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Author(s): Steven J. Brams and Morton D. Davis

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The 3/2's Rule in Presidential Campaigning*

STEVEN J. BRAMS

New York University

MORTON D. DAVIS

City College of New York

Our main thesis in this article is that the winner-take-all feature of the Electoral College—i.e., that the popular-vote winner in each state wins all the electoral votes of that state—induces candidates to allocate campaign resources roughly in proportion to the 3/2's power of the electoral votes of each state. This creates a peculiar bias in presidential campaigns that makes the largest states the most attractive campaign targets of the candidates, even out of proportion to their size.

We shall establish the 3/2's rule first *logically* by showing how the manner in which presidential candidates *should* allocate their resources among the fifty states in order to maximize their expected *electoral* vote can be derived from a mathematical model. We shall then demonstrate *empirically* that the actual campaign behavior of presidential and vice-presidential candidates *does* in fact well approximate this normative rule in terms of the number of campaign appearances each of the major candidates made in each state in the 1960 through 1972 presidential campaigns.

We shall compare this rule with an allocation rule based on the assumption that a candidate desires to maximize his expected *popular* vote, which would be consistent with the goal of winning if the Electoral College were abolished and the president were elected by direct popular vote. On the basis of the 1970 census and the electoral votes of each state through 1980, we shall indicate a presidential candidate's "optimal" expenditures of resources

* This article is a condensation of a paper presented at the 1972 Annual Meeting of the American Political Science Association, Washington, D.C., September 5–9, 1972. The original paper includes, among other things, mathematical derivations and proofs, and a description of a sequential-strategy model, not included in this article. This back-up material has been published in Steven J. Brams and Morton D. Davis, "Resource-Allocation Models in Presidential Campaigning: Implications for Democratic Representation," *Annals of the New York Academy of Science (Proceedings of the Conference on Democratic Representation and Apportionment: Quantitative Methods, Measures and Criteria)*, Vol. 219, ed. Lee F. Papayanopoulos (New York: New York Academy of Science, 1973). We wish to acknowledge the very helpful comments made on an early formulation of the models by John C. Harsanyi, Anatol Rapoport, and Lloyd S. Shapley, and on the original paper by Walter Dean Burnham and Norman Nie, none of whom should be held responsible for the present analysis. We are also grateful to Roman Frydman, Elizabeth Gidengil, and Jeffrey Richelson for valuable research assistance.

in all fifty states and the District of Columbia under both the Electoral-College system and the popular-vote alternative. In the case of the Electoral College, the optimum we shall derive will be shown to be unstable: any allocation of resources can be "beaten" under this system. This is not the case for the popular-vote alternative, which, because of the stability of its optimum, would tend to relieve the candidates of the necessity of making some of the manipulative strategic calculations that are endemic to the present system.

We shall conclude our analysis by comparing the ability of the two different systems to translate the attention (in time, money, and other resources) that presidential candidates—and after the election, incumbent presidents looking to the next election—pay to their state constituencies as a function of their size. Our comparison will reveal that the nonegalitarian bias of the Electoral College, which makes a voter living in one state as much as three times more attractive a campaign target as a voter living in another state, would be eliminated if the president were elected by direct popular vote.

The Need for Models to Assess the Consequences of Electoral Reform

Probably the most important reason that the structural reform of major political institutions is so controversial is that reforms often produce shifts in the distribution of power among political actors. When the precise effects of these shifts are uncertain, then confusion tends to beset and compound controversy. As Senator Birch Bayh of Indiana said on the floor of the United States Senate on September 8, 1970 about hearings that had been held on the reform of the Electoral College:

I must say, sitting through two or three volumes of hearings over the last 4 or 5 years was not at all times an inspirational experience. Some of the testimony was repetitive. Nevertheless, as chairman of the Subcommittee on Constitutional Amendments, I sat there. I thought it amusing, if not ironic, that on the last day—and I am not going to name individuals or organizations—and after 4 years of study, the last two witnesses appeared before our committee. One witness came before our committee suggesting the present [electoral] system should be maintained because it gave an advantage to the larger States and the next witness suggested the present system should be main-

tained because it gave an advantage to the small States.¹

After several thousand pages of testimony before both Senate and House committees and subcommittees in the last few years,² there remains today a good deal of confusion and controversy about the possible effects of various proposed changes in the U. S. Constitution—relating to the election of a president—on the creation of new parties and minor candidates, the political influence of small and large states and groups and individuals within these states, governmental stability, and a host of other aspects of the electoral process. This is true despite the plethora of proposals for electoral reform that have been extensively discussed, if not analyzed, in congressional hearings and in numerous books and articles.

This discussion and analysis have in many cases been shallow, however, producing controversy based not on genuine differences of opinion but rather on a confused understanding on the part of different analysts of what consequences will follow from what changes in the electoral system. The main reason for this confusion seems not to stem from any paucity of factual information on national elections. Rather, there has been a lack of rigorous *deductive models* which can be used to explore the logical and quantitative *consequences* of different electoral systems. As we shall try to show, such models not only can aid one in deducing consequences from a limited set of assumptions but also can help one to clarify the kinds of evidence appropriate to testing the empirical validity of these consequences. In this manner, models can be used to lay the groundwork for the construction of better democratic theory.

The consequences that would flow from electoral reform cannot be assessed simply by asking how hypothetical changes in the present system—specifically, in procedures for aggregating popular votes that produce a winner in presidential elections—would have affected previous elections, as has been frequently done in the past. When an alternative procedure would be likely to have changed the campaign strategies of candidates in these elections to produce returns in states different from those that actually occurred, it is evident that the past returns cannot be held constant, with only the hypothetical procedure for aggre-

gating them being allowed to vary, for purposes of estimating what consequences alternative aggregation procedures *would have had* on previous outcomes. As Alexander Bickel has argued, "Any [major] change in the system . . . may induce subtle shifts in electoral strategies, rendering prediction based on past experience hazardous."³ Curiously, it is just such "hazardous" predictions that Bickel conjures up to support his argument for retention of the Electoral College.

Toward improving this state of affairs, we shall outline and test some mathematical models of the presidential campaign process that will help us to assess the consequences produced by the present electoral system and its most prominent alternative, direct popular-vote election of the president.⁴ We have chosen to focus on the direct popular-vote alternative, and not proportional, district, and other plans for electing the president, because it has been the most widely discussed of the pro-

¹ Alexander M. Bickel, *Reform and Continuity: The Electoral College, the Convention, and the Party System* (New York: Harper and Row, 1971), p. 35.

² From a critical review of recent literature on campaigning, Gerald Pomper concludes that "in future research, more attention needs to be directed to the effects, rather than the characteristics, of campaigns." See Gerald M. Pomper, "Campaigning: The Art and Science of Politics," *Polity*, 2 (Summer 1970), 533–539, at p. 539. Toward this end, mathematical models of the campaign process are developed in John Ferejohn and Roger Noll, "A Theory of Political Campaigning" (Paper delivered at the 1972 Annual Meeting of the American Political Science Association, Washington, D.C., September 5–9, 1972); and Gerald H. Kramer, "A Decision-Theoretic Analysis of a Problem in Political Campaigning," in *Mathematical Applications in Political Science*, II, ed., Joseph L. Bernd (Dallas: Southern Methodist University Press, 1966), pp. 137–160. In the Kramer article, a resource-allocation model is used to analyze the effects of different canvassing techniques on turnout and voting from the vantage point of one candidate—and not his opponent(s) directly, whose possible strategies our later game-theoretic models explicitly take into account; for an empirical test of the effects of canvassing in recent elections, see Gerald H. Kramer, "The Effects of Precinct-Level Canvassing on Voter Behavior," *Public Opinion Quarterly*, 34 (Winter, 1970–71), 560–572. The most explicit treatment of different strategic factors in a campaign, developed from a coalition-theoretic perspective, is John H. Kessel, *The Goldwater Coalition: Republican Strategies in 1964* (Indianapolis: Bobbs-Merrill Co., 1968). A useful compilation of material on techniques of campaign management and communication and their effects on the electorate can be found in Dan Nimmo, *The Political Persuaders: The Techniques of Modern Election Campaigns* (Englewood Cliffs, N.J.: Prentice-Hall, 1970); and for a collection of articles on new campaign methods, see Robert Agranoff, ed., *The New Style in Election Campaigns* (Boston: Holbrook Press, 1972). A study of the use of electoral propaganda in Great Britain, whose practices are compared with those of the United States, is given in Richard Rose, *Influencing Voters: A Study of Campaign Rationality* (London: Faber & Faber, 1967).

¹ *Congressional Record*, September 8, 1970, p. 30813.

² In the Senate, the most recent hearings have been *Electoral College Reform*, Hearings before the Committee on the Judiciary, United States Senate, 91st Congress, Second Session (1970); in the House, *Electoral College Reform*, Hearings before the Committee on the Judiciary, United States House of Representatives, 91st Congress, First Session (1969).

posed alternatives to the Electoral College.⁵ With a provision for a run-off election between the two top candidates if neither secures as much as 40 per cent of the popular vote in the initial election, this alternative was approved by the House of Representatives on September 18, 1969 by a vote of 338 to 70, considerably more than the two-thirds majority required for the proposal of constitutional amendments.⁶ This plan fared less well in the Senate and eventually became the victim of a filibuster by southern and (strangely, as we shall see) small-state senators; cloture motions on September 17 and 29, 1970 won the approval of a majority of senators but failed to receive the required two-thirds endorsement needed to cut off debate.⁷ This plan, nevertheless, has been strongly supported by the American public, receiving 66-19 percent approval (15 per cent undecided) prior

⁵ A recent summary of different proposals and a biased assessment (in favor of the present Electoral College) of their likely impact, considered especially in light of the three-way presidential contest in 1968, is given in Wallace S. Sayre and Judith H. Parris, *Voting for President: The Electoral College and the American Political System* (Washington, D.C.: Brookings Institution, 1970). We find it difficult to accept Sayre and Parris's belief (p. 43) that "the political effects of the electoral college system are as clear as any in the nonexact science of American politics," their "non-exact science" qualification notwithstanding. Other summaries that reflect a similar bias in favor of the Electoral College include Bickel, *op. cit.*, pp. 4-36; and Nelson W. Polsby and Aaron Wildavsky, *Presidential Elections: Strategies of American Electoral Politics*, 3d ed. (New York: Charles Scribner's Sons, 1971), pp. 258-271. On the other side, a report by the American Bar Association's Commission on Electoral College Reform has called the popular-vote plan "the most direct and democratic way of electing a President." See American Bar Association (ABA), *Electing the President: A Report of the Commission of Electoral College Reform* (Chicago: ABA, 1967). Also supportive of the direct-vote plan is Neal R. Pierce, *The People's President: The Electoral College in American History and the Direct-Vote Alternative* (New York: Simon and Schuster, 1968); Lawrence D. Longley and Alan G. Braun, *The Politics of Electoral College Reform* (New Haven, Conn.: Yale University Press, 1972); and Harvey Zeidenstein, *Direct Election of the President* (Lexington, Mass.: Lexington Books, 1973). See also John H. Yunker and Lawrence D. Longley, "The Biases of the Electoral College: Who Is Really Advantaged?" and Max S. Power, "Logic and Legitimacy: On Understanding the Electoral College Controversy," both in *Perspectives on Presidential Selection*, ed. Donald R. Matthews (Washington, D.C.: Brookings Institution, 1973).

