Electoral Competition with Informed and Uniformed Voters

Author(s): David P. Baron

Source: *The American Political Science Review*, Mar., 1994, Vol. 88, No. 1 (Mar., 1994), pp. 33–47

Published by: American Political Science Association

Stable URL: https://www.jstor.org/stable/2944880

ELECTORAL COMPETITION WITH INFORMED AND UNINFORMED VOTERS

DAVID P. BARON   *Stanford University*

I present a model of electoral competition in which candidates raise campaign contributions by choosing policies that benefit interest groups and then expend those contributions to influence voters who are uninformed about the policies. Informed voters, however, vote based on those policies, so candidates face a trade-off between choosing a policy to generate funds to attract the uninformed vote and choosing a policy to attract the informed vote. Electoral equilibria are characterized for two categories of policies: particularistic and collective. In the case of particularistic policies, the equilibrium policies of the candidates are separated if the proportion of uninformed voters is sufficiently high, and the degree of separation is an increasing function of that proportion. The model is extended to include the public financing of elections and incumbency advantages. For the case of collective policies, the candidates locate at the median of the ideal points of the informed voters, and contributions are zero.

Two characteristics of U.S. elections are the substantial campaign expenditures by candidates and the considerable voter ignorance of both issues and candidate positions on those issues. Some campaign funds are used to cover the costs of staff, transportation, supplies, and additional fundraising, but a major portion of campaign expenditures goes for advertising and other informational activities that may influence or persuade some voters. Electoral competition thus involves candidates who raise campaign contributions from interest groups and individuals through their efforts as well as the positions they take. Those positions also affect the voting of those who are informed about candidate positions.

To investigate the interactions among interest groups and their campaign contributions, candidate positions, and the electorate, two categories of voters are considered: *informed voters* are assumed to know the policy positions of the candidates and vote based on those positions; *uninformed voters* are assumed not to know those positions, and their vote is influenced by campaign expenditures. Campaign contributions thus have a productive role as candidates compete for the uninformed vote by raising contributions from interest groups and others. Those contributions depend on the policy positions candidates choose, and those positions affect the votes of informed voters. To the extent that positions affect voting directly (as well as indirectly through their effect on the raising of campaign funds), candidates face competing incentives to seek the informed and the uninformed votes. Electoral competition is driven by these incentives, and an electoral equilibrium is parameterized by the proportions of informed and uninformed voters.

The median voter theorem (Black 1958) is the basic theory of candidate policy positions in voting institutions. That theorem is based on the assumption that voters are informed about the positions of candidates, and when all voters are informed, campaign

expenditures, if they were to be made, would not affect voting or hence the equilibrium positions of the candidates. McKelvey and Ordeshook (1985) present an alternative theory in which some voters are uninformed and learn how to vote based on information provided in polls. In equilibrium, all voters vote as if they were informed, and candidates choose positions at the median of the voters' ideal points. When voters are not perfectly informed, however, campaign expenditures, as well as polls, are a principal means of influencing voting. As will be indicated, the presence of uninformed voters can cause candidates to separate their policy positions so as to cater to interest groups and thus attract campaign contributions that can be expended to increase the candidate's share of the uninformed vote. Polarization thus can result from the presence of uninformed voters and interest group campaign contributions.

The theory presented here provides a set of testable propositions pertaining to the relationships among a set of endogenous variables (candidate policy positions, campaign contributions by interest groups, and electoral outcomes) and a set of exogenous variables (the proportions of informed and uninformed voters, the amount of public financing, and incumbency advantages). The relationships depend importantly on the nature of the policy dimensions on which the candidates compete. Two types of policies will be considered. The first is a particularistic policy, which provides benefits to particular interest groups and can be denied to noncontributors. To determine whether the presence of uninformed voters affects electoral competition more generally, the second type of policy considered is collective and affects all interest groups regardless of whether they contribute. I shall distinguish in more detail between particularistic and collective policies and their modeling, then introduce the model and address symmetric electoral competition in particularistic policies. I then consider public financing of elections and extend the model to

an election in which one of the candidates has an incumbency advantage. Finally, I consider collective policy positions and discuss the results.

POLICY DIMENSIONS AND CAMPAIGN CONTRIBUTIONS

Candidates compete for votes and campaign contributions on a number of dimensions, four of which may be identified as *constituent services, particularistic policies, collective policies,* and *majoritarian policies*. Majoritarian policies are those in which interest groups and their campaign contributions have no significant effect on the election outcome. They are not considered here. Constituent service activities include services ranging from those associated with pork-barrel projects to obtaining immigration clearance for relatives of constituents. These constituent services are generally such that either candidate is willing to provide them. Either candidate, for example, is likely to be willing to provide assistance, perhaps in response to a campaign contribution, in obtaining a defense contract for a firm located in the district. These constituency service activities are not considered here, since both candidates are willing to provide them. Instead, the focus is on particularistic and collective policy dimensions, which have the property that a candidate is willing to support a policy that benefits one set of interest groups but is unwilling to support a policy that benefits another set of interest groups.

Particularistic and collective policy dimensions are distinguished here by (1) whether the benefits associated with policies can be denied to interest groups that do not contribute and (2) whether those policies impose costs on other interest groups sufficient to cause them to make countervailing campaign contributions. Particularistic policies are those that provide benefits to some interest groups and impose insufficient costs on other interest groups to induce them to make campaign contributions. Particularistic policies may impose costs on unorganized interests, such as consumers or taxpayers, but those costs are assumed to be more concentrated than the costs of taking political action (e.g., by campaign contributions), so the unorganized interests do not make countervailing contributions. Consumers and taxpayers who are informed, of course, vote based on those policies. Collective policies are those which provide significant benefits to some interest groups and impose significant costs on others. Providing benefits to one set of interest groups can thus induce interest groups on the other side to contribute to the other candidate. It is the consequences for organized interest groups— and the campaign contributions those consequences generate—that distinguish particularistic policies from collective policies.
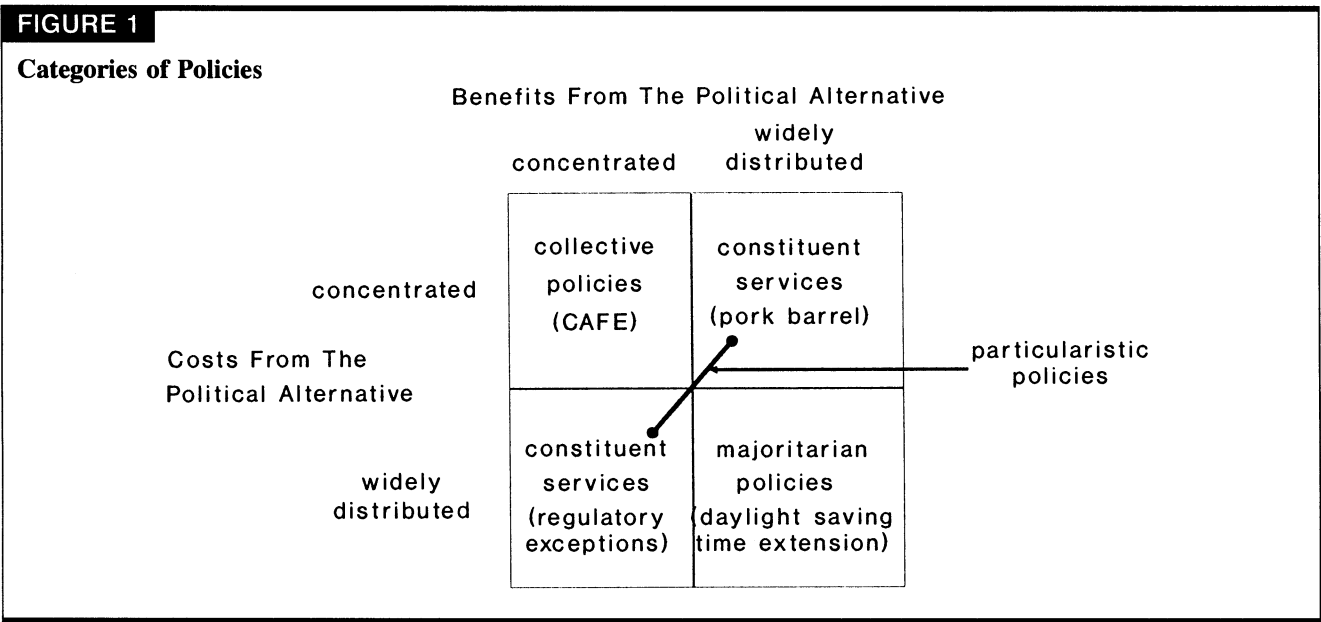
In the model, interest groups on the left of the policy dimension are assumed to be aligned with the candidate of the party on the left and those on the

right with the candidate of the party on the right. In the case of particularistic policies, if the candidate on the left wins the election, the interest groups on the left receive benefits corresponding to that candidate's policy, and the interest groups on the right incur only very small costs. Examples of particularistic policies are special provisions in bills, intervention with the bureaucracy on behalf of the contributor, regulatory exceptions (e.g., an environmental variance), and access to the candidate so that the contributor can present its concerns.[1] In the case of trade policy, a particularistic policy might be a voluntary export restraint that applies only to a specific market or industry and imposes widely distributed costs on other interests, such as consumers. The policy dimension may then be thought of as catering to interest groups, where the candidate on the left caters to interest groups on the left and does not cater to interest groups on the right. For example, a particularistic policy of one candidate of providing a tax break or regulatory exception for small business may not generate contributions to the other candidate by other interest groups. A particularistic policy of providing trade adjustment assistance to labor may not generate contributions by small business to the other candidate. When candidates are willing to cater to any of the interest groups, that is the case of constituency services, which is not considered here.[2]

In the case of a collective policy, if the candidate on the left wins the election, the interest groups on the left receive the benefits and the interest groups on the right incur costs. Such policies are collective because they affect all interest groups in a significant, albeit differentiated, manner. Examples include labor legislation, trade policy that affects both imports and exports, and broad tax policy. The distinction between particularistic policies and collective policies is thus not in terms of the institutional context in which they are provided but, instead, depends on whether a policy that provides benefits to one interest group generates opposition by other interest groups.

