CHAPTER 6

Majority rule – normative properties

> Unanimity is impossible; the rule of a minority, as a permanent arrangement, is wholly inadmissible; so that, rejecting the majority principle, anarchy or despotism in some form is all that is left.
>
> Abraham Lincoln

> . . . unless the king has been elected by unanimous vote, what, failing a prior agreement, is the source of the minority's obligation to submit to the choice of the majority? Whence the right of the hundred who do wish a master to speak for the ten who do not? The majority principle is itself a product of agreement, and presupposes unanimity on at least one occasion.
>
> Jean-Jacques Rousseau

In Chapter 4 we argued that the ubiquitous popularity of majority rule might be attributable to the speed with which committees can make decisions using it. This quickness defense was undermined considerably in Chapter 5 by the results on cycling. A committee caught in a voting cycle may not be able to reach a decision quickly, and the outcome at which it eventually does arrive may be arbitrarily determined by institutional details, or nonarbitrarily determined by a cunning agenda setter. Is this all one can say in majority rule's behalf? Does the case for the majority rule rest on the promise that quasi-omniscient party leaders can arrange stable trades to maximize the aggregate welfare of the legislature discussed in Section 5.13.3?

When asked to explain majority rule's popularity, students unfamiliar with the vast public choice literature on the topic usually mention justness, fairness, egalitarian, and similar normative attributes that they feel characterize majority rule. Thus, to understand why majority rule is so often the committee rule, one must examine its normative as well as its positive properties. In this chapter we offer three sets of normative arguments in favor of the simple majority rule. The second two, although seemingly different, will prove to be quite closely related. The first will be seen to rest on a radically different conception of the nature of democratic choice from the other two.

6.1 Condorcet's jury theorem

Let us assume that after hearing all of the evidence in a case that the probability of a judge reaching the correct verdict regarding the accused's innocence is 0.6.

Obviously in trials presided over by one judge, the correct verdict will be reached 60 percent of the time. A tribunal that employed the unanimity rule would make the correct decision only 21.6 percent of the time. On the other occasions it would either fail to reach a unanimous verdict or would unanimously reach the wrong verdict. If, however, the tribunal used the simple majority rule, it would *always* reach a verdict, and would reach the correct verdict 64.8 percent of the time. Moreover, the probability that a panel of judges reaches the correct verdict grows continuously as its size increases – provided that it employs the simple majority rule.

This property of the simple majority rule was first discussed by the Marquis de Condorcet (1785) over 200 years ago. Condorcet's famous theorem reads as follows:

Condorcet Jury Theorem: *Let n voters (n odd) choose between two alternatives that have equal likelihood of being correct a priori. Assume that voters make their judgments independently and that each has the same probability p of being correct* $(1/2 < p < 1)$. *Then the probability that the group makes the correct judgment using the simple majority rule is*

$$P_n = \sum_{h=(n+1)/2}^{n} [n!\,/\,h!\,(n-h)!\,]p^h(1-p)^{n-h},$$

which approaches one as n becomes large.[1]

This theorem can be used to justify having both large juries and their use of the simple majority rule. The Athenian practice of having the assembly of all citizens serve as a jury in some cases and its use of the simple majority rule put Condorcet's theorem into practice more than two millennia before he proved it.

The theorem can also be used to justify direct democracy as, say, in the form of referenda. Suppose, for example, that all members of society wish to see the crime and suffering associated with the illegal sale and use of drugs eliminated. A proposal is made to legalize and regulate the sale of drugs in the belief that this measure would eliminate the profits and crime associated with drugs, just as the repeal of Prohibition in the United States in 1933 put an end to bootlegging. Other people argue, however, that legalizing drugs would increase their use and lead to even more crime and misery. The Condorcet jury theorem states that a national referendum on this issue would make the *correct* judgment of the facts with a near-one probability, if the probability of any single individual making the correct judgment is greater than 0.5, and all citizens make their judgments independently of one another.

The theorem can also serve as a normative defense of two-party representative government, of a majoritarian/plurality rule for electing representatives, if it is legitimate to assume that all citizens want the same things from their government or representative. If all citizens in the United States, for example, want the president to be a person of high integrity, a good administrator, a person who balances the

[1] Statement of theorem taken from Young (1997, p. 183). See also Young (1988).

budget and produces low inflation and unemployment, and so on, then the contest for the presidency will be to select "the best person for the job," where all citizens agree on the criteria for "best." If each citizen is able to determine with a probability greater than 0.5 the candidate who comes closest to fulfilling these criteria, then the popular election of the president will select the *best* person with a near-one probability.

The jury theorem rests on several assumptions, which might be questioned: (1) a common probability of being correct across all individuals, (2) each individual's choice is independent of all others, and (3) each individual votes sincerely (honestly) taking into account only his own judgment as to the correct outcome.

Allowing each individual i to have his own probability p_i does not fundamentally alter the theorem. For example, if the distribution of the p_is is symmetric, then the theorem still holds if the mean of the distribution is greater than one half.[2]

A potentially more serious problem arises when the second condition is relaxed. Imagine, for example, that when the jury meets to decide the fate of the accused, they begin by going around the table with each juror stating her opinion. In such an environment, where no one knows for sure if the accused is guilty, it is possible that those speaking late in the sequence are influenced by the opinions stated earlier. The more jurors who have already said "guilty," the more likely it is that the next juror says guilty. Clearly, in this situation the information content from the aggregation of all votes is less than if the jurors secretly wrote their opinions on pieces of paper. In the limit, if all jurors merely repeat the opinion of the first juror to speak, the probability of their then unanimous verdict being correct is no greater than that of any single juror's being correct. Fortunately, if the correlation between any two jurors' votes is not too high, the "truth revealing" property of majority rule is not overturned. Ladha (1992) computed the following expression for the upper bound for the correlation between any two votes that still allows the jury theorem to hold:

$$\hat{p} = p - \frac{n}{n-1}\,\frac{1-p}{p}(p - 0.25). \tag{6.1}$$

As the size of the electorate, n, grows, the *lowest* possible value for the upper bound approaches 0.25.[3]

This last example indirectly raises the question of the source of information from which voters make their decisions, and whether it is indeed optimal for them to vote sincerely ignoring how other citizens vote. Austen-Smith and Banks (1996) have presented a "model [in which] sincere behavior by all individuals is not rational even when individuals have . . . a common preference, [and] sincere voting does not constitute a Nash equilibrium" (p. 34). To see the logic behind their arguments, consider the following game.

