CHAPTER 11

Two-party competition – deterministic voting

> Politicians neither love nor hate. Interest, not sentiment, governs them.
>
> Earl of Chesterfield

> . . . a candidate for the Presidency, nominated for election by the whole people, will, as a rule, be a man selected because he is not open to obvious criticism, and will therefore in all probability be a mediocrity.
>
> Sir Henry Sumner Maine

With large numbers of voters and issues, direct democracy is impossible. Even in polities sufficiently small so that all individuals can actually come together to debate and decide issues – say, a polity of 500 – it is impossible for all individuals to present their own views, even rather briefly, on every issue. Thus the "chairman's problem" is to select individuals to represent the various positions most members of the polity are likely to hold (de Jouvenal, 1961). When the polity is too large to assemble together, representatives must be selected by some means.

The public choice literature has focused on three aspects of representative democracy: the behavior of representatives both during the campaign to be elected and while in office; the behavior of voters in choosing representatives; and the characteristics of the outcomes under representative democracy. The public choice approach assumes that representatives, like voters, are rational economic actors bent on maximizing their utilities. Although it is natural to assume that voters' utilities are functions of the baskets of public goods and services they consume, the "natural assumption" concerning what maximizes a representative's utility is not as easily made. The fundamental hypothesis of Downs's (1957, p. 28) model is that "parties formulate policies in order to win elections, rather than win elections in order to formulate policies." His study was the first to explore systematically the implications of this assumption, and the literature has developed around the framework he laid.[1]

Much of the literature on public choice and political science has centered on representative democracy because it is the dominant mode of political expression. Although many of the issues discussed in this literature have been described here in the context of a model of direct democracy or committees, the committees in mind are often assemblies of representatives and the coalitions are parties. Many of the

[1] For a well-documented defense of the vote-maximizing assumption, see Mayhew (1974).

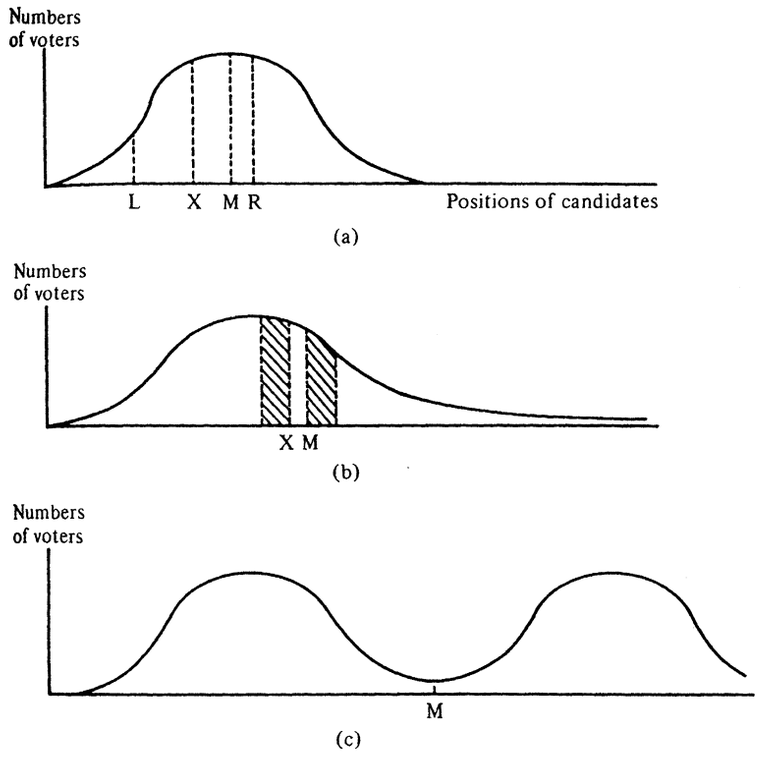

Figure 11.1. Median voter outcomes under two-party competition.

problems and results already discussed carry over almost directly into the area of representative democracy. Thus, the reader will perhaps not be surprised to find the median outcome, cycling, and logrolling all reappearing.

11.1 Outcomes under two-party democracy

Hotelling first presented the median voter theorem as an outcome of two-party representative democracy in 1929, and this paper is a clear intellectual antecedent to both Downs's and, more directly, Black's work. Indeed, it could be regarded as *the* pioneering paper in public choice, for it was the first direct attempt to use economics to analyze a political process.

In the Hotelling-Downs model, political opinion is depicted as lying along a single liberal–conservative (left-right) dimension. Each voter is assumed to have a most preferred position along the spectrum for his candidate or party[2] to take. The farther the candidate is from this position, the less desirable his election is for the voter; thus, the Hotelling-Downs model assumes single-peaked preferences. Figure 11.1 depicts a frequency distribution of most preferred candidate positions. We assume, first, that this frequency distribution is unimodal and symmetric.

[2] The words "candidate" or "party" can be used interchangeably here, for the implicit assumption when discussing parties is that they take a single position in the voter's eyes.

If every voter votes, and votes for the candidate closest to the voter's most preferred position, L receives all the votes of individuals lying to the left of X, the midpoint of the segment LR. R receives all votes to the right of X. If L and R are the positions that the two candidates take, R wins. L can increase his vote total by moving toward R, shifting X to the right, as can R. Both candidates are thus driven toward the position favored by the median voter. The logic of the argument is the same as that demonstrating the victory of the *issue* favored by the median voter, for in the Hotelling-Downs model there is only one issue to be decided: how far to the left or right the winning candidate will be.

The assumptions underlying this initial result are so unrealistic (one-issue dimension; a unimodal, symmetric preference distribution; all individuals vote; two candidates) that many researchers were naturally led to examine the consequences of relaxing them. As long as all voters vote, the median outcome holds regardless of the distribution of preferences. As long as all voters vote, the voters lying between a candidate's position and the farthest extreme on his side of the other candidate are "trapped" into voting for him. Thus, a candidate can "go after" the votes of the other candidate by "invading his territory" and both continue to move toward the median.

