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Issues in Gerrymandering: An Exploratory Measure of Partisan Gerrymandering Applied to Minnesota

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I. STATEMENT OF THE PROBLEM

With the approach of 1980 a new round of legislative redistricting will shortly be upon us. Not surprisingly, organized groups are showing their periodic interest in the subject. The Republican Party's pragmatic concern, looking at the overwhelming number of state legislatures and governorships controlled by Democrats, is that unless

1. The terms *districting*, *redistricting*, *apportionment*, and *reapportionment* are treated as equivalents in common parlance. Technically, however, *apportionment* and *reapportionment* involve the allocation of a finite number of representatives among a fixed number of pre-established areas. *Districting* and *redistricting*, on the other hand, refer to the processes by which the lines separating legislative districts are drawn. Thus, state legislatures *redistrict* their states after they know the number of seats that have been *apportioned* to each state from among the 435 seats in the United States House of Representatives. See note 2 infra.

Since counties and other geographic units are not considered fixed units entitled to a certain number of legislative seats, the term *redistricting*, rather than *reapportionment*, is used correctly in referring to state legislative seats.

2. *Apportionment* of the United States House of Representatives is mandated by the Constitution: "Representatives . . . shall be apportioned among the several States . . . according to their respective Numbers . . . . The actual Enumeration shall be made . . . within every . . . Term of ten Years in such Manner as they shall by Law direct." U.S. Const. art. 1, § 2, cl. 3. The mechanics of House reapportionment begins with the publication of results of the decennial United States Census. After setting 435 as the total number of representatives, the Congress has delegated to the Bureau of the Census the task of calculating the number of representatives to which each state is entitled. This calculation is to be made according to the method of equal proportions, with no state having less than one representative. See 2 U.S.C. § 2a (1976). Congress then requires that the states be subdivided into districts, with the only requirement being that single-member districts be used. See id. § 2c. The states are allowed to choose the means of subdividing. Should any state legislature fail to redistrict according to population, the appropriate United States district court will accept jurisdiction and provide a remedy, drawing the district lines itself, if necessary. See Wesberry v. Sanders, 376 U.S. 1 (1964).

3. After the 1976 elections, Democrats controlled both legislative houses and the
Republicans can win a significant portion of the 1978 races, Democrats will be able to redistrict in such a way as to perpetuate their majority position both in state legislatures and in the United States House of Representatives for another decade.\(^4\) Common Cause, the self-described "citizens lobby," also has placed reapportionment high on its agenda, but with the goal of removing the issue from partisan politics by requiring that legislative districting be done by nonpartisan commissions\(^5\) in order to "bypass the self-interest of incumbent legislators and set objective standards for reapportionment."\(^6\)

The concern of both groups is gerrymandering.\(^7\) Throughout our history, the gerrymander has existed without much more than moral indignation to combat it. Today, it remains the last major obstacle to fair and effective representation, for while the Supreme Court has eliminated gross inequities in population among legislative districts,\(^8\) there is as yet no guarantee that the district lines will themselves be fairly drawn. Just as districting based on population equality was worthwhile as a contribution to political equality, so too an effective remedy for gerrymandering would contribute significantly to increased fairness in the political process.\(^9\) One commentator who advo-

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4. Republican National Committee Chairman Bill Brock evidenced this concern when he stated that the "fundamental goal for this Committee must become the election of more Republicans to state legislatures. Given the coming of the decennial census in 1980 and the mandated reapportionment in 1981, no goal can have a higher priority." Brock, Rebuilding the GOP, FIRST MONDAY, January-February 1977, at 2.


7. The term "gerrymandering" has come to describe the excessive manipulation of the shape of legislative districts. The term is derived from the name of Elbridge Gerry, who was Governor of Massachusetts in 1812 when the legislature created a peculiar salamander-shaped district to benefit the party to which he belonged.

8. [As a basic constitutional standard, the Equal Protection Clause requires that the seats in both houses of a bicameral state legislature must be apportioned on a population basis. Simply stated, an individual's right to vote for state legislators is unconstitutionally impaired when its weight is in a substantial fashion diluted when compared with votes of citizens living in other parts of the State. Reynolds v. Sims, 377 U.S. 533, 568 (1964).

9. Partisan gerrymandering is a major concern, of course, only in a political system dominated by party politics. There are those who say that political parties are irrelevant, or nearly so, in the American system today. While this view seems fashionable, it is wrong. A two-party system has been a dominant aspect of American government for a century and that dominance shows no likelihood of diminishing. Opinion polls do show that the public at large is disenchanted with the present parties, and
cates a judicial response has suggested that the courts should create "a reasonable presumption of gerrymandering [placing] . . . [t]he burden of explanation and justification . . . upon those responsible for the representational design." Without precise guidance on how the presence of gerrymandering can be detected, however, this useful idea is mere rhetoric.

As a means of making the problem of gerrymandering more amenable to solution, we urge that an effort be made to devise an objective measure of partisan gerrymandering, despite the serious analytic and research problems this entails. By carefully defining gerrymandering, establishing specific criteria for fair districting, and ultimately proposing a method for evaluating redistricting schemes, we hope to assist redistricting authorities—whether legislatures, independent commissions, or, if necessary, the courts—in eliminating the inequities of partisan gerrymandering.

At the outset, however, we wish to dispel the fatalistic notion that nothing can be done about gerrymandering. While the United States Supreme Court has thus far refused to declare a redistricting plan invalid on the ground of partisan gerrymandering, we believe indeed considerable "party decomposition"—abandonment of prior admitted identification with one of the parties—has occurred. See generally W. Burnham, Critical Elections and the Mainsprings of American Politics 91-134 (1970). But there is no concerted move to abandon the existing parties either for third parties or for independents. The United States Supreme Court has recognized the reality of the two-party system by upholding the public financing of presidential campaigns even though the allocation of funds is biased toward the existing major parties. See Buckley v. Valeo, 424 U.S. 1 (1976). Almost all congressmen and senators bear the label of one party or the other. Indeed, competition between the two parties is growing at the state level. See M. Jewell & D. Olson, American State Political Parties and Elections 48 (1978).

The glib statement that the labels of the two existing parties are simply empty alternative vehicles for public choice between personalities with no significant policy or ideological differences is also untrue. Careful investigation shows important, though not antipodal, differences between partisans in the public and in Congress on contemporary issues. The widest differences can be seen at the level of the party elites—United States' Representatives and Senators. See Backstrom, Congress and the Public: How Representative Is the One of the Other?, 5 Am. Pol. Q. 411 (1977).

10. R. Engstrom, The Supreme Court and Equi-Populous Gerrymandering 38 (Sept. 3, 1975) (paper presented at the annual meeting of the American Political Science Association, San Francisco). Not everyone, however, believes that a judicial response to gerrymandering is appropriate. Thus Dean Auerbach, while emphasizing the importance of the one person/one vote concept, nonetheless cites mobility of population, flux in party affiliation, and contradictory estimates of political strategists trying to achieve partisan advantage as factors that would make it difficult for the courts effectively to address gerrymandering. See Auerbach, Commentary, in Reapportionment in the 1970's, at 74 (N. Polsby ed. 1971).

11. See Gaffney v. Cummings, 412 U.S. 735 (1973); cf. United Jewish Organizations v. Carey, 430 U.S. 144 (1977) (no constitutional violation where a community of Hasidic Jews was split by a redistricting plan that sought to achieve a fair allocation of voting strength between white and nonwhite voters).
that the history of efforts to achieve equal-population districting suggests that continued Court inaction on partisan gerrymandering should not be assumed nor need it be inevitable. In 1946, the Supreme Court refused to act against malapportionment because of the fear of entering a "political thicket."\(^{12}\) Subsequently, political scientists developed several measures of malapportionment that dramatically demonstrated the possibility of a minority of the electorate controlling the electoral process.\(^{13}\) In 1962, the Supreme Court accepted jurisdiction over reapportionment\(^ {14}\) and set out to enforce the one person/one vote standard.\(^ {15}\) While we cannot demonstrate conclusively a causal link between the increased technical sophistication on the subject of malapportionment and the Court's subsequent actions, we are persuaded that the existence of widely accepted measures of the problem, and therefore criteria for remedial action, facilitated Court action.\(^ {16}\) We believe that a similar methodological development in measuring partisan gerrymandering would facilitate action if the political will is present.

Nor need the fear of political repercussions preclude judicial action. The belief that dire consequences would befall the Court because of its requirement that redistricting be on the basis of population equality has clearly proven unfounded. Initially, many incumbent state legislators and interest groups that benefited from the existing order expressed anger at the Court's intervention in the districting process. Their immediate response was to try to withdraw all jurisdiction of the courts in redistricting suits\(^ {17}\) and then to propose a constitutional amendment that would have exempted one house of the state legislatures from the requirement that representation be

\(^{12}\) See Colegrove v. Green, 328 U.S. 549 (1946).