There are two urns. One contains 60 white balls and 40 black balls, the other 1 black ball. This information is common knowledge to all n players. A ball will be

[2] See Grofman, Owen, and Feld (1983) and Shapley and Grofman (1984). Shapley, Grofman, Nitzan, and Paroush (1982) proved early generalizations of the theorem in which weighted voting is optimal, where each voter i's weight is $w_i = \ln(p_i/1 - p_i)$.

[3] See also Shapley and Grofman (1984), Ladha (1993, 1995), Berg (1993), and Ben-Yashar and Nitzan (1997).

drawn from one of these two urns, and the n players must decide using the simple majority rule what the color of this ball is (n is odd). If they decide correctly, they each receive a cash prize. A neutral game master first flips a coin to determine the urn from which this ball will be taken. He then picks a ball from this urn and shows it to the first player. He returns this ball to the urn and picks another ball from it and shows it to the second player. This continues until all n players have been shown one ball from this urn. The game master then picks another ball from the urn and the players vote on its color. At the time that they vote, each player is unaware of the outcome of the coin flip and knows only the color of the one ball that she has been shown.

Now consider the strategy choices of a single player, Alice. If she has been shown a black ball, she knows that it could have come from either urn, and she calculates the probability of the winning ball's being black as 0.7 $(0.5(1) + 0.5(0.4))$. Her optimal strategy based solely on her private information is to vote black. This vote reveals her private information as the jury theorem requires. But voting for black is not her optimal strategy, once she takes into account that the other voters are making similar calculations and the collective choice will be made using the majority rule.

Under the majority rule two possibilities exist: one of the other colors has gotten a clear majority of the votes of the other $n - 1$ players, or they are divided evenly between the two colors. Since $n - 1$ is an even number, if one color has a clear majority it must win by at least two votes not counting Alice's vote. Her vote cannot change the outcome, and she can forget about this possibility. When the other $n - 1$ players are evenly divided over the color, however, Alice's vote is pivotal. But in this case half of the other players have voted white. If even one of those voting white does so because he has been shown a white ball, Alice knows that the winning ball comes from the urn containing 60 white balls. The probability that it is a black ball is not 0.7 as her private information would lead her to believe, but 0.4. If she ignores the fact that some other voters must be shown a white ball when the votes of the other players are evenly split, and simply votes on the basis of her private information, she will tilt the committee's choice in favor of the lower probability event. She and all other members of the committee are better off if Alice ignores her private information and votes taking into account only the common knowledge about the game, and the fact that her vote is only decisive when the other players are evenly split.

What is true for Alice is, of course, true for all other players. The individually optimal strategy for everyone is to vote white, and everyone voting white is a Nash equilibrium. Once everyone understands the structure of the game and adopts the sophisticated strategy that this structure dictates, all will vote white even though the overall probability of drawing a white ball is only 0.3. Moreover, all vote white even in the event that every player has been shown a black ball. In this game sincere voting is irrational, and rational (sophisticated) voting on the part of everyone produces worse outcomes than sincere voting. Austen-Smith and Banks (1996) prove that these pathological results can be produced under a variety of assumptions that do not violate the basic spirit of the Condorcet jury theorem.

Unfortunately, there are many Nash equilibria in these sorts of games. Fortunately, on the other hand, not all of them involve the degree of pathology of the previous example in which everyone votes white. Indeed, in this example when $n = 3$, two persons voting sincerely and one voting strategically (always white) is also a Nash equilibrium, and it yields higher expected payoffs to the committee than would *all three* voting sincerely.[4] Ladha, Miller, and Oppenheimer (1995) have run experiments with games of the type just described, and found that when the games are repeated and the players can verify how the other players voted in earlier rounds, as well as their private information, that the players can lock in on combinations in which some vote sincerely and some vote following the sophisticated strategy of assuming that they are the pivotal player.

What should we conclude from this discussion? Is it most plausible to assume that people vote sincerely taking into account their private information (in which case the jury theorem may be a reasonable defense of majority rule), that they vote strategically assuming that they are a pivotal voter, or some combination of the two? In contemplating this question, perhaps it is useful to return to the example of a referendum on legalizing drugs. If such a referendum were held today in the United States, each citizen would place a probability of, say, 0.6 on the status quo being the best option, and 0.4 on legalization being better, given the common knowledge about the two options that exists today. But the referendum is announced for one year from today. Thus, each citizen has time to gather information and cast an informed vote. Some read about life under Prohibition in the United States and changes following its repeal. Others read about Holland's experience with the de facto legalization of the "softer" drugs. Some even travel to Holland to witness the effects first hand. When the day of the referendum comes, the sophisticated voter recognizes that his vote will only "count" if the other 80 million voters split evenly on both sides of the issue. But this would imply that all of the information gathering of the other voters has led to as many people in favor of the status quo as the number in favor of legalization. The aggregate effects of the private information on the vote are a wash. The sophisticated voter now recognizes that the information he has gathered is no more likely to have led him to the correct judgment than a flip of a coin would. The sophisticated voter recognizes that his vote will be pivotal only in the event that his private information is worthless, and thus he rationally ignores his private information and bases his vote on the common knowledge that he and his fellow citizens shared one year ago.