⁶ *Congressional Record*, September 18, 1969, pp. 26007-26008.

⁷ *Congressional Quarterly Almanac*, Vol. 26, 91st Congress, 2nd Session (Washington, D.C.: Congressional Quarterly, 1971), p. 840. For further details, see Allan P. Sindler, "Basic Change Aborted: The Failure to Secure Direct Popular Election of the President, 1969-1970" in *Policy and Politics in America: Six Case Studies*, ed. Alan P. Sindler (Boston: Little, Brown, and Co., 1973), pp. 30-80.

to the three-way 1968 presidential election, 81-12 per cent approval (7 per cent undecided) after this election.⁸

Presidential Campaigns and Voting Behavior

If there is anything that has emerged from research on electoral behavior over the last thirty years, it is that most people make up their minds about whom they will vote for in a presidential election well before the onset of the campaign—at least the final campaign between the two major-party nominees that traditionally commences at the beginning of September in a presidential election year. Yet, while the campaign changes few minds, it does serve the important function of reinforcing choices already made, as many studies have documented.

On the other hand, for the typically 20-40 per cent of the electorate who are normally undecided about their choice of a candidate at the start of a presidential campaign,⁹ the campaign will not only be decisive to their individual voting decisions but also will often prove decisive to the choice of a candidate by a majority or a plurality of the electorate. This 20-40 per cent minority of the electorate is usually more than sufficient to change the outcome of almost all elections, which is why most campaigns are waged to make only marginal changes in the distribution of voter preferences. Indeed, when a presidential candidate does succeed in capturing as much as 55 per cent or more of the popular vote, his victory is considered a landslide.

If presidential campaigns are decisive principally for the minority of undecided or uncommitted voters who will be crucial to determining the election outcome, then a candidate's ability to project favorably his personality and positions on issues during the campaign assume great importance. Recent research in voting behavior has suggested the importance of issue-oriented aspects of elections first surfaced by V. O. Key, Jr. some years ago.¹⁰ Moreover, since the pioneering work

⁸ Sayre and Parris, p. 15.

⁹ William H. Flanigan, *Political Behavior of the American Electorate*, 2d ed. (Boston: Allyn and Bacon, 1972), p. 109.

¹⁰ V. O. Key, Jr., with the assistance of Milton C. Cummings, Jr., *The Responsible Electorate: Rationality in Presidential Voting, 1936-1960* (Cambridge, Mass.: Belknap Press, 1966). For a general discussion of the role of issues in presidential elections, see the articles, comments, and rejoinders by Gerald M. Pomper, Richard W. Boyd, Richard A. Brody, Benjamin I. Page, and John H. Kessel, *American Political Science Review*, 66 (June, 1972), 415-470. The voting decisions of ticket-splitters, in particular, who comprised 54 percent of the American electorate in the 1968 election, are influenced primarily by the candidates and issues, and only secondarily by party identification and other group affiliations; see Walter De Vries and Lance Tarrance,

of Anthony Downs the development of spatial models of party competition, which also make the positions that candidates and parties take on issues the focal point of the analysis, has proceeded apace.¹¹

The campaign models that we shall describe in the sections that follow have much in common with the logical structure, though not the substantive assumptions, of the party-competition models. As in these models, for example, we define optimal strategies to be those strategies that maximize some objective function. Unlike these models, however, we ignore in our models the positions that candidates adopt on issues.

While these positions are central to the determination of optimal strategies in party-competition models, we instead take the positions (and personality) of a presidential candidate as given and ask how he should allocate his total resources among the fifty states and the District of Columbia in order to convey as favorable an image to the voters as possible. An optimal strategy in our models is thus a set of resource allocations to each state rather than a specification of issue positions of candidates. We shall show later how these allocations can be derived from the maximization of different objective functions and discuss the different goals that these functions embody.

Although in some campaigns expenditures beyond a certain point may become counterproductive, we assume that in general a positive correlation exists between the amount of resources that a candidate spends in a state—in relationship to that spent by his opponent—and the favorability of the image he projects to voters in that state. We further assume that the more favorable a candidate's image, the more likely previously uncommitted voters will vote for him.

Given this connection between campaign spending and voting behavior, the major strategic problem a candidate faces is how best to allocate his total resources among the states to win over that portion of the electorate (i.e., the uncommitted voters) who will prove decisive in most states—without in the process alienating those supporters already predisposed to his candidacy. His prob-

Jr., *The Ticket-Splitter: A New Force in American Politics* (Grand Rapids, Michigan: William B. Eerdmans Publishing Co., 1972).

¹¹ Anthony Downs, *An Economic Theory of Democracy* (New York: Harper and Row, 1957). For a review of the more recent literature on party-competition models, see William H. Riker and Peter C. Ordeshook, *An Introduction to Positive Political Theory* (Englewood Cliffs, N.J.: Prentice-Hall, 1973), chaps. 11 and 12; and Kenneth A. Shepsle, "Theories of Collective Choice," in *Political Science Annual V: An International Review*, ed. Cornelius P. Cotter (Indianapolis: Bobbs-Merrill Co., forthcoming, 1974).

lem is rendered even more difficult by the fact that his opponent(s) will tend to allocate his (their) resources in such a way as to exploit any mistakes he might make in his allocations. It is this competitive aspect of presidential campaigns that the mathematics of game theory will prove helpful in illuminating.¹²

We shall not consider here second-order strategic and tactical questions relating to how a candidate should spend his campaign resources *within* each state (e.g., on mass media advertising versus canvassing). Neither will we consider the question of what portion of a candidate's resources should be devoted to *nonstate*-oriented campaign activities (e.g., nationwide TV broadcasting).

The Goals of Candidates

The basic assumption of our analysis is that both voters and candidates are rational individuals who seek to maximize the attainment of certain goals. To be sure, these goals may be the products of sociological, psychological, and other conditioning forces in their lives, but this does not invalidate the assumption that, whatever their goals, candidates and voters seek out the most rational means to achieve them. In the 1964 presidential election, for example, there is strong evidence to support the contention that the Republican nominee, Senator Barry Goldwater, did not so much desire to win as to present voters with "a choice, not an echo." If this is true, then his apparently aberrant campaign behavior, at least as measured against the normal canons of presidential campaigning, may have been quite rational, given his principal goal of espousal of a conservative ideology rather than winning.¹³

Provided one can impute plausible—if not

¹² For a related application of a game-theoretical model to the analysis and evaluation of election procedures in the American Political Science Association, see Steven J. Brams, "The APSA and Minority Representation," *PS*, 3 (Summer 1970), 321–335.

¹³ As another possible goal, Stanley Kelley, Jr. has suggested that ". . . at least some of the Goldwater inner circle set control of the Republican party—not winning the Presidency—as their principal objective in 1964. That is the implication, certainly, of Senator Goldwater's statement that the conservative cause would be strengthened if he could win as much as 45 percent of the vote." Stanley Kelley, Jr., "The Presidential Campaign," in *The National Election of 1964*, ed. Milton C. Cummings, Jr. (Washington, D.C.: Brookings Institution, 1966), p. 58. Further, there is evidence that Goldwater, who was well aware of his impending defeat from polls commissioned by the Republican National Committee, did little to try to stem its magnitude in the latter half of his campaign (which would be consistent with the goal of winning) but instead tried to rationalize the conduct of his campaign and the anticipated action of the voters. See Stephen C. Shadegg, *What Happened to Goldwater?* (New York: Holt, Rinehart and Winston, 1965), p. 241.

totally realistic—goals to the actors in question, the test of rationality involves determining whether the actors behave *as if* they order their alternative courses of action and choose that which is most preferred, consistent with one or more postulated goals. If a person does not actually make, or is not able to understand, the rationalistic calculations that the theorist imputes to him, the rationality assumption may still satisfactorily account for his behavior by providing a parsimonious explanation from which predictions can be made.

To illustrate, consider the assumption that voters in each state vote for a presidential candidate solely on the basis of how much time (and, in principle, other resources) he spends in each state as compared with that spent by his opponent. Clearly, this assumption is wildly unrealistic for the majority of voters already predisposed to one or the other of the candidates before the start of a campaign.

The assumption is even a radical simplification for the uncommitted voters, whom we argued earlier are usually decisive to the outcome of most presidential elections. Yet this assumption, which we *shall* apply to uncommitted voters in our models, does offer a means for capturing one salient aspect of the campaign—how candidates view the relationship between their expenditures and the potential voting behavior of uncommitted voters in each state—from which we can derive nonobvious prescriptions of how much time the candidates should allocate to each state. Whether in fact this assumption is plausible is an empirical proposition we shall try to test not directly but rather indirectly through corroboration of the consequence deducible from it of how much time the candidates would spend in each state if their goals were to maximize their expected electoral or popular vote.