The differences among these types of policies are illustrated in Figure 1 in terms of the corresponding distribution of the costs and benefits.[3] A policy dimension that generates both concentrated costs for some interest groups and concentrated benefits for other interest groups is referred to as collective, and each set of interest groups has an incentive to make a contribution to the candidate on its side. An example is corporate average fuel economy standards, which pit automobile manufacturers and the United Auto Workers against environmental interest groups.

In contrast, the lower-right cell of Figure 1 corresponds to alternatives that have widely distributed benefits and costs. Wilson (1980) refers to such policies as majoritarian, and in the context of the model considered here, they correspond to the absence of interest group activity and hence of campaign contributions. An example is the 1986 extension of daylight saving time, which had broad and widely distributed costs and benefits.[4] If the majoritarian policy alterna-

FIGURE 1

Categories of Policies

Benefits From The Political Alternative

	concentrated	widely distributed
concentrated	collective policies (CAFE)	constituent services (pork barrel)
widely distributed	constituent services (regulatory exceptions)	majoritarian policies (daylight saving time extension)

Costs From The Political Alternative

particularistic policies

tive is in a single dimension, the median voter theorem is applicable.

If a policy generates concentrated benefits (costs) and widely distributed costs (benefits), taking action to obtain those benefits (reduce the costs) will generate little opposition. When either candidate is willing to provide those benefits, the policy can be thought of as constituent services. Delivering pork, assisting with immigration problems, and seeking exceptions to regulations are in this category.

Particularistic policies can be thought of as a pattern of providing such services to particular sets of interest groups. The diagonal line in Figure 1 is intended to illustrate a dimension of electoral competition in which (1) concentrated benefits are provided by one candidate to one set of interest groups and widely distributed costs are borne by others (e.g., consumers and taxpayers) and (2) concentrated benefits are provided by the other candidate to another set of groups, with that provision also generating widely distributed consequences for consumers and taxpayers. These policies may be thought of as catering to interest groups on the left of the policy dimension by the candidate on the left and to interest groups on the right by the candidate on the right. This catering is assumed to be observable to informed voters who have preferences over which interest group the candidates cater to. In this case, the candidate on the right can compete for the informed vote by moving to the left, but the interest groups on the right will then contribute less because that candidate is not catering as much to their interests.

Particularistic and collective policies are modeled differently in accord with these distinctions. For particularistic policies, the campaign contributions of an interest group are a function only of the policy of the candidate who caters to that interest group, since the policy does not have a sufficient impact on other interest groups to cause them to contribute to the

other candidate. For collective policies, campaign contributions of interest groups depend on the policies of both candidates, since concentrated benefits and costs are imposed by whichever candidate wins.

In the literature, models assume a correspondence between particularistic and collective policies and whether the benefits can be denied by a candidate. In the model considered here, particularistic policies can be denied to an interest group by a candidate, whereas a collective policy affects all interest groups regardless of whether a contribution is made. A contribution can be denied in either of two conditions: (1) if no contribution is made or (2) if contributions are made to both candidates. In models of campaign contributions and electoral competition, this distinction is often reflected in the formulation of the model. In the case of particularistic policies, the interest groups are typically assumed to take the probability of a candidate winning as given, rather than as a function of their own contributions. A rational expectations condition is then used to close the model. In the case of collective policies, interest groups are typically assumed to act as if their contributions affect the probability of winning.

In the literature, Hinich and Munger (1989), Morton and Cameron (1991), Snyder (1990a and b) and I (Baron 1989a and b) consider either constituent services or particularistic policies. Denzau and Munger (1986) consider a nonelectoral model in which particularistic policy services in the form of the allocation of a legislator's effort are provided to elicit contributions from interest groups.[5] Austen–Smith (1987), Brock and Magee (1978), Cameron and Enelow (1989), and Edelman (1990) consider models of electoral competition in collective policies. Some models accommodate aspects of both particularistic and collective policies (Baron and Mo 1993; Londregan and Romer 1993; Magee, Brock, and Young 1989, 248–50).

35

THE MODEL

The model is formulated in a parsimonious manner to highlight the incentives underlying electoral competition as structured by the presence of informed and uninformed voters and the opportunity to generate campaign contributions. To investigate these interactions, the model focuses on candidate competition for votes, rather than on competition for interest groups. Each candidate is thus assumed to be aligned with a set of interest groups.[7] Although the number of interest groups aligned with each candidate is not affected by the choice of positions, the campaign contributions that they receive depend on those positions. Those positions also affect the votes of informed voters. Uninformed voters, however, are influenced only by campaign expenditures. To expose the electoral incentives, campaign contributions by individuals are assumed to be zero. Since the qualitative properties of the electoral equilibrium when individuals make contributions are similar, only the incentives that those contributions create are discussed.

Electoral competition takes place on a number of policy dimensions, but to simplify the model, policies are assumed to be one-dimensional. As indicated, the interpretation of the policy dimension depends on the nature of the policy in question. In the case of particularistic benefits, the policy dimension can have two interpretations. The first corresponds to a general left–right spectrum in which policies on the left provide benefits to interest groups on the left without imposing substantial costs on interest groups on the right.[8] Policies on the right have an analogous interpretation. This policy dimension is thus best thought of as a *catering dimension*, with policies on the left corresponding to catering to interest groups on the left and policies on the right corresponding to catering to interest groups on the right. The location of interest groups on this dimension is consistent with the results of Poole and Romer (1985), who find that interest groups can be arrayed on one dimension and are located at the extremes of that dimension relative to candidate positions.

The second interpretation is that candidates choose positions in different policy dimensions. One candidate chooses a position to cater to one set of interest groups, and the other candidate chooses a position on another policy dimension to cater to a different set of interest groups. The two sets of interest groups could, for example, be those aligned with the parties of the candidates.

With either interpretation, candidate 1 is assumed to choose a position $p_1 \in [0, 1/2]$, and candidate 2 is assumed to choose a position $p_2 \in [1/2, 1]$.[9] The policy position of a candidate is assumed to be meaningful in the sense that the winner will pursue that policy in the legislature. The legislative process is not modeled, but electoral positions would be expected to be correlated with legislative efforts.[10]

A continuum of voters is assumed, with the total number of voters normalized to one. Voters are assumed to be of one of two types. A proportion k of the voters is uninformed about the policy positions of the candidates, and a proportion $1-k$ of the voters is perfectly informed about those positions. Informed voters are assumed to understand the positions of the candidates in terms of whose interests the candidates are serving and the policy positions that they will work to implement. Informed voters have preferences over which interests are served by the candidates; hence their preferences depend on the policy positions of the two candidates. The electoral incentives resulting from the presence of informed voters are the same as those underlying the median voter theorem and lead toward convergence of the candidate positions to the median of the informed voters. The median informed voter can be thought of as preferring that the candidates cater to interest groups located at the center of the policy space. In the terminology of Cox (1990), the presence of informed voters creates *centripetal incentives* for the candidates.

Informed voters include those who are members of interest groups and those who are not. The preferences of those informed voters who are not members of interest groups are represented by a quadratic utility function with an ideal point x_j for voter j. Informed voters are uncertain about how the uninformed voters will vote and hence are uncertain about the election outcome. The beliefs of informed voter j about the likelihood that candidate 1 will win is denoted by w_{j1}. The expected utility $u_j(p_1, p_2)$ of an informed voter who is not a member of an interest group is thus

$$u_j(p_1, p_2) = -w_{j1}(p_1 - x_j)^2 - (1 - w_{j1})(p_2 - x_j)^2,$$

where p_i is implemented if candidate i wins. The informed voter will vote for the candidate whose position is closer to his or her ideal point, so those with ideal points to the left (right) of the midpoint $m = (p_1 + p_2)/2$ of the policy positions will vote for the candidate on the left.