Indeed, if he were truly rational, he would not vote at all, since the probability of 80 million voters splitting precisely evenly on any issue is infinitesimal. Any costs of gathering information and voting will outweigh the expected gain from casting the pivotal vote, given the low probability of this event. More paradoxical than why a rational voter would reveal his private information and vote sincerely is why he would vote at all.

[4] More generally, Ladha, Miller, and Oppenheimer (1995) prove that there exists some minority $m < n/2$ for any committee of size n, n being odd, such that the probability that the committee votes correctly (and thus its expected payoff) is *higher* than that predicted by the Condorcet jury theorem, when the minority votes strategically ignoring its private information, and the majority votes *informatively* using its private information.

This "voting paradox" strikes at the very normative foundations of democracy, just as the Condorcet jury theorem purports to provide a normative foundation for majoritarian democracy. Many attempts have been made to resolve this paradox, and we shall examine some of them in Chapter 14. One hypothesis as to why people vote sees them voting out of a sense of civic duty, in step with a social norm. If this hypothesis does resolve the paradox of *why* people vote, it may also provide an explanation for *how* they vote on issues like those assumed in the Condorcet jury theorem. If the good citizen knows that the efficacy of the use of majority rule as a means for determining the *correct* policy depends on his honestly revealing what his private views are on this policy, perhaps he will vote sincerely – if he votes at all.

The assumptions underlying the Condorcet jury theorem depict politics as a cooperative, positive sum game. All citizens have the same objective – to convict the guilty and acquit the innocent, to choose the best person to fill the office. Many observers of politics do not view it in such a favorable light, however. Many view politics as a noncooperative, zero-sum game. The issue to be decided in the national referendum is whether to ban all abortions. People do not disagree about the *facts* involved, but rather over the ethical issues. A national referendum on this issue would simply determine which side is allowed to impose its judgment on the other. Can the use of the simple majority rule be given a normative justification in these situations? We turn to two sets of arguments that say it can.

6.2 May's theorem on majority rule

A most important theorem concerning majority rule was proved a half century ago by May (1952). May begins by defining a *group decision* function:

$$D = f(D_1, D_2, \ldots, D_n),$$

where n is the number of individuals in the community. Each D_i takes on the value $1, 0, -1$ as voter i's preferences for a pair of issues are xP_iy, xI_iy, and yP_ix, where P represents the strict preference relationship and I indifference. Thus, the D_i serve as ballots, and $f(\cdot)$ is an aggregation rule for determining the winning issue. Depending on the nature of the voting rule, $f(\cdot)$ takes on different functional forms. Under the simple majority rule, $f(\cdot)$ sums the D_i and assigns D a value according to the following rule:

$$\left(\sum_{i=1}^{n} D_i > 0\right) \rightarrow D = 1$$

$$\left(\sum_{i=1}^{n} D_i = 0\right) \rightarrow D = 0$$

$$\left(\sum_{i=1}^{n} D_i < 0\right) \rightarrow D - 1.$$

May defines the following four conditions:[5]

Decisiveness: The group decision function is defined and single valued for any given set of preference orderings.

Anonymity: D is determined only by the values of D_i, and is independent of how they are assigned. Any permutation of these ballots leaves D unchanged.

Neutrality: If x defeats (ties) y for one set of individual preferences, and all individuals have the same *ordinal* rankings for z and w as for x and y (i.e., $xR_iy \rightarrow zR_iw$, and so on), then z defeats (ties) w.

Positive responsiveness: If D equals 0 or 1, and one individual changes his vote from -1 to 0 or 1, or from 0 to 1, and all other votes remain unchanged, then $D = 1$.

The theorem states that a group decision function is the simple majority rule *if and only if* it satisfies these four conditions. It is a most remarkable result. If we start from the set of all possible voting rules one can conceive of, and then begin imposing conditions we wish our voting rule to satisfy, we shall obviously reduce the number of viable candidates for our chosen voting rule as we add more and more conditions. May's theorem tells us that once we add these four conditions, we have reduced the possible set of voting rules to but one, the simple majority rule. All other voting rules violate one or more of these four axioms.

This result is both surprising and ominous. It forebodes that if we were to demand more of a voting rule than that it satisfy only these four axioms, that is, were we to demand a fifth axiom, then even majority rule might not qualify and we would have no voting rule satisfying the proposed conditions. Chapter 5 also gives us a strong hint as to what that fifth condition might be – transitivity. But for the moment we are concerned with the choice between just two issues, and we need not concern ourselves with transitivity. The foreboding can be suppressed until Chapter 24.

The equivalence between majority rule and these four conditions means that all of the normative properties majority rule possesses, whatever justness or egalitarian attributes it has, are somewhere captured in these four axioms, as are its negative attributes. We must examine these conditions more closely.

Decisiveness seems at first uncontroversial. If we have a *decision* function, we want it to be able to decide at least when confronted with only two issues. But this axiom does eliminate all probabilistic procedures in which the probability of an issue's winning depends on voter preferences. Positive responsiveness is also a reasonable property. If the decision process is to reflect each voter's preference, then a switch by one voter from opposition to support ought to break a tie.

The other two axioms are less innocent than they look or their names connote. The neutrality axiom introduces an issue-independence property.[6] In deciding a pair of issues, only the ordinal preferences of each voter over this issue pair are

[5] The names and definitions have been changed somewhat to reflect subsequent developments in the literature and to simplify the discussion. In particular, the definition of neutrality follows Sen (1970a, p. 72).

[6] Sen (1970a, p. 72) and Guha (1972).

considered. Information concerning voter preferences on other issue pairs is ruled out, and thereby one means for weighing intensities is eliminated. The neutrality axiom eliminates voting rules like the Borda count and point voting described in the next two chapters. It requires that the voting rule treat each issue pair alike regardless of the nature of the issues involved. Thus, the issue of whether the lights on this year's community Christmas tree are red or blue is decided by the same kind of weighing of individual preference orderings as the issue of whether John Doe's property should be confiscated and redistributed among the rest of the community.