\(^{13}\) See P. David & R. Eisenberg, Devaluation of the Urban and Suburban Vote 7 (1961); Dauer & Kelsay, Unrepresentative States, 44 Nat'l Municipal Rev. 571 (1955).


\(^{16}\) V. O. Key very early identified as the primary reason for judicial reluctance to act on reapportionment "the absence of any precise standards by which legislation on the subject can be tested." Key, Procedures in State Legislative Apportionment, 26 Am. Pol. Sci. Rev. 1050, 1051 (1932).

\(^{17}\) Legislation to this effect was introduced by Representative Tuck during the 88th Congress, and it passed the House of Representatives on August 19, 1964, by a vote of 218 to 175. See H.R. 11926, 88th Cong., 2d Sess., 110 Cong. Rec. 20300 (1964). When it reached the Senate, however, the bill was filibustered for a month by liberal Senators, leading to the substitution of a mild "sense of the Congress" resolution attached to a pending foreign aid bill that merely asked the courts to give the legislatures six months to act. See 110 Cong. Rec. 22758 (1964). House conservatives were so incensed at the weakness of the Senate action that they persuaded the House conferees to kill the measure when it reached the conference committee. See Congressional Quarterly Service, Congress and the Nation, 1945-1964, at 1526-27 (1965).
GERRYMANDERING based on population. Once these efforts were defeated, however, the movement to retain the old order quickly lost its appeal. The reason for this loss of momentum, overlooked by those who feared the Court would suffer politically for taking jurisdiction on this question, is that redistricting on the basis of population equality ultimately produced as many gainers as losers. Once the groups who held power artificially by delaying redistricting were replaced by the metropolitan benefactors of redistricting, the new majority in the legislatures no longer clamored for a change in the Constitution. Moreover, having gained acceptance, the continued availability of a judicial remedy for mal-districting seems likely to ensure that future redistricting as a result of shifts in population will be accomplished with little opposition.

The political controversy over the Court's earlier equal population decisions was temporary and self-correcting, indicating that fears of political repercussions need not be a serious impediment to Court action to remedy partisan gerrymandering. The reluctance of the Supreme Court to involve itself in the problem of partisan gerrymandering seems more readily justified in terms of the absence to date of any solid measure of gerrymandering and the consequent difficulty of obtaining convincing proof of its existence.

II. PROPER CRITERIA FOR MEASURING GERRYMANDERING: PROBLEMS WITH EXISTING MEASURES

A major problem with several of the methods for measuring gerrymandering currently in vogue is that they rely solely on appearance. In general, if districts appear tidy on a map, analysts assume there has been no gerrymandering; if districts twist and turn, they assume that gerrymandering has occurred.

That crooked district lines are a sufficient guide to ascertaining gerrymandering underlies the recommendations of several commentators who assert that the courts can cure the problem of gerrymandering.

18. In 1965, the Senate defeated the “Dirksen amendment,” S.J. Res. 2, 89th Cong., 1st Sess., 111 Cong. Rec. 172 (1965), by a vote of 59 to 39, seven votes short of the required two-thirds majority. See 111 Cong. Rec. 19335 (1965). In 1966, the Senate defeated a similar proposal, S.J. Res. 103, 89th Cong., 1st Sess., 111 Cong. Rec. 20119 (1965), by a vote of 55 to 38, again seven votes short of the required total. See 112 Cong. Rec. 8583 (1966). By 1967, legislatures in 33 states had requested Congress to call a constitutional convention and submit to the states for ratification an amendment on this subject. While the number of states requesting such action was only one short of the number required for calling a constitutional convention, the different wordings of the states’ resolutions cast doubt on the actual closeness of the attempt to compel congressional action. See Congressional Quarterly Service, Congress and the Nation, 1965-1968, at 423-34 (1969).

dering by mandating that legislatures apply certain visual rules in redistricting. Their assumption is that if courts, while continuing to require population equality, also require districts to adhere to subdivision boundaries and be compact and contiguous, it will be impossible to gerrymander.

A visual approach has a number of flaws. First, the visual rules contain implicit operational difficulties because they fail to recognize that there must be tradeoffs between population equality and following political subdivision lines, or between following subdivision lines and maintaining compact districts. All simply cannot be maximized simultaneously since at some point they come into conflict with each other. Second, to be meaningful, criteria such as compactness and fidelity to subdivision lines must be expressed not as general guidelines, but as precise, mathematical terms, specifying how much deviation from the ideal will be tolerated. Third, and most important, reliance on visual rules can be a source of misinformation as well as information when it comes to identifying a gerrymander. Those holding the view that requiring population equality, compactness, and adherence to subdivision boundaries will prevent gerrymandering assume that if these rules are followed, only one districting plan will be feasible, eliminating the possibility of discretionary line drawing for partisan advantage. As our case study will show, however, many plans are in fact possible under fairly strict rules of district compactness, feasible adherence to subdivision boundaries, and population equality. This is not to say that rules of this type are unhelpful in restricting gerrymandering. Indeed, strict population equality standards do make it more difficult to gerrymander: "[T]he artistry of the political cartographer is put to the highest test when he must work with constituencies of equal population."

Other typical requirements, such as compactness and respect for subdivision lines, also place meaningful constraints on the district drawer's freedom to gerrymander, especially when imposed simultaneously. We therefore


21. See text at pp. 1143-46 infra.

22. It has been suggested that excessive striving for mathematical equality actively facilitates gerrymandering. See R. DIXON, JR., DEMOCRATIC REPRESENTATION 456-57 (1968). We expressly reject such a suggestion. Indeed, in one case in which the Supreme Court backed off from strict population equality, the empirical result appeared to be the allowance of a gerrymander against a specific region. See Mahon v. Howell, 410 U.S. 315, 344 (1973) (Brennan, J., dissenting) (sacrificing population equality to allow adherence to local subdivision lines may well have "discriminated against one region of the state").

subscribe to the need for rules on these several criteria, but recognize that those rules alone are not sufficient to preclude partisan gerrymandering.

Aside from those analysts who emphasize physical appearance as a means of identifying gerrymandering, others purport to measure gerrymandering by focusing on the partisan outcome of the legislative election following a redistricting. Analysts using this approach compare the percentage of a party's legislative vote statewide with the percentage of seats gained. Marked disparities between the two figures are said to indicate the existence of a gerrymander.

This method of identifying gerrymandering, like the first, has major flaws. First, the approach fails to account for the fact that the difference between percentage of vote and number of seats captured may in fact be the result of natural advantages—the inordinate concentration of partisans in one place—rather than any deliberate partisan districting scheme. For example, it is well-known that Michigan Democrats are heavily concentrated in Detroit but are in a minority in many other parts of the state. Thus, in every election, Detroit Democrats will win heavily but their excess votes—those above fifty percent—do their party no good. Similarly Democrats in outstate Michigan waste votes in those districts where they are a strong but persistent minority. No tolerable districting plan can effectively use either kind of votes, but typical postelection bias measures would show a gerrymander in favor of Michigan Republicans.

Second, gauging party strength by using the sum of party votes in individual districts instead of the vote totals for some common statewide race contaminates the results with the effects of a multitude of candidate personalities, campaign techniques, and strictly local issues. We know that even strongly partisan voters on occasion vote for a candidate from the opposite party. Yet a disparity between the vote for all of a party's legislative candidates and the percentage of seats the party gains would be used by some as evidence of a gerrymander. Any such use of individual district situations as a test for gerrymandering results in a party being accused of seizing an

24. See R. Dixon, Jr., supra note 22, at 321 (58% of the statewide vote captured 65% of the seats—an eight-seat “bonus”); A. Hacker, supra note 23, at 61 (“The test employed here is to check on a party's proportion of the total statewide congressional vote, and how this compared with the proportion of seats that party secured in the state's congressional delegation.”); Tuft, The Relationship Between Seats and Votes in Two-Party Systems, 67 Am. Pol. Sci. Rev. 540, 549-53 (1973) (measuring legislative bias and condemning results in which candidates of one party captured nine out of fifteen seats, even though they received less than half of the votes cast).


27. See note 24 supra and accompanying text.
undue advantage when it should be congratulated for recruiting outstanding candidates and conducting a first-class campaign for the legislature.

Aside from the theoretical problems associated with the use of district vote totals rather than vote totals for a statewide race, practical problems are presented as well. For instance, many legislative candidates go uncontested. Because the vote from a single uncontested race will in all probability add more to the total of the winning party than the margin by which several opposition candidates win in contested races elsewhere, the result will be a distortion in the total vote considered to reflect overall party strength.

An even more important practical problem of using legislative votes as a basis for districting, however, is that legislative votes are not "cross-addable"; that is, it is not accurate to assume that the votes for a party’s candidate in one district would translate into votes for the same party’s candidate in another district. Therefore, as district lines are moved in various redistricting schemes, adding the votes of different legislative candidates as a means of approximating party strength within the new district could prove unreliable as an indicator of the actual political composition of the new district.