Smithies (1941) pointed out in an early extension of Hotelling's model, however, that voters might leave a candidate as he moved away from them to support another (third) candidate or simply not vote at all. Two reasonable assumptions about abstentions are that (1) candidate positions can be too close together to make voting worthwhile (indifference), and (2) the nearest candidate may still be too far away to make voting attractive (alienation). Letting P_j be the platform of candidate j, P_i^* the ideal point (platform) of voter i, and $U_i(P_j)$ voter i's utility from platform j; then we can formally define indifference and alienation as follows:

> **Indifference:** Voter i votes if and only if $|U_i(P_1) - U_i(P_2)| > e_i$ for some $e_i > 0$.
>
> **Alienation:** Voter i votes if and only if there exists some $\delta_i > 0$, such that $[U_i(P^*) - U_i(P_j)] < \delta_i$, for $j = 1$ or 2.
>
> The e_i and δ_i are voter specific constants that determine whether they vote or not.

If the probability that a voter does not vote is an increasing function of the closeness of two candidates' positions, a movement toward the center of a symmetric distribution of preferences has a symmetric effect on the two candidates' vote totals. The pull of the median remains, and the equilibrium is again at the median. Indifference does not affect this result. If the probability that a voter will abstain is an increasing function of a candidate's distance from him, the candidate is pulled toward the mode of the distribution. If the distribution is symmetric and unimodal, the median and mode coincide, however, and again the median voter result is not upset. Thus, neither indifference nor alienation, nor the two combined will affect the tendency of two candidates to converge on the position most favored by the median voter when the frequency distribution of voter preferences is symmetric and unimodal (Davis, Hinich, and Ordeshook, 1970).

The median voter result can be upset, however, if the distribution of voter preferences is either asymmetric or multimodal. If the distribution is asymmetric, but unimodal, the optimal position for each candidate is pulled toward the mode if voters become alienated as candidates move away from them (Comanor, 1976). This can be seen by considering Figure 11.1b. Suppose that both candidates are at M, the median of the distribution. A move of one to X decreases the probability that the voters in the cross-hatched region to the right of M will vote for him. The move also increases the probability by the same amount that the voters in the cross-hatched region to the left of X will vote for him (the two cross-hatched areas having equal bases). Since there are more voters in the region to the left of X than in the region to the right of M, the net effect of a move toward the mode taking into account only the effect of alienation must be to increase a candidate's expected vote. However, because M is the median, the same number of voters must lie to the left and right of this point, and the effect of alienation on the candidate's vote must dominate for small moves from M. As Comanor (1976) has shown, however, the distance between the median and mode is not likely to be great enough to cause a significant shift in candidate positions owing to alienation away from those predicted under the median voter hypothesis.

Figure 11.1c depicts a bimodal symmetric distribution. As one might expect, the presence of alienation *can*, via the logic just discussed, lead the candidates away from the median toward the two modes (Downs, 1957, pp. 118–22). But it need not. If weak, alienation can leave the median outcome unchanged or produce no stable set of strategies at all; such is the strength of the pull toward the middle in a two-party, winner-take-all system (Davis et al., 1970).

A spreading out of candidates may occur if elections consist of two steps: competition for nomination within parties, and competition among parties. To win the party's nomination, the candidate is pulled toward the *party* median; the need to win the election pulls him back toward the *population* median. If he treats the other candidate's position as fixed, a Cournot strategy game results, with equilibria generally falling between the party and population medians (Coleman, 1971, 1972; Aranson and Ordeshook, 1972; Calvert, 1985).

In Chapter 5 we noted that single-peakedness ensures a majority rule equilibrium in general only when issues are defined over a single dimension. When this occurs, single-peakedness ensures that Plott's perfect balance criterion is met for an outcome at the peak preference of the median voter. But the single-peakedness condition does not ensure the existence of an equilibrium when we move to more than one dimension. The reader will not be surprised to learn, therefore, that the results concerning the instability of majority rule equilibria in a multidimensional world carry over directly for the literature on representative democracy. The problem a candidate faces in choosing a multidimensional platform that defeats all other platforms is, under majority rule, the same as finding an issue in multidimensional space that defeats all other issues.

One can combine the assumptions of multimodal distributions and alienation and envisage a candidate presenting a platform of extreme positions on several issues and winning the support of a sufficient number of minorities to defeat another

Table 11.1

	Voter		
Issue	A	B	C
I	4	−2	−1
II	−2	−1	4
III	−1	4	−2

candidate taking median positions on all. When this happens, a minority, which supports a candidate for the position he takes on a couple of key issues, regardless of his position on others, is essentially trading away its votes on the other issues to those minorities feeling strongly about these other issues.[3]

Unfortunately, the possibility of logrolling producing cycles persists. Consider the voter preferences in Table 11.1. Suppose that two candidates vie for election on three issues. If the first takes a position in favor of all three, the outcome that maximizes the net utility gains for all voters, he can be defeated by a candidate favoring any two issues and opposing the third (say, PPF), since two of the three voters always benefit from the defeat of an issue. PPF can be defeated by PFF, however, and PFF by FFF. But all three voters favor PPP over FFF, and the cycle is complete. Every platform can be defeated.

In a single election, candidates cannot rotate through several platforms, and cycling is not likely to be evidenced. Over time it can be. To the extent that incumbents' actions in office commit them to the initial platform choice, challengers have the advantage of choosing the second, winning platform. Cycling in a two-party system should appear as the continual defeat of incumbents (Downs, 1957, pp. 54–62).[4]

Thus we confront again the political instability issue, appearing now as the danger of revolving-door political representation. Yet how well supported is this prediction? Although it is difficult to discern a cycle from a committee's actions, the predication that incumbent candidates are regularly defeated is rather easily tested. In Table 11.2 data are presented on the frequency with which the incumbent *party's* candidate is defeated in a gubernatorial election. To the extent that candidates of the party holding the governor's chair must run on the record of the previous governor, whether that is the same person now running for office or a new one, the cycling theorem predicts the defeat of the candidate whose party currently is represented in the governor's chair.

