for Measure 10, and .83 for Measure

9), highest median household income (-.40, -.41, and .66); highest median family income (-.51, -.53, and .73); highest median nonfamily income (-.43, -.45, and .61); and highest median value of owner-occupied housing units (-.52, -.53, and .62). High correlation coefficients also were with a high percentage of persons coming from the Northeast (-.54, -.57, and .32) and from the central cities of different Metropolitan areas (-.52, -.55, and .24); also with high percentages of persons employed in public administration (-.69, -.74, and .79), health services (-.52, -.55, and .43); other professional and related services (-.48, -.50, and .64). Support for the anti-abortion measures (and rejection of the 'safety belt' measure) was found in precincts with a high number of persons per family (.56, .59, and -.40); as well as with high percentages of persons employed in agriculture, forestry, and fisheries (.46, .49, and -.55), construction (.53, .57, and -.64), manufacturing nondurable goods (.51, .56, and -.48); communications and other public utilities (.36, .38, and -.53). Again, the socioeconomic factor is important in this case — correlation coefficients with the Factor 1 are high (-.64, -.72, and .87).

The 'safety belt' measure has another set of linkages that are unique for the group (and for the whole set of measures). This is the only measure that has a relatively high correlation with race/ethnicity variables. Indeed, correlation coefficients are high with the percentage of American Indians in a precinct (-.49); 'other race' persons (-.47); black males 18 - 24 years (-.46); black males 45 - 64 years (-.45); as well as percentages of young males and females of Hispanic origin in the county (-.47 and -.48 respectively). There also is a resistance among separated

females (-.50) and persons who have moved from another house but the same county (-.48).

Tax Reform Measures

The last group of measures is the one associated with tax reform (Measures 3, 5, 7, and 11). Among this group, two subgroups can be seen. The first subgroup is dependent upon the set of socioeconomic variables - Measure 3 (repeals tax exemptions for PERS retirees) and Measure 11 (tax credit for education outside public schools) (TABLE XII). However, variables concomitant with votes for Measure 3 have an opposite effect on votes for Measure 11, although both were defeated in Multnomah County. These variables are educational attainment (.79 for Measure 3 and -.62 for Measure 11); median family income (.56 and -.45); median household income (.46 and -.38); median nonfamily income (.45 and -.38); median value of the owner occupied housing unit (.52 and -.42); the percentage of persons from the Northeast (again!) in a precinct (.48 and -.30); the percentage of persons employed in public administration (.74 and -.58); health services (.55 and -.44); other professional and related services (.47 and -.42); and the percentage of persons employed in construction (-.60 and .50); agriculture, forestry, and fisheries (-.47 and .43); communications and other public utilities (-.46 and .33); manufacturing nondurable goods (-.45 and .38). Correlation coefficients with the socioeconomic factor (Factor 1) are — .84 (Measure 3) and -.41 (Measure 11).

TABLE XII

CORRELATION COEFFICIENTS BETWEEN TAX REFORM MEASURES (FIRST SUBGROUP) AND SOCIOECONOMIC VARIABLES

	Measure 3 - Repeals tax exemption, grants additional benefit payments for PERS retirees.	Measure 11 - School choice system, tax credit for education outside public schools.
Education attainment.	.79	-.62
Median family income.	.56	-.45
Median household income.	.46	-.38
Median nonfamily income.	.45	-.38
Median value of the owner-occupied housing unit.	.52	-.42
Percent of persons moved from the Northeast.	.48	-.30
Percent of persons employed in public administration.	.74	-.58
Percent of persons employed in health services.	.55	-.44
Percent of persons employed in other professional and related services.	.47	-.42
Percent of persons employed in construction.	-.60	.50
Percent of persons employed in agriculture, forestry, and fisheries.	-.47	.43
Percent of persons employed in communications and other public utilities.	-.46	.33
Percent of persons employed in manufacturing nondurable goods.	-.45	.38
Factor 1.	.84	-.41

The second subgroup consists of Measure 5 (limit on property taxes for schools and government operations) and Measure 7 (welfare benefits pilot program), both of which passed in Multnomah County (TABLE XIII). Another set of variables is associated with these measures. As in the group of environmental issues, they mainly reflect the stage of life cycle rather than socioeconomic status. High positive

TABLE XIII

CORRELATION COEFFICIENTS BETWEEN TAX REFORM MEASURES (SECOND SUBGROUP) AND SOCIOECONOMIC VARIABLES

	Measure 5 - State constitutional limit on property taxes for schools, government operations.	Measure 7 - Six-county work in lieu of welfare benefits pilot program.
Percent of owner-occupied housing units.	.57	.48
Percent of married males.	.76	.65
Percent of married females.	.75	.64
Percent of persons lived in the same house for at least five years.	.47	.36
Percent of whites.	.47	.29
Percent of other race males 25-44 years.	-.45	-.26
Percent of never married males.	-.66	-.58
Percent of never married females.	-.76	-.61
Percent of never married females 25-34 years.	-.59	-.50
Percent of never married females 35-44 years.	-.52	-.47
Percent of divorced females.	-.52	-.48
Percent of persons living in the Portland and having moved to another house or apartment during the last five years.	-.58	-.55
Percent of persons moved from the Northeast.	-.50	-.42
Factor 2.	.87	.91

correlation coefficients were found in percentage of owner-occupied housing units in the precincts (.57 for Measure 5 and .48 for Measure 7); married males (.76 and .65); married females (.75 and .64); persons who lived in the same house for at least five years (.47 and .36); also, the white population was more likely to support these measures (.47 and .29) and the 'other race males 25 - 44 years' to reject them (-.45 and -.26). High negative coefficients were found with percentage of never-married

males in a precinct (-.66 and -.58); never married females (-.76 and -.61), especially in age groups 25 - 34 years (-.59 and -.50) and 35 - 44 years (-.52 and -.47); divorced females (-.52 and -.48); persons living in Portland and having moved to another house or apartment during the last five years (-.58 and -.55), and persons who moved to Multnomah County from the Northeast (-.50 and -.42). Unlike the first subgroup, the "life-cycle" factor (Factor 2) plays a major role for these measures. Correlation coefficients are .87 for Measure 5 and .91 for Measure 7.

Measure 5 was the most controversial among the measures in the November, 1990, elections. The outcomes of this Measure will influence life in Oregon for many years. An article in *The Oregonian* by R. Sahr and R. Mason (April 23, 1993) stated that a telephone survey of a random sample of 604 Oregon voters completed by Oregon State University researchers one week prior to the November, 1990, vote showed that voters supported Measure 5 because they wanted property tax relief. Yet, my analysis shows that the correlation coefficient between votes *for* Measure 5 and the median value of owner-occupied housing units is only .11. These coefficients are slightly higher with median family income (.21), median nonfamily income (.24), and median household income (.34). The point here is that voters decisions are sometimes more complex than they would seem, and that a non-survey (ecological) analysis very often might give a researcher a more accurate picture of the forces behind voter's decision-making.

In the spatial distribution of votes, two major factors seem to influence the geographic distribution of voters choices. First is a sharp east/west division of the

county. In general, the more liberal part of the county is associated with the western part of the City of Portland, and is closely linked to higher educational attainment areas and white-collar suburbs. Indeed, because most individuals in the metropolitan areas still live in some proximity to their workplaces (Guest et al, 1988), residential areas in the western and central parts of Portland especially have attracted large numbers of workers to service industries. This partly reflects the nearby location of educational institutions, including Portland State University, and also major medical-health complexes. Other workers from these industries are concentrated in higher income areas in northeast Portland's Alameda district and the south-eastern part of the city. In contrast, workers in manufacturing are congregated more in the northern and eastern parts of the city. The second split, center/periphery, is associated with marital status and migration (part of the life cycle). Traditionally, central neighborhoods are acting as so called "stopover neighborhoods" (Abbott, 1987), with a high percentage of newcomers who can influence the political life of the area. People do not usually stay there for a long time, migrating after several years to suburbs.

One of the most interesting findings is that some of the chosen variables were not important for Multnomah County, including, in most cases, gender, race, ethnicity, and to some extent age structure. This result contradicts the results of other researchers. Non-partisan elections in American cities have been characterized by ethnic-based voting (O'Loughlin, 1981; Sharp, 1987), or at least cities have been viewed as contested areas that are shaped by political conflict not only between

business, political actors, and labor, but also between genders, races, and ethnicities (Clarke and Kirby, 1990; Cox, 1991; Fincher, 1989, Hodge and Staeheli, 1992). However, the fact that these factors are not playing the major role in the voting (for measures) process might be simply a distinguishing peculiarity of Multnomah County within the United States.

Of course, testing all measures (or even several groups of measures) on a one-by-one basis is not an easy task, since the attention is spread among eleven measures and several dozen census variables. Another way to check the importance of socioeconomic variables is to take factor scores from a principal components analysis for the eleven measures from each precinct and run a correlation analysis between these scores and the census data. These variables are most important for the geographical patterns of voting shown above. The complete table of correlation coefficients is shown in Appendix D.

Factor 1 (64.55 percent of total variance explained) has a clear "west/east" geographic split. All measures, except Measure 5 and Measure 7, have high correlation coefficients with factor scores. Variables with high correlation coefficients (more +- .45) are persons employed in public administration (.77); construction (-.59); "other professional and related services" (.58); manufacturing nondurable goods (-.49), agriculture, forestry & fisheries (-.49); communication & other public utilities (-.48); as well as median family income (.68); median household income (.61); median nonfamily income (.57); median value of the owner-occupied housing unit (.63). Only two variables with high coefficients might be considered as non-socioeconomic: the

percentage of separated females (-.48), and the percentage of persons residing in the same county since 1985. This factor may be called the "socioeconomic factor" as the socioeconomic status is usually measured by the educational achievement and income, professional and managerial employment, and ownership of expensive homes (Greenberg et al, 1989).

Factor 2 explained 17.6 percent of the variance. Unlike the "west/east" split of Factor 1, Factor 2 has a very strong "inner city/periphery" split. The outcome of votes for four measures have essentially strong correlation coefficients with this factor - Measure 7 (.91) - work on welfare benefits, Measure 5 (.87) - limit on property taxes for schools and government operations, Measure 4 (-.88), and Measure 6 (-.79) - both being environmentally oriented. These results might demonstrate 'rational self-interest', 'socioeconomic status', 'taxpayer revolt' and 'community conflict' from Cataldo and Holm (1983) explanations of local voting. Census variables with a high correlation are completely different from what is seen in the first factor. Variables with the highest positive coefficients are: married females (.78), married males (.77), percent of owner-occupied housing units (.59), and percent of persons living in the same house for at least five years. The highest negative correlation can be found among the percentage of never married females (-.74) and males (-.71); persons having moved during the last five years from the central city of the same metropolitan area (-.60); divorced females (-.53) and males (-.50); and males widowed (-.47) or separated (-.46). These variables might be characterized in terms of "life cycle stage".

The term "life cycle" is used here not to emphasize the importance of age structure, as it appears to be not very significant in the analysis (at least not if using the census definition), but rather to the significance of different stages (positions) in the family life cycle and strong determinative effects upon the area of residence which the family selected (Gans, 1962).

The clear "inner city/periphery" split and the high correlation coefficient above make it possible to use previous findings on a wide mixture of types of people in the inner city. Gans (1962) suggested that there are five groups, which he designated as cosmopolities, the unmarried and childless, the ethnic villages (neighborhoods), the deprived, and the trapped. The reasons underlying their central location are threefold: choice, economic disability, and age structure. The young unmarried element illustrates the functioning of the life cycle factor, since typically they are found in inner city areas only in the early stages of their life cycle and move to more peripheral areas when they marry and rise families. As a family grows older and children leave their parents, the parents' needs for the large amounts of space correspondingly diminish. Whether a family chooses to live in the inner or the peripheral parts of a city can therefore be determined by its assessments of the importance of land inputs as against commuting inputs and the balance of this equation of family budgeting will change depending on with stage of its life-cycle the family is in as much as upon its income level (Robson, 1971).

A sizable number of potential measures of socioeconomic indicators that are expected to influence electoral behavior have been derived. While the logic behind

each individual relationship is understandable, it is critical not to lose sight of the fact that these characteristics (conditions) do not exist independently of each other. Indeed, income is related conceptually and empirically to a large number of other conditions, such as education, occupation, and tenure status (Hodge et al, 1992). So the performed factor analysis simplified these relationships.

IS THERE A NEIGHBORHOOD EFFECT?

As it was mentioned earlier, many empirical studies have indicated the existence of broad patterns of behavior (as exemplified by aggregate data) which are consistent with the concept of structural effects. Here, I would like to illustrate an empirical method that might be used to investigate whether structural effects exist in certain circumstances. It is frequently suggested that the voting behavior of individuals depends not only on their personal characteristics (especially their socioeconomic status) but also on the characteristics of the population among whom they live (Taylor and Johnston, 1979). This example of a structural effect if often termed the "neighborhood effect", indicating that individuals are affected by the milieu of their local environment (Johnston, Hay, and Rumley, 1984).

The method I used in my analysis, suggested by O'Loughlin (O'Loughlin, 1981), is based on testing residuals between voting on different issues and socioeconomic characteristics of the population. According to the structural effect hypothesis, the greater the proportion of individuals in a population who are in a

particular socioeconomic group, the greater the proportion of members of that group who support a particular issue (Rumley, 1979).

First of all, to test the spatial distribution of the regression, residuals between votes for Measure 8 (anti-abortion) and educational attainment were calculated. Measure 8 and educational attainment were chosen because votes for Measure 8 are a rather good discriminator between precincts, and this variable has a high negative correlation coefficient with educational attainment (-.73). The residuals were calculated in SuperCalc®[5] and mapped in Atlas Pro® (FIGURE 22). The map shows that in the central part of Portland, people favored the measure even less than predicted by the regression, and in the eastern part favored more. However, the picture is somewhat mosaic.

From the overview above, it is known that socioeconomic variables are unable to completely explain variations of votes. O'Loughlin (1981) proposed a simple model of voting behavior:

Vote % = f(social/economic status, social context, relative space, campaign effort, other electoral cleavages, random elements).

Relative space and campaign efforts were excluded from the analysis because all measures were state-wide and the analysis were done only for one county, so that

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[5] Computer Associates International, Inc., SuperCalc®, Ver. 5.0, San Jose, CA, 1989.