The goal of maximizing one's expected electoral vote under the present system, and one's expected popular vote under a system allowing for popular-vote election of the president, seem plausible goals to ascribe to most presidential candidates, the case of Senator Goldwater notwithstanding. Both goals, based on probabilistic calculations, incorporate the idea that presidential campaigning is shot full of uncertainties and that there is no surefire campaign strategy that can guarantee victory. For the models we shall develop, the goal of maximizing one's expected popular vote will always be synonymous with maximizing one's probability of winning under the popular-vote system, though under the Electoral-College system the maximization of one's expected electoral vote may under certain circumstances be inconsistent with maximizing one's probability of winning. We shall point out some

implications of these different maximization goals for the Electoral College in our later analysis.

The Popular-Vote Model

To motivate the need for models of the campaign process, compare Richard Goodwin's testimony before the Judiciary Committee of the Senate that

Today, nearly every State has a swing vote which, even though very small, might win that State's electoral vote. Thus, nearly every State is worth some attention. If the focus shifts to numbers alone [under a system of direct popular vote], then the candidate will have to concentrate almost exclusively on the larger States. That is where the people are, and where the most volatile [*sic*] vote is to be found. . . . What does this mean? It means that direct election would greatly intensify the attention given to the largest States.¹⁴

and Senator Bayh's response that

The record will show that the major party candidates spend considerably more time [under the Electoral-College system] in States that have large blocks of electoral votes. . . . It seems to me you have to be rather naive to overlook the fact that today the whole emphasis of the campaign is in . . . major states.¹⁵

If these contrary assertions leave one perplexed, what is one to say after several further pages of testimony, interspersed with inconclusive evidence presumably supporting each of these diametrically opposed viewpoints, about which system will force candidates to spend a disproportionately large portion of their time in the largest states? A recognition that the rules of politics are not neutral does not necessarily produce an immediate understanding of what bias they create and what contestants they favor.

To develop the kinds of models that might help to resolve such a question as that discussed above, we shall consider first the popular-vote plan. We shall begin by assuming that the probability that a randomly-selected *uncommitted voter* in state i votes for the Republican candidate is

$$p_i = \frac{r_i}{r_i + d_i},$$

where r_i is the amount (of time, money, or other resources) spent by the Republican candidate in state i and d_i is the amount spent by the Democratic candidate over the course of the campaign. This is the same assumption that we shall make later in the case of our Electoral-College model.

If n_i is the number of uncommitted voters in state i , then to maximize his *expected popular vote* among the uncommitted voters in all fifty states,

¹⁴ Senate Hearings on Electoral College Reform (1970), p. 82.

¹⁵ Senate Hearings (1970), pp. 82–83.

the Republican candidate should maximize the quantity W_p , which is defined below:¹⁶

$$W_p = \sum_{i=1}^{50} n_i p_i \quad r_i, d_i, n_i > 0,$$

where

$$\sum_{i=1}^{50} r_i = R, \quad \sum_{i=1}^{50} d_i = D, \quad \text{and} \quad \sum_{i=1}^{50} n_i = N.$$

The term "expected" is used to signify the fact that W_p , the sum of the number of uncommitted voters in each state times the probability of their voting Republican, is not a certain quantity but instead the *average* Republican share of the total uncommitted vote for given allocations r_i and d_i by both candidates in all states.

Given that neither candidate has any information about the allocations made by his opponent(s), it is not difficult to show that the optimal strategy for each candidate consists in allocating funds in proportion to the number of uncommitted voters in each state. That is,

$$r_i = \left(\frac{n_i}{N} \right) R \quad (1)$$

and

$$d_i = \left(\frac{n_i}{N} \right) D \quad (2)$$

for all states i . With these values, the expected number of uncommitted voters that the Republican candidate can pick up from the entire pool of uncommitted voters is

$$W_p = \left(\frac{R}{R + D} \right) N.$$

If $R = D$ (i.e., the total resources of the Republican and Democratic candidates are equal), then

$$W_p = \frac{N}{2}.$$

¹⁶ This model leads to the same results as one in which the quantity maximized is the *expected plurality* of uncommitted voters:

$$\begin{aligned} \sum_{i=1}^{50} n_i \left(\frac{r_i - d_i}{r_i + d_i} \right) &= \sum_{i=1}^{50} n_i \left(\frac{2r_i}{r_i + d_i} - 1 \right) \\ &= 2 \sum_{i=1}^{50} n_i p_i - N. \end{aligned}$$

See Richard A. Epstein, *The Theory of Gambling and Statistical Logic* (New York: Academic Press, 1967), pp. 121–123. Note that the summations which follow range only over the fifty states, though in presidential elections beginning in 1964 the District of Columbia must also be included.

That is, the two candidates would split the total uncommitted vote.

To this vote, of course, must be added the votes of previously committed Republican and Democratic voters (on whom we assume the campaign has no effect) to get the total number of votes that each candidate receives. We shall show later how these committed voters can be incorporated directly into the resource-allocation calculations. For now, it will be convenient to assume that there are only two candidates (and parties) in each state, though this assumption will later be dropped. Also, we shall assume that the committed voters are split evenly between the parties in each state so that the winner of the uncommitted vote in each state captures a majority of votes in that state.

The allocations given above are "optimal" in the sense that if either candidate adopts the proportionate-allocation strategy, the other cannot gain by deviating from such a strategy. This sense of optimality is game-theoretic in nature: neither candidate has an incentive to depart from this strategy because he might fare worse if he did. Because these strategies minimize a candidate's maximum losses, they are called *minimax* strategies, and the set of such strategies is said to be *in equilibrium*.

Any departure from a minimax strategy by one candidate can be exploited by his opponent. If the Republican candidate, for example, were able to obtain information about deviations by the Democratic candidate from his minimax strategy, he could act on this information (i.e., the nonoptimal allocations of the Democratic candidate) in distributing his own resources so as to capitalize on his opponent's weaknesses. It can be readily demonstrated that, knowing the d_i , the Republican candidate can maximize his expected popular vote among the uncommitted voters by allocating his own resources in the following way:

$$r_i = \frac{\sqrt{n_i d_i}}{\sum_{i=1}^{50} \sqrt{n_i d_i}} (R + D) - d_i. \quad (3)$$

Similarly for the Democratic candidate,

$$d_i = \frac{\sqrt{n_i r_i}}{\sum_{i=1}^{50} \sqrt{n_i r_i}} (R + D) - r_i. \quad (4)$$

If the Democratic candidate pursues a minimax strategy of proportionate allocations according to Eq. (2), then for the Republican candidate Eq. (3)

Table 1. Allocation of Resources

State i	Number of Voters n_i	Nonoptimal Democratic Allocations d_i	Optimal Republican Allocations r_i	Expected Vote W_{p_i}	Minimax Allocations r_i and d_i
1	20	100	143	11.8	200
2	30	200	247	16.6	300
3	40	400	404	20.1	400
4	50	600	553	23.4	500
5	50	600	553	23.4	500
Sum	190	1900	1900	95.3	1900

reduces to Eq. (1)—that is, his best response is to allocate his resources proportionately, too, which is the minimax solution in pure strategies for both candidates in this two-person zero-sum infinite game. The game is *zero-sum*, because what uncommitted votes one candidate wins the other candidate necessarily loses, and it is *infinite* because each player has a choice among infinitely many possible expenditure levels in each state. The outcome is a *saddlepoint* when the *pure strategies* (sets of resource allocations to the states) prescribed by Eqs. (1) and (2) are played, for if either candidate plays his prescribed strategy, his opponent can do no better than play his own.

To illustrate how the Republican candidate could do better than his minimax strategy, given nonoptimal allocations by his Democratic opponent, consider the nonoptimal allocations d_i of the Democratic candidate given in Table 1 (which we assume for convenience total ten times the total number of voters). Note that the Democrat's allocations are less than the (proportionate) minimax allocations for the two smallest states (states 1 and 2) and greater than these minimax allocations for the two largest states (states 4 and 5). Assuming that the Republican candidate is privy in advance to these (planned) allocations by his Democratic opponent, his best response according to Eq. (3) is to outspend his opponent in the three smallest states and underspend him in the two largest states, as shown in Table 1.

It can be observed that the Republican candidate, knowing the Democratic candidate's allocations, usually responds with an allocation somewhere between his opponent's allocations and the minimax allocations. Yet, out of 190 votes this best response garners the Republican candidate only 0.6 votes (95.3 for Republican to 94.7 for Democrat) more than his opponent when their total resources are equal, illustrating the relative insensitivity of the popular-vote model to non-optimal allocations. In sharp contrast, it can be

shown that allocations under the Electoral-College system are extremely sensitive in the range where the two candidates about match each other's expenditures in states (i.e., $p_i \approx 0.50$ for voters in state i).

The Electoral-Vote Model

Under the present Electoral College system, the geographic origin of the vote is salient. Because all the electoral votes of each state—equal to the total number of its Senators plus Representatives—are awarded to the majority (or plurality) winner in that state, such a winner-take-all decision rule is often referred to as "unit rule." In this section we shall outline some of the difficulties connected with the concept and interpretation of "optimal strategy" under this system, and in the next section we shall develop an intriguing, but somewhat fragile, solution to the resource-allocation problem for this system.

For purposes of comparison with the popular-vote model, assume that v_i is the number of electoral votes of state i , where

$$\sum_{i=1}^{50} v_i = V.$$

Then, to maximize his *expected electoral vote* among the uncommitted voters in all fifty states, the Republican candidate should maximize the quantity W_e :

$$W_e = \sum_{i=1}^{50} v_i \pi_i, \quad (5)$$

where, assuming for convenience an even number of voters, n_i ,

$$\pi_i = \sum_{k=(n_i/2)+1}^{n_i} \binom{n_i}{k} p_i^k (1-p_i)^{n_i-k} \quad (6)$$

is the probability that the Republican candidate obtains *more* than 50 per cent of the uncommitted

voters in state i —that is, the probability that state i goes Republican if the committed voters are split 50-50. We assume here that the voting of uncommitted voters *within* each state is statistically independent.

Unfortunately, unlike the maximization of W_p in the popular vote model, the maximization of W_e in the electoral-vote model does not yield a closed-form solution for the optimal values of $r_i(d_i)$ when the $d_i(r_i)$ are known. This makes problematic comparisons with the explicit solution to the popular-vote model [Eqs. (3) and (4)].