In addition to the cycling theorem's prediction that the probability of a change in control of the governorship is one, two other "naive" hypotheses can be put forward:

1. *Random hypothesis:* The elections are random events, perhaps because voters do not take the trouble to gather information about the candidates

[3] Downs (1957, pp. 132–7); Tullock (1967a, pp. 57–61); Breton (1974, pp. 153–5). Note that this form of logrolling is even easier to envisage when issues are arrayed in more than one dimension. When this occurs, one need not assume alienation to get a dominant logrolling strategy.

[4] Of course, one of the advantages of being an incumbent is that one can rewrite the election laws to favor incumbents.

Table 11.2. *Election outcomes and growth rates, 1775–1996*

Time period (1)	Number of elections (2)	Fraction of changes in party[a] (3)	Winning party's vote fraction (4)	Difference between 1st and 2nd parties (5)	Minority party totals (6)
1775–93	41	.273	.708[b]	.489[b]	.073[b]
1794–1807	85	.133[b]	.700[b]	.426[b]	.026
1808–19	95	.211	.637[b,c]	.297[c]	.022[b]
1820–34	163	.190[b]	.675[b]	.406[b,c]	.055[b]
1835–49	201	.292[c]	.551[b,c]	.142[b,c]	.039
1850–9	156	.296	.541[b]	.137[b]	.056[b]
1860–9	176	.260	.627[b,c]	.271[c]	.017[b,c]
1870–9	167	.259	.571[b,c]	.177[b,c]	.035
1880–9	160	.244	.580	.196	.036
1890–9	178	.299	.551[b,c]	.172[b]	.070[b,c]
1900–9	184	.143[b,c]	.588[c]	.218[c]	.043[c]
1910–19	185	.315[c]	.565[b]	.215	.085[b,c]
1920–9	187	.211[c]	.619[c]	.269[b]	.031[c]
1930–9	180	.320[c]	.608	.248	.032
1940–9	178	.243	.633[b]	.272	.010[b]
1950–9	173	.236	.612	.232	.009[c]
1960–9	156	.372[b,c]	.568[b,c]	.146[b,c]	.010[b]
1970–9	151	.391[b]	.596	.160[b]	.024[b]
1980–9	120	.325	.569	.160	.018[b]
1990–6	103	.379[b]	.565	.175[b]	.040
1775–1996	3,039	.273	.596	.226	.037

[a] Adjusted by removing first election in each state, since no party change is possible in this election.
[b] Significantly different (5 percent two-tail) from mean of remainder of sample.
[c] Significantly different (5 percent two-tail) from mean of preceding subsample.
Source: Glashan (1979); Mueller (1982); Election Research Center (1985); Scammon, Gillivary, and Cook (1998); and Congressional Quarterly (1998).

because the incentive to do so is low. This hypothesis leads to the prediction that the probability of a change in the party of the governor is 0.5 in the U.S. two-party system.[5]

2. *Conspiracy hypothesis:* The incumbents can manipulate the system or voter preferences so that they are never defeated. The probability of their defeat is zero.

Since the birth of the Republic, the party of the incumbent governor has failed to regain the governorship only slightly more than one-fourth of the time. Although the frequency of change in the party occupying the governor's chair has increased since the 1960s, in no decade has the challenging party won a gubernatorial election as much as 40 percent of the time. On average over the U.S.'s history gubernatorial elections have produced a turnover in the governor's chair falling about halfway between the elections being rigged for the incumbent party and a coin toss. The

[5] Some states have at times had more than two parties with candidates for the governorship, but then the appropriate probability figure is only slightly less than 0.5.

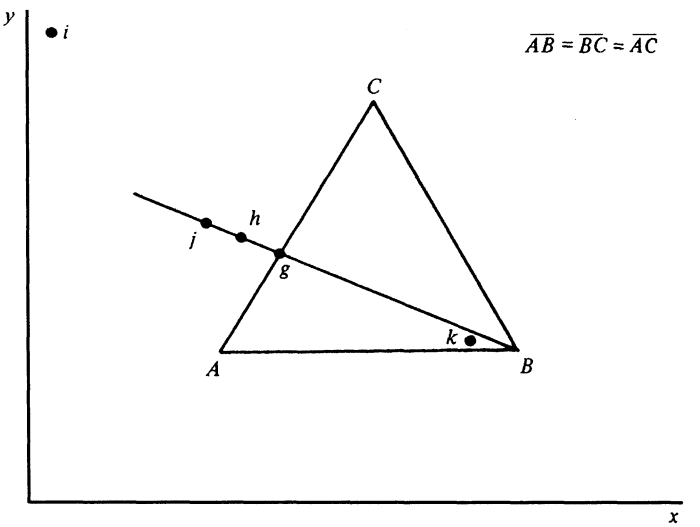

Figure 11.2. Three-voter electorate with equilateral triangle as Pareto set.

revolving-door hypothesis of cycling theory is resoundingly rejected.[6] As with the outcomes from committee voting, Tullock's question, "Why so much stability?" is appropriate.

11.2 Two-party competition in a constrained policy space

11.2.1 *The uncovered set*

One explanation for the apparent stability of electoral politics, at least as judged by the policy outcomes of the process, may be that candidates do not choose platforms from the entire feasible policy space, but restrict their choices to a particular subset of the policy space.

Consider Figure 11.2, where the ideal points of three voters are again depicted assuming a two-dimensional issue space. If voter indifference curves are concentric circles centered at the ideal points, then the lines $\overline{AB}$, $\overline{BC}$, and $\overline{AC}$ are contract curves for each respective pair of voters, and form the sides of the Pareto set.

