

Public Choice: A Survey

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Public choice can be defined as the economic study of nonmarket decision making, or, simply the application of economics to political science. The basic behavioral postulate of public choice, as for economics, is that man is an egoistic, rational, utility maximizer.¹ This places public choice within the stream of political philosophy extending at least from Thomas Hobbes and Benedict Spinoza, and within political science from James Madison and Alexis de Tocqueville. It is separated from much of this earlier work on politics, however, by its use of the analytic tools of economics (see, however, Black 1958, 156–213; Buchanan and Tullock 1962, 307–22; Haeefe 1971; and Ostrom 1971).

Indeed, public choice's development as a separate field has been largely within the last three decades and in response to issues and needs arising elsewhere in economics. Starting with Bergson's 1938 article (1969) and spurred by Arrow's 1951 book (1963) a large literature has grown exploring the properties of social welfare or social choice functions.² It focuses on the problems of aggregating individual preferences to *maximize* a social welfare function or to satisfy some set of normative criteria. This research on optimal methods of aggregating preferences has naturally spurred interest in the properties of *actual* procedures for aggregating preferences via voting rules, i.e., in public choice. The problem of finding a social choice function satisfying certain normative criteria turns out to be quite analogous to establishing an equilibrium under different voting rules. Thus, both Arrow's study (1963) of social welfare functions and Black's seminal work on committee voting procedures build on the works of de Borda (1781), Condorcet (1785), and Dodgson (1876). We discuss the most directly relevant parts of the social welfare function literature as part of normative public choice in Part Two.

The second development in economics fostering interest in public choice has been the work on market failures, again stemming from papers appearing in the forties and fifties. This work centers on establishing conditions for efficient allocation in the presence of market failures and leads directly to the study of nonmarket procedures for revealing individual preferences in these situations. The public choice approach to nonmarket decision making has been (1) to make the same behavioral assumptions as general economics (rational, utilitarian man), (2) often to depict the preference revelation process as analogous to the market (voters engage in exchange, citizens exit and enter clubs), and (3) to ask the same questions as traditional price theory (Do

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equilibria exist? Are they stable? Pareto efficient?). This part of the literature resembles positive economics so closely, that it is referred to here as positive public choice, although parts of it have normative implications. Positive public choice is reviewed in Part One.

Public choice and public expenditure theory share an ancestry in the work of the “Continental” writers on public finance (see Musgrave and Peacock 1958). Of particular importance here are the papers by Lindahl (1919) and Wicksell (1896). Lindahl’s paper has had the greatest influence on public goods theory; Wicksell’s on public choice and public finance. Wicksell’s view of government as a *quid pro quo* process of exchange among citizens underlies Buchanan and Tullock’s *Calculus of Consent* (1962) and much of the positive public choice literature. Musgrave’s (1959) influential separation of government activity into allocation and redistribution decisions is directly traceable to Wicksell. In Part Three, we argue that this Wicksellian distinction constitutes the natural conceptual boundary between positive and normative public choice.³

Not surprisingly, given this background, many contributors to public choice have worked in or started from public finance. Despite this overlap, the amount of work on the interface between public choice and public finance remains small,⁴ and little is said about it in this survey.

Along with the above intellectual developments, interest in public choice has undoubtedly been stimulated by the actual growth of the public sector. Between 1946 and 1974 total government (federal, state, and local) purchases of goods and services as a percentage of GNP in the United States increased from 13 to 22 percent, total government receipts as a percentage of national income from 28 to 40. Regardless of the normative properties of the collective choice process, the mere magnitude of the public sector warrants study of its decision rules.

Part One: The Positive Theory of Public Choice

The Reasons for Collective Choice

Probably the most important accomplishment of economics is the demonstration that individuals with purely selfish motives can mutually benefit from exchange. If *A* raises cattle and *B* corn, both may benefit by exchanging cattle for corn. With the help of the price system, the process can be extended to accommodate a wide variety of goods and services.

Although often depicted as the perfect example of the beneficial outcome of purely private, individualistic activity in the absence of government, the invisible hand theorem presumes a system of collective choice comparable in sophistication and complexity to the market system it governs. For the choices facing *A* and *B* are not merely to trade or not, as implicitly suggested. *A* can choose to steal *B*’s corn, rather than give up his cattle for it; *B* may do likewise. But, unlike trading, stealing is at best a zero sum game. What *A* gains, *B* loses. If stealing, and guarding against it, detract from *A* and *B*’s

ability to produce corn and cattle, it becomes a negative sum game. While with trading each seeks to improve his position and both end up better off, with stealing the selfish pursuits of each may leave them both worse off.

The example can be illustrated with strategy Matrix 1. Square 1 gives the allocations when *A* and *B* trade and refrain from stealing, square 3 when they steal and trade. Both are better off when they both refrain from stealing, but each is still better off if he alone steals (squares 2 and 4). Both may be induced to adopt the dominant stealing strategy with the outcome square 3. Once there, both can become better off by tacitly or formally agreeing not to steal, providing the enforcement of such an agreement costs less than they jointly gain from it.