When the allocations of an opponent are not known, the solution to the optimization problem in general does not take the form of pure strategies in a two-person zero-sum infinite game, where the players are the two candidates. Like the popular-vote model, the contest is a game because it depends on the strategy choice of the other player (i.e., an interdependent decision situation exists). Unlike the popular-vote model, this game has no saddlepoint, which means that the choice by a candidate of an optimal strategy will depend on his opponent's choice. To keep his opponent from discovering his choice, each candidate will leave his choice to chance by choosing from a set of pure strategies at random, with only the probabilities determined. That is, he will use a *mixed strategy*, which is a probability distribution over a set of pure strategies, but we have not been able to establish what the minimax mixed-strategy solution to the game we have described is.¹⁷

Only under special circumstances does such a game have a pure-strategy solution. We shall not offer any details here except to note that if

$$p_i = \frac{r_i}{r_i + d_i}$$

is defined to be the probability that a majority of uncommitted voters (rather than a randomly-selected uncommitted voter) in state i votes Republican—i.e., if $\pi_i = p_i$ instead of the quantity defined in Eq. (6)—then the game will have a solu-

¹⁷ In Colonel Blotto games—where the candidate who outspends his opponent in a state by whatever amount wins that state with certainty, in contrast to the probabilistic relationship that we assume between expenditures and winnings—a minimax solution in mixed strategies has been found when all states have the same number of electoral votes. See David Sankoff and Koula Mellos, "The Swing Ratio and Game Theory," *American Political Science Review*, 56 (June, 1972), 551-554; and for a discussion of related Colonel Blotto games, see Lawrence Friedman, "Game Theory Models in the Allocation of Advertising Expenditures," *Operations Research*, 6 (Sept.-Oct., 1958), 699-709. For a non-mathematical description of pure and mixed strategies, see Morton D. Davis, *Game Theory: A Nontechnical Introduction* (New York: Basic Books, 1970), pp. 19-48.

tion in pure strategies for both candidates. Analogous to the solution in the popular-vote model (with v_i and V now substituted for n_i and N , respectively), the (pure) minimax strategy of each candidate is to allocate resources in proportion to the number of electoral votes of each state:

$$r_i = \left(\frac{v_i}{V} \right) R; \quad \text{and} \quad d_i = \left(\frac{v_i}{V} \right) D.$$

Because this consequence is derived from the assumption that resource expenditures under the Electoral College system affect directly a majority, and not single individuals, in each state, it is not directly comparable to the proportionate-allocation rule in the popular-vote model, which is derived from the individualistic assumption. While it is hard for us to entertain the belief that aggregates, rather than individuals, respond to the actions of the candidates, we shall nonetheless test the truth of the proportionate-allocation strategy for the Electoral College in our later empirical analysis.

Whatever its exact form, a mixed-strategy solution to the electoral-vote model based on the individualistic assumption will be difficult to interpret, let alone to verify empirically. To exorcise this strategy of its random element, we shall show in the next section how an additional assumption can be made that invests optimal strategies under the Electoral College system with greater determinateness.

The 3/2's Allocation Rule

The assumption we shall make is that the two presidential candidates match each other's resource expenditures in each state. This assumption seems reasonable in light of the fact that the candidates tend to agree on what states (usually large and heterogeneous) are the most attractive campaign targets. Even Senator Goldwater decided to abandon early plans in 1964 to write off the big industrial northeastern states and instead "go shooting where the ducks are." Of the seven states he ended up spending the most time in, which collectively claimed more than half of his time, three (New Jersey, New York, and Pennsylvania) were in the Northeast.¹⁸

As further support for the matching assumption, the product-moment correlation coefficients between the combined appearances (to be defined later) of the Republican and Democratic presidential and vice-presidential candidates in all fifty states are 0.92 in the 1960 campaign, 0.83 in the 1964 campaign, 0.90 in the 1968 campaign, and 0.74 in the 1972 campaign. Such strong empirical

¹⁸ Kelley, in Cummings, *The National Election of 1964*, pp. 50-51, 75.

relationships between appearances of the two slates lend support to the proposition that the goal of maximizing one's expected electoral vote that we postulated for the candidates is generally consistent, at least in the four most recent presidential campaigns, with concentrating one's time in the same set of states.

In the calculations of our Electoral College model, we can incorporate this matching assumption by assuming that $r_i = d_i$ (and necessarily $R = D$) for all states i in solving Eq. (5) for a maximum. This assumption enables us to obtain an explicit expression for r_i that maximizes the Republican's expected electoral vote:

$$r_i = \left(\frac{v_i \sqrt{n_i}}{\sum_{i=1}^{50} v_i \sqrt{n_i}} \right) R. \quad (7)$$

Since we assumed that $d_i = r_i$ (and $D = R$) for all i , the Democrat's optimal resource allocation,

$$d_i = \left(\frac{v_i \sqrt{n_i}}{\sum_{i=1}^{50} v_i \sqrt{n_i}} \right) D, \quad (8)$$

is the same as his Republican opponent's.

It can be shown that these allocations are in equilibrium: any *arbitrarily small* (but finite) deviation from these strategies on the part of either candidate will be nonoptimal. A *sufficiently large* deviation by one candidate could, however, prove profitable. If, for example, the Republican candidate reallocated all the resources he spends in one state, as prescribed by Eq. (7), to a larger state, he would lose the smaller state with certainty but almost surely win a majority of popular votes (and all the electoral votes) in the larger state. Thus, instead of exactly splitting his expected electoral vote with his opponent—by matching expenditures with him in all states according to Eqs. (7) and (8)—he could, by such a unilateral deviation, easily win a majority of the electoral votes, holding constant his total expenditures.

We cannot easily specify *how small* the deviation must be so as to be nonoptimal for a candidate. As we have shown by the above example, however, the equilibrium is only *local* and not a minimax solution, for *some* unilateral deviation can secure for a candidate a more-preferred outcome (i.e., a higher expected electoral vote). The matching strategies prescribed by Eqs. (7) and (8) are therefore not optimal in a *global* sense.

To be optimal in this sense, the strategies would have to be such that, whenever the candidates

spend the same amount in all states, there would be an incentive for both to move toward the particular matching expenditures defined by Eqs. (7) and (8). There is, however, no such incentive. Only when the candidates' expenditures are near or at this point is there an incentive *not to deviate* from these expenditures by a small amount.

Because the allocations defined by Eqs. (7) and (8) constitute only a local equilibrium point, it is unstable.¹⁹ Yet, despite its instability, it is suggestive of a possible reference point in the calculations of candidates that does have an interesting interpretation.

This interpretation can most easily be grasped if we make the simplifying assumption that the electoral votes of state i , v_i , are proportional to the number of uncommitted voters, n_i , in that state. Given this assumption, the terms in the first factor of the numerator, and in the summation of the denominator, of Eqs. (7) and (8), $v_i \sqrt{n_i}$, will be proportional to $v_i \sqrt{v_i} = v_i^{\frac{3}{2}}$. The (local) equilibrium strategies of the Republican and Democratic candidates who match each other's resource expenditures in each state will then be, respectively,

$$r_i = \left(\frac{v_i^{\frac{3}{2}}}{\sum_{i=1}^{50} v_i^{\frac{3}{2}}} \right) R$$

and

$$d_i = \left(\frac{v_i^{\frac{3}{2}}}{\sum_{i=1}^{50} v_i^{\frac{3}{2}}} \right) D.$$

In other words, each candidate should allocate his total resources, which we assumed are the same for the Republican and Democratic candidates ($R = D$) in making the matching assumption ($r_i = d_i$ for all i), in proportion to the 3/2's power of the number of electoral votes of each state.

This is what is meant by the "3/2's rule" in the title of this article. It implies that both candidates, in matching each other's resource expenditures, should not simply allocate on the basis of the electoral votes of each state but rather should allocate decidedly more than proportionately to large states than to small states. For example, if one state has 4 electoral votes, and another state has 16 electoral votes, even though they differ in size only by a factor of four, the candidates should allocate eight times as much in resources to the

¹⁹ Whenever we use the term "unstable," we mean "globally unstable," for this point is stable locally (i.e., is impervious to small deviations).

larger state because

$$\frac{16^{\frac{1}{2}}}{4^{\frac{1}{2}}} = \frac{64}{8} = 8.$$

This allocation rule thus favors large states with more electoral votes, even out of proportion to their size. It is a strikingly simple and nonobvious consequence of the postulated goal that candidates seek to maximize their expected electoral vote, given that they match each other's resource expenditures.²⁰ While simple in form, however, it is not immediately obvious why large states are so advantaged, apart from the commonsensical observation that voters in large states have greater potential influence over the disposition of large blocs of electoral votes.

Why the Large States Are Favored

To give greater insight into the quantitative dimensions of this "potential influence," it is useful to calculate the "expected minimum number of voters sufficient to change the outcome" in a state. This quantity is simply the sum of the probability of an exactly even split (i.e., a tie, assuming an even number of voters) times 1 (one "swing voter" is minimally sufficient to change the outcome—a deadlock—by changing his vote), the probability of a 2-vote victory by either candidate ($k=+1$ or $k=-1$ below) times 2 (two "swing voters" are minimally sufficient to change the outcome by changing their votes), etc. If we assume for convenience, that there are $2n$ voters (i.e., an even number) in a state, then this expected minimum number, which we shall refer to as the *expected number of decisive voters*, is

$$N(D) = \sum_{k=-n}^n \binom{2n}{n+k} p^{n+k}(1-p)^{n-k}(|k|+1),$$

where p is equal to the probability that a randomly selected uncommitted voter in the state votes for one candidate and $(1-p)$ the complementary probability that such an uncommitted voter votes for the other candidate. When $p=(1-p)=\frac{1}{2}$, it can be shown that

$$N(D) = \left(\frac{1}{2}\right)^{2n} \left[n \binom{2n}{n} + 2^{2n} \right].$$

Since

$$\left(\frac{1}{2}\right)^{2n} \binom{2n}{n} \simeq \sqrt{\frac{1}{\pi n}},$$

²⁰ If the total resources of the candidates are not equal (i.e., $R \neq D$), it is not difficult to show that a "proportionate matching" of expenditures, wherein the candidates spend the same proportion (or percentage) of their total resources in each state, yields a somewhat more complicated expression for a local maximum.

the central term of the binomial distribution,²¹

$$N(D) \simeq \sqrt{\frac{n}{\pi}} + 1. \quad (9)$$

That is, when the probability is 50-50 that the voters will vote for one candidate or the other—and thereby enhance the likelihood of a close outcome—the expected number of decisive voters in a state varies with the square root of its size, the first term on the right-hand side of Eq. (9).