As indicated in Chapter 5, no point in the $x - y$ orthant can defeat all other points under majority rule, and the cycling property of majority rule could lead to a sequence of pairwise votes that leads anywhere in the feasible policy space, for example, to point i. Moreover, some points like j lying outside of the Pareto set can defeat points like k inside it in a direct majority rule vote. But do we really expect candidates in a two-party election to pick platforms like i or even j? Will the

[6] Of course, in many state elections only one party has put forward a gubernatorial candidate. But this fact still seems more in keeping with the conspiratorial hypothesis than with the cycling hypothesis. Given the inherent vulnerability of the incumbent predicted by cycling theory, why is it that the Democrats in Vermont and Republicans in Alabama have been so ineffective in coming up with platforms and candidates to challenge the incumbents?

inherent attractiveness of platforms near the voter ideal points not manifest itself somehow?

Tullock (1967a,b) was one of the first to argue that cycling would be restricted to a fairly circumscribed space near the point where the voters' median lines intersect.[7] Theoretical justification for this prediction has been provided by Miller's work on the uncovered set.[8]

The uncovered set: The uncovered set is the set of all points y within the set of feasible alternatives S, such that for any other alternative z in S, either yPz or there exists some x in S such that $yPxPz$, where aPb means a beats b under majority rule.

Absent a Condorcet winner, no platform is unbeatable. But if a candidate chooses a platform from the uncovered set, she knows that she is at most "once removed" from defeating any platform her opponent chooses. At worst, her platform will be involved in a cycle of length three with any platform that defeats it. Conversely, if she chooses a platform that is covered, not only can this platform be defeated, but the platforms that defeat it include some that her platform cannot defeat. Thus, her platform can be contained in a transitive triple in which it is the least preferred of the three platforms.

To see this point more clearly, assume that there are but four distinct choices, x, y, z, and w, from which two candidates must choose one as a platform. Majority rule establishes the following binary relationships:

$$\begin{array}{lll} xPy & yPz & zPx \\ xPw & yPw & wPz. \end{array}$$

Outcomes x, y, and z are all uncovered. For example, although z beats x, z is in turn beaten by y, which x can beat. Similarly, neither x nor z covers $w - z$ because it loses to w, and x because it is defeated by z. However, y does cover w, since it both beats w and is defeated by x, which w cannot beat; y defeats both z and w, and w defeats only z. The outcome that w defeats is a subset of the outcome that y defeats. Thus, y dominates w as a strategy choice; y defeats every outcome w can defeat, and y defeats w, also. The uncovered set, in this case (x, y, z), consists of the undominated set of platforms.[9]

Returning to Figure 11.2, we can easily see that j is covered by h, since h beats j and is in turn defeated by g, but j cannot defeat g. Every point that j defeats is also defeated by h, so that no candidate should choose j over h.

When there are three voters and the Pareto set is an equilateral triangle, as in Figure 11.2, the uncovered set is the Pareto set (Feld et al., 1987). But the uncovered

[7] A median line divides the issue space so that no more than half of the voter ideal points are on either side of it (see Chapter 5, Sections 5.4 and 5.5).

[8] The initial exposition is in Miller (1980), with a correction in Miller (1983). Further explication is given by Ordeshook (1986, pp. 184–7) and Feld et al. (1987).

Other papers that argue that observed outcomes under majority rule will fall in a circumscribed area within the policy space, although not necessarily one that is identical to the uncovered set, include McKelvey and Ordeshook (1976); Kramer (1977); McKelvey, Ordeshook, and Winer (1978); and Schofield (1996).

[9] This property holds in general; see Ordeshook (1986, pp. 184–6).

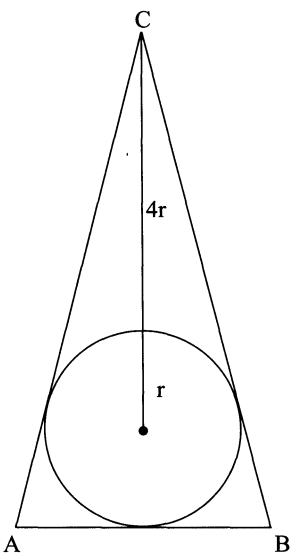

Figure 11.3. Three-voter electorate with isosceles triangle as Pareto set.

set can be much smaller than the Pareto set. McKelvey (1986) has proved that the uncovered set is always contained within a circle of radius $4r$, where r is the radius of the circle of minimum radius that intersects all median lines.[10] This latter circle has been defined as the yolk. With an equilateral triangle, the yolk is tangent to each side at its midpoint. But consider now the three voter ideal points, which form an isosceles triangle with a height of $6r$, where r is the radius of the circle, which is again tangent to the three median lines (see Figure 11.3). McKelvey's theorem implies that ideal point C, although still within the Pareto set, is now outside the uncovered set and thus is dominated by points near and along $\overline{AB}$.

In Figure 11.4, two more voters have been added with ideal points to either side of m, the median of $\overline{AB}$. The three median lines are now $\overline{CD}$, $\overline{CE}$, and $\overline{AB}$. The radius of the yolk shrinks to $e < r$, and so too the dimensions of the uncovered set. As more and more voters are added to either side of m along $\overline{AB}$, the uncovered set converges on m. The outcome under two-candidate competition, when candidates restrict their choices to the uncovered set, approaches in this case what one would expect from the median voter theorem, if voter C were not present, even though C's presence suffices to destroy Plott's (1967) perfect balance condition and the guarantee of an equilibrium it provides.

As a final example, consider Figure 11.5. Voter ideal points are all arrayed on the circumference of the circle with radius c centered at o. Plott's (1967) condition ensures an equilibrium at o only when voter ideal points occur in pairs at the opposite ends of lines of length $2c$, which pass through o, as for example A and B, *and* one voter's ideal point is at o. Even with no voter's ideal point at o, however, the uncovered set shrinks in toward o as more voter ideal points are added at random

[10] Feld et al. (1987) prove that the uncovered set is always within $3.7r$ of the center of the yolk, and conjecture that for three voters it is within $2.83r$ of the center.