Finally, and of special importance, analysts who use the disparity between total vote and seats held after redistricting as evidence of gerrymandering neglect the crucial fact that reapportionment battles are, by their very nature, before-the-fact. That is, during the redistricting process, evaluations of the possible effects of a plan on the next legislative election must necessarily be based on electoral behavior that has occurred prior to the redistricting itself. A measure that purports to be a basis for evaluating a proposed districting plan is not useful unless it is available before the plan has operated to the possible detriment of one party in an election.

III. A PROPOSED MEASURE OF GERRYMANDERING

To be effective, a measure of gerrymandering must fulfill a number of specific requirements. Generally, any means of evaluating a redistricting scheme must take into account the received parameters within which those charged with redistricting are required to operate. Thus, for example, districts may be required to exhibit a certain degree of population equality, compactness, and respect for subdivision lines. Beyond this, a test for gerrymandering must meet three requirements. First, it must provide a precise definition of gerrymandering, one that takes into account the fact that not all advantages arising under a redistricting scheme are properly termed gerrymanders. Second, the test must provide a reliable method of estimating party strength within the state since ultimately whether a gerrymander has occurred depends on how closely the projected representation
under a particular redistricting scheme approximates the overall strength of the party. To ensure that the estimate of party strength is as accurate as possible, the method by which the estimate is made must, to the extent possible, control for candidate personalities, idiosyncratic campaign techniques, and local issues. Finally, an effective measure of gerrymandering must be capable of detecting gerrymandering a priori since the object of devising a test in the first place is to be able to evaluate a proposed redistricting scheme before it is implemented.

A. DEFINING GERRYMANDERING

Before we can describe our method of measuring partisan gerrymandering in a two-party system we must establish a rigorous definition: partisan gerrymandering is gaining through discretionary districting an unjustifiable advantage for one political party as opposed to the others. This definition insists that not all advantages attained as a result of a districting plan constitute gerrymandering. For example, the geographic concentration of various social groups within a state is a common phenomenon. Under any districting plan, certain groups of people will end up dominant in certain districts, thus creating advantages for these groups as opposed to all others. Because our definition of gerrymandering is limited to districting that is within

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28. Partisan gerrymandering can exist in a multiparty system as well. For a description of how the French and Italian election laws discriminate against the Communist party by this means, see D. Rae, The Political Consequences of Electoral Laws 137 (1967). In a two-party system, involving single-member districts, there will always be discrimination against third parties since it is nearly impossible for a small group to amass sufficient strength to dominate a district. See generally M. Duverger, Political Parties 217 (1954).

We do not address here the relevance of our measure of gerrymandering to a multiparty system, nor do we deal with its application to other types of gerrymandering—for example, racial gerrymandering—though we acknowledge the importance of such issues. Indeed, it should be noted that the strategies involved in racial gerrymandering may be considerably different from those involved in partisan gerrymandering. The strategic goal of political party draftsmen is always to concentrate their partisans within a district so as to constitute a majority. By contrast, racial minorities could seek to maximize their political power by distributing significant pockets of minority voters among a large number of districts, thus hoping to have some degree of influence over as many elected representatives as possible, rather than concentrating their numbers within a relatively few districts in the hopes of actually electing a minority candidate.

29. Only if the basis of legislative representation were changed from a single-member district system to a proportional representation system, such as existed in the Fourth French Republic, could all important factions, wherever they lived, be represented rather accurately in the legislative body. But proportional representation tends to produce certain undesirable side effects—such as fragmentation of political parties and inability to obtain a majority in the legislature—which contribute to instability in government. For the technical explanation of this relationship, see D. Rae, supra note 28.
the discretion of district designers to counteract, any advantage that a party may attain because of a concentration of its supporters is termed "natural" and is not a gerrymander since it cannot be reduced further under any plan.

Similarly, we exclude from our definition of partisan gerrymandering advantages that accrue to the benefit of specific individuals, typically incumbents. An example might be a legislator who seeks to have her district drawn to include a particular slice of territory that includes major campaign supporters, a district that permits occupational identification (a farmer in a largely farm district), or a district beneficial to someone with a locally famous family name. Another and more important example of such individual advantages would result if districts were drawn so as to maximize the reelection chances of all incumbents. Such idiosyncratic advantages from district drawing, while real and important, are individualistic and therefore not universally recognizable nor measurable by reference to party strength. Therefore, it is hard to imagine effective remedies to deal with all of these ad hominem advantages, and indeed, the desirability of trying to eliminate them is questionable.

What remains as gerrymandering are those districting decisions that give to one political party a representational advantage that is unjustified in relation to its statewide support and that could be reduced by opting for some other districting scheme that is possible given the received criteria of population equality, compactness, and

30. We are not saying that ethnic ghettos, concentrations of partisans, or any other geographical group patterns are "natural" in the sense that they are uninfluenced by prior human decisions. Those having the responsibility of drawing legislative districts, however, cannot be expected to alter significantly the effects of society, geography, and history. Thus, the district designers must accept as "givens" the demographic conditions existing at the time of redistricting.

31. The intended result of what others call "bipartisan" gerrymandering is to reduce the possibility of one party capturing seats held by the other, that is, to minimize the "swing ratio." Although we do not address ourselves to this problem, we share the fear of those who have noted that declining swing ratios may ultimately lead to increased rigidity in decisionmaking and insensitivity to changing public opinion on the part of seemingly unbeatable legislators. See Erickson, Malapportionment, Gerrymandering, and Party Fortunes in Congressional Elections, 66 AM. POL. SCI. REV. 1234 (1972); Lebedoff, The Essential Reform, HARPERS, October 1976, at 16-19; Mayhew, Congressional Representation: Theory and Practice in Drawing the Districts, in REAPPORTIONMENT IN THE 1970's, supra note 10, at 249; Tufte, supra note 24, at 549-53.

Recent studies have suggested, however, that the difficulty in beating incumbents may be less attributable to the way districts are drawn than to either a general decline in ideology or, more probably, to the growth of incumbents' ability to perform constituent services. See, e.g., Ferejohn, On the Decline of Competition in Congressional Elections, 71 AM. POL. SCI. REV. 166 (1977); Fiorina, The Case of the Vanishing Marginals: The Bureaucracy Did It, 71 AM. POL. SCI. REV. 177 (1977).

32. For a thorough discussion of representation theory, see H. Pitkin, THE CONCEPT OF REPRESENTATION (1967).
adherence to subdivision lines. The paradigmatic examples of such decisions are, of course, conscious—those that occur when Democrats try to benefit themselves at the expense of Republicans and vice versa. It should be emphasized, however, that our definition of gerrymandering is an objective one. Misrepresentation is an evil whether it is intentional or not, and a person contesting a districting plan should not be required to prove scienter. Any plan, even one constructed by a nonpartisan or bipartisan reapportionment commission, will have political effects. A tossed coin can be completely neutral, but using it to allocate legislative seats could produce highly distorted results. To a group discriminated against under such a plan, it would be only mildly comforting to know that its woes were not deliberately planned.

B. CHOOSING A DATA BASE

Having defined gerrymandering, the first step in measuring it is to select an adequate indicator of relative strength of the political parties in the state's electorate. This indicator is the "base percentage" and, once chosen, it is used to produce an estimate of the percentage of the electorate in each of the proposed districts that, all else being equal, could be expected to vote for candidates of a particular party simply because of that affiliation. Deciding which election will be used as the base race is one of the difficult choices required in developing a measure of gerrymandering. Questions about the reliability of any measure of statewide partisan strength can always be raised. Yet for all that, some estimate of overall party strength is clearly a necessity for any measure of gerrymandering. Any choice involves trade-offs that can and will affect the ultimate decision. What is necessary is to attend to the costs and benefits of each choice and, given those parameters, to choose the one that is most likely to be accurate and administratively feasible.

Given the wide political variation among states, it would be presumptuous to suggest that a single race or average of races would be optimal everywhere, or even at all times in a single place, for use as the base percentage. We can, however, indicate a number of considerations that should guide the choice. It is first necessary to eliminate two superficially attractive alternatives. One of these is the use of party registration figures. Most states do not provide for voter registration by party.

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34. See generally M. Barone, G. Ujifusa, & D. Matthews, The Almanac of American Politics passim (1972) (27 states provided no figures for voter registration by party).
party registration would not be a satisfactory base for evaluating
districting plans because of the loose correlation between voting be-
havior and registration and the impossibility of accurately allocat-
ing the growing number of independents.