Where the neutrality axiom guarantees that the voting procedure treats each *issue* alike, anonymity assures that each *voter* is treated alike. On many issues this is probably a desirable property. On the issue of the color of the Christmas lights, a change of one voter's preferences from red to blue and another from blue to red probably should not affect the outcome. Implicit here is a judgment that the color of the tree's lights is about as important to one voter as to the next. This equal intensity assumption is introduced into the voting procedure by recording each voter's expression of preference, no matter how strong, as a plus or minus one.

But consider now the issue of whether John Doe's property should be confiscated and distributed to the rest of the community. Suppose John is a generous fellow and votes for the issue and the issue in fact passes. Suppose now that John changes his vote to negative, and that his worst enemy, who always votes the opposite of John, switches to a positive vote. By the anonymity condition, the issue still should pass. A voting procedure satisfying this procedure is blind as to whether it is John Doe or his worst enemy who is voting for the confiscation of John Doe's property. In some situations this may obviously be an undesirable feature.

6.3* Proof of May's theorem on majority rule

Theorem: *A group decision function is the simple majority rule iff it satisfies the four conditions stated in Section 6.2.*

That majority rule implies the four conditions is rather obvious.

1. It always adds to an integer, which by the decision function is transformed into -1 or 0 or $+1$, and thus is decisive.
2. Change any $+1$ to -1, and any -1 to $+1$, and the sum is left unchanged.
3. If the rankings are the same on any two pairs of issues, then so too will be the vote summations.
4. If $\sum D_i = 0$, increasing any D_i will make $\sum D_i > 0$, and decide the contest in favor of x. If $\sum D_i > 0$, increasing any D_i will leave $\sum D_i > 0$ and will not change the outcome.

Now we must show that the four conditions imply the majority rule. We first show that the first three conditions imply

$$[N(-1) = N(1)] \rightarrow D = 0, \tag{6.2}$$

where $N(-1)$ is the number of votes for y and $N(1)$ is the number for x.

Assume that (6.2) does not hold – for example, that

$$[N(-1) = N(1)] \rightarrow D = 1. \qquad (6.3)$$

When the number of votes for y equals the number of votes for x, the outcome is x.

Now relabel y to z and x to w, where a vote for z is now recorded as a -1 and a vote for w as a $+1$. Reverse all $+1$s to -1s, and -1s to $+1$s. By anonymity, this latter change should not affect the group decision. All individuals who originally regarded x at least as good as $y(x R_i y)$ will now regard z as at least as good as w. By the neutrality axiom, the collective outcome must be z if it was originally x. But z is equivalent to y, not x. The decisiveness axiom is violated.

Thus, (6.3) is inconsistent with the first three axioms. By an analogous argument one can show that (6.4) is inconsistent with the first three axioms:

$$[N(-1) = N(1)] \rightarrow D = -1. \qquad (6.4)$$

Thus, (6.2) must be valid. From (6.2) and positive responsiveness, we have

$$[N(1) = N(-1) + 1] \rightarrow D = +1. \qquad (6.5)$$

When the number of votes for x is one greater than the number for y, then x must win. Now assume that when the number of votes for x is $m - 1$ greater than the number for y, x wins. A change in preferences of one voter so that the number preferring x to y is now m greater than the number preferring y to x cannot reverse the outcome by positive responsiveness. By finite induction, the four conditions imply the method of simple majority rule.

6.4 The Rae-Taylor theorem on majority rule

Although on the surface they seem quite different, May's theorem on majority rule is quite similar in its underlying assumptions to a theorem presented by Rae (1969) and Taylor (1969).

Rae (1969, pp. 43–4) sets up the problem as one of the choice of an optimal voting rule by an individual who is uncertain over his future position under the voting rule. Thus, the discussion is set in the context of constitutional choice of a voting rule as introduced by Buchanan and Tullock (1962, pp. 3–15).[7] Politics, as Rae and Taylor depict it, is a game of conflict. Some individuals gain from an issue's passage; some inevitably lose. The representative individual in the constitutional stage seeks to avoid having issues he opposes imposed upon him, and to impose issues he favors on others. He presumes that the gains he will experience from a favorable issue's passage will equal the loss from an unfavorable issue's passage, that is, that all voters experience equal intensities on each issue.[8] Issues are impartially proposed so that each voter has the same probability of favoring or opposing

[7] See also Buchanan (1966).

[8] Rae (1969, p. 41, n. 6). The importance of this equal intensity assumption has been recognized by several writers. Additional references for each assumption are presented in the notes to Table 6.1, where the assumptions are summarized.

any issue proposed. Under these assumptions, it is reasonable to assume that the representative voter selects a rule that minimizes the probability of his supporting an issue that is defeated, or opposing an issue that wins. Rae (1969) illustrates and Taylor (1969) proves that majority rule is the only rule that satisfies this criterion.[9]

The full flavor of the theorem can best be obtained by considering an example of Brian Barry (1965, p. 312). Five people occupy a railroad car that contains no sign either prohibiting or permitting smoking. A decision must be made as to whether those occupants of the car who wish to smoke are to be allowed to do so. If an individual placed himself in the position of one who was uncertain as to whether he would be a smoker or nonsmoker, the natural assumption is that nonsmokers suffer as much from the smoking of others as smokers suffer from being stopped from smoking.[10] The equal intensity assumption seems defensible in this case. With this assumption, and uncertainty over whether one is a smoker or nonsmoker, majority rule is the best decision rule. It maximizes the expected utility of a constitutional decision maker.