The number of decisive voters *per voter* in a state, or what might be called the *decisiveness* of an average voter, is found by dividing $N(D)$ by $2n$:

$$D(2n) = \frac{1}{2\sqrt{\pi n}} + \frac{1}{2n}.$$

To illustrate this measure of decisiveness, in a state with $2n=100$ voters,

$$D(100) = 0.040 + 0.010 = 0.050,$$

while in a state with $2n=400$ voters,

$$D(400) = 0.020 + 0.003 = 0.023.$$

Thus, although the larger state has four times as many voters as the smaller state, the decisiveness of an individual voter in the larger state decreases only by a factor of about two. In other words, while an individual voter has a reduced chance of influencing the outcome in a large state because of the greater number of people voting, this reduction is more than offset by the larger number of electoral votes he can potentially influence. Hence, despite the apparent dilution of his vote under a winner-take-all system like the Electoral College, he has on balance greater potential voting power to affect the outcome of a presidential election than a voter in a small state.²²

²¹ James S. Coleman has developed a measure of power based on this term, which here gives the probability of an exactly even split of the uncommitted voters in a state. (Note that "π" in the expressions in this section refers to the number 3.14159, not the probability we defined earlier.) See James S. Coleman, "Loss of Power," *American Sociological Review*, 38 (February 1973), 1-17.

²² Cf. the similar findings in John P. Banzhaf III, "One Man, 3,312 Votes: A Mathematical Analysis of the Electoral College," *Villanova Law Review*, 13 (Winter 1968), 304-332. Banzhaf's analysis of power is similar to that of Coleman, *op. cit.*, but the correctness of Banzhaf's numerical calculations of voting power in the Electoral College has recently been contested in Lawrence D. Longley and John H. Yunker, "The Changing Biases of the Electoral College" (Paper prepared for delivery at the 1973 Annual Meeting of the American Political Science Association, New Orleans, Louisiana, September 4-8, 1973). While Banzhaf bases his analysis on the concept of a "critical vote," which can occur only if there is a 50-50 split, our concept of "decisiveness" takes into account other possible divisions of the vote.

It is precisely this greater potential voting power of voters in large states that makes them more attractive as campaign targets to the candidates. Is it any wonder why, then, the candidates view the large states as more deserving of their attention, even on a per-capita basis, than small states?

This result, though not directly tied to our earlier resource-allocation models, sheds considerable light on the strategic advantage of voters in large states. Yet, because the 3/2's rule that favors large states is only a local equilibrium point when candidates match each other's resource allocations, it is highly vulnerable when the matching assumption is discarded. In fact, it can be shown that when a candidate knows the allocations of his opponent under the Electoral College system, the most devastating strategy that he can generally use against him is to spend nothing in the smallest state and instead use these extra resources (assuming the total resources of both candidates are equal) to outspend his opponent by a slight amount in each of the other states.

In general, adaptive strategies which exploit the commitments of an opponent demand a flexibility in responding to an opponent's allocations and recommitting one's own resources that does not seem to mirror the campaign realities of advance scheduling, purchase of future broadcast time, etc. It is for this reason that the 3/2's rule, despite its instability, may better reflect a fixed, if intuitive and not well understood, point of reference for the major candidates than do allocation strategies directed only to responding to an opponent's commitments. While admitting that most candidates, and especially successful ones, are probably incrementalists in the way they define and quickly respond to issues in a campaign,²³ it nevertheless appears that decisions about resource allocations are inherently less fluid.

Having already described and justified the assumptions and logic that generate the 3/2's rule, and posted warnings about its fragile nature, we turn in the next section to testing its empirical validity. Since by election time the candidates necessarily have made a set of choices that fixes their allocations, we can check these against the 3/2's and other rules without inquiring into what determines each and every choice. In this analysis, we shall refine the 3/2's rule by assuming that the number of uncommitted voters in each state is directly proportional to the population, and not to the number of electoral votes, of that state. Especially in small states, where the two-senator bonus in the Electoral College greatly magnifies

their per-capita electoral-vote representation, there is no reason to assume that the proportion of uncommitted voters will be so magnified. It seems far more reasonable to tie estimates of uncommitted voters directly to the population, thus retaining the original form of the 3/2's rule, $v_i \sqrt{n_i}$, where n_i is assumed proportional to the population.²⁴

Testing the Models

Political campaigns in the United States have grown enormously expensive in recent years. Herbert E. Alexander, director of the Citizen's Research Foundation, estimated that political spending on all levels during the 1968 campaign ran to \$300 million—up 50 per cent from the total cost of campaigns in 1964—and that it cost \$100 million to elect a president that year.²⁵ *The New York Times* estimated that a total of \$400 million was spent on political campaigns in 1972,²⁶ though a final accounting of expenditures at the presidential level at the time of this writing (July 1973) seems likely to be prolonged by the Watergate scandal.

The per-capita costs of presidential campaigns have also soared, with expenditures per potential voter increasing by 71 per cent between 1964 and 1968.²⁷ Only recently enacted legislation promises some relief from these spiraling costs by limiting the campaign spending of presidential candidates for radio, television, and other media advertising, as well as paid telephone solicitation, to ten cents per voter, with no more than 60 per cent to be spent on broadcast advertising.²⁸

Unfortunately, reliable data on the financial expenditures of the presidential candidates in each state are not generally available. Although the Federal Communications Commission has published data on the campaign expenditures of the major political parties for radio and television advertising in recent presidential election years,²⁹

²⁴ The population of a state, of course, is not an exact reflection of the proportion of the voting-age population who are registered and actually do vote in a presidential election. Since it is not at all clear whether and how the proportion of uncommitted voters in a state is related to differences in registration and turnout among the states, we have taken the simplest course of using population as a first-approximation estimate of the proportion of voters likely to be uncommitted at the start of a campaign. This assumption can, of course, be modified at a later time.

²⁵ *The New York Times*, January 31, 1972, p. 48.

²⁶ *The New York Times*, November 19, 1972, p. 1.

²⁷ Computed from figures given in Delmer D. Dunn, *Financing Presidential Campaigns* (Washington, D.C.: Brookings Institution, 1972), p. 33.

²⁸ *The New York Times*, April 9, 1972, p. 44.

²⁹ Federal Communications Commission (FCC), *Survey of Political Broadcasting: 1960, 1964, 1968* (Washington, D.C.: FCC, April 1961, July 1965, August 1969), which include data on both primary and general election campaigns.

²³ See Karl A. Lamb and Paul A. Smith, *Campaign Decision-Making: The Presidential Election of 1964* (Belmont, Calif.: Wadsworth Publishing Co., 1968).

these figures are not disaggregated for the presidential races. Despite the wealth of data that has been collected on the financial contributions and expenditures of candidates,³⁰ its completeness and reliability have been hampered by unsystematic reporting and the lack of effective governmental controls on contributions and expenditures. The Federal Election Campaign Act of 1971, which went into effect on April 7, 1972, tightens up reporting procedures that should improve this situation.

In the absence of reliable state-by-state data on financial expenditures of presidential candidates, we have turned to the one resource which imposes the same implacable restraints on the campaign behavior of all candidates—time. With a finite amount of it to spend in a campaign, the crucial question for a candidate becomes how to apportion it most wisely so as to gain favorable and far-reaching exposure.

In our models we have assumed that the favorableness of a candidate's image in a state will depend on his resource expenditures in that state as compared to those of his opponent. We shall measure expenditures of time in terms of the total number of *campaign appearances* that a candidate makes in a state. Campaign appearances are defined to be events at which a candidate either makes some public address to an audience (whether the address takes the form of a major speech or brief remarks, but excluding news conferences) or participates in some public activity like a parade, motorcade, or fair. To be sure, our counting of all campaign appearances in a state as equivalent ignores important differences among them (e.g., size of audience, extent of news coverage, etc.), but the distribution of both politically "important" and "unimportant" appearances in each state visited probably makes the aggregated data roughly comparable for the purposes of our analysis.

Our data are based on news coverage of the 1960, 1964, 1968, and 1972 presidential campaigns in *The New York Times* from September 1 to the day before Election Day in November in each year, supplemented by such other sources as congressional reports, *Congressional Quarterly Weekly Reports*, and *Facts on File*.³¹ While these data on

³⁰ The most comprehensive source of this information for the 1968 election is Herbert E. Alexander, *Financing the 1968 Election* (Lexington, Mass.: D. C. Heath and Co., 1971).

³¹ After collecting our data we learned of the data on the itineraries of presidential candidates published in John H. Runyon, Jennefer Verdini, and Sally S. Runyon, eds., *Source Book of American Presidential Campaign and Election Statistics: 1948-1968* (New York: Frederick Ungar Publishing Co., 1971), pp. 139-173. This work contains no data on the itineraries of vice-presidential candidates, however, whose campaign appearances we have combined with the appearances of presidential candidates in the data analyzed below.

campaign appearances are only as accurate as coverage by the media, they are generally highly correlated with data collected by Stanley Kelley, Jr. on the number of hours spent by the presidential and vice-presidential candidates in each state in the 1960 and 1964 elections, which is based in part on the candidates' own personal schedules.³² In 1960, the correlation between number of appearances (our data) and number of hours (Kelley's data) for the Republican slate is 0.88, for the Democratic slate, 0.94; in 1964, the comparable figures for the Republican and Democratic slates are 0.92 and 0.70, respectively.

For each party, we have combined the number of appearances made by both the presidential and vice-presidential candidates and used this total as an indicator of the candidates' resource allocations to each state in the four campaigns studied. Combining the appearances of each party's two nominees seemed preferable to singling out only the time expenditures of the presidential candidate, since often the two candidates adopt complementary strategies. For example, in the 1960 race, Lyndon Johnson, the Democratic vice-presidential candidate, was assigned the task of holding the South for the Democrats, and he devoted more than twice as much time to this region as his running mate, John Kennedy, or either of the Republican candidates, Richard Nixon and Henry Cabot Lodge.³³ If we did not add Johnson's campaign appearances to Kennedy's, it would appear that the Democrats did not consider the southern states to be strategically important to their fashioning a victory, which was manifestly not the case.