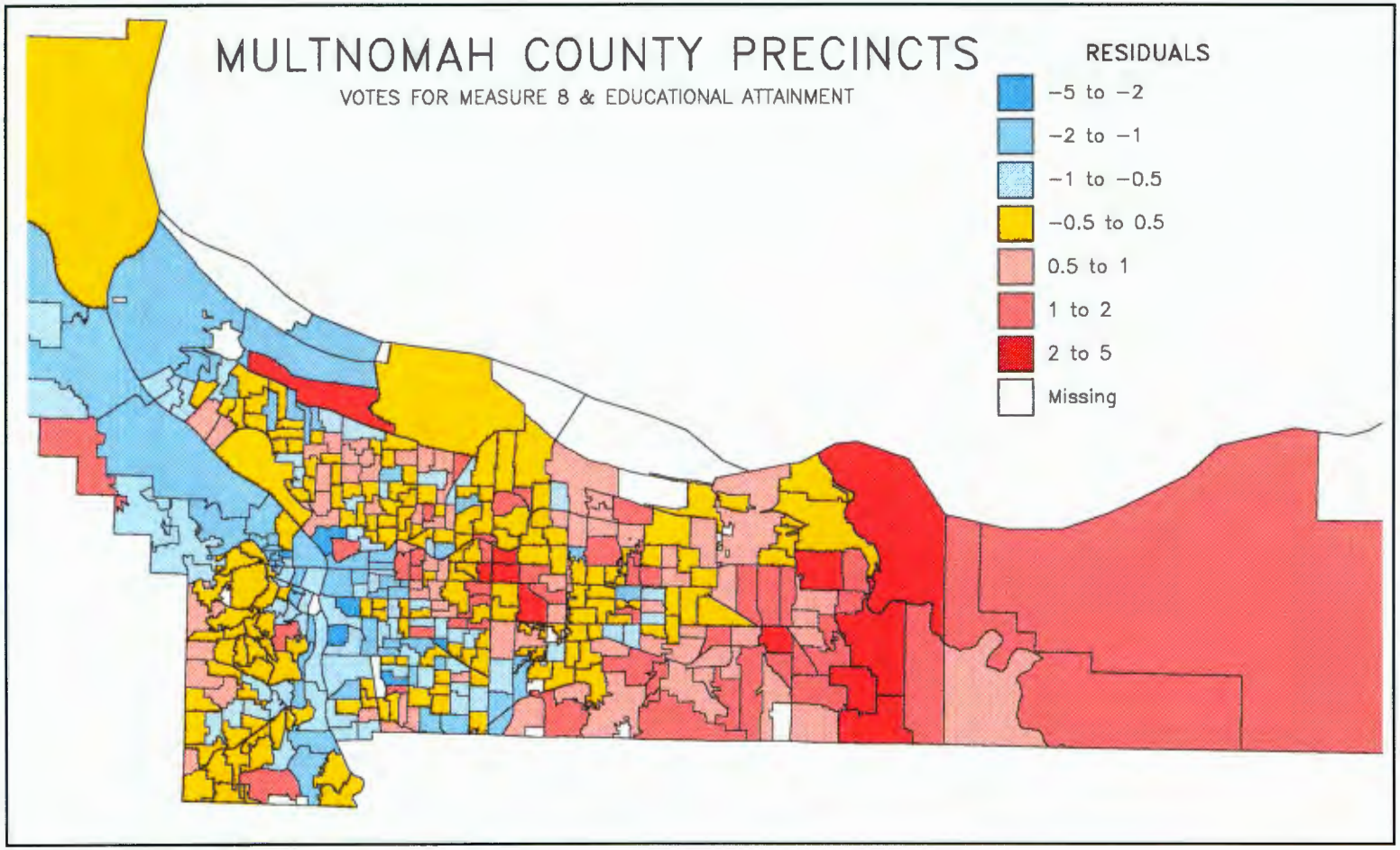

Figure 22. Residuals between the votes for Measure 8 and educational attainment.

the whole area should be covered at least by the same television and radio stations. The influence of campaign efforts in changing a voter's preference or in swinging undecided voters has not been well documented. On the other hand, referenda returns, unlike other votes, are not complicated by personality, party or (often) campaign efforts. However, in order to check the neighborhood effect presence and significance, a further analysis was done.

A conceptual problem noted by O'Loughlin (1981) is that in using aggregate data to study political context, the contextual effect itself is essentially the product of a group effort upon an individual. Affected individuals were put into groups, making what should be an individual focus an aggregate examination. This can result in possible aggregation bias, produced by differences between the specification bias of aggregate and individual level estimation. Additionally, it is assumed that individuals living in heterogeneous block groups behave in a similar fashion and are subject to similar influences as voters living in homogeneous neighborhoods. Yet all the evidence (Keller, 1968) points to the opposite - different interaction intensity and pattern. However, it is simply impossible to use a data-cell smaller than a precinct, so it was assumed that heterogeneity is minimized.

Residuals were calculated for each precinct between the eleven measures and also some important socioeconomic variables, including percentage of never-married females, number of persons per family, educational attainment, and percentage of persons employed in the manufacture of nondurable goods. After that, correlation coefficients between these residuals were calculated (Appendix E). These coefficients

appeared to be high. The average absolute value of the correlation coefficients is .39. That means that the deviations from the regression occur for different sets of variables within the same precincts.

In order to understand how these residuals are geographically distributed, cluster analyses were prepared for residuals between educational attainment, persons employed in the manufacture of nondurable goods, never married females, family size and Measures 1, 3, 5, 8, and 9 (these measures are from different groups and of different origin; and the correlation coefficients between these measures and selected socioeconomic variables are high). These clusters were then mapped. As shown in FIGURES 23 - 28, even with the increase of the number of clusters of the residuals up to twenty, they seem to be located in neighboring precincts, which might be the true evidence of the neighborhood effect in elections in Multnomah County.

In order to quantify the results, the same procedure was used for clusters of votes for the eleven measures, using ARC/INFO® capabilities. Scores appear to be high, confirming good spatial clustering among residuals (TABLE XIV). This might confirm the existence of the neighborhood effect.

One of the problems in these analyses is the significant autocorrelation in the residuals. As Geary (1968) argued, if residuals from the regression are not significantly autocorrelated while originals were, then the independent variables completely 'explain' the phenomenon. The discussion on autocorrelation presented here was performed by O'Loughlin in 1981 for larger areas, namely for census tracts. My analysis suggests the strong possibility of a neighborhood effect. A more detailed

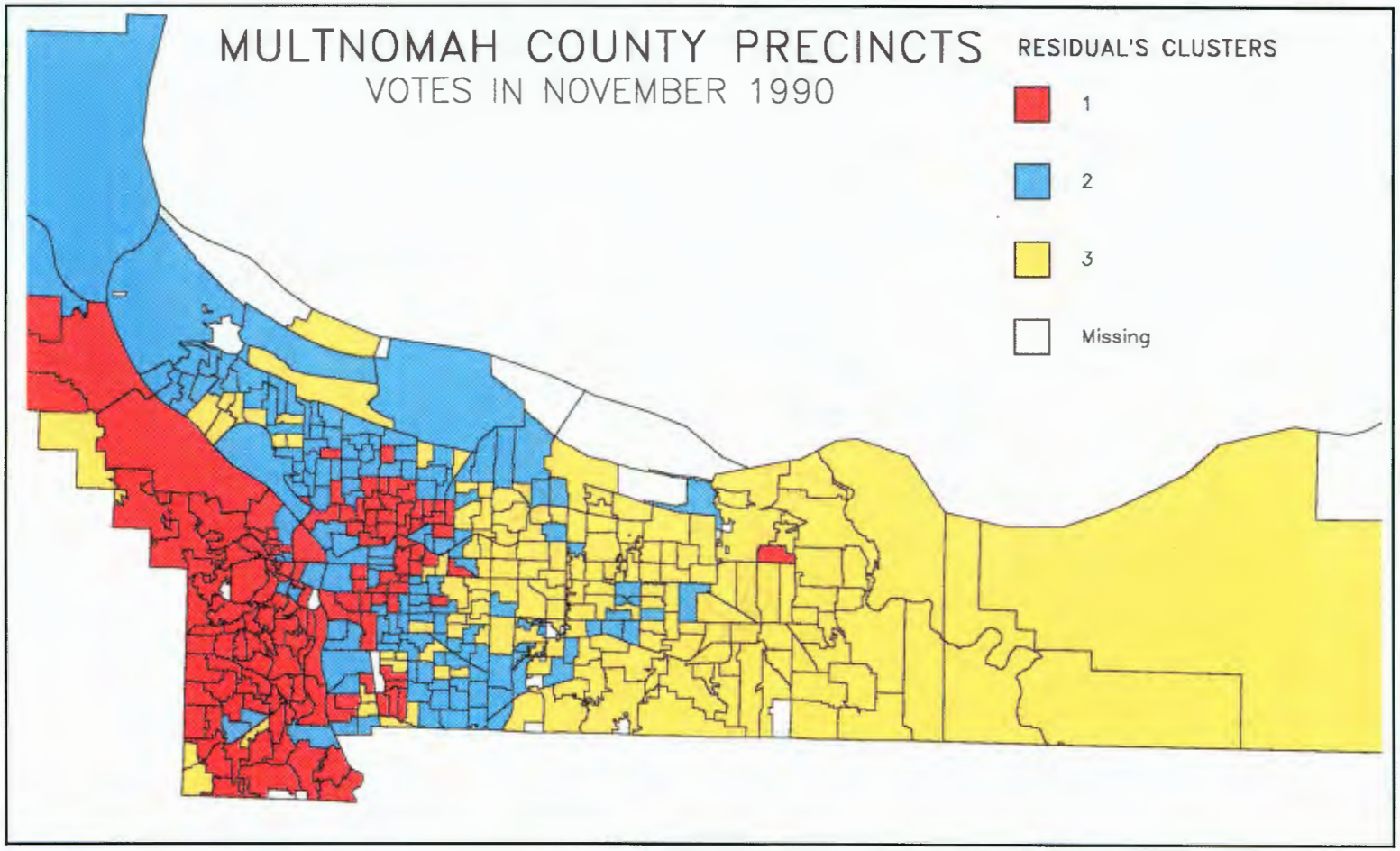

Figure 23. Three clusters of residuals of votes for the eleven measures on November 1990 Elections.

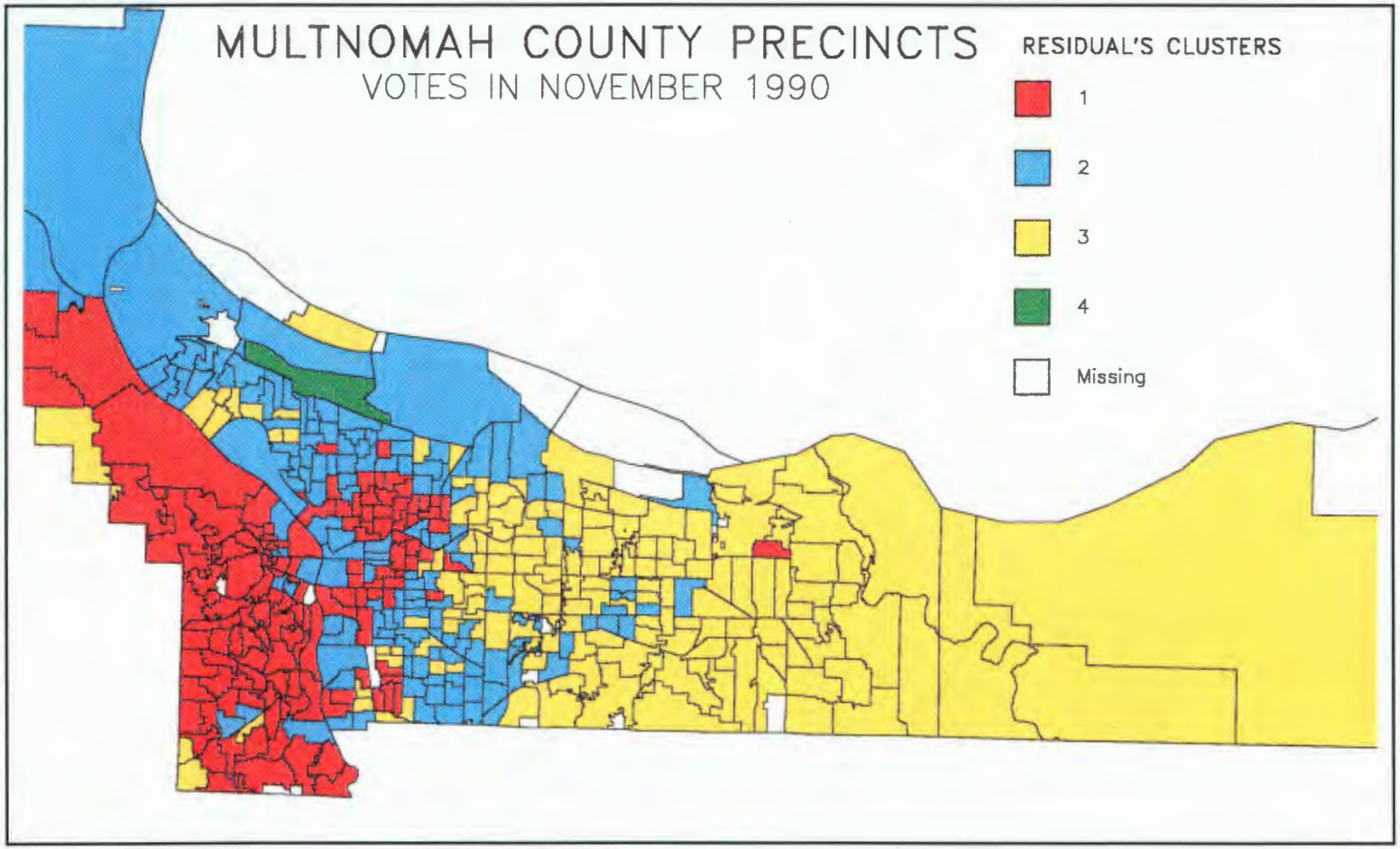

Figure 24. Four clusters of residuals of votes for the eleven measures on November 1990 Elections.

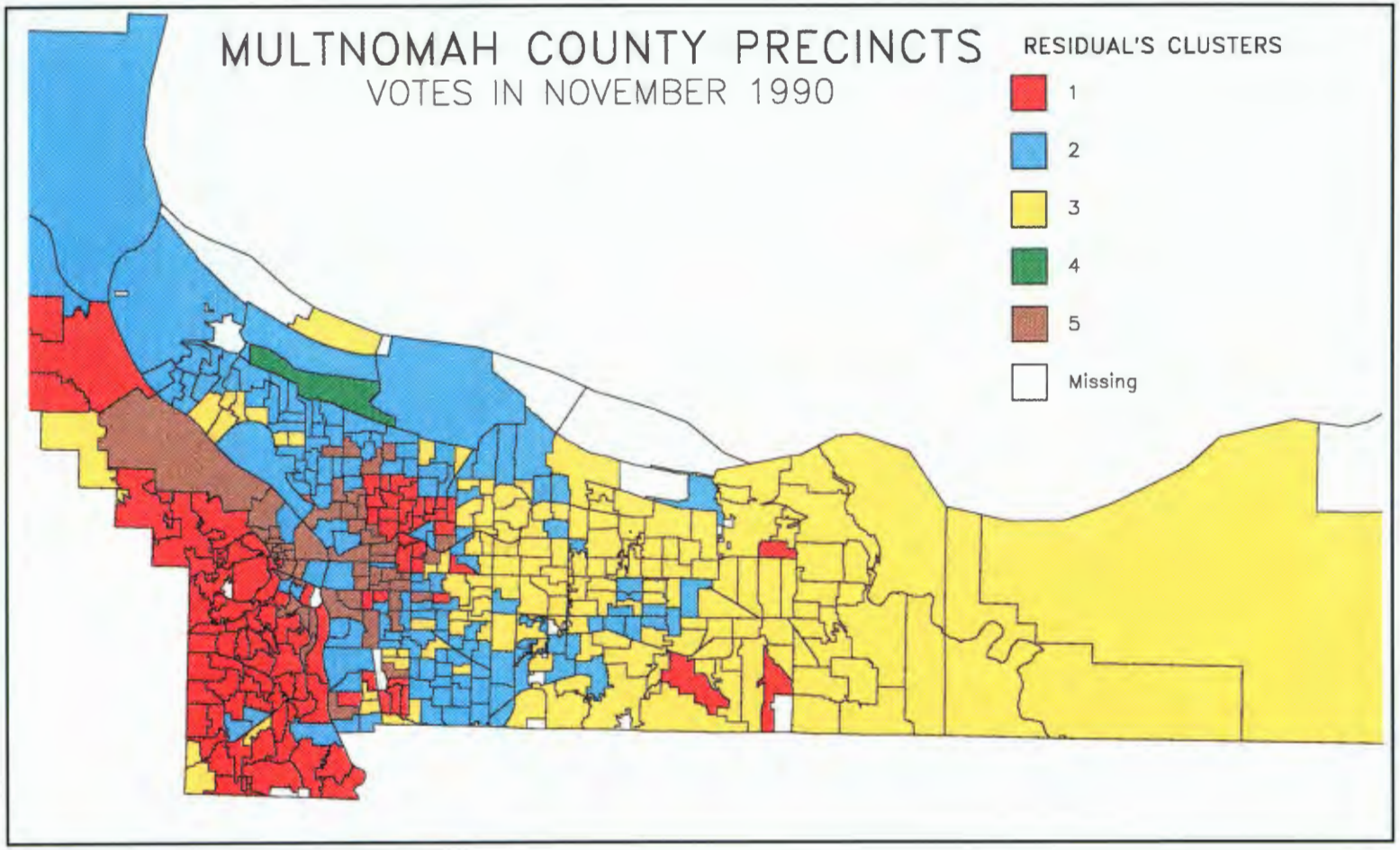

Figure 25. Five clusters of residuals of votes for the eleven measures on November 1990 Elections.