This example illustrates both the explicit and implicit assumptions underlying the Rae-Taylor theorem on majority rule. First, the situation is obviously one of conflict. The smoker's gain comes at the nonsmoker's expense, or vice versa. Second, the conflictual situation cannot be avoided. The solution to the problem provided by the exit of one category of passenger from the wagon is implicitly denied.[11] Nor does a possibility exist to redefine the issue to remove the conflict and obtain a consensus. Each issue must be voted up or down as is. Fourth, the issue has been randomly or impartially selected. In this particular example, randomness is effectively introduced through the chance assemblage of individuals in the car. No apparent bias in favor of one outcome has been introduced via the random gathering of individuals in the car. The last assumption contained in the example is the equal intensity assumption.

The importance of each of these assumptions to the argument for majority rule can perhaps best be seen by contrasting them with the assumptions that typically have been made in support of its antithesis, the unanimity rule.

6.5 Assumptions underlying the unanimity rule

As depicted by Wicksell (1896) and Buchanan and Tullock (1962), politics is a cooperative, positive-sum game. The committee's business is the collective satisfaction of needs common to all members. The committee (or community) is a voluntary association of individuals brought together for the purpose of satisfying these common needs.[12] Since the association is voluntary, each member is guaranteed the right to preserve his own interests against those of the other members. This right

[9] The "only" must be qualified when the committee size, n, is even. With n even, majority rule and the rule $n/2$ share this property. See Taylor (1969). Chapter 26 contains a proof of the simple majority rule's optimality under assumptions similar to those made by Rae and Taylor.

[10] This assumption would seem less "natural" to many in the United States today than it did 35 years ago.

[11] Rae (1975) stresses this assumption in the implicit defense of majority rule contained in his critique of unanimity.

[12] See also Buchanan (1949).

is preserved by the power contained in the unanimity rule to veto any proposal that runs counter to an individual's interest, or through the option to exit from the community, or both.

Given that the purpose of the committee is the satisfaction of the wants of the committee members, the natural way for issues to come before it is from the individuals themselves. Each individual has the right to propose issues that will benefit him and that he thinks might benefit all. Should an initial proposal fail to command a unanimous majority, it is redefined until it does, or until it is removed from the agenda. Thus, the political *process* implicit in a defense of the unanimity rule is one of discussion, compromise, and amendment, continuing until a formulation of the issue is reached benefiting all. The key assumptions underlying this view of politics are both that the game is cooperative and positive sum, that is, that a formulation of the issue benefiting all exists, *and* that the process can be completed in a reasonable amount of time, so that the transaction costs of decision making are not prohibitive.[13]

Let us also illustrate the type of voting process that the proponents of unanimity envisage through the example of fire protection in a small community. A citizen at a town meeting proposes that a truck be purchased and a station built to provide fire protection, and couples his proposal, in Wicksellian fashion, with a tax proposal to finance it. Suppose that this initial tax proposal calls upon each property owner to pay the same fraction of the costs. The citizens with the lowest-valued property complain. The expected value of the fire protection (the value of the property times the reduction in the risk of fire) to some property owners is less than their share of the costs under the lump-sum tax formula. Enactment of the proposal would make the poor subsidize the protection of the property of the rich. As an alternative proposal, a proportional tax on property values is offered. The expected benefits to all citizens now exceed their share of its cost. The proposal passes unanimously.

6.6 Assumptions underlying the two rules contrasted

Fire protection, the elimination of smoke from factories, and similar examples used to describe the mutual benefits from collective action all pertain to public goods and externalities – activities in which the market fails to provide a solution beneficial to all. The provision of these public goods is an improvement in allocative efficiency, a movement from a position off the Pareto frontier to a point on it. Proponents of unanimity have assumed that collective action involves collective decisions of this type.

[13] Both Wicksell (1896) and Buchanan and Tullock (1962) recognize that decision time costs may be sufficiently high to require abandonment of a full unanimity rule in favor of a near unanimity rule (Wicksell) or some even lower fractional rule. Indeed, much of Buchanan and Tullock's book is devoted to the choice of the optimal "nonunanimity" rule, as discussed in Chapter 4. Thus, one might question whether they can legitimately be characterized as champions of unanimity. I have chosen them as such because I think their arguments can be fairly characterized as stating that *were it not for these transaction costs*, unanimity would be the best rule, and, therefore, that some rule approaching unanimity, or at least greater than a simple majority, is likely to be the best in many situations. In contrast, Rae (1975) and Barry (1965) both argue that their critique of unanimity is not based solely on the decision cost criterion.

In contrast, many advocates of majority rule envisage conflictual choices in which no mutually beneficial opportunities are available, as occurs when a community is forced to choose from among a set of Pareto-efficient opportunities. In the fire protection example, there might be a large number of tax share proposals that would cover the cost of fire protection and leave all better off. All might receive unanimous approval when placed against the alternative of no fire protection. Once one of these proposals has achieved a unanimous majority no other proposal from the Pareto-efficient set can achieve unanimity when placed against it. Any other proposal must make one voter worse off (by raising his tax share), causing him to vote against it.

Criticisms of unanimity and defenses of majority rule often involve distributional or property rights issues of this type. In Barry's example, the train car's occupants are in conflict over the right to clean air and the right to smoke; Rae (1975, pp. 1287–97) uses the similar example of the smoking factory and the rights of the nearby citizens to clean air in criticizing the unanimity rule. In both cases, a property rights decision must be made with distributional consequences. If the smokers are given the right to smoke, the seekers of clean air are made worse off. Even in situations in which the latter can be made better off by bribing the smokers to reduce the level of smoke, the nonsmokers are worse off by having to pay the bribe than they would be if the property right had been reversed and the smokers had to offer the bribe (Rae, 1975). Buchanan and Tullock (1962, p. 91) discuss this same example, but they assume that the initial property rights issue has already been fairly resolved at the constitutional stage. This illustrates another difference between the proponents of unanimity and majority rule. The former typically assume decision making takes place *within* a set of predefined property rights; the latter, like Barry and Rae, assume that it is the property rights decision itself that must be made. In Barry's example it is the only decision to be made. Rae's argument is more complicated. He argues that the constitution cannot resolve all property rights issues for all time, so that technological and economic changes cause some property rights issues to *drift* into the resolution of public goods and externalities. In either case, however, unanimous agreement on the property rights issue of who has the initial claim on the air is obviously unlikely under the egoistic-man assumptions that all writers have made in this discussion. A less than unanimity rule *seems* necessary for resolving these initial property rights-distributional issues.