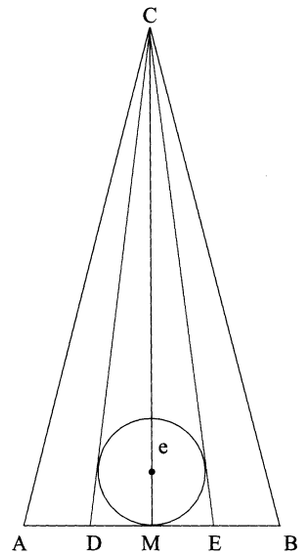

Figure 11.4. Five-voter electorate with isosceles triangle as Pareto set.

to the perimeter of this circle, yielding o or points very near it as the predicted outcomes under two-party competition when candidates choose their platforms from the uncovered set.

With voter ideal points as in Figures 11.4 and 11.5, one's intuition suggests that candidates will choose platforms at or near points m and o. But both m and o can be defeated under majority rule, as can every other point in the $x - y$ space. Most of the literature in public choice has been content to leave the discussion at that, the implication being that any and all outcomes in $x - y$ space are (equally) likely.

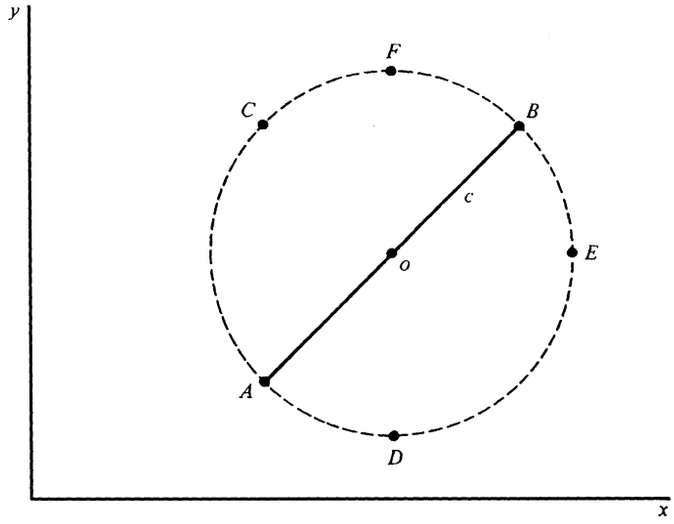

Figure 11.5. Six-voter electorate with circular Pareto set.

The dominance property of the uncovered set seems a compelling reason to choose points within it, however, and this in turn draws our attention back to points near m and o.[11]

11.2.2 *The uncovered set with high valence issues*

In one of the first critiques of the Downsian spatial model Stokes (1963) chastised Downs for, among other things, neglecting the existence of *valence* issues in his model. Valence issues are issues for which all voters agree that more is better than less. An example might be honesty. All voters prefer an honest candidate to a dishonest one, and the more honest a candidate is perceived to be, the higher she stands in every voter's estimation. Although Stokes was perhaps justified in criticizing Downs for ignoring valence issues, in fact their addition to the Downsian model can help to produce equilibria even with a multidimensional issue space.

To see this assume again that there are only three voters. Let voter i's utility from the platform of candidate j be given as follows:

$$U_i^j = K_i + \gamma V_j - |I_i - P_j|^2. \tag{11.1}$$

V_j is the value of the valence issue in each voter's utility function and γ is the weight this issue gets. $|I_i - P_j|$ is the Euclidean distance between voter i's ideal point, I_i, and the platform of candidate j, P_j. Assume now that the three voters' ideal points are located at the corners of an equilateral triangle as depicted in Figure 11.6, with the coordinates $A(1, 1)$, $B(3, 1)$, and $C(2, 1 + \sqrt{3})$. Assume further that all voters evaluate candidate 1 higher on the valence issue than candidate 2, $V_1 > V_2$. If candidate 1 chooses as a platform the point one-third of the way up the line from C bisecting line $\overline{AB}$, the utilities to each voter from 1's platform will be as follows:

$$U_i^j = K_i + \gamma V_1 - (2\sqrt{3}/3)^2 = K_i + \gamma V_1 - 4/3. \tag{11.2}$$

The best response of candidate 2 is to choose the midpoint of one of the lines between two voters' ideal points, that is, 2, 2′, or 2″. This platform promises each of these two voters

$$U_i^j = K_i + \gamma V_2 - (1)^2 = K_i + \gamma V_2 - 1. \tag{11.3}$$

Thus, if $V_1 - V_2 > 1/3$, there is no platform that 2 can choose that will defeat 1.

Ansolabehere and Snyder (2000) have examined the conditions needed to generate equilibrium strategies in the presence of valence issues. Among the theorems that they prove is the following:

Theorem: *Suppose $V_1 > V_2$. Then an equilibrium pair of strategies (P_1, P_2) exists if and only if $r < \sqrt{\gamma(V_1 - V_2)}$,*

where r is the radius of the yolk.

[11] Goff and Grier (1993) argue that patterns of voting in Congress are more easily accounted for by assuming that outcomes are falling within the uncovered set.