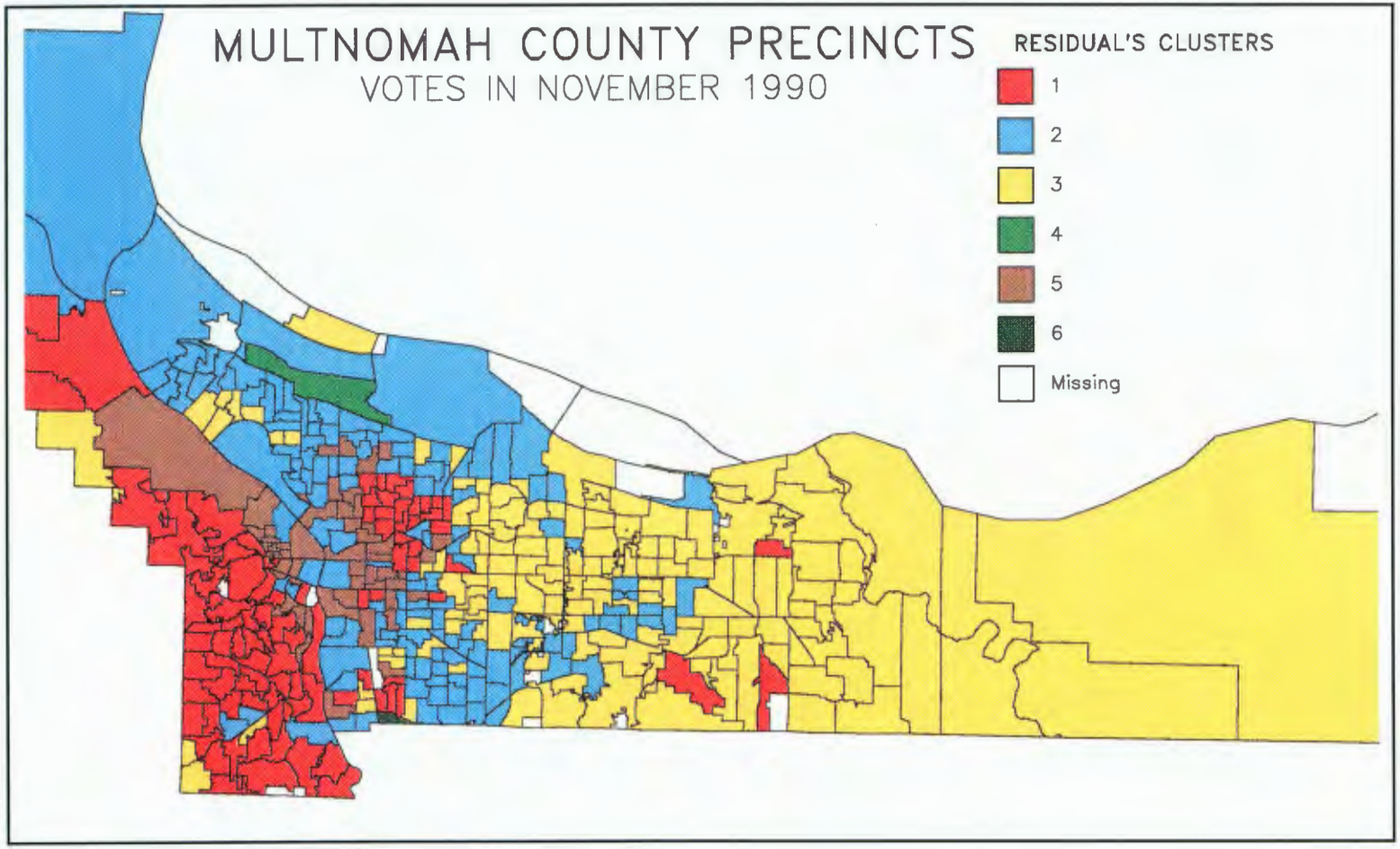

Figure 26. Six clusters of residuals of votes for the eleven measures on November 1990 Elections.

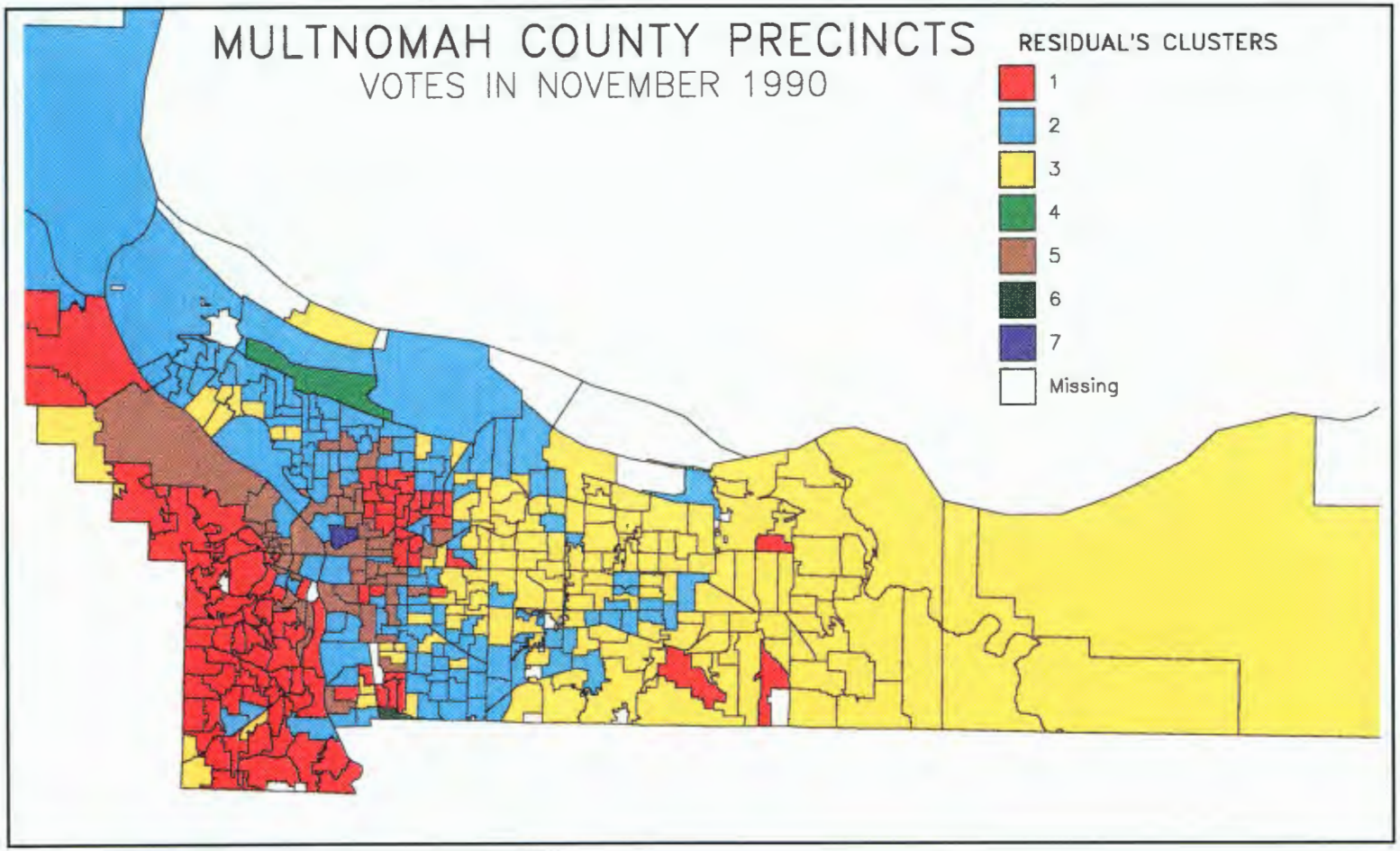

Figure 27. Seven clusters of residuals of votes for the eleven measures on November 1990 Elections.

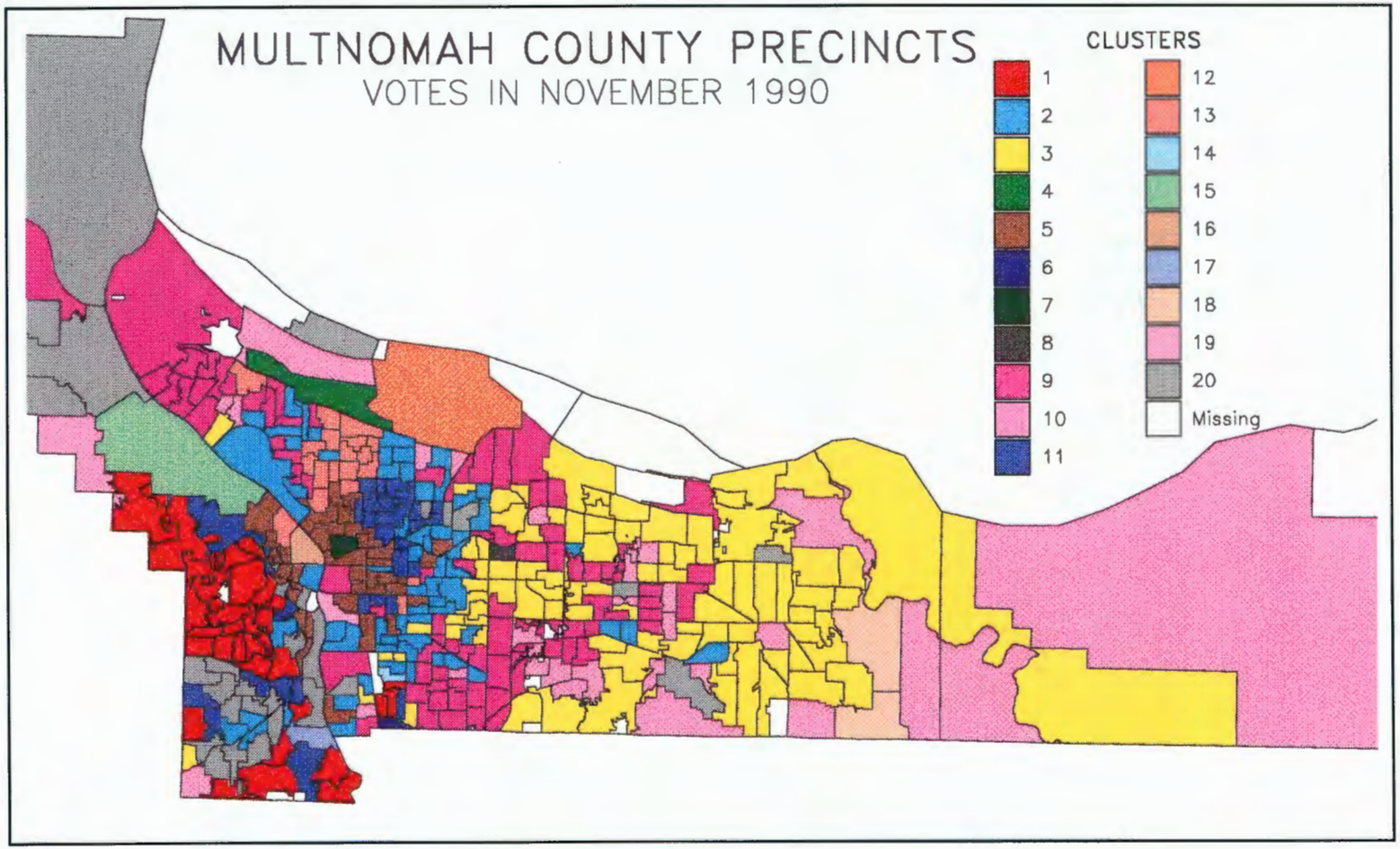

Figure 28. Twenty clusters of residuals of votes for the eleven measures on November 1990 Elections.

TABLE XIV

QUANTIFICATION OF THE GEOGRAPHICAL COMPONENT OF THE RESIDUALS BETWEEN VOTES FOR THE ELEVEN MEASURES IN MULTNOMAH COUNTY AND SOCIOECONOMIC VARIABLES

# OF CLUSTERS	OPTIMAL	ACTUAL	RESIDUALS	RANDOM
	Percent	of arcs	dissolved	
3	79.48	67.37	58.74	23.00
4	76.22	64.57	58.74	16.77
5	75.37	57.47	53.86	15.50
6	73.46	56.48	53.79	11.18
7	72.89	56.33	53.57	10.54
20	56.62	39.07	37.58	4.39
	Final	scores		
3	100	78.57	63.28	0
4	100	80.36	70.60	0
5	100	70.09	64.07	0
6	100	72.73	68.41	0
7	100	73.44	69.01	0
20	100	66.40	63.55	0

analysis must be performed in order to confirm or to reject its presence.

Within the whole voting population, the neighborhood effect may not be very important in determining electoral outcome, since a contextual vote in one part of the county may be counterbalanced by a similar vote in other areas. Nevertheless,

if we wish to understand why people are voting as they do, it is important to isolate and measure a possible contextual effect.

The last question asked was about the role of existing neighborhoods in Portland in connection with voting behavior. My analysis does not directly answer this question as it requires an extensive separate analysis of neighborhoods. As a basis for the future investigation, two maps were done in a manner, I would call "look-and-see", where the twenty clusters of votes for the eleven measures and twenty clusters of residuals between four socioeconomic variables and five measures were printed within neighborhood boundaries as they existed on October, 1992 (FIGURES 29-30). Some differences between neighborhood boundaries and different clusters are due to the fact that very often precinct and neighborhood boundaries do not match. However, in FIGURE 29 the diversity inside neighborhoods is greater, than in FIGURE 30. This fact suggests that there are no direct influences of the neighborhood on voting. At the same time, it shows that existing neighborhoods reflect to some extent differences in social and economic status among residents of Portland.