Informed voters who are members of interest groups are assumed to have ideal points on the same side of the median of the policy space. A member j of interest group k receives benefits b_{jk} if that interest group is catered to by the winning candidate.[11] The interest group may also assess its members an amount d_{jk}, and the members of the interest group may be thought of as those who have benefits that are at least as great as the assessment. The expected utility of an informed voter who is a member of interest group k is specified as

$$u_j(p_1, p_2) = -w_{j1}(p_1 - x_j)^2$$

$$- (1 - w_{j1})(p_2 - x_j)^2 + (w_{j1}b_{jk} - d_{jk}),$$

where the last term is the expected benefits from membership in the interest group. The voter then will vote for the candidate on the left if and only if

$$2(p_1 - p_2)[x_j - m] + b_{jk} \geq 0. \tag{1}$$

To simplify the analysis, the ideal points of both the informed voters who are and are not in interest groups are taken to be uniformly distributed over the policy set $P = [0, 1]$. A proportion α of the informed voters are assumed to be members of interest groups, and their vote depends on the distribution of benefits, as indicated in equation 1. All members of interest group k with ideal points to the left of the midpoint m will vote for the candidate on the left when m is to the left of the median $\mu = 1/2$ of the ideal points of the informed voters. Rather than specifying how the benefits b_{jk} are distributed within an interest group, a proportion ρ_l of those voters with ideal points in $(m, \mu]$ will be assumed to vote for candidate 1. If m is to the right of the median, all interest group members with ideal points to the left of the median vote for candidate 1 and a ρ_r proportion of those with ideal points in (μ, m) are assumed to vote for candidate 1. The number of informed voters who vote for candidate 1 is thus

$$(1 - \alpha)m + \alpha(m + \rho_l(\mu - m)) \quad \text{if} \quad m < \mu$$

and

$$(1 - \alpha)m + \alpha(\mu + \rho_r(m - \mu)) \quad \text{if} \quad m > \mu.$$

To simplify the analysis further, half the voters in the intervals (m, μ) and (μ, m) will be assumed to vote for candidate 1, so $\rho_l = \rho_r = 1/2$. Candidate 1 thus receives s_1 of the informed vote, where

$$s_1 = m + \frac{\alpha}{2} (\mu - m). \tag{2}$$

Uninformed voters are ignorant of the positions of the candidates, and their votes are assumed to be influenced by the messages they receive during the election campaign. Those messages may, for example, provide nonpolicy information about the candidates. These messages are funded by campaign expenditures, which are assumed to persuade uninformed voters to be more likely to vote for the candidate making the expenditure. How the uninformed voters will actually vote is uncertain, so let $\tilde{\nu}$ be a random variable representing the proportion of the uninformed voters who vote for candidate 1. The probability W_1 that candidate 1 wins then is

$$W_1 = Pr\left(k\tilde{\nu} + (1 - k)s_1 \geq \frac{1}{2} \,|\, C_1, C_2 \right)$$

$$= G\left(\frac{1}{2k} - \frac{1 - k}{2k} \, s_1 \,|\, C_1, C_2 \right),$$

where C_1 and C_2 are the campaign expenditures of candidates 1 and 2, respectively, and G is the complement of the distribution function of $\tilde{\nu}$. The probability W_1 is assumed to be increasing in candidate 1's expenditures C_1 and decreasing in candidate 2's expenditures C_2.

The specific functional form of G depends on the theory used to represent how uninformed voters

decide to vote. Such theories include those based on probabilistic voting (e.g., Austen-Smith 1987; Hinich 1977) and Luce's (1959) theory of choice under incomplete information. A micromodel of how uninformed voters decide to vote will not be presented. Instead, the probability of winning will be specified in a manner intended to expose the incentives in the electoral competition and allow a closed-form characterization of equilibria. The probability W_i of candidate i's winning is specified as

$$W_1 = k \frac{C_1}{C_1 + C_2} + (1 - k)\left(m + \frac{\alpha}{2} (\mu - m) \right) \tag{3}$$
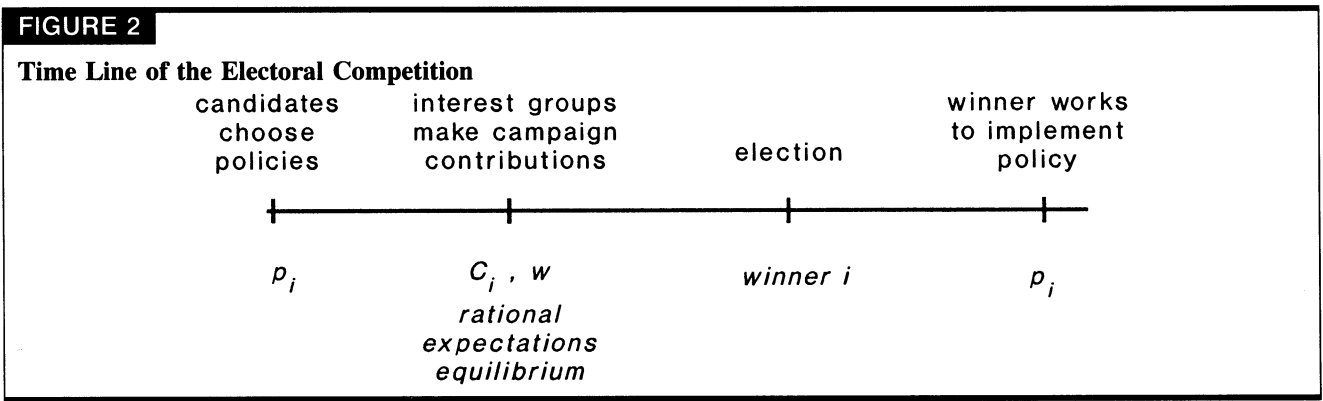
and

$$W_2 = k \frac{C_2}{C_1 + C_2} + (1 - k)\left(1 - \left(m + \frac{\alpha}{2} (\mu - m) \right) \right). \tag{4}$$ [12]

The first term in equation 3 represents the effect on the probability of winning of the uninformed vote for candidate 1,[13] and the second term is the effect of the informed vote from (2) for that candidate. The first terms in equations 3 and 4 are frequently used specifications in both the empirical and theoretical literature. Jacobson (1987) and Snyder (1990a and b) use this specification in empirical studies, and Snyder (1989) and I (Baron 1989a and b) use it in theoretical studies. It may be derived from axiomatic theories of (partially) uninformed voting (as presented by Luce) or from theories of probabilistic voting.[14]

ELECTORAL COMPETITION IN PARTICULARISTIC POLICY POSITIONS

In the case of particularistic policies, the policy p_1 of candidate 1 generates contributions from the interest groups aligned with candidate 1, and the policy p_2 of candidate 2 generates contributions from the interest groups aligned with candidate 2. The interest groups are assumed to be of the investment type and to make their contribution based on the return they can expect from their contribution.[15] The benefits—and thus the contributions—depend on the policy, and since the benefits can be denied if the interest group does not contribute, the interest groups and candidates can be thought of as bargaining over the contribution (Baron and Mo 1993). Since the benefits and the contributions depend on the policy, they represent a demand to pull the policy of a candidate toward that desired by the interest groups. Campaign contributions create what Cox (1990) calls *centrifugal incentives*, which are in opposition to the centripetal incentives created by the presence of informed voters.

The benefits to interest group k aligned with candidate i are denoted $b_k(p_i)$, and the total benefits provided by the catering of candidate i are $B_i(p_i) = \Sigma_k b_k(p_i)$. The benefits are provided only if the candidate to whom the contribution is made wins the election, so interest groups discount the benefits by

FIGURE 2

Time Line of the Electoral Competition

candidates choose policies — interest groups make campaign contributions — election — winner works to implement policy

p_i — C_i, w — winner i — p_i

rational expectations equilibrium

the probability of winning. Interest groups are assumed to have beliefs w about the probability that candidate 1 will win. Since there are many interest groups, their beliefs are assumed to be independent of the contribution they make. In equilibrium, those beliefs must be rational, so w must equal the actual probability of winning W_1.

The assumption that the beliefs of interest groups are independent of their own contribution is consistent with the limits on campaign contributions and with some empirical results. Snyder (1990a and b) tests a model based on this assumption and finds that the data support the model. Chappell (1982) finds that the probability of winning does not respond significantly to an individual contribution. The assumption that interest groups take the probability of winning as given requires only a weak informational assumption, since interest groups only need to base their beliefs on publicly available information. For example, the beliefs w can be based on polls.

The bargaining between candidate 1 and interest groups can be thought of as resulting in contributions equaling some share of the aggregate expected benefits $wB_1(p_1)$. To facilitate a closed-form characterization of an equilibrium, the aggregate contributions C_1 are specified as a linear function:

$$C_1 = w(z_1 - p_1). \qquad (5)$$

Similarly, the contributions to candidate 2 are specified as

$$C_2 = (1 - w)(z_2 - (1 - p_2)), \qquad (6)$$

where z_i is a parameter that is assumed to satisfy $z_i \geq 1/2$, $i = 1, 2$, so that contributions are nonnegative.[16] The specifications in equations 5 and 6 indicate that candidates raise more contributions, the more they cater (lower p_1, higher p_2) to interest groups.[17] This is consistent with Poole and Romer's study of interest group locations.