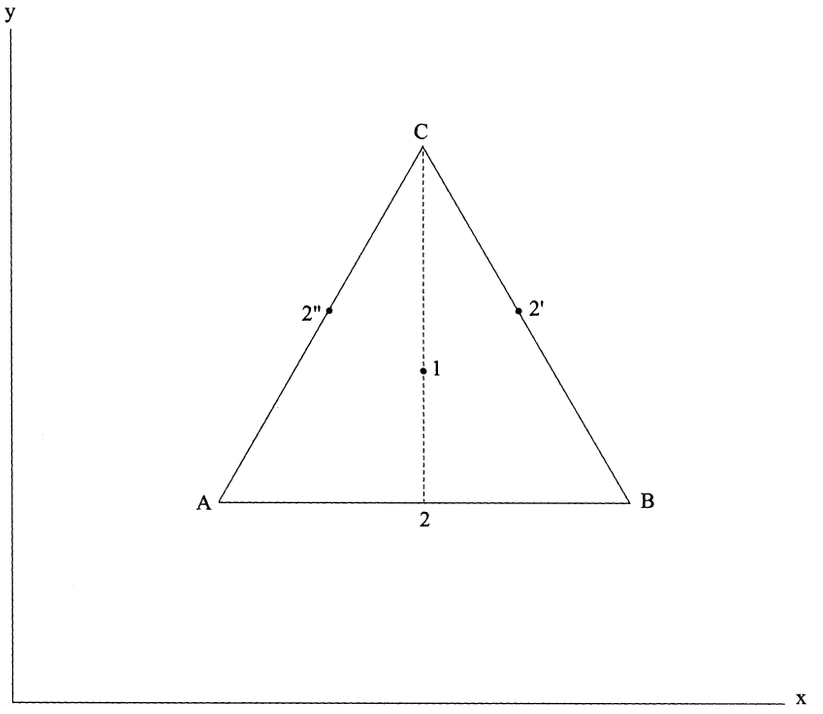

Figure 11.6. Three-voter electorate with equilateral triangle as Pareto set.

Thus, for any given distribution of voter ideal points, there exists a difference of the valence issue(s) between the two candidates sufficiently large to guarantee the leading candidate on this issue victory, if she selects a platform near the center of the yolk. The addition of valence issues both increases the likelihood that equilibria exist, and our expectation that the winning platform will lie near the center of the distribution of voter ideal points.

11.3 Relaxing the assumptions of the Downsian model

Several authors have questioned the plausibility of some of the assumptions that underlie Downs's model. By relaxing these assumptions, one can sometimes find another explanation for not observing the degree of instability expected from the model in a multidimensional context. One set of models relaxes the assumption that a voter votes with probability one for the candidate who takes a position closest to her ideal point. This class of models is treated in Chapter 12. Here we briefly discuss two additional modifications of the Downsian model.

11.3.1 *Candidates have preferences over policies*

Wittman (1973, 1977) was one of the first to question Downs' assumption that candidates were only interested in winning elections. If candidates are concerned

about the *policy* outcomes of elections, as well as whether they are elected or not, they will be less quick to abandon certain policy positions to win votes. Wittman's suggestion has found considerable empirical support in *partisan* political cycle models (see Chapter 19).

Kollman, Miller, and Page (1992) allow candidates to give weight to their own ideologies when choosing positions, and to have imperfect information on voters' preferences. Simulations of two-candidate competitions lead to convergence on centralist positions.

Glazer and Lohman (1999) also model candidates as having personal preferences on policies, and allow them to precommit to certain policy positions. This action takes these issues out of the election, and thereby reduces the dimensionality of the issue space and the likelihood of cycling.

If the issue space can be reduced to a single dimension, the cycling problem disappears, of course, if we can invoke the single-peakedness assumption. Poole and Romer (1985) employed a least-squares multidimensional unfolding technique to map the ratings of members of the House of Representatives by 36 interest groups into a multidimensional policy space. They found that three dimensions suffice to obtain all of the predictive power inherent in the ratings, with a single liberal conservative dimension providing 94 percent of the explanatory power. In a follow-up study, Poole and Rosenthal (1997) analyzed *every roll call vote* in the House and Senate between 1789 and 1985. They too appear to be able to explain most of the voting behavior of individual members of Congress with a single ideological dimension.

If the issue space in presidential elections were similar to that in Congress, then the Poole-Romer-Rosenthal results would imply an issue space for these elections that conforms to that of the simple Hotelling-Downs model. Most observers of politics outside of the United States identify at least two salient dimensions to the political policy space.[12] Thus, dispensing with the potential for political instability by reducing the issue space to a single dimension does not seem possible for countries other than, perhaps, the United States.[13]

11.3.2 *Candidates can enter and exit the contests*

The Downsian model assumes that candidates are only concerned about winning the election and treats the number of candidates as a given. In addition to assuming that candidates are concerned about policy outcomes, a few papers have explored the implications of allowing candidates (citizens) to enter and exit an election.[14]

To see what is involved, let us assume that citizens are only concerned about policy outcomes. They obtain no personal rewards from being a candidate or winning an election other than that they can implement their most preferred policy. Becoming

[12] See, for example, Budge, Robertson, and Hearl (1987); Budge (1994); Laver and Schofield (1990); Schofield (1993a,b, 1995); and Schofield, Martin, Quinn, and Whitford (1998).

[13] Kenneth Koford (1989, 1990) has also challenged the result for the United States.

[14] See Palfrey (1984); Feddersen, Sened, and Wright (1990); Osborne and Slivinski (1996); Besley and Coate (1997); and Congleton and Steunenberg (1998). The following discussion relies on Besley and Coate.

a candidate implies incurring a fixed cost of C, however. Assume that all citizens vote for the candidate who promises them the highest utility. With entry and exit possible, an equilibrium must satisfy two conditions. No citizen who has chosen to be a candidate can increase her expected utility by changing her platform or withdrawing from the election. No citizen who is not a candidate can increase her expected utility by becoming one.

For an equilibrium to exist in which there is only one candidate, there must exist a platform choice that is a Condorcet winner. One citizen who's most preferred outcome is this platform chooses to become a candidate, and no one else bothers to incur the cost of entry, since no other platform can win. For an equilibrium to exist in which there are exactly two candidates, there must exist two issues that evenly divide the electorate, and no third issue favored by a larger number of voters. Since no one will choose to be a candidate unless he thinks he has a chance of winning, equilibria with higher numbers of candidates also require a number of separate issues equal to the number of candidates, which partition the population into groups of equal size.