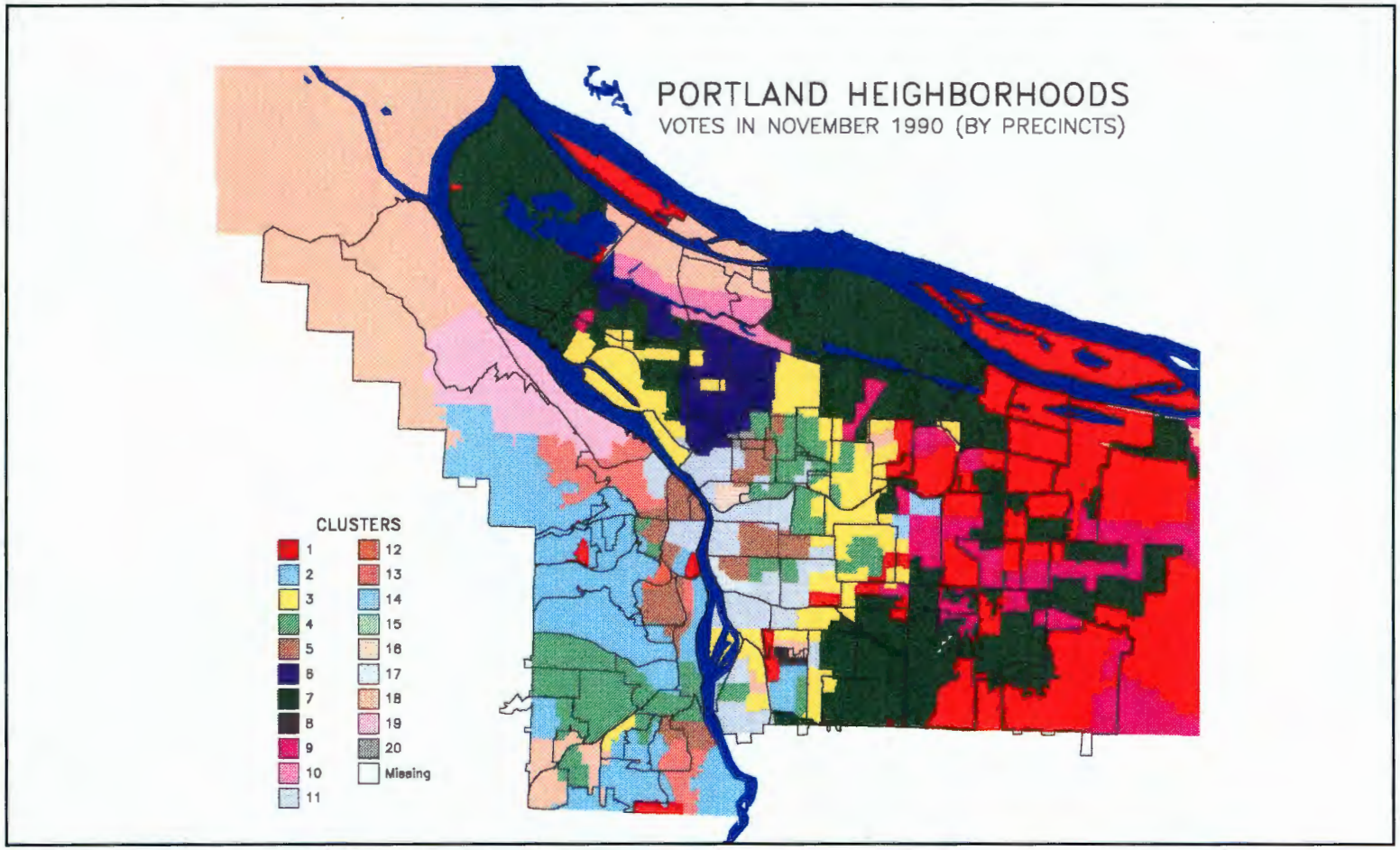

Figure 29. Portland's officially recognized neighborhood boundaries and twenty clusters of votes for the eleven measures on November 1990 Elections (by precincts).

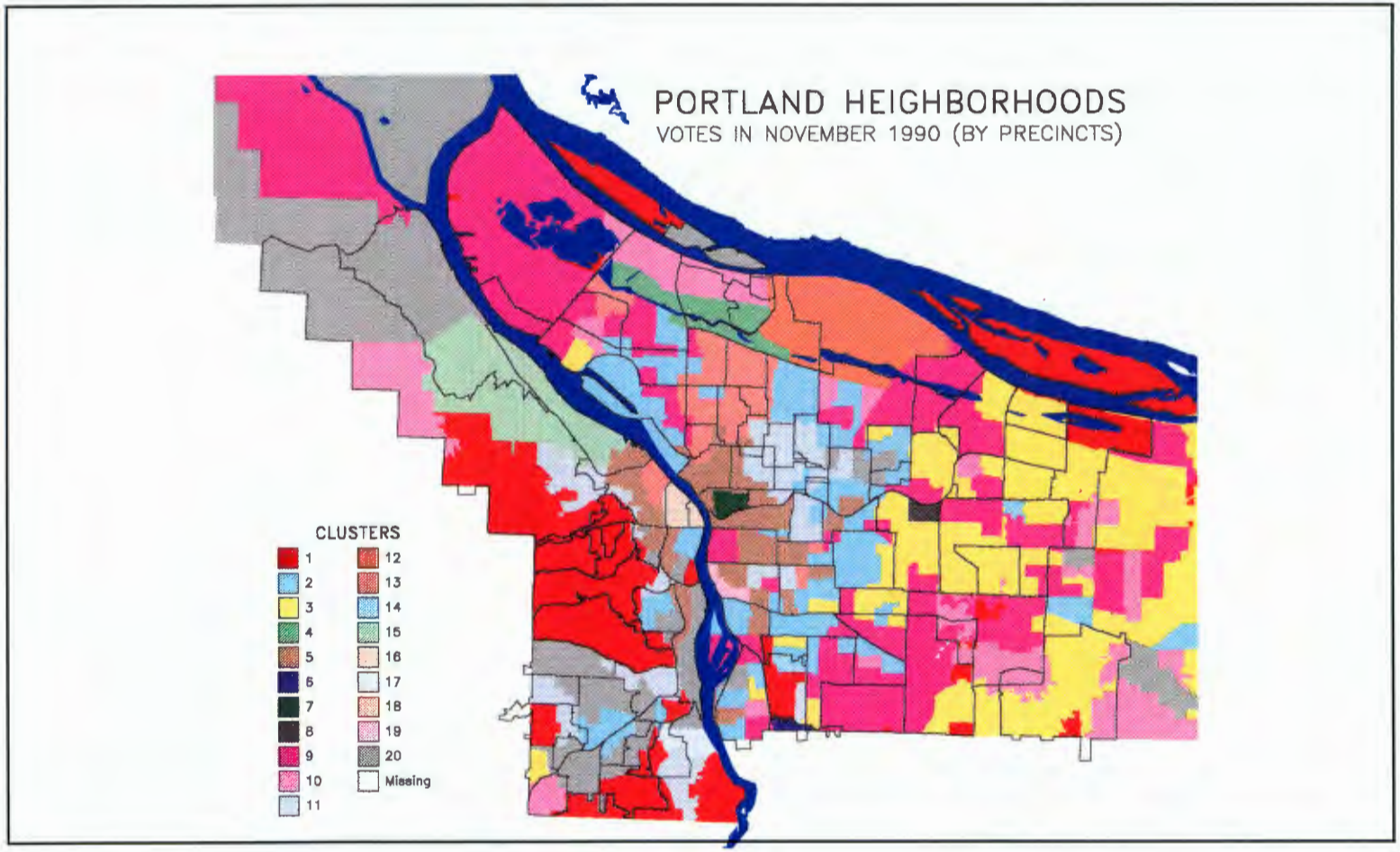

Figure 30. Portland's officially recognized neighborhood boundaries and twenty clusters of residuals of votes for the eleven measures on November 1990 Elections (by precincts).

CHAPTER IV

CONCLUSIONS

Voting is immediately intelligible as an act of citizenship that provides individuals with the opportunity to voice their views formally on issues and to select representation (Ettlinger, 1990). Elections in most democratic countries are surrounded by intense and prolonged discussion of spatial patterns of support for candidates, parties, and issues. The primary purpose of this thesis has been an attempt to understand the relationships between ballot items and socioeconomic characteristics of the electorate using less aggregated electoral and census data in more geographically detailed research.

The analysis of results of November, 1990, votes for the eleven issues on the ballot resulted in the following conclusions:

First, within selected categories (management efficiency, tax reform, environmental issues, and personal rights) the correlation coefficients are exceptionally high. Discrepancy between passed and defeated measures on the one hand and measures with high correlation on the other, shows to some extent the different origin and possible outcome of these proposals.

Second, the geographical distribution of the votes for the eleven issues appears in two major dimensions which might be aggregated to "westside versus eastside" and

"inner city (central part of the city) versus periphery". Factor analysis of voting outcomes confirmed these findings.

Third, cluster analysis of votes defined geographical areas in Multnomah County with common patterns of votes. According to the analysis, neighboring precincts have a common pattern of votes, creating very distinctive geographical regions. This spatial pattern does not disappear with an increase in the number of clusters. More numerous clusters define more specific areas of the city (for example, African-American neighborhoods). The GIS method of analysis was invented in order to quantify the geographical component of cluster analysis. Such method allows relative comparisons within the context. However, it lacks a basis for comparison with the other existing methods.

Fourth, new GIS capabilities including the use of ARC/INFO®, make it possible to perform better, more geographically detailed analysis of census data and comparison with the outcome of elections. Census data were recalculated by precincts, instead of using existing procedures in which data is employed by far larger census tracts. It also became possible to use smaller census divisions - less aggregated data by census block groups. Correlation between census and voting data was found, and socioeconomic variables with the high correlation coefficients with votes were established. These variables reflects two dimensions important in studying of the voters behavior: socioeconomic status (education, income, occupation) and position in the life cycle (age, marital status, family size). However, the origin of a particular measure has, to some extent, very little influence on a set of variables with

high (or low) correlation coefficients and issues, which at first appear unrelated, are based on similar patterns of support.

Fifth, an attempt to investigate the existence of the neighborhood effect was done. My analysis did not answer this question directly. In my analysis, I used the method of O'Loughlin (1981) of calculating residuals between voting outcome and socioeconomic data (with high correlation coefficients with votes). After the exhaustive analysis of inter-personal variations the presence of a strong geographical pattern suggests the existence of a neighborhood effect. However, further analysis must be performed to confirm or reject its presence. A conclusion on the possible role of existing neighborhoods in voting behavior also has to be confirmed by using other methods of analysis.

Further research is needed to develop and evaluate models of analyses of the voting behavior. The experimental method of quantification of the geographical clustering, suggested in the thesis, needs comparisons with other existing methods and after that can be used in a large variety of different researches along with more sophisticated methods. It is essentially important to use different models for cluster and regression analyses in order to evaluate contextual effects in voting. The available statistical apparatus, GIS capabilities, and the modeling opportunities are many, however, further work is needed to benefit from them.

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APPENDIX A

STATE MEASURES ON NOVEMBER 1990 ELECTIONS

(PERCENT YES/NO IN MULTNOMAH COUNTY)

Measure 1. Grants Metropolitan Service District electors the right to self-governance.

> Shall the state constitution give the metropolitan service district the right of self-governance, over metropolitan matters, through district charter? Passed, (55/45).

Measure 2. Constitutional amendment allows merged school districts to combine tax bases.

> Shall constitution allow school district created by merger a tax base equal to the sum of tax bases of merged districts? Passed, (70/30).

Measure 3. Repeals tax exemption, grants additional benefit payments for PERS retirees.

> Shall tax exemption for PERS (Public Employer's Retirement System) members pensions be repealed, and the amount equaling taxes plus 11 percent interest returned to IRS retires? Failed, (44/56).

Measure 4. Prohibits Trojan operation until nuclear waste, cost, earthquake standards are met.

> Shall the nuclear power plant (Trojan) be allowed to operate only if state regulatory agency finds that certain conditions are met? Failed, (49.9/50.1).

Measure 5. State constitutional limit on property taxes for schools, government operations.

> Shall the constitution set limits on property taxes, and dedicate them to fund public schools and non-school government operations? Passed, (55/45).

Measure 6. Product packaging must meet recycling standards or receive hardship waiver.

> By 1993, shall packaging used in Oregon meet certain recycling goals,

unless a hardship waiver is obtained? Passed, (53/47).

Measure 7. Six-county work in lieu of welfare benefits pilot program.

Shall Oregon law establish a program of work by public assistance recipients for government-funded wages in lieu of welfare benefits? Passed, (57/43).

Measure 8. Amends Oregon Constitution to prohibit abortion with three exceptions.

Shall the state constitution prohibit abortions except to prevent death of pregnant woman and in reported cases of rape or incest? Failed, (27/73).

Measure 9. Requires the use of safety belts.

Shall a law, effective December 7, 1990, require safety belt use by motor vehicle drivers and passengers over 16? Passed, (61/39).

Measure 10. Doctor must give parent notice before minor's abortion.

Shall state law require a doctor to give notice to a parent or custodian at least two days before minor's abortion? Failed, (41/59).

Measure 11. School choice system, tax credit for education outside public schools.

Should Constitution provide choice of public schools, tax credit for education outside public schools, voter approval of certain education laws? Failed, (32/68).

APPENDIX B

CODES USED FOR MEASURES AND SOCIOECONOMIC VABIABLES

HH61A001	-	SPECIFIED OWNER-OCCUPIED HOUSING UNITS - MEDIAN VALUE
H0030001	-	OWNER OCCUPIED HOUSING UNITS
H0030002	-	RENTER OCCUPIED HOUSING UNITS
M1	-	MEASURE 1
M2	-	MEASURE 2
M3	-	MEASURE 3
M4	-	MEASURE 4
M5	-	MEASURE 5
M6	-	MEASURE 6
M7	-	MEASURE 7
M8	-	MEASURE 8
M9	-	MEASURE 9
M10	-	MEASURE 10
M11	-	MEASURE 11
N0000001	-	WHITE PERSONS 18 YEARS & OVER
N0000002	-	BLACK PERSONS 18 YEARS & OVER
N0000003	-	AMERICAN INDIANS, ESKIMO, OR ALEUT PERSONS 18 YEARS & OVER
N0000004	-	ASIAN OR PACIFIC ISLADER PERSONS 18 YEARS & OVER
N0000005	-	OTHER RACE PERSONS 18 YEARS & OVER
N0000006	-	HISPANIC PERSONS 18 YEARS & OVER
N0000007	-	TOTAL PERSONS 18 YEARS & OVER
P0050001	-	MALE PERSONS
P0050002	-	FEMALE PERSONS
P0060001	-	WHITE PERSONS
P0060002	-	BLACK PERSONS
P0060003	-	AMERICAN INDIANS, ESKIMO, OR ALEUT PERSONS
P0060004	-	ASIAN OR PACIFIC ISLADER PERSONS
P0060005	-	OTHER RACE PERSONS
P0110012M	-	TOTAL PERSONS UNDER 18 YEARS
P0110017M	-	TOTAL PERSONS 18 - 24 YEARS
P0110021M	-	TOTAL PERSONS 25 - 44 YEARS
P0110026M	-	TOTAL PERSONS 45 - 64 YEARS
P0110027P	-	TOTAL PERSONS 65 & OVER
P0120012M	-	WHITE MALES UNDER 18 YEARS
P0120017M	-	WHITE MALES 18 - 24 YEARS
P0120021M	-	WHITE MALES 25 - 44 YEARS
P0120026M	-	WHITE MALES 45 - 64 YEARS
P0120027P	-	WHITE MALES 65 & OVER
P0120043M	-	WHITE FEMALES UNDER 18 YEARS
P0120048M	-	WHITE FEMALES 18 - 24 YEARS
P0120052M	-	WHITE FEMALES 25 - 44 YEARS
P0120057M	-	WHITE FEMALES 45 - 64 YEARS
P0120058P	-	WHITE FEMALES 65 & OVER
P0120074M	-	BLACK MALES UNDER 18 YEARS
P0120079M	-	BLACK MALES 18 - 24 YEARS
P0120083M	-	BLACK MALES 25 - 44 YEARS
P0120088M	-	BLACK MALES 45 - 64 YEARS
P0120089P	-	BLACK MALES 65 & OVER
P0120105M	-	BLACK FEMALES UNDER 18 YEARS