Figure 2 presents the time line of the electoral competition. Candidates move first by choosing positions, then interest groups make contributions, the election is held, and the policy of the winner is implemented. To focus on the relations among policy positions, voters, and campaign contributors (and not on the policy preferences of candidates) candi-

dates are assumed to maximize their probability of winning the election. An equilibrium (p_1^*, p_2^*, w^*) is thus policy positions and beliefs such that given the equilibrium beliefs of interest groups and the policy position of the other candidate, each candidate's policy maximizes his or her probability of winning. Given those policies, the equilibrium beliefs must agree with the actual probability of winning W_1.

A candidate chooses a policy to maximize his or her probability of winning, taking the policy of (and thus the contributions to) the other candidate as given, as well as taking interest group beliefs w as given. Candidate 1 thus chooses p_1 according to[18]

$$\max_{p_1} W_1 = k \frac{w(z_1 - p_1)}{w(z_1 - p_1) + C_2}$$
$$+ (1 - k)\left(\frac{p_1 + p_2}{2} + \frac{\alpha}{2}\left(\frac{1}{2} - \frac{p_1 + p_2}{2}\right)\right).$$

The necessary optimality conditions for interior optima ($p_1 \in (0, 1/2), p_2 \in (1/2, 1)$) for the two candidates are

$$-\frac{kwC_2}{(C_1 + C_2)^2} + \frac{(1 - k)(2 - \alpha)}{4} = 0 \qquad (7)$$

and

$$\frac{k(1 - w)C_1}{(C_1 + C_2)^2} - \frac{(1 - k)(2 - \alpha)}{4} = 0, \qquad (8)$$

respectively. These conditions are also sufficient, since the probabilities of winning are strictly concave functions of the candidate's own policy and are strictly convex in the policy of the other candidate.

The conditions in equations 7 and 8 reflect the centripetal and centrifugal incentives. The first term in equation 7 is the centrifugal incentive to move away from the median so as to increase campaign contributions that can be expended to obtain the votes of uninformed voters. The second term in equation 7 is the incentive to move toward the median to obtain a greater share of the informed vote.

These two conditions imply that

$$wC_2 = (1 - w)C_1. \qquad (9)$$

Using equation 9 in equations 7 and 8 yields, for $k < 1$,

$$p_1 = z_1 - \frac{4kw(1 - w)}{(1 - k)(2 - \alpha)} \qquad (10)$$

and

$$p_2 = 1 - z_2 + \frac{4kw(1 - w)}{(1 - k)(2 - \alpha)}. \qquad (11)$$

To close the model, substitute equations 10 and 11 into equation 3 and use the rational expectations condition $W_1 = w$ to obtain for an interior equilibrium

$$w = kw + (1 - k)\left(\frac{1 + z_1 - z_2}{2} + \left(\frac{\alpha}{2}\right)\frac{z_2 - z_1}{2}\right).$$

This implies that the equilibrium probability of winning is

$$w^* = \frac{1}{2} + \frac{z_1 - z_2}{4}(2 - \alpha), \qquad (12)$$

for those (z_1, z_2) such that $w^* \in [0, 1]$. If $z_1 = z_2 = z$ so that the interest groups aligned with each candidate have symmetric demands for particularistic policies, the probability of winning is $w^* = 1/2$. If $z_1 > z_2$, candidate 1 is aligned with the higher-demand interest groups and thus has an interest group advantage. In equilibrium, that candidate is the more likely to win. The probability of winning is independent of the proportion of uninformed voters regardless of the interest group advantage.

The equilibrium policies for an interior equilibrium characterized by equations 10 and 11 are given by

$$p_1^* = z_1 - \frac{k}{(1 - k)(2 - \alpha)}\left(1 - (z_1 - z_2)^2\left(\frac{2 - \alpha}{2}\right)^2\right) \qquad (13)$$

and

$$p_2^* = 1 - z_2 + \frac{k}{(1 - k)(2 - \alpha)}$$

$$\cdot \left(1 - (z_1 - z_2)^2\left(\frac{2 - \alpha}{2}\right)^2\right). \qquad (14)$$

At an interior equilibrium, the policies satisfy

$$p_1^* + p_2^* = 1 + z_1 - z_2. \qquad (15)$$

If $z_1 = z_2$, equation 15 implies that the policies are symmetric about the median. If $z_1 > z_2$, candidate 1 is aligned with higher-demand interest groups and chooses a policy closer to the median than does candidate 2. The candidate with the higher-demand interest groups is more likely to win and can afford to sacrifice some contributions by moving closer to the median to attract more informed voters. As will be indicated, the equilibrium campaign contributions may also increase even though the candidate caters less to interest groups.

FIGURE 3

Equilibrium Positions
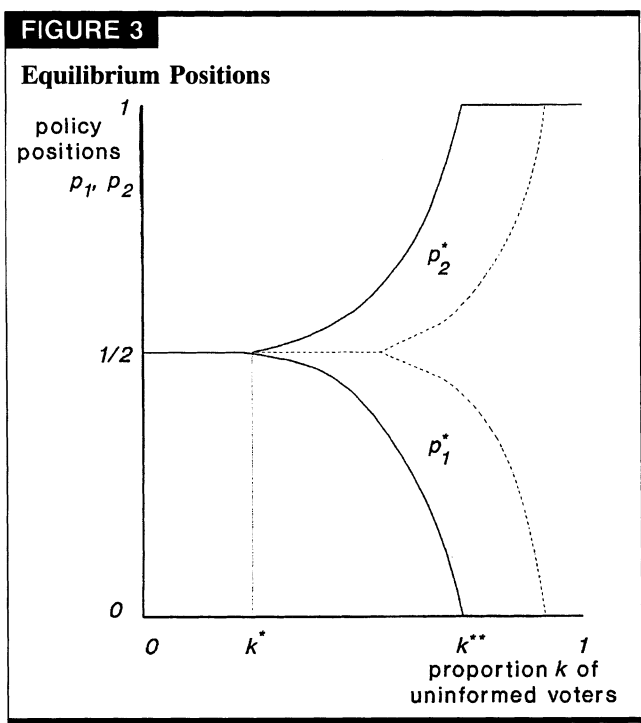
The equilibrium policies thus reflect the two incentives. The centripetal incentives underlying the median voter theorem induce candidates to choose policies closer to the median, so as to increase their share of the informed vote. The presence of uninformed voters, however, creates a centrifugal incentive to raise campaign contributions, and those contributions are greater the closer the policy is to that preferred by the interest groups. The equilibrium positions balance the response to these two incentives, taking into account the position of the other candidate.

These incentives depend on the proportion of informed voters. Figure 3 illustrates the equilibrium positions for the symmetric case in which $z_1 = z_2 = z$. The higher the fraction k of uninformed voters the stronger is the incentive to obtain campaign contributions, and the candidates respond by choosing policies (weakly) closer to the policies preferred by the interest groups. Consequently, the higher the proportion of uninformed voters, the more the candidates cater to interest groups and the more divergent are their policies.

If the proportion of uninformed voters is sufficiently low, that is

$$k \leq k^* \equiv 1 - \frac{2}{2 + (2 - \alpha)(2z - 1)},$$

the incentives that underlie the median voter theorem are sufficiently strong that both candidates choose positions at the median. It is not necessary that $k = 0$ for these incentives to dominate. As the proportion k of uninformed voters increases for

$$k \in \left(k^*, k^{**} \equiv \frac{(2 - \alpha)z}{1 + (2 - \alpha)z} \right),$$

the candidates' equilibrium policies move toward those preferred by the interest groups, reflecting the higher electoral productivity of contributions. For $k \geq k^{**}$, the incentive to raise contributions dominates, and the candidates are fully responsive to the preferences of the interest groups.

The equilibrium policies also depend on the interest groups' valuations, z_1 and z_2.[19] For the symmetric case, an increase in z shifts the policies in Figure 3 to the right, indicating that candidates cater less to interest groups, the more valuable their policies are to those groups. That is, the more valuable the catering is to the interest groups, the easier it is to raise campaign contributions, and the candidate can afford to move toward the median. Higher-demand interest groups thus strengthen the centripetal incentive to move toward the median to attract a higher share of the informed vote.[20] Hence, the higher the demand of interest groups for particularistic policies the less responsive, and more independent, are the candidates to interest group preferences.

The higher the proportion α of informed voters who are members of interest groups, the (weakly) farther from the median the equilibrium positions are. A higher proportion of interest group members decreases the centripetal incentives because it is easier to obtain their votes; hence, candidates compete less hard for the informed vote and cater more to the interest groups, so as to generate greater contributions.