The last statement is qualified because it requires the other assumptions introduced in the discussion of majority rule: exit is impossible (or expensive); the issue cannot be redefined to make all better off. The need for the first assumption is obvious. If the occupants of the railroad car can move to another car in which smoking is explicitly allowed or prohibited, the conflict disappears, as it does if either the factory or the nearby residents can move costlessly. The importance of the second assumption requires a little elaboration.

Consider again the example of smoking in the railway car. Suppose the train is not allowed to proceed unless the occupants of this car can decide whether smoking is to be allowed or not. If the unanimity rule were employed, the potential would exist for the type of situation critics of unanimity seem to fear the most – a costly impasse. Out of this impasse, the minority might even be able to force the majority to capitulate, if the benefits to the majority from the train's continuation were high enough. Under these assumptions, majority rule is an attractive alternative to unanimity.

Now change the situation slightly. Suppose that *all passengers of the entire train* must decide the rules regarding smoking before the train may proceed. Since there is undoubtedly some advantage in having the entire train from which to choose a seat rather than only part of it, a rational egoist can be expected to prefer that the entire train be declared an area that accords with his preferences regarding smoking. If majority rule were used to decide the issue, then smoking would be either allowed or prohibited throughout the train. But if a unanimity rule were employed, the train's occupants would be forced to explore other alternatives to having the entire train governed by the same rule. The proposal of allowing smoking in some sections and prohibiting it in others might easily emerge as a "compromise" and win unanimous approval over having the train remain halted. Members of the majority would be somewhat worse off under this compromise than they would have been had the entire train been designated according to their preferences, but members of the minority would be much better off. An impartial observer might easily prefer the compromise forced on the group by the unanimity rule to the outcome forthcoming under majority rule.

The arguments in favor of majority rule implicitly assume that such compromise proposals are not possible. The committee is faced with mutually exclusive alternatives.[14] Mutually beneficial alternatives are assumed to be technologically infeasible or the voting process is somehow constrained so that these issues cannot come before the committee.

Table 6.1 summarizes the assumptions that have been made in support of the majority and unanimity decision rules. They are not intended to be necessary and sufficient conditions, but are more in the nature of the most favorable conditions under which each decision rule is expected to operate. It is immediately apparent from Table 6.1 that the assumptions supporting each decision rule are totally opposed to the assumptions made in support of the alternative rule. The importance of these assumptions in determining the normative properties of each rule can be seen easily by considering the consequences of applying each rule to the "wrong" type of issue.

6.7 The consequences of applying the rules to the "wrong" issues

6.7.1 *Deciding improvements in allocative efficiency via majority rule*

On an issue that all favor, nearly one-half of the votes are "wasted" under majority rule. A coalition of the committee's members could benefit from this by redefining the issues to increase their benefits at the expense of noncoalition members. In the town meeting example, one could easily envisage a reverse scenario. An initial proposal to finance fire protection via a proportional property tax is made.

[14] Buchanan and Tullock (1962, p. 253) and Rae (1969, pp. 52–3).

Table 6.1. *Assumptions favoring the majority and unanimity rules*

Assumption	Majority rule	Unanimity rule
1. Nature of the game[a]	Conflict, zero sum	Cooperative, positive sum
2. Nature of issues	Redistributions, property rights (some benefit, some lose)	Allocative efficiency improvements (public goods, externality elimination)
	Mutually exclusive issues of a single dimension[b]	Issues with potentially several dimensions and from which all can benefit[c]
3. Intensity	Equal on all issues[d]	No assumption made
4. Method of forming committee	Involuntary; members are exogenously or randomly brought together[e]	Voluntary; individuals of common interests and like preferences join[f]
5. Conditions of exit	Blocked, expensive[g]	Free
6. Choice of issues	Exogenously or impartially proposed[h]	Proposed by committee members[i]
7. Amendment of issues	Excluded, or constrained to avoid cycles[j]	Endogenous to committee process[i]

[a] Buchanan and Tullock (1962, p. 253); Buchanan (1966, pp. 32–3).
[b] Barry (1965, pp. 312–14); Rae (1975, pp. 1286–91).
[c] Buchanan and Tullock (1962, p. 80); Wicksell (1896, pp. 87–96).
[d] Rae (1969, p. 41, n. 6); Kendall (1941, p. 117); Buchanan and Tullock (1962, pp. 128–30).
[e] Rae (1975, pp. 1277–8).
[f] Wicksell (1896, pp. 87–96); Buchanan (1949). This assumption is common to all contractarian theories of the state, of course.
[g] Rae (1975, p. 1293).
[h] This assumption is implicit in the impartiality assumed by Rae (1969) and Taylor (1969) in their proofs, and in Barry's example (1965, in particular on p. 313).
[i] Wicksell (1896); Kendall (1941, p. 109).
[j] Implicit.

All favor the proposal and it would pass under the unanimity rule. But the town meeting now makes decisions under majority rule. The town's wealthiest citizens caucus and propose a lump-sum tax on all property owners. This proposal is opposed as being regressive by the less well-to-do members of the community, but it manages to secure a majority in its favor when placed against the proportional tax proposal. A majority coalition of the rich has succeeded in combining the provision of fire protection with a regressive tax on the poor. Wicksell's (1896, p. 95) belief that the unanimity rule would favor the poor was probably based on similar considerations.