As an aid to summarizing the Republican and Democratic candidates' time allocations in the last four campaigns, we have categorized the fifty states on the basis of number of Electoral College votes as small (3-9 electoral votes), medium (10-19 electoral votes), and large (more than 20 electoral votes). Comparing the percentage of electoral votes of these three groups of states in 1960, 1964 and 1968 (after the 1960 reapportionment), and 1972 (after the 1970 reapportionment) with the actual percentage allocations of campaign appearances by candidates to these groups given in Table 2, we see that, with the exception of the 1964 campaign, the candidates of both parties made substantially more appearances in the large states, and substantially less in the medium and small states, than would be proportionate to the elec-

³² We are grateful to Stanley Kelley, Jr. for furnishing us with his data, which he has analyzed in his articles entitled "The Presidential Campaign," in *The Presidential Election and Transition*, ed. Paul T. David (Washington, D.C.: Brookings Institution, 1961), pp. 57-87; and in Cummings, *The National Election of 1964*, pp. 42-81.

³³ Computed from data given in Kelley, in David, *The Presidential Election and Transition*, p. 72.

suggests may simply not have been in the cards for him no matter how he campaigned. By the same reasoning, President Johnson may not have felt compelled to follow a "normal" optimal strategy—at least not the 3/2's rule. Whatever the peculiarities of this campaign, it is noteworthy that Goldwater's strategy adheres closer to the 3/2's rule than the proportionate rule in large and medium states, while for Johnson the 3/2's rule works as well as the proportionate rule in the medium states.

President Nixon's margin of victory in the 1972 election (61 per cent of the popular vote, 97 per cent of the electoral vote) matched President Johnson's in 1964, but unlike previous campaigns the candidates of each party in 1972 made very different decisions about the proportion of time they would spend on the campaign trail versus other activities. In this campaign, the Democratic slate made a total of 189 campaign appearances, the Republican slate only 54, which would appear to violate our matching assumption (i.e., $r_i = d_i$ for each state i and $R = D$ for all states) that generated the 3/2's rule. However, insofar as campaign appearances can be regarded as a surrogate variable for other forms of attention paid to states, and all forms taken together can be assumed to be the same for each slate, then the $r_i = d_i$ assumption for resources (i.e., attention) expended in states will be met if the *proportionate* (or percentage) allocations of campaign appearances made in each state are the same for both slates, even if the total numbers of appearances are not. The correlation coefficients given earlier relating the number of campaign appearances of the Democratic and Republican slates in all fifty states for each of the four campaigns show that the proportionate allocations for both slates match each other quite closely.

A rather convincing case can be made for the general applicability of the 3/2's rule from the correlation coefficients relating number of campaign appearances to proportionate and 3/2's allocations for all fifty states (see Table 4). The proportionate coefficients exceed the 3/2's coefficients only for the Democratic candidates in the 1964 campaign, though the 3/2's rule correlations in the remaining seven cases are not significantly higher. What we may infer is that the 3/2's rule fits the actual campaign allocations at least as well, and probably slightly better, than the proportionate rule.³⁴ Because the proportionate and

³⁴ We must also note that the 3/2's rule works less well than the proportionate rule (correlation coefficients of 0.84 and 0.87, respectively) in the case of the only major third-party presidential bid since 1948, that by George Wallace's American Independence Party in 1968, which captured 14 per cent of the popular vote and 9 percent of the electoral vote. However, Wallace

Table 4. Correlation Coefficients Between Campaign Appearances and Proportionate and 3/2's Allocation Rules

Year	Republican Slate		Democratic Slate	
	Prop.	3/2's	Prop.	3/2's
1960	0.91	0.95	0.94	0.96
1964	0.86	0.87	0.84	0.83
1968	0.94	0.94	0.90	0.93
1972	0.79	0.80	0.85	0.86

3/2's allocations are in fact very highly correlated (0.98), however, it is not surprising that the differences in fit of the two rules to the campaign-appearance data are small.

We wish to emphasize that while the 3/2's rule fits the appearance data somewhat better overall than the proportionate rule does, we do not promulgate it as an immutable law. Like any theoretical consequence of a set of assumptions, its applicability will be limited to those situations that can be reasonably well characterized by these assumptions—particularly the postulated goal of maximizing one's expected electoral vote and the assumption that candidates match each other's campaign expenditures in each state—which are not easy to verify. Further, the instability of the 3/2's rule as an equilibrium point, which makes it vulnerable to only small deviations, may also limit its applicability, especially when candidates resort to adaptive strategies in response to each other's allocations. Finally, another potential source of slippage between the theoretical allocations and the actual campaign behavior of candidates occurs in the reconstruction of campaign itineraries, which is a task fraught with difficulties that certainly contributes to unreliability in the data.

Despite all these warnings, our data do make clear that the candidates generally make disproportionately large expenditures of time in the largest states. While one could always find a better-fitting function than the 3/2's rule for any particular campaign, it would not constitute an explanatory model unless one could derive it from assumptions that are both interpretable and plausible. Fitting a curve to empirical data may help one summarize repeated instances of a phenomenon, but in itself it does not impart a logic to the curve that we consider the hallmark of scientific explanation.

Having shown that the 3/2's rule mirrors quite

and his running mate, General Curtis LeMay, did not campaign in nearly one-third of the fifty states, which throws doubt on the substantive significance of correlations based on all fifty states.

well actual campaign allocations of time, we shall show in the next section what the allocations prescribed by this rule are for each state from 1972 through 1980, when the next decennial census will be taken and serve as the basis of a reapportionment of electoral votes among the states in the 1984 presidential election. (Our analysis assumes that Maine operates under the Electoral College system, although starting with the 1972 presidential election system it adopted a "district plan," whereby its two electoral votes based on population are decided on a district-by-district basis and its two senatorial electoral votes are decided on a statewide basis.) Our calculations will also reveal the extent to which the 3/2's rule favors the largest states, even on a per-capita basis, despite the two-senator bonus that favors the smallest states.

Campaign Allocations and Biases through 1980

Based on the 1970 census and the electoral votes of each state through 1980, we have indicated in Table 5 the percentage of time a candidate should spend in each state and the District of Columbia if he allocates his resources proportionately or allocates them according to the 3/2's rule. For example, a candidate's proportionate allocation to California on the basis of its forty-five electoral votes represents about an 8-per cent commitment of his resources, but the 3/2's rule nearly doubles this commitment to 15 per cent. On the other hand, the 3/2's rule would slash a 0.56 per cent commitment to Alaska by nearly a factor of five. According to this rule, then, California should receive about twice as much, and Alaska about one-fifth as much, resources *per electoral vote* as would be commensurate with their respective forty-five and three electoral votes.

This is what we call the *electoral bias* (EB) of the present system, which is simply the ratio of 3/2's allocations to proportionate allocations for all states. These ratios are given in Table 5 and show that the nine largest states, with 52 per cent of the population, are advantaged by the 3/2's rule ($EB > 1.00$), the remaining forty-one and the District of Columbia disadvantaged ($EB < 1.00$).

The *individual bias* (IB) of the Electoral College is the concept most relevant to assessing the degree to which the 3/2's rule engenders campaign allocations in states that are inconsistent with the egalitarian principle of "one man, one vote." This bias is the ratio of each state's 3/2's percentage allocation to its percentage share of the total population.

In substantive terms, IB represents the relative proportion of resources that a candidate should commit *per person* to each state, given that he makes his allocations according to the 3/2's rule. These per-capita allocation ratios are given in

Table 5, along with the ranks (in parentheses) of these ratios from the highest to the lowest for the fifty states and the District of Columbia.

The ranking of states on the basis of their IB values, unlike their ranking on EB values, does not correspond perfectly to their ranking in terms of electoral votes. Thus, for example, while an individual voter in the largest state, California, ranks as the most attractive target for a candidate who allocates according to the 3/2's rule—receiving 50 per cent more attention ($IB = 1.50$) than he would get if the candidate allocated his time strictly according to the population of each state—a voter in the smallest state, Alaska, with an IB of 0.81, is still comparatively well off based on the sixteenth position of Alaska among the fifty states and the District of Columbia. His IB is below the proportionate norm of 1.00 but far from the bottom rung of the ladder that citizens who live in Washington, D. C. have the dubious distinction of occupying with IB's equal to 0.51.

There are two reasons why the IB scores of states are only an imperfect reflection of their electoral votes. First, when two states have the same number of electoral votes, like Texas and Illinois with twenty-six each, citizens of the larger state (i.e., Texas) will be slightly disadvantaged, because the attention that they receive from the candidates according to the 3/2's rule must be divided among more people.

The two-senator bonus accorded to all states more seriously upsets the generally positive relationship between IB scores and the electoral votes of a state. This bonus, naturally, is much more significant to a state like Alaska with one representative than a state like California with forty-three representatives: percentagewise, the two-senator bonus inflates Alaska's per-capita representation by 200 per cent, California's by only about 5 per cent.

Some critics of the Electoral College have charged that this bonus favors small states, which it obviously does on a proportional basis. On the other hand, proponents of the Electoral College have responded that this favoritism is counteracted by the fact that the large blocs of votes cast by large states in the Electoral College have a greater chance of being decisive, especially in close elections.³⁵ To what extent do these opposing forces cancel each other out?

³⁵ In the context of voting in the Electoral College, Mann and Shapley demonstrated that the Shapley-Shubik index of pivotalness for each state produces only a slight bias in favor of the largest states. See Irwin Mann and L. S. Shapley, "The A Priori Voting Strength of the Electoral College," in *Game Theory and Related Approaches to Social Behavior*, ed. Martin Shubik (New York: John Wiley & Sons, 1964), pp. 151–164. For an elementary discussion of the Shapley value on which the Shapley-Shubik index is based, see Davis,

The balance between these forces, it turns out, is very one-sided: the large-state bias created by the 3/2's rule swamps the small-state bias resulting from the two-senator bonus, giving citizens of the most populous fifteen states the highest IB scores. This is not unexpected, since the 3/2's rule compels the candidates to make inordinately large expenditures of resources in the largest states that are well out of proportion to their populations.