Matrix 1.

A ↓ B →		
	Does not steal	Steals
Does not steal	1 A(10-cattle, 9-corn) B(8-cattle, 6-corn)	4 A(6-cattle, 5-corn) B(10-cattle, 9-corn)
Steals	2 A(10-cattle, 10-corn) B(5-cattle, 3-corn)	3 A(7-cattle, 5-corn) B(7-cattle, 5-corn)

The agreement against stealing is necessary to achieve Pareto optimality. More generally, the collective act of establishing and enforcing laws and property rights is undoubtedly a necessary precondition for a system of voluntary exchange (Bush and Mayer 1974; Buchanan 1975a). Problems of collective choice exist in all but a purely Hobbesian, anarchistic society and are coterminous with the existence of recognizable groups and communities.

A judicial system is a Samuelsonian public good in "that each individual's consumption leads to no subtraction from any other individual's consumption of that good" (Samuelson 1969a). Nearly all public goods, whose provision requires an expenditure of resources, time, or moral restraint, can be depicted with a strategy box analogous to Matrix 1 (Runciman and Sen 1965; Riker and Ordeshook 1973, 296–300). National defense is the collective provision of protection against external threats; laws and their enforcement against internal threats; fire departments against fires. Replace stealing with paying for an army, or a police force, or a fire department, and the same strategy choices emerge. Each individual is better off if all contribute to the provision of the public good than if all do not, and each is still better off if he alone does not pay for the good.

A pure public good is characterized by indivisibilities in production or jointness of supply and the impossibility or inefficiency of excluding others from its consumption, once it has been supplied to some members of the community (Musgrave 1959, 9–12, 86; Head 1962). The joint supply characteristic creates the potential gain from a cooperative move from square 3 to square 1. Given jointness of supply, a cooperative consumption decision is necessary to provide the good efficiently. If it took twice as many resources to

protect *A* and *B* from one another as it does to protect only one of them, collective action would be unnecessary. The failure of the exclusion principle to apply provides an incentive for noncooperative individualistic behavior, a gain from moving from square 2 or 4. The impossibility of exclusion thus raises the likelihood that purely voluntary schemes for providing a public good break down. Together the properties of public goods provide the *raison d'être* for collective choice. Jointness of supply is the carrot, making cooperative-collective decisions beneficial to all; absence of the exclusion principle the apple tempting individuals into independent noncooperative behavior.

Matrix 1 depicts the familiar and extensively analyzed prisoner's dilemma. Despite the obvious superiority of the cooperative nonstealing outcome to the joint stealing outcome, the dominance of the stealing strategies ensures that nonstealing does not constitute an equilibrium. Nonstealing can be assured only through a joint, enforceable agreement. Such an agreement can be reached informally, through repeated plays of the game. Player *A* may induce player *B* not to steal, by not stealing himself. *A* can enforce this agreement by indicating by word or deed that he will begin to steal as soon as *B* does. By so tying his behavior to *B*'s, the strategies reduce to a choice between cells 1 and 3, and the cooperative solution can emerge.

The appearance of cooperative solutions in prisoners' dilemma games has been found in experimental studies to depend on the number of players, and number of plays of the game (Siegel and Fouraker 1960; Sherman 1971). When the number of other players is small, it is easier to learn their behavior and predict whether they will respond to cooperative strategy choices in a like manner. It is also easier to detect noncooperative behavior and single it out for punishment, thereby further encouraging the cooperative strategies. When numbers are large, some players can adopt the noncooperative strategy, and either not be detected, since the impact on the rest is small, or not be punished, since they cannot be discovered or it is too costly to the cooperating players to punish. Thus, voluntary compliance with behavioral sanctions or provision of public goods is more likely in small communities than large (Buchanan 1965*b*). Reliance on voluntary compliance in large groups leads to free riding by many individuals bringing about the under or nonprovision of the public good (Olson 1965).

In the large, mobile, heterogeneous community a formal statement of what behavior is mutually beneficial (e.g., how much each must contribute for a public good) may be needed, for individuals even to know what behavior is consistent with the general welfare. Given the incentives to free ride, compliance may require the implementation of individualized rewards or sanctions (Olson 1965, 50–51, 132–35).

Thus, democracy, formal voting procedures for making and enforcing collective choices, is needed by communities of only a certain size and impersonality. The family makes an array of collective decisions without ever voting; a tribe perhaps only occasionally. A metropolis or nation-state must make a great number of decisions by collective choice processes. Small stable

communities may elicit voluntary compliance and contributions for collective decisions by merely publicizing them. Larger, more impersonal communities must establish formal penalties for asocial behavior and levy taxes (penalizing nonpayment) to provide for public goods.