Another figure infeasible for use as a base percentage is a state's
"normal vote." The normal vote for a state is the percentage split
between the parties that could be expected in an election if all other
factors were equal. It is derived by survey research techniques using
party identification and the differential likelihood of various parti-
sans to turn out at elections and eliminating the distorting short-term
effects of particular issues and candidates. The critical weakness of
using the normal vote as a base percentage for evaluating a districting
plan is that it is a statewide figure, not disaggregable to legislative
districts nor to precincts or census tracts, the fundamental units
traded between districts in changing legislative district lines. In order
to obtain survey data sufficient to enable accurate estimates of party
strength for each precinct or tract in the state, a substantial number
of voters would have to be surveyed in each subunit, amounting to a
total of hundreds of thousands of voters throughout the state. This
technique would be prohibitively expensive and literally impossible
to manage.

There are really only two acceptable options for figuring a base
percentage: use of either a single "typical" statewide race or a com-
posite of several statewide races. Each has its advantages and disad-
vantages. A consideration in favor of using a single typical race is that
in most states some relatively invisible office, such as State Public
Service Commissioner, can be considered a relatively accurate meas-
ure of base partisan electoral strength, because, in the absence of an
extensive personality-oriented campaign, voters tend to follow only

35. For a general overview of the rise of split-ticket voting, see Burnham, The
(1974).
36. On the rise of independents, see F. Sorauf, Party Politics in America 166
37. The concept of the normal vote was developed by Philip E. Converse. See
A. Campbell, P. Converse, W. Miller, & D. Stokes, Elections and the Political
38. The methodology involves calculating separately the expected turnout pro-
portions, strength of partisanship relative to short-term forces, and level of political
involvement of each of the five classifications of party identifiers (Strong Democrats,
Weak Democrats, Independents, Weak Republicans, and Strong Republicans) and
then unifying these estimates. See id.
39. See Backstrom & Agranoff, Aggregate Election Data in the Campaign: Limita-
tions, Pitfalls, and Uses, in The New Style in Election Campaigns 204-05 (2d ed.
the cue of party designation on the ballot. Another consideration that is by no means insignificant is that the use of a single race vastly simplifies the task of acquiring and manipulating data. A point against the use of a single race is the possible difficulty of reaching agreement on which race to use. It is important that the candidates in the chosen race have no particularly attractive or negative characteristics differentially affecting certain parts of the state—for example, an ethnic name if fellow ethnics are concentrated in a certain section of the state, or advocacy of a strong position on environmental preservation if that position poses an economic threat to a particular section of the state. Since the base percentage will be used to estimate party strength in particular precincts as they are moved from one potential district to another, local distortions such as these are highly undesirable.

The other acceptable base measure of partisan strength is an average of several statewide partisan races from recent elections. In its favor, an average fineses the controversy over which race to use. Relying on an average also dampens the effect of a single candidate's outstanding personal appeal as well as the idiosyncrasies arising from the support a candidate receives from "friends and neighbors," even of the opposite party.

But use of an index of several races is not without flaws. Candidates for major races, such as governor or United States Senator, especially candidates of a minority party, tend to run highly personal campaigns virtually divorced from partisan identification. Conversely, since minor offices frequently are held for long periods by incumbents with high name familiarity, the traditional vote for them hardly reflects current partisan strength. A possible way to lessen the effect of atypical races would be to use as the base percentage the average of a limited number of election contests, for example, an average of the statewide races remaining after eliminating those races with the widest margins of both victory and defeat.

A further choice affecting the base percentage is whether it should be selected from a single year or from several years. Any single year may be atypical, for example, because a party's popularity is temporarily depressed by adverse publicity. On the other hand, if the base percentage is to be derived by averaging the outcomes of several elections over time, changing precinct lines and population movements among precincts vastly complicate preparation and evaluation of data.

The final consideration in the choice among various possible base

percentages should be their correspondence to the state's normal vote. While the normal vote can be neither feasibly applied as a base percentage nor broken down by legislative districts, it does serve as an index against which to assess the reasonableness of the base percentage actually chosen.

C. Determining Fair Representation

Picking the standard of fair representation against which a given districting plan will be judged is the most value-laden choice in the development of a measure of gerrymandering. In a nutshell, the issue is whether majority rule or proportional representation for the minority is to be preferred, since, as will be demonstrated, the two may be mutually exclusive.

At first it seemed obvious that a proportional representation standard should be adopted. Such a standard would have defined fair representation as a situation in which both parties control the same percentage of legislative districts as their statewide base percentage. This method seemed the fairest because it appeared to give each party exactly what it deserved. Extended examination of the consequences of using a proportional representation standard, however, showed that it is impossible to give both parties what they deserve at the same time. Because a proportional representation districting standard will be unfair to one party or the other, a choice must be made as to whether the majority or the minority party is to be favored.

The explanation for this seeming paradox lies in the operation of what we call the "balloon effect," which causes the percentage of the majority party's votes to be inflated in terms of seats gained.42

42. See text accompanying notes 37-39 supra.

43. The reason the balloon effect operates as it does is attributable to the geographic distribution of partisans within a state. If partisans were uniformly distributed throughout all legislative districts, the party that received 51% of the statewide vote would also have 51% of the vote in every legislative district. Accordingly, every vote of the losing party would be wasted and the majority party would control all legislative seats. If, by contrast, all partisans were segregated geographically within the state, then the percentage of districts dominated by each of the two political parties would be roughly equivalent to that party's statewide percentage. In this situation, the extra votes of the majority party in those districts it dominates would be wasted. In reality, of course, voters are neither distributed evenly by party within a state nor completely segregated; yet a party that achieves 51% of the vote is almost certain to be in a majority in more than 51% of the districts.

The balloon effect has been demonstrated empirically. Because the percentage of districts won by the dominant party tends to be higher than its percentage of the statewide popular vote, Dixon has observed that single-member districting creates at least a mild bias in favor of the dominant party. See R. Dixon, Jr., supra note 22, at 50-54. See generally D. Rae, supra note 28, at 72; Tufte, supra note 24, at 544-46.
With only slight reflection, the reality of the balloon effect becomes apparent. For example, in an election in which the winning candidate received 75% of the vote statewide, we would probably not expect that candidate to lose in one quarter of the districts. George McGovern polled over one-third of the national vote in 1972, but carried only Massachusetts and the District of Columbia, which represent slightly fewer than four percent of the "districts."

Given the balloon effect, every percentage point increase in the statewide percentage for one party typically translates to more than a one percentage point gain in the districts it would dominate. If a reapportionment plan is specially designed to limit a 55% majority party to being in a majority in 55% of the districts, at such time as that party in fact receives only fifty percent of the votes, it would likely be dominant in fewer than fifty percent of the districts. Because the majority party would not, in the latter situation, control the legislature, it would not be in a position to implement its legislative goals. To us, the likelihood of a minority party actually dominating the majority is intolerable. Indeed, to illustrate how unpopular this result would be, imagine the adverse public reaction that would follow if the electoral college were to give the presidency to a minority candidate.

On the other hand, one might understandably feel that the protection of full minority potential is more important to American values than the principle of majority rule, and thus be willing to exchange a guarantee of majority rule for the assurance that the minority would get their full quota of legislative seats. Accordingly, in designing a measure of gerrymandering, one might want to counteract the balloon effect to safeguard the interests of the minority.

Because our value choice comes down on the side of majority rule, however, we prefer to let the balloon effect benefit the majority party rather than deflate it via a standard of proportional representation. We therefore define fair representation as a situation in which the majority party is assured of maintaining its numerical supremacy in a majority of districts if its statewide percentage—whatever the actual figure—is reduced to a bare majority: in a two-party system,


45. We will illustrate this with actual data in the case study. See text accompanying note 62 infra.

46. This is illustrated hypothetically in figure 1-a, Appendix at p. 1150 infra.

47. Many scholars have argued that the majority party deserves an opportunity to accomplish its legislative goals. Under this party government model, if the majority party then abuses the power given it, the electorate will know whom to blame and can take appropriate action in the next election. For the standard apologia for effective majority rule, see E. Schattschneider, Party Government (1942).
fifty-plus percent of the vote.\textsuperscript{48} Thus, rather than measuring the degree of fair representation in a proposed districting plan by comparing the proportion of districts in which the statewide majority party would be in a majority with its statewide base percentage, we look to see whether the majority party would dominate a majority of districts if its statewide base percentage were reduced to a bare majority—the adjusted base percentage. If, for example, the Democrats' statewide base percentage is 55\%, they are fairly represented as long as they would be in the majority in fifty percent of the districts if their base percentage total in each district was reduced by five percentage points. Any other result would constitute misrepresentation. Continuing the above example, if, after adjusting its base percentage in each district, the Democratic party is in a majority in only 43\% of the districts, then the degree of representation is 43/50, or 86\%, and the party would be underrepresented by fourteen percent. To ensure majority dominance at the fifty percent level, a bigger-than-proportional standard of district dominance will have to be tolerated when the majority party receives more than a bare majority of the vote.\textsuperscript{49} Counterbalancing this reward to the majority, however, the use of an adjusted base percentage to determine fair representation also means that the minority will be assured of being dominant in a majority of districts should it attain a majority statewide. Thus, this proposed method of measuring fair representation checks the usual gerrymandering pattern in which the majority party draws the districts in such

\textsuperscript{48} The adjustment is made by reducing each precinct by a uniform absolute percentage, determined by taking the difference between the statewide base percentage and fifty percent. To illustrate this assumption, assume a party with a statewide base of 55\%. Applying the uniform absolute percentage, each precinct would be reduced by five percentage points, regardless of whether the original figure was 75\% or 25\%.