P0120110M - BLACK FEMALES 18 - 24 YEARS
P0120114M - BLACK FEMALES 25 - 44 YEARS
P0120119M - BLACK FEMALES 45 - 64 YEARS
P0120120P - BLACK FEMALES 65 & OVER YEARS
P0120136M - AMERICAN INDIANS, ESKIMO, OR ALEUT MALES UNDER 18 YEARS
P0120141M - AMERICAN INDIANS, ESKIMO, OR ALEUT MALES 18 - 24 YEARS
P0120145M - AMERICAN INDIANS, ESKIMO, OR ALEUT MALES 25 - 44 YEARS
P0120150M - AMERICAN INDIANS, ESKIMO, OR ALEUT MALES 45 - 64 YEARS
P0120151P - AMERICAN INDIANS, ESKIMO, OR ALEUT MALES 65 & OVER
P0120167M - AMERICAN INDIANS, ESKIMO, OR ALEUT FEMALES UNDER 18 YEARS
P0120172M - AMERICAN INDIANS, ESKIMO, OR ALEUT FEMALES 18 - 24 YEARS
P0120176M - AMERICAN INDIANS, ESKIMO, OR ALEUT FEMALES 25 - 44 YEARS
P0120181M - AMERICAN INDIANS, ESKIMO, OR ALEUT FEMALES 45 - 64 YEARS
P0120182P - AMERICAN INDIANS, ESKIMO, OR ALEUT FEMALES 65 & OVER
P0120198M - ASIAN OR PACIFIC ISLADER MALES UNDER 18 YEARS
P0120203M - ASIAN OR PACIFIC ISLADER MALES 18 - 24 YEARS
P0120207M - ASIAN OR PACIFIC ISLADER MALES 25 - 44 YEARS
P0120212M - ASIAN OR PACIFIC ISLADER MALES 45 - 64 YEARS
P0120213P - ASIAN OR PACIFIC ISLADER MALES 65 YEARS & OVER
P0120229M - ASIAN OR PACIFIC ISLADER FEMALES UNDER 18 YEARS
P0120234M - ASIAN OR PACIFIC ISLADER FEMALES 18 - 24 YEARS
P0120238M - ASIAN OR PACIFIC ISLADER FEMALES 25 - 44 YEARS
P0120243M - ASIAN OR PACIFIC ISLADER FEMALES 45 - 64 YEARS
P0120244P - ASIAN OR PACIFIC ISLADER FEMALES 65 YEARS & OVER
P0120260M - OTHER RACE MALES UNDER 18 YEARS
P0120265M - OTHER RACE MALES 18 - 24 YEARS
P0120269M - OTHER RACE MALES 25 - 44 YEARS
P0120274M - OTHER RACE MALES 45 - 64 YEARS
P0120275P - OTHER RACE MALES 65 YEARS & OVER
P0120291M - OTHER RACE FEMALES UNDER 18 YEAR
P0120296M - OTHER RACE FEMALES 18 - 24 YEARS
P0120300M - OTHER RACE FEMALES 25 - 44 YEARS
P0120305M - OTHER RACE FEMALES 45 - 64 YEARS
P0120306P - OTHER RACE FEMALES 65 YEARS & OVER
P0130012M - MALES OF HISPANIC ORIGIN UNDER 18 YEARS
P0130017M - MALES OF HISPANIC ORIGIN 18 - 24 YEARS
P0130021M - MALES OF HISPANIC ORIGIN 25 - 44 YEARS
P0130026M - MALES OF HISPANIC ORIGIN 45 - 64 YEARS
P0130027P - MALES OF HISPANIC ORIGIN 65 YEARS & OVER
P0130043M - FEMALES OF HISPANIC ORIGIN UNDER 18 YEARS
P0130048M - FEMALES OF HISPANIC ORIGIN 18 - 24 YEARS
P0130052M - FEMALES OF HISPANIC ORIGIN 25 - 44 YEARS
P0130057M - FEMALES OF HISPANIC ORIGIN 45 - 64 YEARS
P0130058P - FEMALES OF HISPANIC ORIGIN 65 YEARS & OVER
P0140001 - MALE 15 YEARS & OVER NEVER MARRIED
P0140002 - MALE 15 YEARS & OVER NOW MARRIED, EXCEPT SEPARATED
P0140003 - MALE 15 YEARS & OVER SEPARATED
P0140004 - MALE 15 YEARS & OVER WIDOWED
P0140005 - MALE 15 YEARS & OVER DIVORCED

P0140006	-	FEMALE 15 YEARS & OVER NEVER MARRIED
P0140007	-	FEMALE 15 YEARS & OVER NOW MARRIED, EXCEPT SEPARATED
P0140008	-	FEMALE 15 YEARS & OVER SEPARATED
P0140009	-	FEMALE 15 YEARS & OVER WIDOWED
P0140010	-	FEMALE 15 YEARS & OVER DIVORCED
P017A001	-	PERSONS PER FAMILY
R0370004	-	18 YEARS & OVER NATIVE
R0370005	-	18 YEARS & OVER NATURALIZED CITIZEN
R0370006	-	18 YEARS & OVER NOT A CITIZEN
R0380001	-	FEMALES 15 - 24 YEARS NEVER MARRIED
R0380002	-	FEMALES 25 - 34 YEARS NEVER MARRIED
R0380003	-	FEMALES 35 - 44 YEARS NEVER MARRIED
R0380004	-	FEMALES 45 YEARS & OVER NEVER MARRIED
R0380005	-	FEMALES 15 - 24 YEARS EVER MARRIED
R0380006	-	FEMALES 25 - 34 YEARS EVER MARRIED
R0380007	-	FEMALES 35 - 44 YEARS EVER MARRIED
R0380008	-	FEMALES 45 YEARS & OVER EVER MARRIED
R0430001	-	PERSONS 5 YEARS & OVER RESIDENCE IN 1985 - SAME HOUSE
R0430002	-	PERSONS 5 YEARS & OVER RESIDENCE IN 1985 - SAME COUNTY
R0430003	-	PERSONS 5 YEARS & OVER RESIDENCE IN 1985 - SAME STATE
R0430004	-	PERSONS 5 YEARS & OVER RESIDENCE IN 1985 - NORTHEAST
R0430005	-	PERSONS 5 YEARS & OVER RESIDENCE IN 1985 - MIDWEST
R0430006	-	PERSONS 5 YEARS & OVER RESIDENCE IN 1985 - SOUTH
R0430007	-	PERSONS 5 YEARS & OVER RESIDENCE IN 1985 - WEST
R0430008	-	PERSONS 5 YEARS & OVER RESIDENCE IN 1985 - PUERTO RICO
R0430009	-	PERSONS 5 YEARS & OVER RESIDENCE IN 1985 - U.S. OUTLYING AREA
R0430010	-	PERSONS 5 YEARS & OVER RESIDENCE IN 1985 - FOREIGHN COUNTRY
R0440001	-	PERSONS 5 YEARS & OVER RESIDENCE IN 1985 - SAME HOUSE
R0440002	-	PERSONS 5 YEARS & OVER RESIDENCE IN 1985 - CENTRAL CITY/THIS MSA/PMSA
R0440003	-	PERSONS 5 YEARS & OVER RESIDENCE IN 1985 - REMAINDER OF THIS MSA/PMSA
R0440004	-	PERSONS 5 YEARS & OVER RESIDENCE IN 1985 - CENTRAL CITY/DIFFERERENT MSA/PMSA
R0440005	-	PERSONS 5 YEARS & OVER RESIDENCE IN 1985 - REMAINDER OF DIFFERENT MSA/PMSA
R0440006	-	PERSONS 5 YEARS & OVER RESIDENCE IN 1985 - NOT IN MSA/PMSA
R0440007	-	PERSONS 5 YEARS & OVER RESIDENCE IN 1985 - ABROAD
R0600000	-	EDUCATIONAL ATTAINMENT
R0770001	-	EMPLOYED PERSONS 16 YEARS & OVER - AGRICULTURE, FORESTRY, AND FISHERIES
R0770002	-	EMPLOYED PERSONS 16 YEARS & OVER - MINING
R0770003	-	EMPLOYED PERSONS 16 YEARS & OVER - CONSTRUCTION
R0770004	-	EMPLOYED PERSONS 16 YEARS & OVER - MANUFACTURING, NONDURABLE GOODS
R0770005	-	EMPLOYED PERSONS 16 YEARS & OVER - MANUFACTURING, DURABLE GOODS
R0770006	-	EMPLOYED PERSONS 16 YEARS & OVER - TRANSPORTATION

R0770007	-	EMPLOYED PERSONS 16 YEARS & OVER - COMMUNICATIONS AND OTHER PUBLIC UTILITIES
R0770008	-	EMPLOYED PERSONS 16 YEARS & OVER - WHOLESALE TRADE
R0770009	-	EMPLOYED PERSONS 16 YEARS & OVER - RETAIL TRADE
R0770010	-	EMPLOYED PERSONS 16 YEARS & OVER - FINANCE, INSURANCE, AND REAL ESTATE
R0770011	-	EMPLOYED PERSONS 16 YEARS & OVER - BUSINESS AND REPAIR SERVICES
R0770012	-	EMPLOYED PERSONS 16 YEARS & OVER - PERSONAL SERVICES
R0770013	-	EMPLOYED PERSONS 16 YEARS & OVER - ENTERTAINMENT AND RECREATION SERVICES
R0770014	-	EMPLOYED PERSONS 16 YEARS & OVER - HEALTH SERVICES
R0770015	-	EMPLOYED PERSONS 16 YEARS & OVER - EDUCATIONAL SERVICES
R0770016	-	EMPLOYED PERSONS 16 YEARS & OVER - OTHER PROFESSIONAL AND RELATED SERVICES
R0770017	-	EMPLOYED PERSONS 16 YEARS & OVER - PUBLIC ADMINISTRATION
R0790001	-	EMPLOYED PERSONS 16 YEARS & OVER - PRIVATE FOR PROFIT WAGE AND SALARY WORKERS
R0790002	-	EMPLOYED PERSONS 16 YEARS & OVER - PRIVATE NOT-FOR-PROFIT WAGE AND SALARY WORKERS
R0790003	-	EMPLOYED PERSONS 16 YEARS & OVER - LOCAL GOVERNMENT WORKERS
R0790004	-	EMPLOYED PERSONS 16 YEARS & OVER - STATE GOVERNMENT WORKERS
R0790005	-	EMPLOYED PERSONS 16 YEARS & OVER - FEDERAL GOVERNMENT WORKERS
R080A001	-	MEDIAN HOUSEHOLD INCOME IN 1989
R107A001	-	MEDIAN FAMILY INCOME IN 1989
R110A001	-	MEDIAN NONFAMILY INCOME IN 1989

APPENDIX C

CORRELATION COEFFICIENTS BETWEEN MEASURES AND SOCIOECONOMIC VARIABLES

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
HH61A001	0.51	0.52	0.52	-0.03	0.11	0.17	0.09	-0.52	0.62	-0.53	-0.42
H0030001	-0.18	-0.01	-0.06	-0.42	0.57	-0.35	0.48	0.14	0.23	0.15	-0.07
H0030002	0.18	0.01	0.06	0.42	-0.57	0.35	-0.48	-0.14	-0.23	-0.15	0.07
N0000001	0.14	0.32	0.01	-0.16	0.47	-0.14	0.28	-0.15	0.34	-0.20	-0.14
N0000002	-0.11	-0.29	0.06	0.13	-0.43	0.13	-0.24	0.11	-0.26	0.18	0.07
N0000003	-0.14	-0.30	-0.15	0.14	-0.21	0.01	-0.22	0.13	-0.46	0.16	0.31
N0000004	-0.05	-0.01	-0.16	0.10	-0.13	0.08	-0.12	0.05	-0.13	0.03	0.10
N0000005	-0.23	-0.34	-0.18	0.03	-0.13	-0.05	-0.14	0.20	-0.40	0.23	0.25
N0000006	-0.19	-0.34	-0.17	0.12	-0.25	0.02	-0.25	0.15	-0.44	0.17	0.26
N0000007	0.51	0.51	0.39	0.38	-0.37	0.48	-0.35	-0.53	0.36	-0.57	-0.33
P0050001	0.05	0.00	0.04	0.12	0.00	0.10	-0.07	-0.08	-0.12	-0.09	0.15
P0050002	-0.05	0.00	-0.04	-0.12	0.00	-0.10	0.07	0.08	0.12	0.09	-0.15
P0060001	0.15	0.33	0.02	-0.17	0.47	-0.14	0.29	-0.15	0.34	-0.20	-0.15
P0060002	-0.11	-0.30	0.05	0.14	-0.43	0.13	-0.25	0.12	-0.27	0.18	0.08
P0060003	-0.18	-0.33	-0.19	0.17	-0.23	0.02	-0.29	0.13	-0.49	0.16	0.31
P0060004	-0.06	0.00	-0.18	0.09	-0.14	0.08	-0.13	0.05	-0.11	0.02	0.13
P0060005	-0.25	-0.39	-0.24	0.04	-0.17	-0.05	-0.17	0.24	-0.47	0.27	0.28
P0110012M	-0.45	-0.46	-0.37	-0.25	0.19	-0.37	0.25	0.48	-0.35	0.51	0.33
P0110017M	-0.10	-0.13	-0.14	0.12	-0.19	0.06	-0.09	0.11	-0.21	0.10	0.22
P0110021M	-0.11	-0.10	0.13	0.10	-0.11	0.00	-0.04	0.15	-0.15	0.14	0.15
P0110026M	-0.26	-0.21	-0.2	-0.30	0.23	-0.33	0.30	0.27	-0.07	0.28	0.15
P0110027P	-0.19	-0.13	-0.19	-0.16	-0.01	-0.15	0.07	0.21	-0.04	0.20	0.08
P0120012M	-0.39	-0.32	-0.38	-0.31	0.39	-0.43	0.37	0.43	-0.21	0.43	0.28
P0120017M	-0.13	-0.29	0.04	0.10	-0.39	0.1	-0.20	0.12	-0.25	0.19	0.11
P0120021M	-0.13	-0.29	0.04	0.10	-0.39	0.1	-0.20	0.13	-0.25	0.19	0.10
P0120026M	-0.13	-0.29	0.06	0.09	-0.37	0.09	-0.18	0.14	-0.22	0.19	0.07
P0120027P	-0.08	-0.27	0.10	0.12	-0.38	0.13	-0.21	0.10	-0.20	0.14	-0.01
P0120043M	-0.32	-0.40	-0.30	0.00	-0.08	-0.13	-0.12	0.25	-0.46	0.28	0.33
P0120048M	-0.08	-0.08	-0.16	0.07	-0.07	0.01	-0.02	0.09	-0.16	0.07	0.21
P0120052M	-0.18	-0.25	-0.17	0.06	-0.15	-0.03	-0.14	0.14	-0.32	0.15	0.29
P0120057M	-0.11	-0.21	-0.11	0.18	-0.26	0.09	-0.26	0.10	-0.33	0.11	0.26