The contributions generated in an interior equilibrium ($k \in (k^*, k^{**})$) are

$$C_1^* = \frac{k}{16(1 - k)(2 - \alpha)} (2 + (z_1 - z_2)(2 - \alpha))^2$$

$$\cdot (2 - (z_1 - z_2)(2 - \alpha)) \quad (16)$$

$$C_2^* = \frac{k}{16(1 - k)(2 - \alpha)} (2 + (z_1 - z_2)(2 - \alpha))$$

$$\cdot (2 - (z_1 - z_2)(2 - \alpha))^2. \quad (17)$$

The contributions in equations 16 and 17 are strictly increasing functions of k. Campaign contributions are greater, the higher the proportion of uninformed voters, because campaign expenditures are more productive. Candidates thus have stronger incentives to compete for the uninformed vote by catering more to the interest groups. For the symmetric case, the contributions are independent of the valuation parameter z. In the asymmetric case, the contributions to the candidate with the higher-demand interest groups are increasing in z_i for

$$z_i < z_j + \frac{4}{3(2 - \alpha)}, \quad j \neq i.[21]$$

In an interior equilibrium, the contributions satisfy equation 9, which implies that the ratio of the contributions equals the odds ratio for the election, that is,

$$\frac{C_1^*}{C_2^*} = \frac{w^*}{1 - w^*}. \quad (18)$$

Consequently, even though the candidates compete for the informed vote, the odds of candidate 1 winning equal the ratio of the contributions. The prediction in equation 18 involves two endogenous variables and has been tested by Snyder (1990a and b). His results support the prediction. Proposition 1 summarizes these results.

PROPOSITION 1. *An interior equilibrium is characterized by equations 12–14: (a) The equilibrium probability of winning is (weakly) greater for the candidate with the interest group advantage, that is, the one aligned with interest groups that have the higher valuations of the particularistic policies.*

(b) *As the proportion of uninformed voters increases, the equilibrium policies diverge and move (weakly) away from the median.*

(c) *As the symmetric valuation $z_1 = z_2 = z$ increases, the equilibrium policies move (weakly) toward the median, since the candidates find it easier to raise contributions and need less to cater to interest groups.*

(d) *The higher is the proportion α of informed voters who are members of interest groups, the more the candidates cater to the interest groups by choosing positions (weakly) farther from the median.*

(e) *In an interior equilibrium, campaign contributions are a strictly increasing function of the proportion of uninformed voters and for $z_1 = z_2$ are a strictly increasing function of the proportion α of informed voters who are members of interest groups.*

(f) *The (interior) equilibrium probability of winning is independent of the proportion of uninformed voters.*

(g) *In an interior equilibrium, the ratio of the contributions equals the odds ratio for the election.*

PUBLIC FINANCING OF ELECTIONS

At the federal level, public financing is limited to the presidential election, although broader public financing is considered regularly in Congress. This section investigates the effect of that financing and shows that the probability of winning becomes (weakly) closer to one-half. Public financing of elections thus makes the election closer. This results because public financing mitigates the interest group advantage of a candidate.

If the government provides a lump sum a to each candidate, the interior equilibrium (p_1^+, p_2^+, w^+) satisfies

$$p_1^+ = z_1 + \frac{a}{w^+} - \frac{4k}{(1 - k)(2 - \alpha)} (w^+(1 - w^+)), \quad (19)$$

$$p_2^+ = 1 - z_2 - \frac{a}{1 - w^+} + \frac{4k}{(1 - k)(2 - \alpha)} (w^+(1 - w^+)),$$

$$(20)$$

and

$$w^+ = \frac{1}{2} + \frac{2 - \alpha}{4} (z_1 - z_2) + \frac{a(1 - 2w^+)}{w^+(1 - w^+)}. \quad (21)$$

Note that $z_1 > z_2$ implies that $w^+ > 1/2$.
The following results then obtain.

PROPOSITION 2. a) In an interior equilibrium, higher levels of public financing result in particularistic policies closer to the median, so that candidates cater less to interest groups and compete harder for the informed vote (in this sense, public financing offsets voter ignorance); b) the (interior) equilibrium probability of winning is independent of the proportion k of uninformed voters; and c) public financing of elections has an "underdog property," since an increase in public financing increases the probability of winning of the candidate with the lower probability of winning—that is,

$$\frac{dw^+}{db} < (=)(>) 0 \quad \text{if} \quad w^+ > (=)(<) \frac{1}{2}.$$

The probability w^+ of winning thus is weakly closer to one-half with public financing than the probability w^* without that financing; that is,

$$z_1 > z_2 \rightarrow w^* > w^+ > \frac{1}{2}$$

$$z_1 < z_2 \rightarrow \frac{1}{2} > w^+ > w^*$$

$$z_1 = z_2 \rightarrow w^* = w^+ = \frac{1}{2}.$$

This underdog property holds for both interior equilibria and equilibria with both policies at the extremes or at the median. Public financing thus results in closer elections by mitigating, but not overturning, the interest group advantage (e.g., $z_1 > z_2$) of a candidate.

Proof. The proofs of Proposition 2a and b are immediate from equations 19–21. As for 2c, subtracting the probability w^* in equation 12 from equation 21 yields

$$w^+ - w^* = \frac{a(1 - 2w^+)}{2w^+(1 - w^+)}.$$

Thus, the sign of $w^+ - w^*$ is the same as the sign of $(1 - 2w^+)$; and the result follows.   Q.E.D.

Public financing of elections thus results in closer elections and in less catering to interest groups. In terms of electoral incentives, public financing weakens the centrifugal incentive to provide particularistic benefits to interest groups and strengthens the centrifugal incentive to compete for the informed vote.

These results support the conventional wisdom that public financing of elections allows candidates to be more independent of interest groups.

Campaign contributions by interest groups are decreasing in a, but total contributions $C_1^+ + C_2^+ + 2a$ are increasing in a, since at an interior equilibrium

$$\frac{d(C_1^+ + C_2^+ + 2a)}{da} = \frac{4k}{(1 - k)(2 - \alpha)} (1 - 2w^+) \frac{dw^+}{da},$$

and the sign of dw^+/da is the same as the sign of $(1 - 2w^+)$. These results are summarized in a formal proposition.

PROPOSITION 3. Public financing of elections results in higher total campaign expenditures, and the expenditures are increasing in the proportion k of uninformed voters.

Individuals, rather than interest groups or government, make the bulk of the campaign contributions. Individual contributions affect the incentive to raise contributions from interest groups and hence affect the policy positions of the candidates and the total contributions generated in the election. In a model in which each informed voter not a member of an interest group is assumed to make a contribution to the candidate with the closer policy position, the equilibrium policy positions are weakly closer to the median, as with public financing (Baron 1992). For symmetric equilibria, policy positions are closer to the median with individual contributions than with public financing, because candidates have an additional centripetal incentive to compete not only for the votes of the informed voters but also for their campaign contributions. Indeed, in contrast to public financing, total campaign contributions are decreasing in the amount of individual contributions, since interest groups decrease their contributions at a faster rate than individual contributors increase theirs. Individual contributions thus decrease the dependence of candidate on interest groups more effectively than does public financing. Individual contributions, however, suffer from the free-rider problem.

INCUMBENCY ADVANTAGES

This model is electorally symmetric in the sense that neither candidate has an a priori advantage in the electorate. The model thus may be thought of as corresponding to an open-seat election. If one of the candidates is an incumbent, however, symmetry is not a good assumption. Incumbents have a variety of advantages, two of which are considered here.

One incumbency advantage arises from how much interest groups value the policy efforts of the candidates. A candidate with seniority may have more influence in the legislature and thus be more likely to be successful in legislative matters. In that case, the valuations of their policy efforts by interest groups would satisfy $z_1 > z_2$. As indicated, the policy p_1^* in equation 13 is strictly increasing in z_1, as is the equilibrium probability w^* in equation 12. The incum-

bent then has a higher probability of winning because he or she can afford to be more independent of interest groups, since those groups value the policy more highly. The incumbent is thus more responsive to the informed voters and chooses a policy closer to the median than does the challenger. Challengers cater more to interest groups than do incumbents, and incumbents are more independent of interest groups. If the incumbency advantage increases with seniority, then, over time, an incumbent caters less to interest groups.

Other sources of incumbency advantage are party identification and name recognition, which might, for example, come from past campaigns or the use of franking privileges. In the context of the model, these advantages do not affect the informed voters, who continue to vote according to the positions of the candidates, but do affect the uninformed voters. The simplest representation of this advantage is to specify the probability of candidate 1 winning as[22]

$$W_1 = k \frac{\beta w(z_1 - p_1)}{\beta w(z_1 - p_1) + C_2}$$
$$+ (1 - k)\left(\frac{p_1 + p_2}{2} + \frac{\alpha}{2}\left(\frac{1}{2} - \frac{p_1 + p_2}{2}\right)\right), \quad (22)$$

where candidate 1 is assumed to be the incumbent and $\beta > 1$ parameterizes the incumbency advantage.