An alternative method, which we reject, would be to reduce each precinct by a constant proportional amount. Using the foregoing illustration, a five percentage point difference (55\% to 50\%) would result in a constant proportion of 5/55 or 9.1\%. This method would thus require a subtraction of seven percentage points from a district with a 77\% vote and a subtraction of three percentage points from a district with a 33\% vote.

The rationale for adjusting all districts by a uniform absolute percentage rather than a proportional amount is based on a phenomenon termed the "uniform national swing." See generally D. Butler & D. Stokes, \textit{Political Change in Britain} 140-51 (2d ed. 1974). Butler and Stokes believe this empirically demonstrated phenomenon to arise from two tendencies that counteract each other: national influences, which tend to be proportional to existing party support, and local persuasive personal contacts, which tend to draw additional strength to the already dominant party. See id. at 143. Tufte concurs in the belief that the principle conforms to reality, stating that percentage swings are relatively independent of starting point and are therefore best assessed in terms of untransformed percentage point differences. See Tufte, supra note 24, at 545.

\textsuperscript{49} The relationship is shown hypothetically in figure 1-b, Appendix at p. 1150 \textit{infra}. 
GERRYMANDERING

a way that it will be dominant in a majority of them even if it loses its statewide majority.

Once the essential choices of definition, base race, and a standard of fair representation have been made, a districting plan can be tested for gerrymandering. The test consists of two steps: measuring the degree to which the plan deviates from the standard of fair representation and ascertaining whether it is possible to reduce that deviation. If there is no deviation, the plan is obviously not a gerrymander. Even if there is some deviation, however, the plan will still not constitute a gerrymander so long as that deviation cannot be further reduced. Thus, before it can be said with certainty that gerrymandering has occurred, it must be determined whether those who designed the districting scheme had any leeway for adjustment, that is, any discretion in what they could achieve in terms of gaining advantages for a particular party or weakening its opponents.

Given the natural concentration of partisans in any state and a set of minimum standards for compactness, population equality, and adherence to subdivision lines, there will be both a maximum and minimum percentage of districts in which each party could be dominant. This spread is the band of discretion available to district drawers. For example, if with an existing concentration of partisans in a state the minimum percentage of districts in which a given party could be a majority is 45 and the maximum is 60, the spread between 45 and 60 is the band of discretion for drawing districts.

The magnitude of the specific band of discretion for districting in any situation depends upon four criteria: (1) the required degree of compactness of districts, (2) the allowable deviation from population equality, (3) the required degree of adherence to subdivision lines, and (4) the relationship between the size of legislative body and state population. To the extent the allowed tolerances in the above criteria are narrow, the band of discretion within which district designers must operate is restricted. Thus, for example, if district designers are required to adhere rigorously to subdivision lines, they are constrained from building a majority within a district by joining portions of the population with several adjoining units. In theory, it might seem possible to eliminate all possibilities for gerrymandering by simultaneously enforcing strict standards for all criteria, thus eliminating the band of discretion entirely. In practice, however, this is not possible since the foregoing criteria interact in such a manner that applying one standard strictly necessarily requires the relaxation of some other standard.

50. See Morrill, Ideal and Reality in Reapportionment, 63 ANNALS A. AM. GEOGRAPHERS 463, 475 (1973).
In summary, the decisional rules governing the determination whether a specific reapportionment plan is a gerrymander are as follows:

(1) If, after reducing the majority party's legislative vote totals in each district by the difference between that party's percentage in the base race and fifty percent, the majority is dominant in exactly fifty percent of the districts, the plan is obviously fair, and one need not look at it further.

(2) If the majority party has not achieved fair representation, but has achieved the maximum number of districts possible given the band of discretion, there is no gerrymander. Since there is no way, given the criteria of compactness, population equality, adherence to subdivision lines, and the ratio of legislative size to population, for the majority party to reach fair representation, it cannot blame its underrepresentation on gerrymandering.51

(3) If the majority party has received less than fair representation, and has not achieved its full potential advantage, the designers have engaged in a gerrymander against the majority.

(4) If the majority party predominates in more than fifty percent of the districts, it is overrepresented. If, however, there is no potential for reducing this advantage, the plan is not a gerrymander. In this instance the natural spread of the majority is such that there is no way its overrepresentation can be reduced. This unfairness can either be written off as unavoidable given the operation of the existing criteria, or ultimately a change in the criteria may be sought.

(5) If the majority party is overrepresented, but there is potential to reduce its advantage, this plan is a gerrymander against the minority.

In short, the justification for applying these rules to determine when a gerrymander has occurred is that it is reasonable to accuse district drafters of gerrymandering only when they fail to deal with the disadvantaged party as fairly as they might given the band of discretion within which they must operate. As long as they have done

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51. The only way in which this situation could ultimately be remedied would be to change the underlying criteria that affect the band of discretion that restricts districting possibilities. For example, compactness requirements could be changed, moving the band of districting potential and thus enabling the districting authorities to give the majority increased representation. Or the size of the legislature could be changed, perhaps enabling the majority to assemble majorities in a higher percentage of districts.
all that is possible to achieve fair representation, there can be no gerrymander.

IV. A CASE STUDY

By way of illustration, the proposed method will be used to test the 1972 Minnesota state senate districting plan for gerrymandering. The parameters of the 1972 plan were determined by a three-
han local government officeholders sued in federal district court asking the court to redistrict based upon either the 1966 population to be determined by special census or the 1960 population figures, the only figures then available throughout the state. See Honsey v. Donovan, 236 F. Supp. 8 (D. Minn. 1964). While ruling that the 1959 redistricting plan was unconstitutionally unequal, the court again indicated its reluctance to redistrict on its own, preferring instead to give the legislature and governor a chance to work out a mutually acceptable plan. See id. at 21. Nevertheless, the court retained jurisdiction over the case.

Under judicial threat once more, the legislature, dominated by the “conservative” faction, see note 60 infra, set about to redistrict itself, ignoring the Governor’s Commission report. See C. Backstrom, Problems and Strategies of Reapportionment in Minnesota (May 7, 1965) (paper prepared for the annual meeting of the Minnesota Academy of Science). The resulting plan, S.F. 102, 64th Minn. Legis., 1965 Sess., was calculated by one member of the Governor’s Commission to contain a population disparity of 2:1. See C. Backstrom, Population Variance from Average House Districts (1965) (unpublished report to Minnesota Governor Karl Rolvaag). Because the disparity was considered too great, the Governor vetoed the plan. See JOURNAL OF THE SENATE, 64TH MINN. LEGIS., 1965 Sess. 2554-59 (1965). Thereupon a suit was instituted by the Minnesota Senate challenging the power of the governor to veto redistricting acts, See Duxbury v. Donovan, 272 Minn. 424, 138 N.W.2d 692 (1965). The lower court had ruled against the Governor on the ground that the language of the state constitution said specifically that redistricting was a function of the “legislature,” in contrast to other language requiring action pursuant to “law.” The lower court’s reasoning, however, was rejected by the Minnesota Supreme Court, which held that the act of the legislature was subject to veto by the governor, though the legislature was, of course, free to override the veto. See id. at 442, 138 N.W.2d at 704.

By this time, the United States Supreme Court had indicated clearly that it would invalidate redistricting plans that failed to come as close as possible to the equal population standard. See Reynolds v. Sims, 377 U.S. 533 (1964). Consequently, the Governor reconvened his Reapportionment Commission to draw a tighter plan, one that did not deviate more than ± five percent.

Governor Rolvaag presented a new plan to a special session of the legislature on April 25, 1966, but the legislature came up with its own plan; see S.F. 2, 64th Minn. Legis., 1966 Ex. Sess., which the Governor vetoed, see JOURNAL OF THE SENATE, 64TH MINN. LEGIS., 1966 Ex. Sess. 126-30 (1967). Further compromises were made, and a new districting act was finally passed and signed. See Act of May 20, 1966, ch. 1, 1966 Minn. Ex. Sess. Laws (codified at MINN. STAT. §§ 2.021-.712 (1976)).