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
P0120058P	-0.08	-0.15	-0.07	0.07	-0.11	0.02	-0.10	0.09	-0.23	0.10	0.23
P0120074M	-0.16	-0.18	-0.15	-0.04	-0.06	-0.08	-0.06	0.13	-0.16	0.14	0.14
P0120079M	-0.34	-0.44	-0.28	-0.04	-0.08	-0.17	-0.08	0.27	-0.46	0.31	0.32
P0120083M	-0.17	-0.26	-0.16	0.09	-0.15	-0.01	-0.17	0.16	-0.33	0.17	0.26
P0120088M	-0.28	-0.35	-0.25	0.09	-0.17	-0.05	-0.19	0.21	-0.45	0.23	0.33
P0120089P	-0.22	-0.30	-0.19	0.03	-0.14	-0.07	-0.13	0.15	-0.33	0.19	0.21
P0120105M	-0.05	-0.01	-0.12	0.09	0.00	-0.01	0.01	0.09	-0.08	0.06	0.13
P0120110M	-0.20	-0.26	-0.16	-0.07	-0.09	-0.11	0.00	0.21	-0.23	0.23	0.15
P0120114M	-0.27	-0.22	-0.30	-0.07	0.02	-0.13	0.01	0.24	-0.24	0.24	0.25
P0120119M	0.01	0.03	-0.06	0.15	-0.18	0.14	-0.11	-0.05	-0.06	-0.05	0.07
P0120120P	-0.04	0.01	-0.15	0.11	-0.15	0.09	-0.11	0.04	-0.12	0.02	0.13
P0120136M	-0.18	-0.09	-0.22	-0.06	0.02	-0.09	0.01	0.16	-0.12	0.15	0.14
P0120141M	-0.06	-0.02	-0.10	0.07	-0.10	0.04	-0.11	0.09	-0.07	0.05	0.11
P0120145M	-0.22	-0.17	-0.26	-0.06	0.02	-0.12	0.01	0.21	-0.19	0.21	0.23
P0120150M	-0.16	-0.07	-0.16	-0.28	0.32	-0.30	0.34	0.17	0.03	0.17	0.11
P0120151P	0.00	0.03	-0.07	0.13	-0.17	0.14	-0.12	-0.04	-0.05	-0.05	0.08
P0120167M	-0.09	-0.02	-0.18	0.05	-0.09	0.02	-0.04	0.09	-0.11	0.07	0.14
P0120172M	-0.18	-0.11	-0.23	-0.05	0.02	-0.09	0.01	0.19	-0.12	0.17	0.14
P0120176M	-0.02	0.02	-0.07	0.13	-0.15	0.11	-0.17	0.04	-0.05	0.01	0.09
P0120181M	-0.29	-0.38	-0.23	-0.06	-0.06	-0.15	-0.02	0.26	-0.38	0.30	0.26
P0120182P	-0.21	-0.28	-0.17	-0.07	-0.04	-0.11	-0.02	0.20	-0.29	0.22	0.24
P0120198M	-0.21	-0.29	-0.19	0.00	-0.11	-0.08	-0.08	0.20	-0.32	0.22	0.26
P0120203M	-0.12	-0.22	-0.10	0.01	-0.09	-0.05	-0.08	0.15	-0.27	0.16	0.25
P0120207M	-0.23	-0.11	-0.25	-0.28	0.21	-0.27	0.21	0.20	0.00	0.20	0.11
P0120212M	0.02	-0.04	-0.03	0.14	-0.21	0.11	-0.23	-0.02	-0.16	-0.03	0.06
P0120213P	-0.31	-0.39	-0.27	-0.06	-0.06	-0.15	-0.06	0.28	-0.40	0.31	0.26
P0120229M	-0.14	-0.23	-0.13	0.03	-0.12	-0.01	-0.09	0.16	-0.28	0.17	0.21
P0120234M	-0.22	-0.30	-0.20	0.03	-0.12	-0.06	-0.12	0.17	-0.34	0.20	0.23
P0120238M	-0.23	-0.29	-0.17	0.02	-0.15	-0.05	-0.13	0.18	-0.31	0.22	0.18
P0120243M	-0.07	-0.11	-0.09	0.06	-0.15	0.01	-0.10	0.07	-0.18	0.08	0.13
P0120244P	-0.39	-0.32	-0.38	-0.31	0.39	-0.43	0.37	0.42	-0.21	0.43	0.27
P0120260M	-0.05	-0.05	-0.13	0.10	-0.10	0.03	-0.04	0.08	-0.14	0.05	0.17
P0120265M	-0.08	-0.01	-0.13	0.03	0.07	-0.07	0.08	0.13	-0.03	0.10	0.08

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
P0120269M	-0.25	-0.13	-0.24	-0.37	0.38	-0.39	0.39	0.24	0.01	0.24	0.10
P0120274M	-0.13	-0.04	-0.18	-0.14	0.03	-0.13	0.08	0.16	0.02	0.14	0.06
P0120275P	-0.17	-0.33	0.01	0.06	-0.35	0.05	-0.17	0.17	-0.27	0.23	0.14
P0120291M	-0.13	-0.28	0.05	0.11	-0.38	0.11	-0.20	0.13	-0.24	0.18	0.13
P0120296M	-0.08	-0.25	0.07	0.16	-0.45	0.16	-0.26	0.10	-0.24	0.15	0.11
P0120300M	-0.11	-0.27	0.07	0.11	-0.40	0.11	-0.21	0.12	-0.22	0.18	0.08
P0120305M	-0.09	-0.27	0.09	0.11	-0.39	0.12	-0.21	0.11	-0.21	0.16	0.01
P0120306P	-0.17	-0.33	0.01	0.06	-0.35	0.05	-0.16	0.16	-0.27	0.23	0.13
P0130012M	-0.39	-0.48	-0.31	-0.12	-0.01	-0.24	0.02	0.36	-0.47	0.40	0.35
P0130017M	-0.22	-0.30	-0.19	-0.05	-0.05	-0.12	-0.03	0.22	-0.32	0.23	0.26
P0130021M	-0.20	-0.27	-0.17	0.05	-0.15	-0.04	-0.13	0.19	-0.33	0.20	0.29
P0130026M	-0.12	-0.20	-0.08	0.03	-0.13	-0.03	-0.06	0.14	-0.24	0.15	0.23
P0130027P	-0.01	-0.06	-0.04	0.15	-0.26	0.11	-0.20	0.00	-0.16	0.00	0.13
P0130043M	-0.39	-0.49	-0.32	-0.11	-0.04	-0.22	-0.02	0.36	-0.48	0.40	0.33
P0130048M	-0.17	-0.27	-0.17	0.07	-0.17	-0.01	-0.15	0.18	-0.32	0.18	0.24
P0130052M	-0.20	-0.28	-0.15	0.11	-0.22	0.01	-0.19	0.17	-0.36	0.17	0.24
P0130057M	-0.19	-0.25	-0.14	0.02	-0.10	-0.06	-0.09	0.17	-0.26	0.19	0.20
P0130058P	-0.04	-0.10	-0.07	0.09	-0.28	0.07	-0.18	0.09	-0.14	0.08	0.09
P0140001	0.36	0.17	0.25	0.61	-0.66	0.58	-0.58	-0.33	-0.10	-0.35	-0.04
P0140002	-0.28	-0.07	-0.17	-0.59	0.76	-0.55	0.65	0.25	0.19	0.26	0.01
P0140003	-0.04	-0.20	-0.04	0.25	-0.40	0.19	-0.37	-0.01	-0.37	0.02	0.19
P0140004	-0.11	-0.19	-0.13	-0.05	-0.17	-0.04	-0.10	0.16	-0.19	0.18	0.17
P0140005	0.07	-0.10	0.01	0.34	-0.38	0.26	-0.41	-0.11	-0.33	-0.11	0.17
P0140006	0.44	0.28	0.33	0.68	-0.76	0.66	-0.61	-0.39	0.06	-0.43	-0.18
P0140007	-0.28	-0.06	-0.17	-0.59	0.75	-0.54	0.64	0.25	0.19	0.26	0.00
P0140008	-0.22	-0.43	-0.16	0.13	-0.39	0.03	-0.33	0.19	-0.50	0.25	0.24
P0140009	-0.11	-0.14	-0.14	-0.11	-0.14	-0.07	-0.05	0.18	-0.08	0.19	0.04
P0140010	0.06	-0.07	0.01	0.35	-0.52	0.26	-0.48	-0.09	-0.26	-0.07	0.03
P017A001	-0.53	-0.53	-0.41	-0.31	0.31	-0.43	0.29	0.56	-0.40	0.59	0.36
R0370004	0.01	0.00	0.07	-0.05	0.09	-0.05	0.11	-0.04	0.08	-0.01	-0.11
R0370005	0.00	0.08	-0.02	-0.06	0.06	-0.03	0.04	0.02	0.11	0.02	-0.02
R0370006	-0.01	-0.04	-0.08	0.10	-0.14	0.08	-0.16	0.04	-0.17	0.01	0.15
R0380001	0.11	0.02	0.05	0.30	-0.33	0.29	-0.20	-0.07	-0.08	-0.08	0.07

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
R0380002	0.28	0.15	0.25	0.55	-0.59	0.50	-0.50	-0.26	-0.05	-0.29	-0.05
R0380003	0.30	0.22	0.25	0.50	-0.52	0.49	-0.47	-0.28	0.03	-0.31	-0.08
R0380004	0.34	0.30	0.26	0.37	-0.44	0.43	-0.34	-0.25	0.18	-0.30	-0.08
R0380005	-0.24	-0.28	-0.27	-0.04	-0.01	-0.14	-0.02	0.26	-0.42	0.24	0.36
R0380006	-0.28	-0.28	-0.32	0.00	0.07	-0.13	0.03	0.27	-0.35	0.26	0.36
R0380007	0.03	0.07	0.07	0.11	0.08	0.08	0.05	0.00	0.08	-0.03	0.00
R0380008	-0.07	0.00	-0.02	-0.38	0.33	-0.29	0.27	0.02	0.16	0.06	-0.16
R0430001	-0.21	-0.09	-0.09	-0.39	0.47	-0.33	0.36	0.20	0.15	0.22	-0.07
R0430002	-0.25	-0.36	-0.27	0.09	-0.30	-0.04	-0.22	0.23	-0.48	0.27	0.27
R0430003	0.33	0.34	0.24	0.26	-0.13	0.27	-0.10	-0.35	0.20	-0.37	-0.19
R0430004	0.54	0.46	0.48	0.40	-0.38	0.49	-0.37	-0.54	0.32	-0.57	-0.30
R0430005	0.36	0.27	0.27	0.29	-0.32	0.31	-0.26	-0.32	0.17	-0.33	-0.18
R0430006	0.17	0.13	0.18	0.14	-0.17	0.19	-0.14	-0.19	0.05	-0.19	-0.04
R0430007	0.29	0.21	0.16	0.33	-0.31	0.33	-0.23	-0.26	0.06	-0.29	0.01
R0430008	0.09	0.10	0.06	0.19	-0.16	0.13	-0.18	-0.09	0.00	-0.11	-0.07
R0430009	0.02	0.04	0.03	0.00	0.00	0.00	0.02	0.01	0.02	-0.02	0.04
R0430010	0.06	0.05	0.01	0.10	-0.12	0.12	-0.12	0.00	-0.07	-0.04	0.17
R0440001	-0.21	-0.09	-0.09	-0.39	0.47	-0.33	0.36	0.21	0.14	0.22	-0.06
R0440002	0.06	-0.06	0.04	0.38	-0.58	0.34	-0.55	-0.15	-0.25	-0.12	0.05
R0440003	-0.24	-0.18	-0.25	-0.34	0.43	-0.41	0.47	0.30	-0.10	0.29	0.15
R0440004	0.54	0.43	0.43	0.49	-0.50	0.54	-0.42	-0.52	0.24	-0.55	-0.23
R0440005	0.31	0.29	0.21	0.22	-0.12	0.27	-0.13	-0.31	0.17	-0.33	-0.07
R0440006	0.12	0.08	0.02	0.24	-0.24	0.20	-0.11	-0.05	-0.03	-0.09	0.03
R0440007	0.06	0.05	0.01	0.11	-0.12	0.12	-0.12	0.00	-0.07	-0.05	0.16
R0600000	0.78	0.83	0.79	0.31	-0.19	0.53	-0.17	-0.73	0.83	-0.78	-0.62
R0770001	-0.51	-0.52	-0.47	-0.26	0.25	-0.41	0.19	0.46	-0.55	0.49	0.43
R0770002	-0.31	-0.37	-0.34	-0.13	0.03	-0.22	-0.02	0.34	-0.43	0.36	0.30
R0770003	-0.62	-0.62	-0.60	-0.32	0.34	-0.49	0.22	0.53	-0.64	0.57	0.50
R0770004	-0.52	-0.55	-0.45	-0.35	0.25	-0.45	0.23	0.51	-0.48	0.56	0.38
R0770005	-0.06	-0.01	0.04	0.01	-0.03	0.02	-0.01	0.01	0.07	0.02	-0.14
R0770006	-0.36	-0.25	-0.37	-0.31	0.36	-0.38	0.33	0.33	-0.21	0.34	0.28
R0770007	-0.38	-0.46	-0.46	-0.07	0.00	-0.23	0.01	0.36	-0.53	0.38	0.33
R0770008	0.15	0.20	0.14	-0.13	0.04	-0.05	0.14	-0.12	0.29	-0.12	-0.18

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
R0770009	-0.21	-0.27	-0.21	-0.03	-0.07	-0.10	-0.11	0.14	-0.33	0.18	0.20
R0770010	-0.15	-0.28	-0.20	0.03	-0.16	-0.04	-0.11	0.16	-0.31	0.19	0.24
R0770011	0.11	0.02	0.12	0.16	-0.17	0.13	-0.19	-0.09	-0.04	-0.10	-0.02
R0770012	0.12	0.13	0.16	0.03	-0.05	0.08	0.03	-0.06	0.18	-0.08	-0.11
R0770013	0.23	0.28	0.23	0.17	-0.15	0.26	-0.06	-0.20	0.31	-0.24	-0.17
R0770014	0.53	0.49	0.55	0.39	-0.33	0.51	-0.37	-0.52	0.43	-0.55	-0.44
R0770015	0.06	0.08	0.05	0.04	-0.08	0.06	0.02	0.04	0.12	0.02	-0.10
R0770016	0.47	0.57	0.47	0.06	0.06	0.20	0.06	-0.48	0.64	-0.50	-0.42
R0770017	0.74	0.78	0.74	0.37	-0.22	0.58	-0.22	-0.69	0.79	-0.74	-0.58
R0790001	-0.14	-0.14	-0.11	-0.02	-0.02	-0.07	0.07	0.23	-0.08	0.21	0.07
R0790002	0.33	0.32	0.25	0.25	-0.27	0.32	-0.19	-0.34	0.22	-0.37	-0.17
R0790003	-0.17	-0.15	-0.17	-0.03	-0.05	-0.06	-0.02	0.17	-0.12	0.19	0.10
R0790004	0.03	0.02	0.05	-0.13	0.23	-0.10	0.07	-0.10	0.01	-0.08	-0.04
R0790005	-0.16	-0.16	-0.10	-0.07	0.05	-0.10	0.06	0.14	-0.14	0.15	0.16
R080A001	0.38	0.49	0.46	-0.19	0.34	0.01	0.29	-0.40	0.66	-0.41	-0.38
R107A001	0.50	0.59	0.56	-0.09	0.21	0.13	0.18	-0.51	0.73	-0.53	-0.45
R110A001	0.39	0.49	0.45	-0.09	0.24	0.09	0.19	-0.43	0.61	-0.45	-0.38