For an interior equilibrium, the following results obtain:

$$p_1 = z_1 - \frac{4kw(1 - w)\beta}{(1 - k)(2 - \alpha)(w\beta + (1 - w))^2}$$

$$p_2 = 1 - z_2 + \frac{4kw(1 - w)\beta}{(1 - k)(2 - \alpha)(w\beta + (1 - w))^2}$$

$$p_1 + p_2 = 1 + z_1 - z_2$$

$$C_1 = \frac{4kw^2(1 - w)\beta}{(1 - k)(2 - \alpha)(w\beta + (1 - w))^2} \quad (23)$$

$$C_2 = \frac{4kw(1 - w)^2\beta}{(1 - k)(2 - \alpha)(w\beta + (1 - w))^2} \quad (24)$$

$$W_1 = k \frac{w\beta}{w\beta + (1 - w)}$$
$$+ (1 - k)\left(\frac{\alpha}{4} + (2 - \alpha)\left(\frac{1 + z_1 - z_2}{2}\right)\right). \quad (25)$$

The rational expectations condition $W_1 = w^*$ yields

$$w^* = \frac{1}{2(\beta - 1)}(1 - k\beta - (\beta - 1)\eta$$
$$+ \sqrt{(1 - k\beta - (\beta - 1)\eta)^2 + 4(\beta - 1)\eta}),$$

where

$$\eta \equiv \frac{1 - k}{4}(\alpha + (2 - \alpha)(1 + C - z_2)).$$

Since in equation 25,

$$\frac{w\beta}{w\beta + (1 - w)} > w,$$

the equilibrium probability of winning satisfies $w^* > 1/2$ when $\beta > 1$ and $z_1 \geq z_2$. In equilibrium, the incumbent is thus the more likely to win.

The equilibrium w^* is a strictly increasing, strictly concave function of β, so a greater incumbency advantage results in a higher probability of winning. The probability of winning is strictly increasing in z_1 and strictly decreasing in z_2, so a greater interest group advantage results in a higher probability of winning. If there is no interest group advantage, the probability of winning is constant in the common valuation z. The equilibrium probability w^* is a decreasing function of the proportion α of informed voters who are members of interest groups as long as the challenger does not have a substantial interest group advantage; that is, $1/2 < z_2 - z_1$. In contrast to the case with no incumbency advantage, the equilibrium probability of winning is a strictly decreasing function of the proportion of uninformed voters. This results because the challenger can compete more effectively the more productive his or her campaign expenditures are.

To investigate the effect of the incumbency advantage β on candidate positions, consider the case in which $z_1 = z_2 = z$. The policy positions then are symmetric, and as a function of β, those positions respond as

$$\frac{dp_1^*}{d\beta} = \left(\frac{4k}{(1 - k)(2 - \alpha)}\right)$$
$$\left(\frac{w^*\beta - (1 - w^*)}{(w^*\beta + 1 - w^*)^3}\right)\left[\beta \frac{dw^*}{d\beta} + w^*(1 - w^*)\right]$$

and

$$\frac{dp_2^*}{d\beta} = -\frac{dp_1^*}{d\beta}.$$

An incumbency advantage implies that $w^* > 1/2$; and since $\beta > 1$, the term $(w^*\beta - (1 - w^*))$ is positive, and so is $dp_1^*/d\beta$. A greater incumbency advantage increases the incumbent's share of the uninformed vote, and the incumbent moves toward the median to capture more of the informed vote. The challenger also moves toward the median because contributions are less productive as a result of the advantage of the incumbent.

The ratio of the equilibrium campaign contributions in equations 23 and 24 continues to equal the odds ratio for the election as in equation 18. The contributions C_1^* and C_2^* are strictly increasing and convex in the proportion k of uninformed voters, as in the case in which there is no incumbency advan-

tage. Total contributions, however, are strictly decreasing in β. Campaign contributions are thus greater in closer elections (β close to 1) than in elections in which a candidate has a substantial incumbency advantage.

The following proposition summarizes these results.

PROPOSITION 4. *The probability of the incumbent winning is a strictly increasing function of his or her incumbency advantage and interest group advantage and a strictly decreasing function of the proportion of uninformed voters. The particularistic policy of the incumbent is closer to the median, the greater the incumbency advantage, and the challenger also moves closer to the median. Campaign contributions are decreasing in the incumbency advantage and are increasing in the proportion of uninformed voters. Total contributions are higher, the closer the election.*

COLLECTIVE POLICIES

Collective policies differ from particularistic policies because they cannot be denied to an interest group that does not contribute to a candidate. In addition, collective policies affect all the interest groups, so the contributions by an interest group depend on the policies of both candidates. The policy in this case can be thought of as the scale of a public good provided. For the case of collective policies and informed voters, the median voter theorem implies that candidates choose policy positions at the median. I shall investigate whether this result is robust with respect to the presence of uninformed voters.

Since the collective policy of the winner will be implemented regardless of whether an interest group makes a contribution, the fundamental issue is why an interest group would contribute. Indeed, if an interest group takes the probability of winning as given, there is no reason to contribute. For this reason, models involving collective policies typically make the assumption that the interest group can affect the probability of winning. I shall thus consider the case in which each interest group explicitly takes into account how its contribution affects, at the margin, the probability of winning. Instead of the candidate and the interest groups bargaining over the contribution to be made, each interest group chooses its contribution, taking as given the policies of the candidates. For interest groups to be able to do so, they must know the functional relation between their contribution and the probability of winning. This requires that they have information about the aggregate contributions of other interest groups to the candidates, which is a strong informational assumption.[23] Even with this assumption, for the specifications used earlier, both candidates choose policies at the median and are unable to generate any contributions.

For interest group j, the expected net benefits D_j

from contributions c_{ij} to candidate i, $i = 1, 2$, are specified as

$$D_j = W_1 \eta (z_1 - p_1) + (1 - W_1) \eta (z_1 - p_2) - c_{1j} - c_{2j},$$
$$(26)$$

where η, $\eta > 0$, is a parameter and W_1 is given in equation 22.[24] The interest groups are assumed to take the positions of the candidates and the contributions of the other interest groups as given when they make their contributions. It is straightforward to show that if $p_2 > p_1$, an interest group aligned with the candidate on the left will contribute only to that candidate.[25] The optimal contribution satisfies the first-order condition

$$\eta (p_2 - p_1) \frac{\partial W_1}{\partial c_1} - 1 = 0,$$
$$(27)$$

where

$$\frac{\partial W_1}{\partial c_1} = k \frac{\beta C_2}{(\beta C_1 + C_2)^2}$$
$$(28)$$

and $C_i = \Sigma_j c_{ij}$, $i = 1, 2$. Using equation 28 in equation 27 yields the implicit relation

$$\eta (p_2 - p_1) k \frac{\beta C_2}{(\beta C_1 + C_2)^2} = 1.$$
$$(29)$$

In a similar manner, the optimal contributions to candidate 2 by interest groups aligned with that candidate imply

$$\eta (p_2 - p_1) k \frac{\beta C_1}{(\beta C_1 + C_2)^2} = 1.$$
$$(30)$$

The expressions in equations 29 and 30 are the (implicit) aggregate response functions of the interest groups aligned with the two candidates. Note that the contributions depend on the difference between the policies of the candidates.

Substituting the response functions in equations 29 and 30 into candidate 1's probability of winning yields[26]

$$W_1 = k \frac{\beta}{\beta + 1} + \frac{1 - k}{4} (\alpha + (2 - \alpha)(p_1 + p_2)).$$
$$(31)$$

The first term in equation 31 corresponds to the uninformed voters and is independent of the policy positions. Recognizing this, the candidates compete only for the informed vote. Both candidates thus locate at the median. From equation 27, the contributions are then zero, since the interest groups are indifferent as to who wins. This result is summarized in a formal proposition.

PROPOSITION 5. *In electoral competition based on collective policies, if each interest group believes that its contribution affects the probability of winning, both candidates locate at the median, and contributions are zero. Competition for the informed vote thus dominates.*

This result obtains because the contributions to each candidate depend only on the difference in their policy positions. Hence, a movement to the center by candidate 1 decreases both the candidate's and the opponent's contributions proportionately, and the ratio of his contributions to the total contributions remains constant. A candidate is thus unable to influence his or her share of the uninformed vote, because the interest groups adjust their contributions to any change in policy. Being unable to affect their shares of the uninformed vote, the candidates compete for the informed vote, and the centripetal incentives lead them to the median. Contributors thus lose their power in elections in which the competition is on collective policies.

These results are more general than the linear specification of benefits in equation 26. If $v_i(p_j)$ denotes the value of the benefits to the interest group aligned with candidate i when policy p_j is pursued in the legislature, a sufficient condition for both candidates to locate at the median is that the term

$$\frac{v_2(p_2) - v_2(p_1)}{v_1(p_1) - v_1(p_2)} \qquad (32)$$

be constant in the policies. Whenever the candidates locate at the median, the contributions are zero for each candidate.

The results for particularistic and collective policies suggest that contributions are generated less by collective policies than by particularistic policies. If collective policies do generate contributions from interest groups, it calls into question one of two assumptions: (1) that the interest groups optimize, rather than bargain with candidates, or (2) either that the contributions do not depend on the difference between the collective policy positions as in the expression in equation 32 or the probability of winning have forms different from those considered here.

DISCUSSION

Most candidates devote considerable effort to raising campaign contributions and recognize that the policy positions that they take affect the amount of those contributions. Those policies also affect the voting of the informed portion of the electorate. Candidates thus must take into account the effect of their policy positions both directly, on the voting of informed voters, and indirectly, through the effect of campaign expenditures on uninformed voters. The two types of policy dimensions considered here are *particularistic policies*, which provide benefits to certain interest groups while imposing widely distributed costs on those who cannot be expected to take political action, and *collective policies*, which yield costs and benefits for all interest groups. These policies are distinguished by two characteristics. First, particularistic policies are provided only in exchange for contributions, whereas collective policies are provided by the winning candidate regardless of whether a contribu-

tion is made. Second, for particularistic policies, contributions to a candidate depend only on his or her position, whereas for collective policies, contributions depend on the positions of both candidates.