One interesting result from the citizen-candidate model is that the equilibrium under the Downsian spatial model in which two candidates adopt the platform favored by the median voter is *not* an equilibrium. If one candidate has taken the position favored by the median voter, no second citizen would choose to be a candidate and take the same position, since she would incur the cost of being a candidate without obtaining any benefits from the victory of a preferred policy. With a single-dimensional issue space the only equilibrium involving two candidates has them taking positions on either side of the median position. Each of the two candidates must have an equal chance of winning, and the gain to each from victory must exceed the cost of becoming a candidate. The citizen-candidate model of elections thus gives an additional rationale for candidates in two-party elections not adopting identical platforms.

11.4 Testing the median voter hypothesis

Numerous studies have attempted to penetrate the "veil of representative democracy" by modeling government expenditure decisions *as if* they were made along a single, left-right dimension, and could essentially be treated as the private choices of the median voter.[15] A typical median voter model assumes that voters maximize utility subject to a budget constraint that includes their tax price for the public good, and derives the following demand equation for the median voter:

$$\ln G = a + \alpha \ln t_m + \beta \ln Y_m + \gamma \ln Z + \mu, \tag{11.4}$$

where G is government expenditures, t_m and Y_m are the tax price and income of the median voter, respectively, and Z is a vector of taste parameters (number of children, Catholic or non-Catholic, and so on). Equation (11.4) is then estimated using cross-sectional data on local expenditures of some kind.

[15] For surveys of this literature, see Deacon (1977a,b) and Inman (1979).

A large number of studies have tested some variant on the median voter hypothesis as given by (11.4). The overwhelming majority claim support for the median voter hypothesis on the basis of statistically significant coefficients on both Y_m and t_m of the correct sign. Denzau and Grier (1984) provide further evidence in support of the hypothesis by demonstrating that these coefficients vary over a narrow range when 12 "conditioning" (Z) variables gleaned from the literature are included in equations incorporating data on New York school districts.

The merits of the public choice approach can perhaps be best assessed by comparing its findings with those of the "traditional approach," which related government expenditures to urbanization, population size and density, mean community income, and perhaps several other socioeconomic variables, depending on the good in question.[16] Most of these variables might be included in the Z vector of taste or shift variables, and many have reappeared in public choice studies. The key innovations of the public choice approach have been to replace mean income with median income and to add the median voter's tax price. The inclusion of the tax price variable is a clear improvement over previous studies that did not include tax shares in the demand equation, because it indicates that the purchase of public goods is the outcome of some form of collective choice process in which the *cost* of the public good to the voter, as well as its value to him as reflected by socioeconomic characteristics, is important.

The good performance of median income in explaining local public expenditures cannot be interpreted as readily as lending support to the public choice approach. As already noted, most existing studies have assumed that local public good demand is related to *mean* incomes, and it would take a rather peculiar model of local public finance to obtain a prediction that income and expenditures were unrelated. Therefore, the contribution of the public choice approach must be to argue that it is *median* voter income that determines public good demand, not *mean* voter income. Most studies have not tested this hypothesis. Indeed, it is very difficult to test, given the other assumptions needed to test a median voter demand equation using cross-sectional data. As Bergstrom and Goodman (1973, pp. 286–7) point out, to estimate this equation on cross-sectional data one must assume a certain *proportionality* between the distributions of voters across local communities to ensure that the quantity demanded by the voter with the median income always equals the median quantity of public goods demanded in each community. However, if this proportionality holds, the means of the distributions will also be proportional, the correlation between mean and median income across communities will be perfect, and there will be no way to discriminate between the public-choice-approach demand equation and its rivals on the basis of this variable. The only way for the public choice approach to yield different predictions from other models is if the ratio of median to mean incomes differs across communities; that is, if there are different degrees of skewness across communities, and these differences in skewness are important in determining the demand for public goods.

[16] For a survey of this literature, see Gramlich (1970).

Pommerehne and Frey (1976) have tested this latter hypothesis. They found that the median income variable did work somewhat better at explaining local public expenditures than mean income did, although the superiority of median income as an explanatory variable was not particularly dramatic. More convincing support for the superiority of median income over mean income was obtained in a follow-up study by Pommerehne (1978), who used data on 111 Swiss municipalities to test the hypothesis. These data have the important and singular advantage of allowing one to ascertain the effect of having representative democracy, since the sample contains municipalities that make decisions via direct, town-meeting procedures and those that rely on representative assemblies. Pommerehne found that median income performed significantly better than mean income at explaining public expenditures in cities employing direct democracy. In the cities employing representative democratic procedures, median income led "to somewhat superior results," but its "explanatory power is not significantly better in any expenditure category."

Thus, the introduction of representatives into the democratic decision process does seem to introduce a sufficient amount of "white noise" to disguise or almost disguise the relationship between median voter preferences and final outcomes. This throws a cloud of doubt over the U.S.-based estimates, which rely entirely on representative election outcomes. Interestingly enough, Pommerehne found that even the existence of an optional or obligatory referendum on expenditure bills in cities governed by representative assemblies added enough of a constraint on the representatives' behavior to make the median voter model perform perceptibly better than for those cities in which representative democracy was able to function unchecked.

Turnbull and Mitias (1999) have conducted rigorous econometric tests of the performance of *median* voter income and tax price variables in an expenditure model versus *mean* values of these variables using county and state level data. Their tests tend to reject *both* specifications at both the state and county levels. The only level of government at which the median voter model is not rejected is at the municipal level – the lowest of the three levels of government examined.[17]

Gramlich and Rubinfeld (1982a) have gone even farther in suggesting that the performance of median voter income in most studies may merely be an artifact of aggregation in the cross-sectional data used to test the hypothesis. Using survey data for Michigan, they found that "higher-income individuals within a community... do not appear to have any greater taste for public spending" than lower-income individuals. The income elasticity of demand for expenditures "is very close to zero" when measured within communities (1982a, p. 544). The positive elasticities estimated in cross sections are due entirely to a positive association between community income and expenditures, precisely the relationship that the "traditional approach" estimated and the public choice approach sought to improve upon.

[17] Turnbull and Djoundourian (1994), and Turnbull and Mitias (1999). Further support for the median voter model using municipal data is provided by Deno and Mehay (1987), Wyckoff (1988), and Turnbull and Chan (1998).