Only four years later, however, with the 1970 census data available, the Republican-controlled legislature confronted another Democratic governor over the issue of redistricting. In response to a suit brought in federal district court, see Beens v. Erdahl, 336 F. Supp. 715 (D. Minn.), vacated and remanded per curiam sub nom. Sixty-seventh Minn. State Senate v. Beens, 406 U.S. 187 (1972), the legislature passed a plan, H.F. 76, 67th Minn. Legis., 1971 Ex. Sess., which Governor Wendell Anderson pocket-vetoed. At that point, the three-judge federal court panel intervened, found that Minnesota had again failed to comply with the one person/one vote standard, and, in the process of redistricting, cut the size of the Senate by almost one-half and the House by about one-fourth. See 336 F. Supp. at 721. The Senate appealed to the United States Supreme Court, which held that the district court had overstepped its authority in cutting legislative size. See Sixty-seventh Minn. State Senate v. Beens, 406 U.S. 187 (1972) (per curiam). Restricted to keeping the legislature at its previous size, except for the reduction of one House seat, the district court drew the present lines. See Beens v. Erdahl, 349 F. Supp. 87 (D. Minn. 1972).
judge United States district court. The court required the district drawing masters to adhere to a tight standard of population equality, to maximize compactness and the number of county and municipal boundaries preserved, and to ignore partisan and personal considerations. The final plan divided the state into 29 metropolitan senate districts, 34 essentially outstate districts, and 4 mixed districts.

A. Choosing a Base for Measuring Party Strength

Our choice as the best indicator of base partisan strength in Minnesota prior to the 1972 redistricting is the race for governor in 1970. The reasons for this selection are that two equally popular candidates faced each other for an open seat held by a retiring one-term Republican after a decade of alternation in party control. Moreover, both parties were well organized and financed. These are all conditions for a straightforward party contest uncontaminated by extraneous factors. In addition, the governor's race in 1970 did not exhibit regional idiosyncrasies that could distort the base percentage, as is evidenced by the high correlation between the precinct-by-precinct vote for governor and that for all other statewide races. Finally, the 54.27% by which the Democratic candidate won is very near the 54% state "normal vote" generally attributed to the Democratic party for that period.

57. Our study indicated a correlation of .96. This conclusion, and others cited in this case study section of the Article, is derived from a computer study conducted during the first half of 1975. The full results of that study are on file with author Backstrom and will be hereinafter cited as Computer Study.
B. Measuring the Degree of Fair Representation in the Plan

Having chosen the base percentage, the next step is to test the districting plan for fair representation. To do this, we compare the percentage of districts in which the majority is dominant to its adjusted statewide base partisan strength. It must be remembered that our procedure requires that the base percentage be reduced to fifty-plus percent. This step ascertains whether the majority party, if reduced to a bare majority, would be dominant in a majority of the districts.

The Minnesota case provides an excellent demonstration of why it is important to measure fair representation in this manner. Using the actual base race percentage before reduction (54.27% statewide), Democrats are in the majority in 44 districts, Republicans in 23 districts in the court plan. This dominance in 66% of the districts is a predictable consequence of the previously mentioned balloon effect, as a result of which the percentage of seats obtained by a party having more than a bare majority statewide will be greater than fifty percent. The finding in the Minnesota case that the Democrats were in

60. From 1913 until 1973, Minnesota legislators were elected without party designation on the ballot. Nonetheless, in this case study, reference is made to Republicans and Democrats when discussing legislative races. In fact, virtually all candidates were endorsed by regular party organizations, and legislators divided themselves into liberal and conservative caucuses that corresponded almost exactly to their party preferences. A 1967 study estimated that two-thirds of the conservative senators and three-fourths of the conservative representatives were Republican party-oriented and that no Democratic Farmer-Labor party members caucused with the conservatives. See C. Backstrom, The Minnesota Legislature (June 7, 1967) (paper prepared for Minnesota-Dakotas regional session of the American Assembly on State Legislatures in American Politics).


62. A graphic depiction of the differential increases in district dominance for each percentage point increase in popular vote in Minnesota is set out in figure 2, Appendix at p. 1152 infra. Data collected for other years show that this finding is not atypical of Minnesota. For example, the Democratic candidates running statewide in 1972 dominated legislative districts as follows:

<table>
<thead>
<tr>
<th>Race</th>
<th>Statewide percentage</th>
<th>Percent of districts dominated</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States Senator</td>
<td>56.9</td>
<td>75</td>
</tr>
<tr>
<td>State Public Service Commissioner</td>
<td>51.7</td>
<td>60</td>
</tr>
<tr>
<td>President</td>
<td>47.2</td>
<td>34</td>
</tr>
</tbody>
</table>

a majority in a larger percentage of districts than their actual state-
wide percentage in no way establishes that there was a gerrymander
in their favor under the court plan. To discover whether the court
plan gave fair representation to the majority party, using our pro-
posal, which allows the balloon effect to have its normal effect, we
adjusted the base percentage down to 50.01%. This was done by
reducing the governor's actual vote in every precinct across the state
by 4.26%, the difference between his statewide average and 50.01%,
and readding the totals in each legislative district. The result was
that the Democrats were found to be in a majority in only 32 of the
67 districts. Since using the adjusted base percentage gave the Dem-
ocrats a majority in only 48% of the districts instead of the fifty
percent minimum, they had 48/50 or 96% of their fair representation;
in other words, they were underrepresented by four percent. Using
this method it is clear that despite what might be the initial impres-
sion, the court's plan did not unduly favor the Democrats.

C. POTENTIAL FOR ADJUSTMENT

Whether the underrepresentation of the Democrats in the court
plan can validly be termed a gerrymander, however, requires the
further step of ascertaining whether it would have been possible
within the band of discretion to produce a fairer plan. To anticipate
our findings, there is a great potential for changing the dominant
majority in districts in Minnesota. Actual district drawers, desiring
to create a fair plan by our standards, would have had to move only
a few lines according to the techniques presented below before achiev-
ing the small correction required. While our immediate concern was
to establish that there was the potential for increasing the dominance
of the majority to achieve fair representation in Minnesota, we de-
cided, for purposes of illustration, to establish the extremes of the
band of discretion in both directions.

Describing the band is far easier than actually establishing the
bounds. A computer program that could optimize first one party's

63. The procedure involves several steps. First, the percentage necessary to re-
duce the statewide base percentage to 50.01 is calculated. Next, for each precinct in a
district the actual raw vote for the base race is totaled, and a percentage is taken. Then
the statewide reduction percentage is subtracted from the precinct percentage and the
resulting adjusted percentage multiplied by the total actual vote to yield an adjusted
raw vote figure. When all precincts have been calculated, the adjusted vote for a
legislative district is added and the district adjusted percentage calculated. The reason
that the adjusted vote for each precinct must be calculated separately is to have the
data available if the precinct is moved to another district during the drawing of alter-
native plans. The adjusted base percentage can then readily be figured for these new
districts. An illustration of this process is contained in table 1, Appendix at p. 1153 infra.

64. See Computer Study, supra note 57.
strength and then the other's might seem ideal as a means of defining the outer parameters of the band of discretion. The major effort of this type has been Nagel's districting program, which has been used in California, and which is typical of most computerized efforts in this field to date in being relatively inflexible in the types of manipulations possible.

To achieve more flexibility, we opted for the traditional "manual, patient experimental approach" toward maximizing each party's potential. Wherever possible, the basic objective was to place opposition voters in either "overkill" districts—where additions to their margin of victory do them no good—or "waste districts"—where despite a very large vote they are still in the minority. More specifically, we used five techniques available to district drafters to maximize party potential.

First, the district drafters may discover that a party has a minority enclave split among several opposition districts and carve out a district in which that enclave is a majority. Second, an opposition-dominated district may be eroded until the remaining district is dominated by the party seeking to increase its dominance. This is accomplished by assigning precincts dominated by the opposition party to several surrounding districts already under opposition control, where they are harmlessly absorbed. Third, two adjacent districts can often be partitioned so that both districts are dominated by a single party, whereas previously control of the districts was divided. Fourth, precincts at the borders of two districts can be traded to gain the desired partisan balance. Fifth, heavy opposition precincts can be detached from surrounding districts and packed into a district already controlled by the opposition, thus enhancing the chances of the district drawer's party in the surrounding districts. Each of these techniques is dependent for its success on the existence of a few heavily partisan precincts within marginal districts since, to the extent a district is heavily dominated by one party or the other, its partisan makeup is generally not subject to manipulation.

In applying the five techniques discussed above to establish the extremes of the band of discretion in Minnesota, we accepted as limitations on our redistricting efforts the criteria for district drawing adopted by the court. With respect to the criterion of population

66. On the uses and limitations of the computer in reapportionment, see Craig, Reapportionment and the Computer, 6 Law & Computer Tech. 50 (1973).
67. Morrill, supra note 50, at 472.
68. For schematic illustrations of these techniques, see figure 3, Appendix at p. 1154 infra.
69. A comparison of the criteria used in the court's plan and those used in this
equality, the court was explicit, ordering a deviation of no more than plus or minus two percent. The court was vague as to the weight that should be given to other criteria—compactness and respect for subdivision lines—merely identifying these as general considerations without quantitative specifications. We chose specific measures for these criteria, applied them to the court's final plan, and sought to ensure that our own plans approximated the court's in these regards.