But there are other ways in which de facto redistribution can take place under majority rule. A coalition of the residents of the north side of the town might form and propose that the provision of fire protection for the entire town be combined with the construction of a park on the north side, both to be financed out of a proportional tax on the entire community.[15] On the assumption that the southsiders do not benefit

[15] This example resembles Tullock's (1959) example in his demonstration that majority rule can lead to *over*expenditure in government, as discussed earlier.

from the park, this proposal would redistribute income from the southsiders to the northsiders just as clearly as a proposal to lower the taxes of the northsiders and raise the taxes of the southsiders would.

Thus, under majority rule, a process of issue proposal and amendment internal to the committee can be expected to convert purely positive-sum games of achieving allocational efficiency into games that are a combination of an allocational change and a redistribution. As Buchanan and Tullock (1962, pp. 190–2) have shown, when logrolling games allow side payments, the redistribution of wealth for and against any proposal will balance out. In logrolling games where direct side payments are not allowed, the exact values of the net income transfers are more difficult to measure. Nevertheless, when stable coalitions cannot be formed, the dynamic process of issue redefinition under majority rule to produce winning and losing coalitions of nearly equal size and differing composition can be expected to result in essentially zero *net* redistribution in the long run. Riker's assumption that all politics is a zero-sum game of pure redistribution might characterize *the long-run redistributive aspects of the outcomes* of the political process under majority rule.

This potential of majority rule must be stressed. The redistributive properties of majority rule can have a dynamic such that the winning majority only barely defeats the losing majority, thus justifying Rae's assumption that the probability that one favors the winning issue equals the probability that one favors the losing issue. Add to that the equal intensity assumption that Rae makes, and May's axioms build in, and we have the expected utility gains for the winners on any issue equaling the expected utility losses of the losers. Thus, the assumptions underlying the normative properties of majority rule imply that there are no *net* expected utility gains from the passage of any issue. The game is zero sum in expected utilities as well as dollar payoffs. But then why play the game? The normative assumptions building a case for majority rule when applied to any issue pair undermine its use in the long run. This feature of majority rule may help explain why some observers like Brittan (1975) are frustrated with the long-run benefits to society from majority rule democracy.

We have seen that the redistributive characteristics of majority rule can make stable winning coalitions difficult to maintain and can lead to cycles. If a stable, winning coalition can form, however, the transaction costs of cycling and of forming and destroying coalitions can be greatly reduced or eliminated. If committee members are free to propose and amend issues, a stable majority coalition can engage in continual redistribution from the losing committee members. This "tyranny of the majority" outcome may be even more undesirable than a futile, but more or less impartial, redistribution emerging under a perpetual cycle (Buchanan, 1954a). Stratmann's (1996) tests for the presence of cycling in the U.S. Congress, discussed in the previous chapter, suggest that such a stable, tyrannous majority exists there, at least on federal grants.

Thus, implicit in the arguments supporting majority rule we see the assumption that no stable majority coalition forms to tyrannize over the minority, and a zero-transaction-costs assumption, analogous to the zero-decision-time assumption supporting the unanimity rule. The issue proposal process is to be established so that cycles either cannot form or, if they do, they add a purely redistributive component to a set of allocational efficiency decisions that are predetermined or somehow unaffected by the cycling-redistribution process. Whether this process of issue redefinition, coalition formation, and cycling results in any net welfare gains remains an open question.

6.7.2 *Deciding redistribution by unanimity*

Any issue over which there is unavoidable conflict is defeated under a unanimity rule. Redistribution of income and wealth, other than of the voluntary sort described in Chapter 3, and redefinitions of property rights are all blocked by this rule.

Critics of unanimity have found two consequences of this outcome particularly disturbing. First is the possibility that all progress halts.[16] The train cannot proceed until the five occupants of the car have reached a consensus on the smoking issue. Most technological progress leaves some people worse off. Indeed, almost any change in the economic or physical environment may make someone worse off. Even if the legalization of drugs would eliminate all associated crime and suffering, the few drug barons who profit from their illicit sale would be made worse off and would vote to block legalization.[17] Although in principle each proposed change, down to the choice of color of my tie, could be collectively decided with appropriate compensation paid to those injured, the decision costs of deciding these changes under a unanimity rule are obviously prohibitive. The decision costs objection to the unanimity rule reappears. In addition, as an implicit defense of majority rule, this criticism seems to involve the assumption that technological change, or those changes involving de facto redistributions of income and property rights, are impartial. The utility gain to any individual favoring a change equals the utility loss to an opponent. And, over time, these gains and losses are impartially distributed among the population. Behind this assumption is another, that the process by which issues come before the committee is such that it is impossible to amend them so they will benefit one group systematically at the expense of the others. Time and the environment impartially cast up issues involving changing property rights and redistribution, and the committee votes these issues up or down as they appear, using majority rule. All benefit in the long run from the efficiency gains inherent in allowing technological progress to continue unencumbered by deadlocks in the collective decision process.

The second concern about using the unanimity rule to decide redistribution and property rights is that the veto power this rule gives a minority benefits one particular minority, violating a generally held ethical norm. The abolition of slavery is blocked by the slave owners, the redistribution of income by the rich. If one group achieves a larger than average share of the community's income or wealth via luck, skill,

[16] See Reimer (1951), Barry (1965, p. 315), and Rae (1975, pp. 1274, 1282, 1286, 1292–3).