The model of electoral competition yields a number of testable hypotheses. Any test should, however, be specific as to the nature of the policies with which candidates compete. In the case of particularistic policies, the equilibrium policy positions of candidates depend on the proportion of uninformed voters. If that proportion is low, the dominant electoral incentives are provided by the informed vote. These are the same incentives as those underlying the median voter theorem; hence, both candidates choose positions at the median of the ideal points of the informed voters. This results because when there are relatively few uninformed voters to influence through campaign expenditures, the productivity of those expenditures is low, and candidates compete for the informed vote by moving toward the median, rather than catering to interest groups to raise campaign contributions. If the proportion of uninformed voters is high, however, candidates cater to interest groups and use the campaign contributions received to compete for the uninformed vote. The incentives to compete for the uninformed vote can lead candidates to separate their positions. For intermediate proportions of the uninformed vote, candidate positions are strictly farther from the median, the higher the proportion of the uninformed vote. Polarization can thus result from the conjunction of uninformed voters and interest groups' contributions.

The equilibrium policies and the election outcome also depend on the value of the particularistic policies to the interest groups aligned with each candidate. If one candidate is aligned with higher-demand interest groups, that candidate has an advantage in raising contributions and can afford to choose a policy position closer to the median. The candidate aligned with the higher-demand interest groups thus caters less to interest groups, competes harder for the informed vote by moving closer to the median, and in equilibrium has the higher probability of winning. The candidate aligned with higher-demand interest groups is thus more independent of interest groups in the sense that his or her policy is more centrist. If informed voters cast contributions, in addition to votes, the incentives underlying the median voter theorem are strengthened.

Public financing of elections increases the probability of winning of the candidate who is the underdog, that is, who has the lower probability of winning. The equilibrium locations of the candidates are closer to the median as the amount of public financing increases. Public financing thus results in closer elections and less catering to interest groups, but total campaign expenditures are higher than when there is no public financing.

Most congressional elections involve an incumbent, and incumbents may have an advantage with respect to name recognition, reputation, or party identification. Such advantages presumably pertain

to uninformed voters, so the incumbency advantage is modeled in terms of the effectiveness of the incumbent's campaign expenditures in attracting the uninformed vote. In equilibrium, the probability of the incumbent winning is a strictly increasing function of the incumbency advantage, and the particularistic policy position of the incumbent is closer to the median, the greater the incumbency advantage. Because of that advantage, the incumbent has a lower demand for campaign contributions and competes harder for the informed vote by choosing a position closer to the median. The incumbent is thus more independent of interest groups than is the challenger. Total campaign expenditures are decreasing in the incumbency advantage, so expenditures are higher, the closer the election.

Collective policy positions affect all interest groups regardless of whether they contribute. With collective policies, there is no incentive to contribute unless the contributions are believed to affect the probability of winning. If the probability of winning depends on the contribution of an individual interest group and if interest groups maximize the net benefits from their contributions, then in a symmetric election both candidates locate at the median and contributions are zero. This result depends on the relation between the benefits to interest groups and candidate positions, but it suggests that campaign contributions may be raised more by particularistic policies than by collective policies.

The empirical literature on campaign contributions and policies presents a variety of conflicting results, and the model considered here provides an explanation of some of those disparate results. In particular, the model indicates the importance of distinguishing between particularistic and collective policies. For particularistic policies, the model yields the prediction from equation 9 that the probability of winning is equal to that candidate's fraction of the total campaign contributions. Snyder (1990a and b) tests this proposition for contributions by investor political action committees, and the data for open-seat elections in the House and for Senate elections support that prediction. The model also predicts that the same relation holds for elections with an incumbency advantage and with public financing.

The model also provides predictions about the relation between campaign contributions and policies. Those policies presumably are reflected ex post in the winner's legislative voting, so an endogenous relation between campaign contributions and legislative voting is predicted. That relation, however, depends importantly on the type of policy. Chappell (1982) studied policies for which the proportion of uninformed voters should be high and found weak evidence of a relation between contributions and congressional voting.[27] The model presented here predicts that the relation should depend on the proportion of uninformed voters, as well as whether the winning candidate had an interest group advantage or an incumbency advantage. A high percentage of winners are incumbents, and the model predicts

that with a strong incumbency advantage the position of the winner could be close to the median, which may provide an explanation for Chappell's findings.

Wright (1990) studied two collective policy issues and found no relation between contributions and congressional voting. The model predicts that candidate policies should be at the median and that no contributions should be raised from these policies. Wright's findings are consistent with the first prediction of the model but not with the second. It is, of course, possible that the contributions are made to obtain access for lobbying directed toward particularistic policies. In that case, the model predicts that contributions would be generated.

Wilhite and Theilmann (1987) studied congressional voting on labor issues and found a positive relation between labor political action committee contributions and congressional voting. If the labor issues are collective, the model indicates that a test should include business contributions as well. The relation between labor political action contributions and congressional voting may reflect the alignment of labor interest groups with a set of candidates on the same side of issues as labor.

The theory presented here warrants at least five types of extension. One is to consider a sequence of elections in which candidates can build seniority and incumbency advantage and incumbents can generate campaign contributions through current, as well as anticipated, actions. Second, a theory of electoral competition involving campaign contributions should be extended to include lobbying of current officeholders. Third, electoral competition on policy dimensions should include more than one category of policy and should be multidimensional. Fourth, the effect of campaign expenditures on the voting of the uninformed electorate should be represented not by a reduced form but rather by a micro theory of voter information and behavior. Fifth, to the extent that campaign contributions are informative, the proportion of informed voters should depend on the campaign expenditures of the two candidates.

Notes

1. Wright (1990) studied the relationship between campaign contributions, subsequent lobbying, and legislative voting and found that the effect of contributions is through lobbying, which suggests that access is facilitated by contributions. Wilhite and Theilmann (1987) find that contributions by labor political action committees affect congressional voting on labor issues.

2. Equilibrium models of electoral competition based on the constituency service activities are from Baron 1989a and b.

3. This representation is developed from Lowi 1964 and Wilson 1980.

45

4. See Baron 1993, 125–30. Some interest groups eventually did form on this issue.

5. Denzau and Munger's (1986) model does not include an electoral challenger. They consider an electorate that is rationally ignorant and an electorate that is fully informed, but in contrast to the model here, their focus is on the allocation of a legislator's effort between interest groups and the electorate.

6. Londregan and Romer (1993) consider a model of electoral competition in which parties compete both on a collective policy dimension and on constituent services. The collective policy position is known, but voters receive only a noisy signal about the ability of the candidates to provide services. They find that the more voters value the services, the more separated are the candidates' policies on the collective dimension. In an election in which one candidate is an incumbent, the incumbency advantage is greater, the stronger voters' preferences for services are.

7. A coauthor and I study a model in which interest groups can switch between the candidates based on which candidate makes the more attractive offer of constituent services (Baron and Mo 1993).

8. If a policy imposes significant costs on interest groups on the other side, the policy is said to be collective.

9. Although the policy sets of the candidates may result from party identifications, parties are not actors in the model.

10. Banks (1990) provides a theory in which candidate positions are signals of future legislative actions. Chappell (1982) studied issues affecting only a single interest group and found only a weak relationship between contributions and subsequent legislative voting. The role of reelection interests in generating credible commitments is considered in Austen-Smith and Banks 1989 and Baron 1989b.

11. A voter does not choose an interest group, but instead, interest groups are formed from among voters who have similar characteristics such as occupation.

12. That is, G has the form

$$G(\phi|\theta) = (\theta - \phi)k + \frac{1}{2},$$

where

$$\phi = \frac{1}{2k} - \frac{1-k}{k}s_1 \quad \text{and} \quad \theta = \frac{C_1}{C_1 + C_2}.$$

13. If $C_1 = C_2 = 0$, this term is defined to be 1/2.

14. Another interpretation of the specification in equation 3 comes from models of probabilistic voting. If t (which depends on both positions and campaign expenditures) denotes the probability that a randomly selected voter will vote for candidate 1, then the probability T of candidate 1 winning is

$$T = \sum_{j=\frac{N+1}{2}}^{N} \frac{N!}{j!(N-j)!} t^j(1-t)^{N-j},$$

where N is the number of voters. For large N, maximizing the expected number of votes is equivalent to maximizing the probability of winning (Hinich 1977). Austen-Smith (1987) then assumes that the probability of winning can be approximated by the expected number of votes divided by N, which corresponds to W_1.

15. See Snyder 1990a.

16. The contributions function C_1 in equation 5 is specified as strictly decreasing in p_1, but since interest group preferences can be expected to be distributed across the policy space, there is no natural reason for this response function to be monotonic. If contributions reach a maximum at an interior point, $\bar{p}_1$, of [0, 1/2], the candidate would never choose a position farther from the median than that position. Consequently, the results indicating that the candidates separate their positions can be interpreted as meaning that candidate 1 never chooses a position to the left of max $\{0, \bar{p}_1\}$. To simplify the notation, $\bar{p}_1$ will be assumed to be 0, and the corresponding $\bar{p}_2$ will be assumed to be 1.