APPENDIX D

CORRELATION COEFFICIENTS BETWEEN FACTORS OF VOTES FOR ELEVEN MEASURES BY PRECINCTS AND SOCIOECONOMIC VARIABLES

	FACTOR 1		FACTOR 2		FACTOR 3
VARIABL	COEFF.	VARIABL	COEFF.	VARIABL	COEFF.
M10	-0.723	M4	-0.879	M11	-0.848
M8	-0.643	M6	-0.793	M8	-0.498
R0770003	-0.587	P0140006	-0.735	M10	-0.410
R0770004	-0.495	P0140001	-0.711	R0380006	-0.274
R0770001	-0.491	R0380002	-0.615	R0380005	-0.257
R0770007	-0.479	R0440002	-0.602	N0000003	-0.223
P0140008	-0.477	H0030002	-0.586	R0770001	-0.217
R0430002	-0.452	R0380003	-0.546	R0440007	-0.217
M11	-0.414	P0140010	-0.534	R0430010	-0.215
R0770002	-0.394	P0140005	-0.498	R0770003	-0.215
N0000006	-0.368	R0440004	-0.470	M7	-0.190
N0000005	-0.346	P0140003	-0.463	R0770004	-0.167
N0000003	-0.326	P0140008	-0.415	R0770002	-0.161
P0170001	-0.316	M1	-0.403	N0000006	-0.156
R0380005	-0.309	R0380004	-0.392	R0430002	-0.154
R0770009	-0.303	R0430004	-0.353	R0380001	-0.152
R0380006	-0.291	N0000002	-0.347	N0000005	-0.152
R0770010	-0.287	R0380001	-0.344	P0140005	-0.149
N0000002	-0.279	R0430007	-0.321	R0370006	-0.148
P0140003	-0.266	N0000006	-0.320	R0770010	-0.148
P0140010	-0.215	R0430002	-0.320	R0770007	-0.145
R0770006	-0.213	N0000003	-0.313	P0140003	-0.144
P0140004	-0.206	M3	-0.299	P0170001	-0.137
R0440002	-0.204	R0770014	-0.286	R0770006	-0.136
P0140009	-0.184	R0430005	-0.278	P0140008	-0.125
R0790003	-0.183	R0440006	-0.230	M5	-0.123
P0140005	-0.170	M2	-0.220	P0140004	-0.115
R0790005	-0.126	R0790002	-0.211	R0430007	-0.113

	FACTOR 1		FACTOR 2		FACTOR 3
VARIABL	COEFF.	VARIABL	COEFF.	VARIABL	COEFF.
M5	-0.122	N0000005	-0.200	H0030002	-0.113
R0790001	-0.122	R0370006	-0.193	R0790005	-0.110
H0030002	-0.113	R0770011	-0.190	R0440006	-0.109
N0000004	-0.108	R0770010	-0.183	R0380004	-0.099
R0440003	-0.095	R0430008	-0.179	P0140001	-0.095
R0370006	-0.093	R0440007	-0.163	N0000004	-0.089
M7	-0.063	R0430006	-0.161	R0380002	-0.086
R0770005	-0.025	R0430010	-0.160	R0790001	-0.080
R0380001	-0.009	N0000004	-0.159	R0380007	-0.080
FACTOR2	-0.001	R0440005	-0.153	R0440003	-0.076
R0440001	-0.000	R0430003	-0.136	R0380003	-0.071
FACTOR3	0.001	R0140004	-0.124	R0770009	-0.065
R0430001	0.001	R0770017	-0.123	R0430009	-0.063
R0770011	0.009	R0770009	-0.123	R0790003	-0.059
R0430008	0.024	R0380005	-0.097	N0000002	-0.058
R0440006	0.032	R0770013	-0.081	R0440005	-0.036
R0430010	0.033	R0770007	-0.079	R0440002	-0.030
R0440007	0.036	R0380006	-0.059	P0140010	-0.012
R0370004	0.045	R0770002	-0.043	R0430006	-0.009
R0430009	0.048	R0790003	-0.036	P0140006	-0.008
R0380008	0.050	P0140009	-0.035	R0770011	-0.007
P0140001	0.055	R0600000	-0.028	FACTOR2	-0.000
R0380002	0.056	R0770015	-0.002	FACTOR1	0.001
R0790004	0.059	FACTOR1	-0.001	P0140009	0.004
R0770015	0.059	FACTOR3	-0.000	R0370005	0.005
R0370005	0.061	R0770005	0.009	R0770015	0.017
P0140002	0.078	R0430009	0.011	R0770012	0.021
P0140007	0.078	R0790001	0.012	R0770013	0.025

	FACTOR 1		FACTOR 2		FACTOR 3
VARIABL	COEFF.	VARIABL	COEFF.	VARIABL	COEFF.
R0380007	0.106	R0380007	0.013	R0430008	0.029
H0030001	0.113	R0770012	0.021	M4	0.041
R0380003	0.118	R0790005	0.028	R0440004	0.052
R0430006	0.125	R0370005	0.084	R0790002	0.060
P0140006	0.144	M9	0.100	R0430005	0.061
R0770012	0.150	R0370004	0.114	R0430003	0.075
R0430007	0.181	R0770001	0.125	N0000001	0.077
R0770008	0.220	R0790004	0.148	P0140002	0.087
R0430005	0.228	R0770016	0.159	R0790004	0.088
R0380004	0.240	M11	0.161	P0140007	0.092
N0000001	0.249	R0770003	0.167	H0030001	0.113
R0790002	0.268	R0770008	0.180	R0370004	0.116
R0770013	0.275	R0770004	0.194	R0430004	0.124
R0440005	0.283	H0610001	0.216	R0440001	0.125
R0430003	0.301	P0170001	0.282	R0430001	0.126
M4	0.303	R0770006	0.299	R0770008	0.128
R0440004	0.362	N0000001	0.299	M6	0.128
R0600000	0.406	R110A000	0.302	R0770005	0.132
R0430004	0.418	R107A000	0.321	R0600000	0.142
R0770014	0.434	R0380008	0.411	M2	0.157
M6	0.509	R080A001	0.419	M3	0.169
R110A000	0.565	M8	0.424	M1	0.208
R0770016	0.578	R0440003	0.433	R0770014	0.219
R080A001	0.610	M10	0.452	R0770016	0.233
H0610001	0.628	R0430001	0.482	R110A000	0.241
R107A000	0.685	R0440001	0.482	R080A001	0.246
P0770017	0.767	H0030001	0.586	R0380008	0.247
M3	0.804	P0140007	0.768	R0770017	0.254

	FACTOR 1		FACTOR 2		FACTOR 3
VARIABL	COEFF.	VARIABL	COEFF.	VARIABL	COEFF.
M1	0.823	P0140002	0.778	R107A000	0.272
M9	0.871	M5	0.872	H0610001	0.281
M2	0.908	M7	0.906	M9	0.289

APPENDIX E

CORRELATION COEFFICIENTS BETWEEN RESIDUALS (ELEVEN MEASURES AND EDUCATIONAL ATTAINMENT (EA), PERCENTAGE OF FEMALES NEVER BEEN MARRIED (FNM), FAMILY SIZE (FS), AND PERCENTAGE OF PERSONS EMPLOYED IN MANUFACTURING NONDURABLE GOODS (MN))

	1EA	2EA	3EA	4EA	5EA	6EA	7EA	8EA	9EA	10EA	11EA
1EA	1.00	0.63	0.51	0.60	-0.57	0.65	-0.52	-0.54	0.15	-0.64	-0.24
2EA	0.63	1.00	0.30	0.41	-0.31	0.47	-0.31	-0.38	0.46	-0.53	-0.11
3EA	0.51	0.30	1.00	0.41	-0.43	0.43	-0.38	-0.35	0.07	-0.39	-0.13
4EA	0.60	0.41	0.41	1.00	-0.73	0.91	-0.77	-0.54	-0.14	-0.65	-0.19
5EA	-0.57	-0.31	-0.43	-0.73	1.00	-0.79	0.78	0.48	0.08	0.54	0.27
6EA	0.65	0.47	0.43	0.91	-0.79	1.00	-0.78	-0.58	-0.06	-0.68	-0.22
7EA	-0.52	-0.31	-0.38	-0.77	0.78	-0.78	1.00	0.59	0.19	0.67	0.26
8EA	-0.54	-0.38	-0.35	-0.54	0.48	-0.58	0.59	1.00	0.00	0.93	0.44
9EA	0.15	0.46	0.07	-0.14	0.08	-0.06	0.19	0.00	1.00	-0.03	-0.22
10EA	-0.64	-0.53	-0.39	-0.65	0.54	-0.68	0.67	0.93	-0.03	1.00	0.38
11EA	-0.24	-0.11	-0.13	-0.19	0.27	-0.22	0.26	0.44	-0.22	0.38	1.00
1FNM	0.45	0.31	0.19	0.09	-0.03	0.12	-0.07	-0.18	0.18	-0.21	-0.12
2FNM	0.23	0.51	0.08	0.05	0.03	0.08	-0.01	-0.11	0.31	-0.17	-0.03
3FNM	0.16	0.11	0.54	0.03	-0.02	0.04	-0.04	-0.09	0.09	-0.09	-0.05
4FNM	0.31	0.29	0.22	0.69	-0.26	0.56	-0.46	-0.33	-0.04	-0.41	-0.16
5FNM	-0.27	-0.17	-0.27	-0.33	0.65	-0.41	0.49	0.26	-0.06	0.26	0.28
6FNM	0.29	0.30	0.20	0.45	-0.24	0.54	-0.36	-0.30	0.06	-0.35	-0.16
7FNM	-0.26	-0.18	-0.22	-0.46	0.40	-0.46	0.79	0.43	0.12	0.47	0.25
8FNM	-0.19	-0.17	-0.12	-0.12	0.04	-0.14	0.19	0.58	-0.07	0.49	0.29
9FNM	0.05	0.24	0.02	-0.11	0.08	-0.07	0.14	0.02	0.56	0.01	-0.12
10FNM	-0.20	-0.25	-0.12	-0.14	0.03	-0.16	0.19	0.45	-0.09	0.47	0.22
11FNM	-0.10	-0.04	-0.04	-0.03	0.08	-0.05	0.10	0.28	-0.21	0.22	0.78
1FS	0.55	0.28	0.31	0.33	-0.27	0.34	-0.24	-0.18	0.08	-0.22	-0.11
2FS	0.24	0.48	0.14	0.16	-0.06	0.17	-0.06	-0.03	0.27	-0.11	-0.01
3FS	0.21	0.07	0.63	0.19	-0.19	0.19	-0.16	-0.08	0.02	-0.08	-0.04
4FS	0.50	0.31	0.37	0.94	-0.65	0.84	-0.70	-0.42	-0.16	-0.52	-0.16
5FS	-0.49	-0.22	-0.41	-0.69	0.96	-0.74	0.73	0.38	0.10	0.43	0.24
6FS	0.47	0.30	0.35	0.77	-0.63	0.83	-0.63	-0.37	-0.08	-0.46	-0.16
7FS	-0.44	-0.22	-0.36	-0.74	0.73	-0.74	0.96	0.50	0.21	0.57	0.24
8FS	-0.25	-0.11	-0.22	-0.33	0.24	-0.33	0.34	0.59	0.04	0.50	0.30
9FS	-0.04	0.15	-0.01	-0.16	0.15	-0.13	0.21	0.15	0.58	0.15	-0.09
10FS	-0.28	-0.19	-0.23	-0.38	0.25	-0.37	0.35	0.46	0.02	0.49	0.22

11FS	-0.09	0.02	-0.07	-0.09	0.13	-0.10	0.14	0.24	-0.17	0.17	0.80
1MN	0.61	0.32	0.32	0.31	-0.32	0.35	-0.29	-0.27	0.05	-0.30	-0.13
2MN	0.30	0.52	0.15	0.14	-0.11	0.18	-0.11	-0.12	0.25	-0.18	-0.02
3MN	0.25	0.09	0.65	0.18	-0.22	0.19	-0.19	-0.14	0.00	-0.13	-0.05
4MN	0.53	0.33	0.38	0.94	-0.68	0.85	-0.73	-0.47	-0.18	-0.56	-0.17
5MN	-0.53	-0.26	-0.42	-0.69	0.97	-0.75	0.75	0.43	0.10	0.48	0.25
6MN	0.51	0.33	0.37	0.76	-0.67	0.84	-0.67	-0.44	-0.10	-0.52	-0.17
7MN	-0.48	-0.26	-0.37	-0.74	0.75	-0.74	0.98	0.55	0.21	0.61	0.25
8MN	-0.32	-0.17	-0.23	-0.31	0.29	-0.34	0.38	0.68	0.05	0.58	0.31
9MN	-0.01	0.16	0.00	-0.20	0.13	-0.15	0.20	0.11	0.58	0.12	-0.10
10MN	-0.35	-0.24	-0.24	-0.36	0.31	-0.38	0.41	0.56	0.04	0.58	0.24
	1FNM	2FNM	3FNM	4FNM	5FNM	6FNM	7FNM	8FNM	9FNM	10FNM	11FNM
11MN	-0.13	0.00	-0.07	-0.08	0.16	-0.10	0.16	0.29	-0.15	0.22	0.81
1EA	0.45	0.23	0.16	0.31	-0.27	0.29	-0.26	-0.19	0.05	-0.20	-0.10
2EA	0.31	0.51	0.11	0.29	-0.17	0.30	-0.18	-0.17	0.24	-0.25	-0.04
3EA	0.19	0.08	0.54	0.22	-0.27	0.20	-0.22	-0.12	0.02	-0.12	-0.04
4EA	0.09	0.05	0.03	0.69	-0.33	0.45	-0.46	-0.12	-0.11	-0.14	-0.03
5EA	-0.03	0.03	-0.02	-0.26	0.65	-0.24	0.40	0.04	0.08	0.03	0.08
6EA	0.12	0.08	0.04	0.56	-0.41	0.54	-0.46	-0.14	-0.07	-0.16	-0.05
7EA	-0.07	-0.01	-0.04	-0.46	0.49	-0.36	0.79	0.19	0.14	0.19	0.10
8EA	-0.18	-0.11	-0.09	-0.33	0.26	-0.30	0.43	0.58	0.02	0.45	0.28
9EA	0.18	0.31	0.09	-0.04	-0.06	0.06	0.12	-0.07	0.56	-0.09	-0.21
10EA	-0.21	-0.17	-0.09	-0.41	0.26	-0.35	0.47	0.49	0.01	0.47	0.22
11EA	-0.12	-0.03	-0.05	-0.16	0.28	-0.16	0.25	0.29	-0.12	0.22	0.78
1FNM	1.00	0.86	0.79	0.45	-0.28	0.69	-0.25	-0.76	0.76	-0.82	-0.59
2FNM	0.86	1.00	0.73	0.41	-0.18	0.66	-0.18	-0.72	0.85	-0.82	-0.54
3FNM	0.79	0.73	1.00	0.38	-0.26	0.60	-0.22	-0.68	0.70	-0.73	-0.53
4FNM	0.45	0.41	0.38	1.00	-0.47	0.82	-0.62	-0.46	0.21	-0.52	-0.30
5FNM	-0.28	-0.18	-0.26	-0.47	1.00	-0.53	0.63	0.27	-0.11	0.27	0.29
6FNM	0.69	0.66	0.60	0.82	-0.53	1.00	-0.57	-0.67	0.51	-0.73	-0.48
7FNM	-0.25	-0.18	-0.22	-0.62	0.63	-0.57	1.00	0.39	0.00	0.39	0.25
8FNM	-0.76	-0.72	-0.68	-0.46	0.27	-0.67	0.39	1.00	-0.64	0.96	0.68
9FNM	0.76	0.85	0.70	0.21	-0.11	0.51	0.00	-0.64	1.00	-0.71	-0.62