Yet not all the citizens of even these fifteen large states are favored by the 3/2's rule. Only the citizens of the seven very largest states, which comprise less than a majority (45 per cent) of the population, receive representation greater than in proportion to their numbers ($IB > 1.00$). Citizens in the remaining forty-three states, plus the District of Columbia (whose sad plight will be recounted below), receive attention below the one-man, one-vote standard from candidates who adhere to the 3/2's allocation rule.

Only with Alaska's entry into the sixteenth position of the IB ranking does the two-senator bonus begin to help the very small states. While Wyoming breaks into the IB ranking at the nineteenth position, none of the four other very small states with three electoral votes is successful in outdistancing the 3/2's rule by an amount sufficient to rank it above the fortieth position. In the case of Alaska and Wyoming, the two-senator bonus gives each a per-capita electoral vote representation more than four times greater than that of California, which accounts for their ability to overcome to some degree the large-state bias of the 3/2's rule.

Although the states that the two-senator bonus helps the most are among the smallest, small size alone is not the only factor that tends to counteract the 3/2's rule. The ability of a state just to meet the "quota" for a certain number of electoral votes is also important, for it gives the state higher per-capita representation than that of larger states

with the same number of electoral votes. Thus, the three smallest states with four electoral votes—Idaho, Montana, and South Dakota—succeed in raising their population rankings of forty-second, forty-third, and forty-fourth by eleven, fourteen, and seventeen notches (one more notch if the District of Columbia is included), respectively, on the IB scale. No other states besides these and Alaska and Wyoming are able to better their population rankings by as much as ten positions.

From the perspective of per-capita representation, the most unfortunate citizens are those who live in Washington, D. C. The Twenty-third Amendment limits the District of Columbia to electoral representation no greater than the least populous state (Alaska), which has three electoral votes. This limitation is strangely inconsistent with the fact that the District's population is greater than that of four states that each have four electoral votes. With an IB of 0.51, its citizens rank below those of all fifty states in per-capita representation.

Using Washington, D. C. as a basis for comparison, we have ranked in Table 6 the ratios of the IB's of all states to the District's IB. Similarly, taking the lowest-ranking state on the EB scale (Alaska), we have given the ratios of all states' EB scores to that of Alaska. These comparisons reveal that the largest state, California, has 2.92 times as great individual representation as Washington, D.C., and 8.13 times as great electoral representation as Alaska. This means that a candidate who campaigns according to the 3/2's rule should allocate to California more than eight times as many resources per electoral vote as he does to Alaska, and almost three times as many resources per person as he does to Washington, D.C. Though Washington, D.C. has 1.76 times as many electoral votes per person as California, which is why its individual bias of 0.51 is greater than (i.e., deviates less from the standard of 1.00) than its electoral bias of 0.34, it would still need about twice as many electoral votes as it has (i.e., six), holding all other states constant, to wipe out its individual bias (i.e., make $IB \approx 1.00$).

To be sure, Washington, D.C. is the nation's capital, and its residents probably do not suffer from any lack of exposure to presidential candidates. Yet for Alaska, whose electoral votes have only 12 per cent of the drawing power of California's (EB of 0.22 for Alaska versus 1.76 for California), it may be more than distance that has kept away all presidential and vice-presidential candidates except Richard Nixon in his 1960 campaign. And for the citizens who live in the small and medium states that together comprise 55 per cent of the population of the United States, the average IB and EB scores given in Table 5 for these groups of states indicate that they are gen-

Game Theory, pp. 172-176. We find the Mann-Shapley result interesting but of limited substantive significance since the real contest for the presidency does not occur *within* the Electoral College, which is largely a ratifying institution. Rather, it is the effects of unit rule *outside* the Electoral College (e.g., on presidential campaigning, the two-party system, etc.) that make this institution loom so large; it is precisely some of these effects that we have tried to capture in our models. For an attempt to explain the allocation data reported in this article using alternative models, see Claude S. Calantoni, Terrence J. Levesque, and Peter C. Ordeshook, "Campaign Resource Allocations under the Electoral College" (Paper, Carnegie-Mellon University, May, 1973). For a generalization of the Shapley value and its application to the Electoral College, see Guillermo Owen, "Multilinear Extensions of Games," *Management Science*, 18 (Jan., Part 2, 1972), pp. P-64-P-79.

(one, two, or three, depending on its population): . . . [a practical politician] classifies the counties into three groups: those in which he is sure of a plurality; those in which he has no chance of a plurality; those which are doubtful. He forgets about the first two groups except for routine campaign coverage. He concentrates his resources in the third group: expenditures, appearances by the candidate, negotiations, all the tricks of county politicking.³⁷

The widespread use of public opinion polls today makes it easier than ever before to weed out those states "securely" in the camp of one candidate and pinpoint the "toss-up" states likely to swing either way. Insofar as polls indicate the largest states to be the toss-up states, candidates who act on this information and concentrate almost all their resources in these states will magnify even the large-state bias of the 3/2's rule. If we eliminate the anomalous allocations made by the candidates of both parties in 1964, our data in Table 5 reveal that in four of the six remaining cases the candidates' actual allocations did in fact exceed the 3/2's allocations in the large states.

Limitations and Extensions of the Models

The rationale of the 3/2's rule rests on the idea that states can be pinpointed like military targets and, independent of nearby and faraway other targets, captured with a high probability by a concentration of forces superior to that of one's opponent (given that his allocations are known or can be estimated). As Richard M. Scammon and Ben J. Wattenberg warn, however, this logic may be seriously flawed:

It is extremely difficult, and probably impossible, to move 32,000 votes in a New Jersey Presidential election without moving thousands and tens of thousands of votes in each of the other forty-nine states. The day of the pinpoint sectional or statewide campaign is gone—if it ever existed—and the fact that votes cannot be garnered in bushels on specific street corners is of crucial significance when one looks at the arithmetic of the future.³⁸

Scammon and Wattenberg go on to point out that political rallies usually draw mostly partisans already committed to a candidate. For this reason, relatively few uncommitted voters are likely to ob-

³⁷ V. O. Key, Jr., *Southern Politics in State and Nation* (New York: Alfred A. Knopf, 1949), p. 122. We are indebted for this citation to Melvin J. Hinich and Peter C. Ordeshook, "The Electoral College: A Spatial Analysis" (Paper, Carnegie-Mellon University, February, 1973), in which the effect of the Electoral College on equilibrium strategies, given different distributions of policy preferences of the electorate, are examined.

³⁸ Richard M. Scammon and Ben J. Wattenberg, *The Real Majority: An Extraordinary Examination of the American Electorate* (New York: Coward-McCann, 1970), p. 213.

serve, much less be persuaded by, the speech a candidate makes at a rally in their state.³⁹ Their choices, Scammon and Wattenberg argue, will depend much more on national coverage of the campaign, particularly by television.⁴⁰

Yet, these analysts do not dismiss campaigns as insignificant: . . . The campaign is important in providing the candidate with *something to do* that can be televised, photographed, and written about for national consumption . . . Further, if a candidate does not campaign at all, his opposition will criticize him for "not taking his case to the people."

Beyond all that, however, is a certain extremely valuable democratic symbolism that underlies all the flesh pressing, baby kissing, hurly-burly of a campaign. There is great value in a system that somehow demands that a candidate get sweaty and dirty and exhausted, his hands bleeding, his hair messed by the masses of people whom he wants to represent. The successful candidate in America must *touch* the people, figuratively and literally.⁴¹

How a candidate does this is not well understood, even if we do know that campaigns often decide the outcomes of elections.⁴²

Our interest in this analysis, however, is not in showing how the conduct of campaigns affects

³⁹ According to a series of Gallup polls, less than 6 per cent of all people saw any one of the presidential candidates in person in 1968. See Sara Davidson, "Advancing Backward with Muskie," *Harper's*, June 1972, p. 61.

⁴⁰ Scammon and Wattenberg, *The Real Majority*, pp. 214–216. Moreover, television news shows, documentaries, and other specials, which are generally beyond the direct control of candidates, rank far above television advertising as the most important media influences, at least for the split-ticket voter. See De Vries and Tarrance, *The Ticket-Splitter*, p. 78.

⁴¹ Scammon and Wattenberg, *The Real Majority*, p. 217. Italics in original.

⁴² At the local level, party organization activities do appear to influence election results favorably, including the vote for president. See William J. Crotty, "Party Effort and Its Impact on the Vote," *American Political Science Review*, 65 (June 1971), 439–450, and references cited therein; also, Robert J. Huckshorn and Robert C. Spencer, in *The Politics of Defeat: Campaigning for Congress* (University of Massachusetts Press, 1971), stress the importance of campaign organization on election results. At the national level, on the other hand, there is no clear-cut relationship between the campaign spending of each party and the outcome of presidential elections. See Twentieth Century Fund, *Voters' Time: Report of the Twentieth Century Fund Commission on Campaign Costs in the Electronic Era* (New York: Twentieth Century Fund, 1969), pp. 11–13; Congressional Quarterly, *Dollar Politics: The Issue of Campaign Spending* (Washington, D.C.: Congressional Quarterly, 1971), pp. 14, 19–31; and Dunn, *Financing Presidential Campaigns*, p. 9. More opaque, still, is the relationship between major strategic decisions made by candidates, especially during the heat of a close race, and their effect on the vote. See Polby and Wildavsky, *Presidential Elections*, pp. 199–206.

election outcomes.⁴³ Rather, it is to establish that candidates act *as if* they believe their conduct matters when it comes to making campaign allocations. Perhaps "the spectacle of seeing one's opponent run around the country at a furious pace without following suit is too nerve-racking to contemplate,"⁴⁴ but it also appears that the as-if assumption is rooted in the actual beliefs of candidates, who, at least at the state and local level, think that their campaigns have an impact on the outcome.⁴⁵ As evidence for our postulated goal that presidential candidates campaign as if they seek to maximize their expected electoral vote, we have already shown that the 3/2's rule that follows from this goal reflects quite well the actual campaign allocations of candidates.

The increasing nationalization of presidential campaigns obviously limits the applicability of any resource-allocation model that makes states the units of analysis. It is worth noting, though, that in postulating that candidates maximize their expected electoral vote, we do *not* assume that voting by individuals in *different* states is statistically independent. If we had postulated for candidates the goal of maximizing their probability of winning a majority of electoral votes, the statistical-independence assumption would be convenient, and probably necessary, to obtain tractable results.