A further cloud on the predictive power of the median voter model is provided by the *range* of estimates of the key parameters that have been reported. The income elasticities in the Bergstrom and Goodman (1973) study ranged from 0.16 to 1.73, while the tax price elasticities ranged from −0.01 to −0.50 (Romer and Rosenthal, 1979a, p. 159), although these estimates are for a single model applied to comparable bodies of data. Deno and Mehay's (1987) estimate of the income elasticity of demand for general government services at the municipal level in the states of Michigan and Ohio is 0.76, while Turnbull and Djoundourian's (1994) estimate for municipalities in the five Midwest states of Michigan, Ohio, Illinois, Indiana, and Wisconsin is 0.22. Turnbull and Djoundourian's estimate of the tax price elasticity for these five states (−0.88) comes close to Deno and Mehay's estimate of −0.72 for Michigan and Ohio, but both are far away from Deno and Mehay's estimate for the entire United States of −0.12.

All of this underlines the point that caution must be exhibited when interpreting the empirical results from public choice models. As in all areas of economics, the sophistication and elegance of the theoretical models of public choice far exceed the limits placed by the data on the empirical models that can be estimated. In going from the theoretical models to the empirical "verifications," additional assumptions and compromises must often be made that further hamper a clear interpretation of the results as constituting direct support for a hypothesis. What one is willing to conclude boldly on the basis of results analytically derived from *assumed* behavioral relationships, one must conclude circumspectly on the basis of estimated behavioral equations.

This same caution must be exercised in drawing the broader conclusion that a given set of results from a model based on public choice supports the public choice approach. It is common practice in economics to "test" a hypothesis by checking whether the results are "consistent" with it without exploring whether they are also consistent with other, conflicting hypotheses. Although it is perhaps unfair to hold public choice to higher standards than the other branches of economics, I do not think that this methodology suffices here. To demonstrate that public choice has something useful to contribute to the existing empirical literature on public finance and public policy, its models must be tested against the existing models, which ignore public choice considerations. Unless public choice–derived models can outperform the "traditional, ad hoc" models against which they compete, the practical relevance of public choice theories must remain somewhat in doubt. To date, few studies have attempted such comparisons. Three of those reviewed in this section that do make such comparisons (Pommerehne and Frey, 1976; Pommerehne, 1978; Turnbull and Chan, 1998) present evidence that is hardly encouraging as to the potential for predicting the outcomes of *representative government* with a model that treats the median voter as if he were dictator.

11.5 Are local public expenditures public or private goods?

In addition to estimating median income and tax price elasticities, several papers estimate a "degree-of-publicness" parameter based on the coefficients of the tax

price and population variables. This parameter is defined in such a way that "if [it] were nearly zero, there would be substantial economies to large city size since in larger cities, more consumers could share in the costs of municipal commodities with only minor crowding effects. Where [it] is about one, the gains from sharing the cost of public commodities among persons are approximately balanced by the disutility of sharing the facility among more persons" (Bergstrom and Goodman, 1973, p. 282). All of the studies discussed here find that this parameter is close to one. Borcherding and Deacon (1972, p. 900) urge that "great care should be exercised in interpreting" this coefficient, and in particular note that "normative conclusions drawn from the finding that the goods appear better classified as private or quasi-private rather than public are highly conjectural." Nevertheless, the temptation to make these normative conjectures is obviously appealing to many, and more than one writer has succumbed to it.[18] Such conclusions are not warranted, however. The coefficients upon which this degree-of-publicness parameter is estimated are obtained from cross-sectional equations based on observations from communities of differing sizes, each of which supplies these services (assumed homogeneous across communities) collectively to all members. A parameter estimate of one for police protection implies that a citizen living in a city of two million is no better off after weighing the reduced costs of spreading additional police protection across more taxpayers against the additional costs (crime?) resulting from crowding than a citizen living in a city of one million. It does *not imply* that individuals in the larger city can contract for "private" police protection as efficiently as municipal police departments can supply it. Since no private-contract police service systems are included in the studies, nothing can be said about their costs relative to public police protection. Nor can one even say that citizens in a part of the city of two million can efficiently form a club and provide their own police protection. If there are heavy spillovers from one part of a city to another, there may be no efficient way to supply police protection to a city of two million other than to supply it to all collectively, even though the net benefits from police protection to a citizen in a city of two million may be no greater than those to a citizen of a city half as large. The conclusion that the results of these studies imply that police protection is a private good comes from a confusion of the joint supply and nonexclusion characteristics of public goods. The studies cited above show that the net joint supply benefits of public good provision have generally been exhausted for the range of community sizes considered. Whether subsets of these communities can efficiently be excluded from the benefits of providing these services to other subsets, so that they can be provided via private or local clubs, is another, as yet untested, hypothesis.

Bibliographical notes

The spatial voting and electoral competition literature has been surveyed by Taylor (1971), Riker and Ordeshook (1973, ch. 12), Borooah and van der Ploeg (1983), Enelow and Hinich (1984), Calvert (1986), and Ordeshook (1986, ch. 4; 1997).

[18] See, for example, Niskanen (1975, pp. 632–3); Borcherding, Bush, and Spann (1977).

Barr and Davis (1966) and Davis and Haines (1966) made the pioneering efforts to apply the median voter model, and their work has been followed up by more sophisticated attempts by Borcherding and Deacon (1972), Bergstrom and Goodman (1973), Peterson (1973, 1975), Clotfelter (1976), Pommerehne and Frey (1976), Deacon (1978), Inman (1978), Pommerehne (1978), Holcombe (1980), Congleton and Bennett (1995), and Ahmed and Greene (2000).

The critical remarks in Sections 11.4 and 11.5 parallel in many respects the review by Romer and Rosenthal (1979a).

For further discussion and critiques of the degree-of-publicness parameter, see Inman (1979, p. 296) and Oates (1988a).