17. The specifications in equations 5 and 6 are based on the perspective that an interest group takes the probability of winning as independent of its contribution and that the candidate and the interest group bargain over the amount of the contribution. An alternative formulation is that an interest group believes that its contribution affects the probability of winning and thus chooses its contribution optimally based on its effect on that probability. This formulation is considered in Baron 1992, and the resulting equilibrium is shown to be qualitatively the same as the equilibrium based on equations 5 and 6. For a symmetric election, the equilibrium policies and contributions are identical in the two formulations.

18. Note that the beliefs w are not a direct function of policies. Beliefs adjust to policies only in accord with the contributions those policies generate.

19. The valuations z_i may be related to α, but I shall discuss the partial effects holding constant the other parameters.

20. For the asymmetric case, the responses to changes in the valuation parameters, for an interior equilibrium, are

$$\frac{dp_1^*}{dz_1} = 1 + \frac{2k}{(1-k)(2-\alpha)}(z_1 - z_2)$$

$$\frac{dp_2^*}{dz_2} = -1 + \frac{2k}{(1-k)(2-\alpha)}(z_1 - z_2)$$

$$\frac{dp_1^*}{dz_2} = \frac{dp_2^*}{dz_1} = -\frac{2k}{(1-k)(2-\alpha)}(z_1 - z_2).$$

If $z_1 > z_2$, so that the interest groups aligned with candidate 1 have a higher valuation than the interest groups aligned with candidate 2, an increase in z_1 moves both policies toward the median. This results because candidate 1 finds it easier to raise campaign contributions and thus can choose a policy that attracts more of the informed voters. Candidate 2 responds to candidate 1's move by also moving closer to the median. If $z_2 > z_1$, an increase in z_2 causes both candidates to choose policies closer to the median. If $z_1 > z_2$, however, an increase in z_2 causes candidate 1 to move away from the median. Depending on the values of k and α, candidate 2 may choose a policy closer to or farther from the median as z_2 increases. For k high, candidate 2 may move away from the median.

21. For the asymmetric case, as a function of z_1,

$$\frac{dC_1^*}{dz_1} = \frac{k}{2(1-k)(2-\alpha)}(2 + (z_1 - z_2)(2 - \alpha))$$

$$\cdot (2 - 3(2 - \alpha)(z_1 - z_2))$$

$$\frac{dC_2^*}{dz_1} = -\frac{k}{2(1-k)(2-\alpha)}(2 - (z_1 - z_2)(2 - \alpha))$$

$$\cdot (2 + 3(2 - \alpha)(z_1 - z_2)).$$

22. Public financing is not included here.

23. Campaign contribution reporting requirements provide such information but only with a lag.

24. For particularistic policies, the contributions were represented as $w(z_1 - p_1)$, and here, benefits are $w\eta(z_1 - p_1)$. If $\eta = 2$ and interest groups and candidates bargain to a 50–50 division of the benefits, then C_1 in equation 5 is half the benefits.

25. Austen-Smith (1987) considers electoral competition in collective policy positions and allows interest groups to contribute to both candidates. He shows that an interest group will never contribute to both. Empirical evidence indicates that most political action committees contribute to only one candidate.

26. Analogous to the specification just made, the term $\beta C_1/(\beta C_1 + C_2)$ is specified as $\beta/(\beta + 1)$ when $C_1 = C_2 = 0$.

27. The policies considered by Chappell (1982) include a mixture of particularistic and collective policies. Those policies are mortgage disclosure requirements, milk price supports, truck weight limits, tax rebates for oil companies,

funding for the B-1 bomber, auto emissions controls, and maritime cargo preference.

References

Austen-Smith, David. 1987. "Interest Groups, Campaign Contributions, and Probabilistic Voting." *Public Choice* 54: 123–39.

Austen-Smith, David, and Jeffrey S. Banks. 1989. "Electoral Accountability and Incumbency." In *Models of Strategic Choice in Politics*, ed. Peter Ordeshook. Ann Arbor: University of Michigan.

Banks, Jeffrey S. 1990. "A Model of Electoral Competition with Incomplete Information." *Journal of Economic Theory* 50:309–25.

Baron, David P. 1989a. "Service-induced Campaign Contributions and the Electoral Equilibrium." *Quarterly Journal of Economics* 104:45–72.

Baron, David P. 1989b. "Service-induced Campaign Contributions, Incumbent Shirking, and Reelection Opportunities." In *Models of Strategic Choice in Politics*, ed. Peter Ordeshook. Ann Arbor: University of Michigan.

Baron, David P. 1992. "Electoral Competition with Informed and Uninformed Voters." Working Paper No. 1174. Stanford University.

Baron, David P. 1993. *Business and Its Environment*. Englewood Cliffs, NJ: Prentice-Hall.

Baron, David P., and Jongryn Mo. 1993. "Campaign Contributions and Party–Candidate Competition in Services and Policies." In *Political Economy: Institutions, Information, Competition, and Representation*, ed. W. Barnett et al. Cambridge: Cambridge University Press.

Black, Duncan. 1958. *Theory of Committees and Elections*. Cambridge: Cambridge University Press.

Brock, William, and Stephen Magee. 1978. "The Economics of Special Interest Politics: The Case of the Tariff." *American Economic Review* 68:246–50.

Cameron, Charles M., and James M. Enelow. 1989. "Asymmetric Policy Effects, Campaign Contributions, and the Spatial Theory of Elections." Columbia University. Typescript.

Chappell, Henry. 1982. "Campaign Contributions and Congressional Voting: A Simultaneous Probit–Tobit Model." *Review of Economics and Statistics* 62:77–83.

Cox, Gary W. 1990. "Centripetal and Centrifugal Incentives in Electoral Systems." *American Journal of Political Science* 34: 903–35.

Denzau, Arthur T., and Michael C. Munger. 1986. "Legislators and Interest Groups: How Organized Interests Get Represented." *American Political Science Review* 80:89–106.

Edelman, Susan. 1990. "Two Politicians, a PAC, and How They Interact: Two Sequential Models." Columbia University. Typescript.

Hinich, Melvin. 1977. "Equilibrium Spatial Voting: The Median Voter Is an Artifact." *Journal of Economic Theory* 16:208–19.

Hinich, Melvin, and Michael Munger. 1989. "Political Investment, Voter Perceptions, and Candidate Strategy: An Equilibrium Spatial Analysis." In *Models of Strategic Choice in Politics*, ed. Peter Ordeshook. Ann Arbor: University of Michigan.

Jacobson, Gary C. 1987. *The Politics of Congressional Elections*. 2d ed., Boston: Little, Brown.

Londregan, John, and Thomas Romer. 1993. "Polarization, Incumbency, and the Personal Vote." In *Political Economy: Institutions, Information, Competition, and Representation*, ed. W. Barnett, et al. Cambridge: Cambridge University Press. Forthcoming.

Lowi, Theodore J. 1964. "American Business, Public Policy, Case-Studies, and Political Theory." *World Politics* 16:677–93.

Luce, R. Duncan. 1959. *Individual Choice Behavior*. New York: Wiley.

McKelvey, Richard, and Peter Ordeshook. 1985. "Elections with Limited Information: A Fulfilled Expectations Model Using Contemporaneous Poll and Endogenous Data as Information Sources." *Journal of Economic Theory* 36:55–85.

Magee, Stephen P., William A. Brock, and Leslie Young. 1989. *Black Hole Tariffs and Endogenous Policy Theory*. Cambridge: Cambridge University Press.

Morton, Rebecca, and Charles Cameron. 1991. "Elections and the Theory of Campaign Contributions: A Survey and Critical Analysis." *Economics and Politics* 4:79–108.

Poole, Keith T., and Thomas Romer. 1985. "Patterns of Political Action Committee Contributions to the 1980 Campaign for the United States House of Representatives." *Public Choice* 47:63–111.

Snyder, James M. 1989. "Election Goals and the Allocation of Campaign Resources." *Econometrica* 57:637–60.

Snyder, James M. 1990a. "Campaign Contributions as Investments: The U.S. House of Representatives 1980–1986." *Journal of Political Economy* 98:1195–1227.

Snyder, James M. 1990b. "The Market for Campaign Contributions: Evidence for the U.S. Senate 1980–1986." University of Chicago. Typescript.

Wilhite, Allen, and John Theilmann. 1987. "Labor PAC Contributions and Labor Legislation: A Simultaneous Logit Approach." *Public Choice* 53:267–76.

Wilson, James Q. 1980. *The Politics of Regulation*. New York: Basic Books.

Wright, John. 1990. "Contributions, Lobbying, and Committee Voting in the U.S. House of Representatives." *American Political Science Review* 84:417–38.

David P. Baron is William R. Kimball Professor of Business, Economics, and Environment, Graduate School of Business, Stanford University, Stanford, CA 94305-5015.