[17] This conservatism inherent in the unanimity rule would appear to be one of Rae's main arguments against it, as in his discussion of property rights drift in the smoking chimney example (1975, pp. 1287–93). As Tullock (1975) points out, however, these criticisms do not suffice as a justification for majority rule to decide this issue. The other assumptions we have discussed are needed.

or cunning, the unanimity rule ensures that this distribution cannot be upset by collective action of the community. Under the unanimity rule, those who gain from the maintenance of the status quo always succeed in preserving it.[18]

6.8 Conclusions

A follower of the debate over majority and unanimity rule could easily be forgiven for concluding that there is but one type of issue to be decided collectively, and one best rule for making collective decisions. Thus Wicksell (1896, p. 89) argues:

> If any public expenditure is to be approved . . . it must generally be assumed that this expenditure . . . is intended for an activity useful to the whole of society and so recognized by all classes without exception. If this were not so . . . I, for one, fail to see how the latter can be considered as satisfying a collective need in the proper sense of the word.

A similar position is inherent in all contractarian positions, as in John Locke (1939, p. 455, § 131).

> Men . . . enter into society . . . only with an intention in everyone the better to preserve himself, his liberty and property (for no rational creature can be supposed to change his condition with an intention to be worse), the power of the society, or legislative constituted by them, can never be supposed to extend farther than the common good, but is obliged to secure everyone's property.[19]

On the other extreme, we have Brian Barry (1965, p. 313):

> But a *political* situation is precisely one that arises when the parties are arguing not about mutually useful trades but about the legitimacy of one another's initial position. (Italics in original)

And in a similar vein William Riker (1962, p. 174):

> Most economic activity is viewed as a non-zero-sum game while the most important political activity is often viewed as zero-sum.

But, it should now be clear that the collective choice process is confronted with two fundamentally different types of collective decisions to resolve, corresponding to the distinction between allocation and redistribution decisions (Mueller, 1977). Some important political decisions involve potentially positive-sum game decisions to provide defense, police and fire protection, roads, environmental protection, and

[18] Barry (1965, pp. 243–9); Rae (1975, pp. 1273–6, 1286).

[19] Kendall (1941) depicted Locke as a strong defender of majority rule. The only explicit reason Locke (p. 422, § 98) gives for using the majority rule in place of unanimity is a sort of transaction cost problem of assembling everyone, analogous to the Wicksell-Buchanan-Tullock decisions cost rule for choosing some less-than-unanimity rule. In this sense, Locke is a consistent unanimitarian.

so on. These decisions are made neither automatically nor easily. It is similarly obvious that part of political decision making must and should concern itself with the basic questions of distribution and property. The inherent differences between the underlying characteristics of these two types of decisions suggest both that they should be treated separately conceptually and, as a practical matter, that they should be resolved by separate and different collective decision processes.

In some ways, it is an injustice to Wicksell to have quoted him in the present context, for it was one of Wicksell's important insights, and the most influential contribution to the subsequent development of the literature, to have recognized the distinction between allocation and redistribution decisions, and the need to treat these decisions with separate collective decision processes. Indeed, in some ways he was ahead of his modern critics, for he recognized not only that the distribution and allocation issues would have to be decided separately, but also that unanimity would have to give way to majority rule to resolve the distribution issues (1896, p. 109, note m). But Wicksell did not elaborate on how the majority rule would be used to settle distribution issues, and the entire normative argument for the use of the unanimity rule to decide allocation decisions is left to rest on the *assumption* that a just distribution has been determined prior to the start of collective decision making on allocation issues.

Unfortunately, none of the proponents of majority rule has elaborated on how the conditions required to achieve its desirable properties are established. Somewhat ironically, perhaps, the normative case for using majority rule to settle property rights and distributional issues rests as much on decisions taken *prior to* its application, as the normative case for using the unanimity rule for allocation decisions rests on an already determined just income distribution. The Rae-Taylor theorem presupposes a process that is impartial, in that each voter has an equal chance of winning on any issue and an equal expected gain (or loss) from a decision's outcome. Similar assumptions are needed to make a compelling normative case for May's neutrality and anonymity conditions. But what guarantees that these conditions will be met? Certainly they are not met in the parliaments of today, where issue proposals and amendments are offered by the parliamentary members, and the outcomes are some blend of cycles, manipulated agendas, and tyrannous majorities. To realize majority rule's potential for resolving property rights and redistribution issues, some new form of parliamentary committee is needed that satisfies the conditions that majority rule's proponents have assumed in its defense. A constitutional decision is required.

But what rule is used to establish this new committee? If unanimity is used, those favored by the status quo can potentially block the formation of this new committee, whose outcomes, although fair, would run counter to the status quo's interest. But if the majority rule is employed, a minority may dispute both the outcomes of the distribution process and the procedure by which it was established. What argument does one use to defend the justness of a redistribution decision emerging from a parliamentary committee to a minority that feels the procedure by which the committee was established was unfair and voted against it at that time? This question seems as legitimate when raised against a majority rule decision, whose justification rests on the fairness of the issue proposal process as it does when raised against a unanimity rule that rests its justification on some distant, unanimous agreement on property rights. At some point, the issue of how fairness is introduced into the decision process, and how it is agreed upon, must be faced.

We have run up against the infinite regress problem. The only satisfactory way out of this maze is to assume that at some point unanimous agreement on a set of rules and procedures was attained.[20] If this agreement established a parliamentary committee to function under the majority rule, then the outcomes from this committee could be defended on the grounds that all at one time must have agreed that this would be a fair way of resolving those types of issues that are allowed to come before the committee. This interpretation places the majority rule in a secondary position to the unanimity rule at this stage of the analysis and reopens the question of how unanimous agreement, now limited perhaps to establishing the parliamentary procedures to decide both distributional and allocation efficiency issues, is reached. We take up this question in Part V.

Bibliographical notes

The normative issues and literature regarding the simple majority rule are reviewed by Rae and Schickler (1997) and Young (1997). The most general generalization of the Condorcet jury theorem has been proved by Ben-Yashar and Nitzan (1997) who also reference much of the earlier literature. Sen (1970a, pp. 71–3) offers another proof of May's (1952) theorem, and Campbell (1982) presents a related result.

[20] See Buchanan and Tullock (1962, pp. 6–8).