The goal of maximizing one's expected electoral vote may not be equivalent to maximizing one's probability of winning the election. To illustrate, a candidate who concentrates his resources in states with a bare majority of electoral votes may win these states, and the election, with a high probability, but his expected number of electoral votes will be relatively small. On the other hand, if he spreads his resources somewhat

⁴³ That the organization and planning of presidential campaigns is critical to a candidate's eventual success is stressed in Jerry Bruno and Jeff Greenfield, *The Advance Man* (New York: William Morrow & Co., 1971).

⁴⁴ Polby and Wildavsky, *Presidential Elections*, p. 183. If the steeliness of a candidate's nerves can be judged by this standard, Richard Nixon's nerves progressively hardened in his successive bids for the presidency: as an incumbent president in the 1972 campaign, he made only 18 campaign appearances, while as a nonincumbent in 1968 and 1960 he made 140 and 228 appearances, respectively. Yet, though he cut down his number of appearances in successive campaigns, in all three races Nixon made disproportionately greater allocations to the large states than to the medium and small states, as did the entire Republican state in each of these campaigns (see Table 3).

⁴⁵ John W. Kingdon, *Candidates for Office: Beliefs and Strategies* (New York: Random House, 1968), pp. 109-114. See also Robert A. Schoenberger, "Campaign Strategy and Party Loyalty: The Electoral Relevance of Candidate Decision-Making in the 1964 Congressional Elections," *American Political Science Review*, 63 (June, 1969), 515-520.

thinner over more states, he may increase his expected number of electoral votes, but at the price of lowering the probability that he will win a majority of electoral votes. Thus, the two goals may be logically inconsistent—that is, they may lead to contradictory strategic choices on the part of rational candidates. We do not think that the implications of these different goals will be seriously contradictory in most cases, at least in two-candidate races, but this question needs to be explored further.

Finally, we wish to point out that several restrictive assumptions we made earlier in the development of our models can be relaxed. The minimax solution of the popular-vote model, and the (unstable) equilibrium solution of the electoral-vote model, hold *mutatis mutandis* when three or more candidates compete in an election. Further, it is not necessary to assume, as we did initially, that the committed voters in each state are evenly divided at the outset of a campaign. If a candidate's polls indicate, for example, that he is ahead by particular margins in some states, and behind by particular margins in others, he can use this information to determine his optimal allocations to each state, given that he can estimate the probable allocations of his opponent.

This problem can be conceptualized as one in which a candidate tries to reduce the effect of an opponent's supporters in a state by matching them against his own. If at the start of a campaign one candidate has more supporters in a state than the other, the lesser candidate faces the problem of winning over a sufficient number of uncommitted voters to neutralize both his opponent's extra supporters and those uncommitted voters his opponent is likely to pick up, given that commitments once made are not broken.

Given the allocations of the candidates for all states i that define p_i , and the distribution of supporters committed to each candidate in each state, the probability of neutralizing an opponent's support and then going on to win is given by Lancaster's Linear Law, for which Richard H. Brown has provided a useful approximate solution.⁴⁶ Optimal allocations can be obtained by maximizing the expected electoral vote based on these probabilities for all states. Without having made these kinds of calculations, we would suspect that, holding size constant, the most attractive targets by far for campaign allocations in the electoral-vote model will be those states in which the committed voters are split roughly 50-50.

Finally, it seems possible that the models we have developed may be applicable to the analysis

⁴⁶ Richard H. Brown, "Theory of Combat: The Probability of Winning," *Operations Research*, 11 (May-June 1963), 418-425.

of resource-allocation decisions in other political arenas, particularly where the distribution of pay-offs to members of a coalition is involved.⁴⁷ For example, the apportionment of foreign aid, the commitment of military forces, the granting of patronage and other favors, and even the assignment of priorities all involve decisions about how to allocate resources among actors (or programs) of different weight or importance. Moreover, these decisions are often influenced by the actions or probable responses of an opponent in an essentially zero-sum environment. Presumably, the extent to which decision making in such competitive situations is conditioned by either of the goals we have postulated could be determined by comparing the resource expenditures actually made with the theoretical implications these goals entail (i.e., the proportionate or 3/2's rules).

Summary and Conclusion

We began our analysis on a critical note by contending that many of the arguments for and against the Electoral College suffer from a primarily descriptivist and nontheoretical orientation. They have been responsible for more obfuscation than clarification of the possible consequences that would flow from the abolition of the Electoral College and the substitution of direct popular-vote election of the president in its place.

As a way of making the comparison of alternative electoral systems more rigorous, we assumed at the outset that different electoral systems encourage political actors to seek different goals. By deducing the theoretical consequences that follow from the rational pursuit of these goals, we suggested that the effects of different electoral arrangements—specifically, different vote aggregation procedures—on political behavior could be illuminated.

This approach to the analysis of political behavior in general, and electoral behavior in particular, is still unorthodox in political science, though the recent development of spatial models of party competition provides one example of the power of this approach. Unlike party-competition models, however, which take the positions of candidates on issues as their focus for analysis, we took these positions as given and instead asked how a presidential candidate should allocate his resources to convey as favorable an impression of his positions and personality as possible. We as-

⁴⁷ For a discussion of literature in this area, see Steven J. Brams, "Positive Coalition Theory: The Relationship between Postulated Goals and Derived Behavior," in *Political Science Annual IV: An International Review*, ed. Cornelius P. Cotter (Indianapolis: Bobbs-Merrill Co., 1973), pp. 3-40.

sumed that the favorableness of his image to uncommitted voters in each state would be a function of the amount of resources he allocated to each state, as compared with the amount allocated by his opponent.

Under a system of direct popular-vote election of a president, we postulated that a candidate would seek to maximize his expected popular vote. If this were a candidate's goal, we showed that his optimal minimax strategy would be to allocate his resources in proportion to the number of uncommitted voters in each state. If one candidate deviated from this strategy, and these deviations were known to his opponent, we indicated how this information could be used by the opponent to capitalize on the weaknesses of the candidate who departed from his minimax strategy.

Under the present Electoral-College system, we demonstrated that there is no minimax solution to the resource-allocation problem in pure strategies. We showed, however, that if candidates matched each other's resource expenditures, and if their total resources were the same, then their optimal allocations would be roughly proportionate to the 3/2's power of the electoral votes of each state (subsequently refined to include population). This rule encourages disproportionately large expenditures in the largest states, whose plausibility we demonstrated by showing how the potential voting power of a voter, derived from a measure of his decisiveness, is greater for voters in large states than in small states. We also indicated that the 3/2's allocations are inherently unstable, and we described the most devastating strategy that could be used against them by a candidate who exploits information about his opponent's allocations.

As a test of the models, we compared the 3/2's allocation rule to a proportionate allocation rule based on the electoral votes of each state. Using time as a resource, we operationalized its allocation in terms of the number of campaign appearances of presidential and vice-presidential candidates in each state in the 1960, 1964, 1968, and 1972 presidential election campaigns.

The 3/2's rule proved to be generally superior to the proportionate rule in explaining the time allocations of the candidates. For the upcoming presidential elections in 1976 and 1980, we indicated the 3/2's allocations for all states and electoral and individual biases that these allocations engender in each state. We concluded our analysis with a discussion of both theoretical and empirical limitations and extensions of the models.

We think that probably the most compelling conclusion that emerges from our analysis, at least for noncandidates, does not concern cam-

paign strategy but rather concerns the severely unrepresentative character of presidential campaigns under the Electoral College. By forcing candidates—and after the election, incumbent presidents with an eye on the next election—to pay much greater attention in terms of their allocations of time, money, and other resources to the largest states, the Electoral College gives disproportionate weight to attitudes and opinions of voters in these states. On a per-capita basis, voters in California are 2.92 times as attractive campaign targets as voters in Washington, D.C.; even greater than this ratio of the most extreme individual biases is the most extreme electoral-bias ratio that makes California 8.13 times as attractive per electoral vote as Alaska.

Although no voter today is actually deprived of a vote by the Electoral College, we feel that an aggregation procedure that works to deflate the weight of some votes and inflate the weight of others is clearly in violation of the egalitarian principle of one man, one vote. The reapportionment decisions of the courts since 1962 have upheld this principle, with reapportionment itself obviating the need for an institution with a large-state "urban bias" like the Electoral College to offset the rapidly fading "rural bias" of the House of Representatives. Further, as a procedure that places a premium on gaining information and responding to an opponent's allocations in each state, the Electoral College tends to encourage manipulative strategic calculations for outmaneuvering the opposition in each state that may divert a candidate from seeking broad-based nationwide support.

This is the goal that we believe the electoral system should promote. The Electoral College subverts this goal by giving special dispensation to particular states and, additionally, fostering manipulative strategies in them. As an alternative, we think that direct popular-vote election of the president, which would render state boundaries irrelevant, would encourage candidates to maxi-

mize their nationwide appeal by tying their support directly to potential votes everywhere on a proportionate basis.

To close this analysis on a methodological note, we hardly need indicate that our analytic approach as well as our conclusions are not the usual stuff of conventional democratic theory, whose study is rooted mainly in the traditions of historical inquiry and speculative philosophy. Political theorists have by and large ignored all that smacks of formal analysis and quantitative empirical research. We think this is unfortunate, because questions that relate to such qualities as the representativeness and equality of political institutions, which we have explored in one context, are fundamental to almost all political theory.

We have tried to show that such questions can be fruitfully attacked not just by making endless observations of the workings of political institutions but by assuming that they generate particular forms of political behavior. The theoretical explication of this behavior, we have argued, requires the postulation of goals that motivate rational individuals to act in particular ways as they try to cope with, and benefit from, these institutions. To make sense of their actions in an ever-more complex world necessitates the construction of theoretical models that can help to transform vague insights into coherent and logical explanations that clarify the insights and relate them to each other.

Formal analysis will help to make these explanations more rigorous, but this analysis must be coupled with empirical research that can substantiate the truth of the logical assertions. The most relevant and powerful theory depends on the presence of both ingredients. We hope that our analysis helps to underscore the need for co-operation among theorists and empiricists of different persuasions in the investigation of important theoretical questions in concrete empirical settings.