D. SUMMARY OF CASE STUDY RESULTS

We strongly believe that, given adherence to the criteria of population equality, respect for subdivision lines, and compactness, the results of our study indicate the maximum and minimum number of districts each party might control in Minnesota. No further adjustment could have been made because of the absence of critically close districts or, where marginal districts remain, because of the unavailability of surrounding precincts of the right partisan proclivity. This means that under the plan, at either extreme of the district drawer's band of discretion, there were simply no more readily capturable districts.

The party balance in one extreme plan places the Democrats in a majority in only 22 of the 67 districts; at the other extreme, the Democrats control 39 districts. Using these plans, the degree of Democratic representation, as defined earlier, could range from 66% study is contained in table 2, Appendix at p. 1155 infra; The comparison of the resulting plans used these criteria is shown in table 1, Appendix at p. 1153 infra; the districting schemes themselves appear as figures 4, 5, and 6, Appendix at pp. 1156-58 infra.


71. Specifically, while our plan for maximizing Democratic control violated one more local boundary line than did the court in its plan, our minimum plan equalled the court's in its adherence to boundary lines, splitting five more counties than did the court but healing five splits in municipalities.

As for compactness, we compared our extreme plans with the court's by a geometric device, which enabled us to determine how closely each district came to fully occupying a circle that circumscribed it. Using this device, the court plan had a mean compactness ratio of .50, with a standard deviation of .11; our Democratic maximum plan had a mean ratio of .47, with a standard deviation of .12, while our Democratic minimum plan had a mean ratio of .47, with a standard deviation of .13. For a description of various compactness measures, see Papayanopoulis, Quantitative Principles Underlying Apportionment Methods, 219 N.Y. Acad. Sci. Annals 185 (1973). On the problem of operationalizing all these criteria, see NATIONAL MUNICIPAL LEAGUE, CONFLICTS AMONG POSSIBLE CRITERIA FOR RATIONAL DISTRICTING (1967).

72. See table 3, Appendix at p. 1159 infra.

73. Maps of Minnesota showing the three districting plans may be found in figures 4, 5, and 6, Appendix at pp. 1156-58 infra.

74. See table 3, Appendix at p. 1159 infra.
to 116%. Thus, even with the use of reasonably tight criteria, a very wide potential for district adjustment was possible in Minnesota.

In the court plan, the Democrats, when their base percentage is adjusted to fifty-plus percent, were in the majority in only 32 of the 67 districts, therefore being underrepresented by four percent. At the same time, there was potential for adjusting the districts to provide the Democrats with a fairer representation. Thus, since the Democrats were underrepresented by four percent, and since the underrepresentation was susceptible to correction, the court’s plan constituted an anti-Democratic gerrymander, albeit a small one of four percent.

Our study indicates that, at a maximum, there were seven more districts that could have been drawn with Democratic majorities without violating the constraints of population equality, compactness, and preservation of subdivision lines. To avoid an anti-Democratic gerrymander, the optimal plan would be to add any two of these districts to the 32 districts in the court plan. Such a plan would yield a degree of representation of 102%. Although this provides a small Democratic overrepresentation, the result is as close to perfect as we could achieve without underrepresenting the majority, and therefore it is not a gerrymander.

Calling the court’s plan a gerrymander, as we have defined it, does not mean that this was the intended effect of the court’s action. At the same time, this small gerrymander should not automatically be considered either trivial or inconsequential. In political matters, such small margins may be quite significant. Even more important, any negative gerrymander means that if the majority party were to obtain only a bare majority of the votes statewide, it would not be dominant in a majority of districts.

E. Actual Election Results

Despite our insistence on a prospective rather than retrospective measure of gerrymandering, the reader may be interested in the outcome of the senatorial elections in the court-drawn districts. In November 1972, the Democratic party gained control of the Minnesota
state senate for the first time in history, by a 37-30 margin. Interviews we conducted with state legislators indicate that many thought the court's plan was a conscious pro-Democratic gerrymander, illustrating that the losing party is unlikely to be convinced that it was dealt with fairly, even if the districting plan was drawn by a court or an independent commission. By the traditional after-the-fact examination of legislative election results, moreover, the allegation of a pro-Democratic gerrymander appeared to be substantiated. Counting two-party contested races only, the Republican senate candidates polled 743,905 votes while the Democrats polled 740,844 votes.81

As the reader will by now recognize, we do not feel that these returns prove a Democratic gerrymander. On the whole, Democratic victors may have won by slight margins or in low turnout areas, while Republican candidates may have had bigger margins of victory and achieved substantial votes even in losing efforts.82 Moreover, as suggested earlier, legislative vote totals are apt to be distorted by a variety of idiosyncrasies that make the legislative vote statewide an unreliable indicator of partisan strength. By way of illustrating the effect that idiosyncratic factors may have on election results, according to our measure, the districting plan in effect prior to the 1972 Minnesota reapportionment was virtually identical to the court-drawn plan in terms of partisan advantage, yet Republicans won control of the Senate in both 1966 and 1970.83

Finally, a measure of gerrymandering that is available only after an election can, by definition, never be a cure. The fatal defect in the traditional method of analysis remains that it does not allow district planners to know prior to adoption of a districting scheme whether fair representation has been achieved.

79. Although no party designations were made until April 1973, see note 60 supra, one means of determining party control was to identify the caucuses according to the vote for President of the Senate, which is taken on the first day of the session. For the 1973 Session, the Senate split 37-30 between the nominee of the Democratic-Farmer-Labor caucus, Alec Olson, a proclaimed Democrat, and John Olson, the nominee of the conservative caucus. See Journal of the Senate, 68th Minn. Legis., 1973 Sess. 6-7 (1973).

80. Among those interviewed there was widespread, though not necessarily unanimous, consensus that there was a Democratic gerrymander. Interviews with Senators Ralph Doty, J.A. Josefson, Mel Hansen, Roger Hanson, Alec Olson, Stanley Thorup, Myrton Wegener, and Gerald Willet, and Representative Richard Parish, in St. Paul (Feb. 12-19, 1973).

81. These totals were derived from The Minnesota Legislative Manual 1973-1974, at 540-45.

82. For an extended discussion of the effects of redistricting on individual senate contests, see S. Eller, supra note 61, at 88-110.

83. Specifically, using the same base race (governor, 1970) reduced to fifty percent, Democrats were in a majority in 31 of the 67 districts—only one less than in the current districts. See Computer Study, supra note 57.
V. FINAL THOUGHTS

We have presented our approach to the issue of partisan gerrymandering and have shown how it would apply to the Minnesota reapportionment plan of 1972. We submit that future studies of gerrymandering will have to focus, as ours has done, on developing clear-cut rules for identifying and correcting gerrymanders. Those seriously concerned with resolving the problem cannot be satisfied with an analysis that involves nothing more than an impressionistic eyeballing of a map or with an after-the-fact evaluation of the effect of a redistricting plan already adopted.

We are by no means asserting that our formulation constitutes the final word on gerrymandering. Some observers will disagree with our assessment of the balloon effect, preferring instead a standard based on pure proportional representation despite the possible adverse consequences acceptance of such a standard may have for the majority. Differences of opinion may also exist over the appropriate measure of statewide partisan strength. Finally, our suggested measure may be rejected by some as simply too complicated.

Because of the difficulties inherent in devising an acceptable measure of gerrymandering, some scholars have concluded no legal action should be taken to combat partisan gerrymandering. We, however, feel that the search for a precise definition, an appropriate data base, and a valid standard of fair representation will ultimately yield a technical measure that will enable the courts to act prudently to remedy partisan gerrymandering.

We do not, however, advocate that courts become the ordinary vehicle for actually drawing legislative districts. On the contrary, we feel that this task can be most effectively done by an independent bipartisan commission. A nonlegislative, bipartisan commission would avoid pro-incumbent favoritism typically produced by legislators and eliminate the necessity for the courts to undertake a function to which they do not bring unique expertise. But the view of many reformers that a reapportionment commission could or would ignore their political knowledge while marking out districts on the map is naive. Moreover, the proposal that such commissions should be blinded to the political aspects of their plan is dangerous because, as we have shown, a gerrymander may be created unintentionally that is no less distasteful and undemocratic than if it were created purposefully.