10FNM	-0.82	-0.82	-0.73	-0.52	0.27	-0.73	0.39	0.96	-0.71	1.00	0.67
11FNM	-0.59	-0.54	-0.53	-0.30	0.29	-0.48	0.25	0.68	-0.62	0.67	1.00
	1FNM	2FNM	3FNM	4FNM	5FNM	6FNM	7FNM	8FNM	9FNM	10FNM	11FNM
1FS	0.79	0.63	0.63	0.41	-0.23	0.56	-0.19	-0.51	0.56	-0.56	-0.44
2FS	0.71	0.85	0.63	0.39	-0.15	0.58	-0.13	-0.52	0.73	-0.62	-0.42
3FS	0.62	0.55	0.89	0.34	-0.23	0.50	-0.17	-0.49	0.56	-0.53	-0.41
4FS	0.21	0.17	0.19	0.74	-0.33	0.55	-0.45	-0.21	0.04	-0.24	-0.13
5FS	-0.05	0.02	-0.07	-0.28	0.66	-0.27	0.39	0.03	0.05	0.02	0.10
6FS	0.38	0.34	0.35	0.63	-0.39	0.70	-0.42	-0.34	0.24	-0.38	-0.26
7FS	-0.08	-0.01	-0.08	-0.48	0.49	-0.39	0.79	0.18	0.11	0.17	0.12
8FS	-0.55	-0.49	-0.54	-0.44	0.24	-0.56	0.35	0.79	-0.45	0.73	0.56
9FS	0.64	0.73	0.63	0.18	-0.08	0.43	0.05	-0.49	0.92	-0.55	-0.54
10FS	-0.61	-0.58	-0.58	-0.50	0.23	-0.62	0.36	0.73	-0.51	0.76	0.53
11FS	-0.46	-0.39	-0.43	-0.27	0.27	-0.40	0.22	0.54	-0.50	0.51	0.94
1MN	0.77	0.60	0.58	0.32	-0.23	0.49	-0.20	-0.52	0.51	-0.55	-0.41
2MN	0.69	0.82	0.58	0.29	-0.14	0.51	-0.13	-0.53	0.67	-0.60	-0.39
3MN	0.60	0.52	0.86	0.26	-0.22	0.44	-0.17	-0.49	0.51	-0.51	-0.39
4MN	0.18	0.13	0.15	0.69	-0.33	0.50	-0.45	-0.19	-0.01	-0.21	-0.10
5MN	-0.07	0.01	-0.07	-0.25	0.65	-0.25	0.39	0.07	0.04	0.05	0.11
6MN	0.35	0.31	0.31	0.56	-0.39	0.65	-0.43	-0.34	0.19	-0.36	-0.23
7MN	-0.10	-0.02	-0.08	-0.45	0.49	-0.37	0.79	0.21	0.11	0.20	0.12
8MN	-0.53	-0.47	-0.49	-0.34	0.23	-0.49	0.35	0.80	-0.40	0.72	0.53
9MN	0.61	0.69	0.58	0.09	-0.07	0.36	0.06	-0.48	0.88	-0.52	-0.51
10MN	-0.59	-0.55	-0.53	-0.39	0.22	-0.53	0.36	0.74	-0.45	0.75	0.50
11MN	-0.44	-0.37	-0.40	-0.21	0.26	-0.35	0.22	0.54	-0.46	0.50	0.92
	1FS	2FS	3FS	4FS	5FS	6FS	7FS	8FS	9FS	10FS	11FS
1EA	0.55	0.24	0.21	0.50	-0.49	0.47	-0.44	-0.25	-0.04	-0.28	-0.09
2EA	0.28	0.48	0.07	0.31	-0.22	0.30	-0.22	-0.11	0.15	-0.19	0.02
3EA	0.31	0.14	0.63	0.37	-0.41	0.35	-0.36	-0.22	-0.01	-0.23	-0.07
4EA	0.33	0.16	0.19	0.94	-0.69	0.77	-0.74	-0.33	-0.16	-0.38	-0.09
5EA	-0.27	-0.06	-0.19	-0.65	0.96	-0.63	0.73	0.24	0.15	0.25	0.13
6EA	0.34	0.17	0.19	0.84	-0.74	0.83	-0.74	-0.33	-0.13	-0.37	-0.10
7EA	-0.24	-0.06	-0.16	-0.70	0.73	-0.63	0.96	0.34	0.21	0.35	0.14

8EA	-0.18	-0.03	-0.08	-0.42	0.38	-0.37	0.50	0.59	0.15	0.46	0.24
9EA	0.08	0.27	0.02	-0.16	0.10	-0.08	0.21	0.04	0.58	0.02	-0.17
10EA	-0.22	-0.11	-0.08	-0.52	0.43	-0.46	0.57	0.50	0.15	0.49	0.17
11EA	-0.11	-0.01	-0.04	-0.16	0.24	-0.16	0.24	0.30	-0.09	0.22	0.80
1FNM	0.79	0.71	0.62	0.21	-0.05	0.38	-0.08	-0.55	0.64	-0.61	-0.46
2FNM	0.63	0.85	0.55	0.17	0.02	0.34	-0.01	-0.49	0.73	-0.58	-0.39
3FNM	0.63	0.63	0.89	0.19	-0.07	0.35	-0.08	-0.54	0.63	-0.58	-0.43
4FNM	0.41	0.39	0.34	0.74	-0.28	0.63	-0.48	-0.44	0.18	-0.50	-0.27
5FNM	-0.23	-0.15	-0.23	-0.33	0.66	-0.39	0.49	0.24	-0.08	0.23	0.27
6FNM	0.56	0.58	0.50	0.55	-0.27	0.70	-0.39	-0.56	0.43	-0.62	-0.40
7FNM	-0.19	-0.13	-0.17	-0.45	0.39	-0.42	0.79	0.35	0.05	0.36	0.22
8FNM	-0.51	-0.52	-0.49	-0.21	0.03	-0.34	0.18	0.79	-0.49	0.73	0.54
9FNM	0.56	0.73	0.56	0.04	0.05	0.24	0.11	-0.45	0.92	-0.51	-0.50
10FNM	-0.56	-0.62	-0.53	-0.24	0.02	-0.38	0.17	0.73	-0.55	0.76	0.51
11FNM	-0.44	-0.42	-0.41	-0.13	0.10	-0.26	0.12	0.56	-0.54	0.53	0.94
1FS	1.00	0.82	0.77	0.54	-0.41	0.69	-0.36	-0.71	0.63	-0.80	-0.52
	1FS	2FS	3FS	4FS	5FS	6FS	7FS	8FS	9FS	10FS	11FS
2FS	0.82	1.00	0.70	0.39	-0.20	0.57	-0.19	-0.64	0.80	-0.76	-0.47
3FS	0.77	0.70	1.00	0.41	-0.32	0.57	-0.28	-0.65	0.62	-0.71	-0.47
4FS	0.54	0.39	0.41	1.00	-0.71	0.89	-0.75	-0.52	0.08	-0.59	-0.26
5FS	-0.41	-0.20	-0.32	-0.71	1.00	-0.73	0.76	0.36	0.01	0.39	0.24
6FS	0.69	0.57	0.57	0.89	-0.73	1.00	-0.71	-0.65	0.30	-0.72	-0.39
7FS	-0.36	-0.19	-0.28	-0.75	0.76	-0.71	1.00	0.45	0.09	0.48	0.23
8FS	-0.71	-0.64	-0.65	-0.52	0.36	-0.65	0.45	1.00	-0.50	0.95	0.63
9FS	0.63	0.80	0.62	0.08	0.01	0.30	0.09	-0.50	1.00	-0.57	-0.55
10FS	-0.80	-0.76	-0.71	-0.59	0.39	-0.72	0.48	0.95	-0.57	1.00	0.61
11FS	-0.52	-0.47	-0.47	-0.26	0.24	-0.39	0.23	0.63	-0.55	0.61	1.00
1MN	0.72	0.51	0.53	0.36	-0.30	0.46	-0.26	-0.44	0.38	-0.48	-0.33
2MN	0.53	0.69	0.46	0.20	-0.09	0.33	-0.08	-0.36	0.54	-0.43	-0.27
3MN	0.56	0.46	0.83	0.28	-0.24	0.39	-0.20	-0.44	0.42	-0.47	-0.33
4MN	0.38	0.21	0.28	0.91	-0.66	0.77	-0.71	-0.36	-0.08	-0.41	-0.15
5MN	-0.29	-0.07	-0.22	-0.62	0.94	-0.62	0.71	0.24	0.11	0.25	0.15
6MN	0.48	0.33	0.39	0.76	-0.65	0.82	-0.64	-0.43	0.10	-0.48	-0.24
7MN	-0.25	-0.07	-0.18	-0.67	0.71	-0.61	0.94	0.34	0.19	0.35	0.15

8MN	-0.42	-0.33	-0.40	-0.33	0.25	-0.40	0.34	0.70	-0.24	0.61	0.43
9MN	0.41	0.57	0.44	-0.08	0.10	0.11	0.18	-0.29	0.82	-0.32	-0.41
10MN	-0.47	-0.41	-0.43	-0.38	0.26	-0.45	0.36	0.63	-0.28	0.63	0.39
11MN	-0.34	-0.27	-0.32	-0.14	0.17	-0.24	0.16	0.46	-0.39	0.41	0.88
	1MN	2MN	3MN	4MN	5MN	6MN	7MN	8MN	9MN	10MN	11MN
1EA	0.61	0.30	0.25	0.53	-0.53	0.51	-0.48	-0.32	-0.01	-0.35	-0.13
2EA	0.32	0.52	0.09	0.33	-0.26	0.33	-0.26	-0.17	0.16	-0.24	0.00
3EA	0.32	0.15	0.65	0.38	-0.42	0.37	-0.37	-0.23	0.00	-0.24	-0.07
4EA	0.31	0.14	0.18	0.94	-0.69	0.76	-0.74	-0.31	-0.20	-0.36	-0.08
5EA	-0.32	-0.11	-0.22	-0.68	0.97	-0.67	0.75	0.29	0.13	0.31	0.16
6EA	0.35	0.18	0.19	0.85	-0.75	0.84	-0.74	-0.34	-0.15	-0.38	-0.10
7EA	-0.29	-0.11	-0.19	-0.73	0.75	-0.67	0.98	0.38	0.20	0.41	0.16
8EA	-0.27	-0.12	-0.14	-0.47	0.43	-0.44	0.55	0.68	0.11	0.56	0.29
9EA	0.05	0.25	0.00	-0.18	0.10	-0.10	0.21	0.05	0.58	0.04	-0.15
10EA	-0.30	-0.18	-0.13	-0.56	0.48	-0.52	0.61	0.58	0.12	0.58	0.22
11EA	-0.13	-0.02	-0.05	-0.17	0.25	-0.17	0.25	0.31	-0.10	0.24	0.81
1FNM	0.77	0.69	0.60	0.18	-0.07	0.35	-0.10	-0.53	0.61	-0.59	-0.44
2FNM	0.60	0.82	0.52	0.13	0.01	0.31	-0.02	-0.47	0.69	-0.55	-0.37
3FNM	0.58	0.58	0.86	0.15	-0.07	0.31	-0.08	-0.49	0.58	-0.53	-0.40
4FNM	0.32	0.29	0.26	0.69	-0.25	0.56	-0.45	-0.34	0.09	-0.39	-0.21
5FNM	-0.23	-0.14	-0.22	-0.33	0.65	-0.39	0.49	0.23	-0.07	0.22	0.26
6FNM	0.49	0.51	0.44	0.50	-0.25	0.65	-0.37	-0.49	0.36	-0.53	-0.35
7FNM	-0.20	-0.13	-0.17	-0.45	0.39	-0.43	0.79	0.35	0.06	0.36	0.22
8FNM	-0.52	-0.53	-0.49	-0.19	0.07	-0.34	0.21	0.80	-0.48	0.74	0.54
9FNM	0.51	0.67	0.51	-0.01	0.04	0.19	0.11	-0.40	0.88	-0.45	-0.46
10FNM	-0.55	-0.60	-0.51	-0.21	0.05	-0.36	0.20	0.72	-0.52	0.75	0.50
11FNM	-0.41	-0.39	-0.39	-0.10	0.11	-0.23	0.12	0.53	-0.51	0.50	0.92
1FS	0.72	0.53	0.56	0.38	-0.29	0.48	-0.25	-0.42	0.41	-0.47	-0.34
2FS	0.51	0.69	0.46	0.21	-0.07	0.33	-0.07	-0.33	0.57	-0.41	-0.27
3FS	0.53	0.46	0.83	0.28	-0.22	0.39	-0.18	-0.40	0.44	-0.43	-0.32
4FS	0.36	0.20	0.28	0.91	-0.62	0.76	-0.67	-0.33	-0.08	-0.38	-0.14
5FS	-0.30	-0.09	-0.24	-0.66	0.94	-0.65	0.71	0.25	0.10	0.26	0.17
6FS	0.46	0.33	0.39	0.77	-0.62	0.82	-0.61	-0.40	0.11	-0.45	-0.24
7FS	-0.26	-0.08	-0.20	-0.71	0.71	-0.64	0.94	0.34	0.18	0.36	0.16

8FS	-0.44	-0.36	-0.44	-0.36	0.24	-0.43	0.34	0.70	-0.29	0.63	0.46
9FS	0.38	0.54	0.42	-0.08	0.11	0.10	0.19	-0.24	0.82	-0.28	-0.39
10FS	-0.48	-0.43	-0.47	-0.41	0.25	-0.48	0.35	0.61	-0.32	0.63	0.41
11FS	-0.33	-0.27	-0.33	-0.15	0.15	-0.24	0.15	0.43	-0.41	0.39	0.88
1MN	1.00	0.82	0.76	0.52	-0.44	0.69	-0.39	-0.72	0.61	-0.80	-0.51
2MN	0.82	1.00	0.68	0.36	-0.24	0.56	-0.22	-0.65	0.78	-0.75	-0.46
3MN	0.76	0.68	1.00	0.39	-0.34	0.55	-0.30	-0.64	0.59	-0.69	-0.46
4MN	0.52	0.36	0.39	1.00	-0.72	0.89	-0.76	-0.50	0.02	-0.56	-0.24
5MN	-0.44	-0.24	-0.34	-0.72	1.00	-0.75	0.77	0.40	0.00	0.43	0.25
6MN	0.69	0.56	0.55	0.89	-0.75	1.00	-0.73	-0.64	0.26	-0.71	-0.37
7MN	-0.39	-0.22	-0.30	-0.76	0.77	-0.73	1.00	0.48	0.09	0.51	0.24
8MN	-0.72	-0.65	-0.64	-0.50	0.40	-0.64	0.48	1.00	-0.48	0.95	0.62
9MN	0.61	0.78	0.59	0.02	0.00	0.26	0.09	-0.48	1.00	-0.54	-0.53
10MN	-0.80	-0.75	-0.69	-0.56	0.43	-0.71	0.51	0.95	-0.54	1.00	0.60
11MN	-0.51	-0.46	-0.46	-0.24	0.25	-0.37	0.24	0.62	-0.53	0.60	1.00