84. See, e.g., Auerbach, supra note 10.
85. For an excellent justification of this approach, see Dixon, The Court, the People, and "One Man, One Vote," in REAPPORTIONMENT IN THE 1970's, supra note 10, at 735-39.
While we do not suggest that the political effects of a districting scheme could or should be ignored, we do suggest that the goal of the districting process must be fair representation rather than partisan political advantage. The development of an objective measure of partisan gerrymandering should aid in achieving this goal, for once clear districting guidelines are established that eliminate the opportunity to achieve through the districting process an undeserved political advantage, legislators will have little incentive to retain control over what is a cumbersome and time-consuming task. Accordingly, their willingness to abdicate their power on this question to an independent commission should increase, thus helping to eliminate one of the last remaining obstacles to fairness in the districting process.
Assume that the relationship in a hypothetical state is that a one percentage point change in statewide vote results in a two percentage point change in districts dominated by a given party. Figure 1-a graphs the relationship starting with a party that gets 55% of the vote statewide being equalized at 55% of the districts dominated. When it falls to 54% statewide, it will dominate 53% of the districts; when it gets 53% statewide it will dominate 51% of the districts; when it gets 52% (still a majority) it will dominate only 49% of the districts (a minority position); and so on until when it is at fifty percent statewide, it will dominate only 45% of the districts.
Figure 1-b graphs the same relationship if that party is equalized at being dominant in fifty percent of the districts. When that party gets 51% statewide it will dominate 52% of the districts; when it gets 52% statewide it will dominate 54%; and so on, until when it gets 55% statewide it will be dominant in sixty percent of the districts.
The balloon effect as it appears in Minnesota is shown by plotting the percentage of districts dominated for each one percent change in the statewide base percentage—Democratic candidate for Governor, 1970. The slope of this curve over its major course is roughly 3:1; that is, for every one percentage point rise in the base race, the percentage of districts dominated rises by three percentage points. If the rise were strictly proportional, the curve would have a slope of 1:1, as shown by the straight line on the graph. The actual Democratic statewide result, 54%, is shown to have resulted in that party's dominance of 66% of the districts.
### Table 1: Adjustment of Base Percentage to 50.01%

<table>
<thead>
<tr>
<th>Precinct Identification</th>
<th>Democ-</th>
<th>Republican</th>
<th>Total</th>
<th>% Democratic</th>
<th>Actual % minus 4.26</th>
<th>ADJUSTED VOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>actual</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Democratic</td>
</tr>
<tr>
<td>Minnesota</td>
<td>737,921</td>
<td>621,780</td>
<td>1,359,701</td>
<td>54.27</td>
<td>50.01</td>
<td></td>
</tr>
<tr>
<td>(Statewide Totals)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Golden Valley</td>
<td>513</td>
<td>599</td>
<td>1,112</td>
<td>46.13</td>
<td>41.87</td>
<td>466</td>
</tr>
<tr>
<td>Golden Valley</td>
<td>720</td>
<td>1,018</td>
<td>1,738</td>
<td>41.43</td>
<td>37.17</td>
<td>646</td>
</tr>
<tr>
<td>Golden Valley</td>
<td>985</td>
<td>1,300</td>
<td>2,285</td>
<td>43.11</td>
<td>38.35</td>
<td>888</td>
</tr>
<tr>
<td>Crystal</td>
<td>1,682</td>
<td>1,408</td>
<td>3,090</td>
<td>54.43</td>
<td>50.17</td>
<td>1,550</td>
</tr>
<tr>
<td>Crystal</td>
<td>1,316</td>
<td>1,115</td>
<td>2,431</td>
<td>54.13</td>
<td>49.87</td>
<td>1,212</td>
</tr>
<tr>
<td>Crystal</td>
<td>1,482</td>
<td>787</td>
<td>2,269</td>
<td>65.32</td>
<td>61.05</td>
<td>1,385</td>
</tr>
<tr>
<td>Robbinsdale</td>
<td>477</td>
<td>241</td>
<td>718</td>
<td>66.43</td>
<td>62.17</td>
<td>446</td>
</tr>
<tr>
<td>Robbinsdale</td>
<td>546</td>
<td>325</td>
<td>871</td>
<td>62.69</td>
<td>58.43</td>
<td>509</td>
</tr>
<tr>
<td>District 44 (Total)</td>
<td>7,721</td>
<td>6,793</td>
<td>14,514</td>
<td>53.20</td>
<td>48.94</td>
<td>7,103</td>
</tr>
</tbody>
</table>
Figure 3: Gerrymandering Techniques

**ORIGINAL**

**Percentages Republican**

**CARVING**

<table>
<thead>
<tr>
<th></th>
<th>A 40</th>
<th>B 48</th>
<th>C 45</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>44.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3 Democratic, 0 Republican

<table>
<thead>
<tr>
<th></th>
<th>D 35</th>
<th>E 35</th>
<th>F 48</th>
<th>G 35</th>
<th>H 35</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>37.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5 Democratic, 0 Republican

**ERODING**

<table>
<thead>
<tr>
<th></th>
<th>D 34</th>
<th>E 34</th>
<th>F 52</th>
<th>G 34</th>
<th>H 34</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>37.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4 Democratic, 1 Republican

**PARTITIONING**

<table>
<thead>
<tr>
<th></th>
<th>I 45</th>
<th>J 45</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>45</td>
<td></td>
</tr>
</tbody>
</table>

2 Democratic, 0 Republican

<table>
<thead>
<tr>
<th></th>
<th>I 55</th>
<th>J 35</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>45</td>
<td></td>
</tr>
</tbody>
</table>

1 Democratic, 1 Republican

**TRADING**

<table>
<thead>
<tr>
<th></th>
<th>K 47</th>
<th>L 45</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>46</td>
<td></td>
</tr>
</tbody>
</table>

2 Democratic, 0 Republican

<table>
<thead>
<tr>
<th></th>
<th>K 40</th>
<th>L 52</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>46</td>
<td></td>
</tr>
</tbody>
</table>

1 Democratic, 1 Republican

**PACKING**

<table>
<thead>
<tr>
<th></th>
<th>M 48</th>
<th>N 49</th>
<th>O 49</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>48.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3 Democratic, 0 Republican

<table>
<thead>
<tr>
<th></th>
<th>M 44</th>
<th>N 51</th>
<th>O 51</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>48.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Democratic, 2 Republican

\(\square\) = Republican strength  \(\square\) = Marginal area
### Table 2: Comparison of Criteria Among Plans

<table>
<thead>
<tr>
<th></th>
<th>Court Plan</th>
<th>Maximum Democratic Plan</th>
<th>Minimum Democratic Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>(32 Democratic</td>
<td></td>
<td>(39 Democratic</td>
<td>22 Democratic</td>
</tr>
<tr>
<td>35 Republican)</td>
<td></td>
<td>28 Republican)</td>
<td>45 Republican)</td>
</tr>
<tr>
<td>Population</td>
<td></td>
<td>± 2%</td>
<td>± 2%</td>
</tr>
<tr>
<td>Equality†</td>
<td>± 2%</td>
<td>± 2%</td>
<td>± 2%</td>
</tr>
<tr>
<td>Preservation of</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subdivision</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boundaries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. County Lines</td>
<td>40</td>
<td>40</td>
<td>45</td>
</tr>
<tr>
<td>Broken</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Municipal</td>
<td>28</td>
<td>29</td>
<td>23</td>
</tr>
<tr>
<td>Lines Broken</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Subdivision</td>
<td>68</td>
<td>69</td>
<td>68</td>
</tr>
<tr>
<td>Lines Broken</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compactness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Ratio of District Area to Area of Circumscribed Circle)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Mean</td>
<td>.50</td>
<td>.47</td>
<td>.47</td>
</tr>
<tr>
<td>b. Standard</td>
<td>.11</td>
<td>.12</td>
<td>.13</td>
</tr>
<tr>
<td>Deviation</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

† See text accompanying note 70 supra.
Figure 4: District Boundaries, Court Plan

Democratic majority, base race, adjusted (32 districts)
Figure 5: District Boundaries, Maximum Democratic Plan

Democratic majority base race, adjusted (39 districts)
Figure 6: District Boundaries, Minimum Democratic Plan

Democratic majority, base race, adjusted (22 districts)
<table>
<thead>
<tr>
<th>Percent of base race vote received by majority party (adjusted)</th>
<th>COURT PLAN</th>
<th>MAXIMUM DEMOCRATIC PLAN</th>
<th>MINIMUM DEMOCRATIC PLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safe Democratic (60% +)</td>
<td>12</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>Fighting Democratic (55-60%)</td>
<td>8</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Marginal Democratic (52-55%)</td>
<td>7</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Critical Democratic (50-52%)</td>
<td>5</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>Critical Republican (48-50% Democratic)</td>
<td>3</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Marginal Republican (45-48% Democratic)</td>
<td>10</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>Fighting Republican (40-45% Democratic)</td>
<td>12</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Safe Republican (under 40% Democratic)</td>
<td>10</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>32 Dem.</td>
<td>39 Dem.</td>
<td>22 Dem.</td>
</tr>
</tbody>
</table>