The game theoretic underpinning of public choice, as represented by the prisoners' dilemma, and the different possibilities for arriving at the cooperative solution to this game have important implications for the selection of a set of democratic rules by a community as will become apparent as we examine the properties of these rules.

Public Choice in a Direct Democracy

This section explores the properties of various voting rules. These rules can be thought of as governing the polity itself, as when decisions are made in a town meeting or by referendum, or an assembly or committee of representatives of the citizenry. If the latter is assumed, the results can be strictly related only to the preferences of the representatives. The relationship between citizen and representative preferences is taken up later.

The Unanimity Rule

As we have seen, formal voting procedures are needed to provide public goods due to the incentives for violating voluntary, informal agreements—free riding. Since *all* can benefit by conforming to the cooperative solution to the prisoners' dilemma, the obvious voting rule for public goods would seem to be unanimous consent.

Although all consume a public good, not all benefit to the same degree. A classic problem of public expenditure theory has been the description of processes for revealing individual preferences for public goods. Following Lindahl (1958), a number of writers have described variants of a Walrasian tâtonnement process for providing public goods.⁵ One can easily formulate these procedures into a public choice process. Consider a world with two persons and one public good. Let figure 1 depict the mapping of *A* and *B*'s indifference curves from the private-public good space into public good–tax space (Johansen 1963). *A*'s share of the public good's costs is measured upward along the vertical axis, *B*'s share from top downward. A_1 and B_1 are *A* and *B*'s utilities in the absence of any public good. For a specific quantity of public good, lower indifference curves imply lower tax shares and hence higher utility levels. If A_1 and B_1 intersect, the two individuals are better off under some sets of tax share–public good combinations. The tangency points for their indifference curves form a contract curve (CC^1) mapping the Pareto-possibility frontier (bounded by the zero public good level utilities implied by the initial endowments) into the public good–tax share space.

Now consider the following public choice process. An impartial observer proposes both a pair of tax shares for $A(X)$ and $B(1-X)$ and a quantity of the public good, Q_1 . If this combination (F) falls within the eye formed by A_1 and B_1 , both individuals prefer purchasing this quantity of public good at the

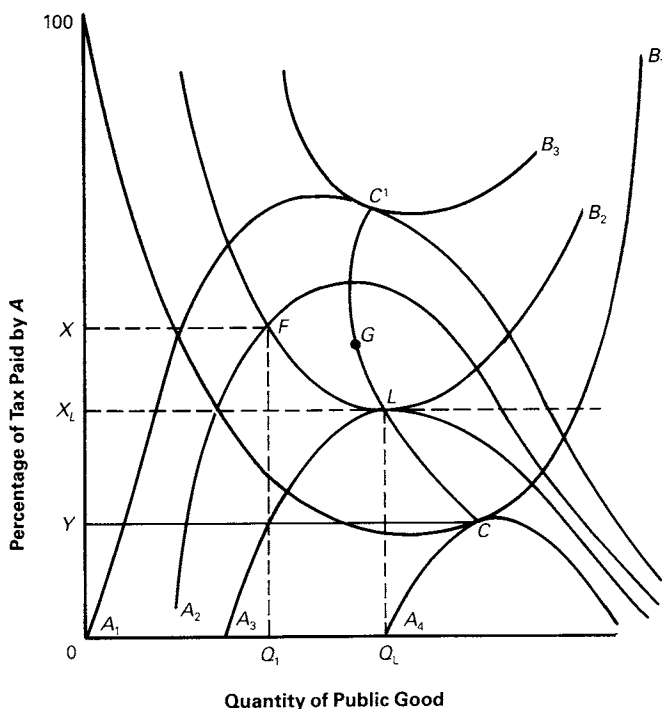


Fig. 1

given tax shares to no public good at all. Both will vote for it, if they vote sincerely. F now becomes the status quo decision and new tax share–quantity pairs are proposed. When a combination falling within the eye formed by A_2 and B_2 is hit upon, it is unanimously preferred to F . It now becomes the status quo and the process is continued until a point on CC^1 , like G , is obtained. Once this occurs no new proposal can be unanimously preferred, i.e., can make both individuals better off, and the social choice has been, unanimously, made.

Under a slightly different procedure the Lindahl equilibrium can be achieved (see Escarraz 1967 and Slutsky 1975). Suppose for tax shares X and $(1-X)$, the voters are asked to vote on all possible pairs of public good quantities. If both voters agree on a quantity of the public good that they prefer to all others at these tax shares, it is the unanimous collective choice. This will occur only if the two individuals' indifference curves are tangent to the tax line from X at the same point. If no such Q is found for this X , a new X is chosen and the process repeated, until an X and Q are found which defeat all proposed quantities for the given X . This occurs in figure 1 at L , the Lindahl equilibrium for the X_L and Q_L combinations.

The length and shape of the contract curve is determined by the initial endowments (determining A_1 and B_1) and the individual preferences. If the

second voting procedure is selected, the equilibrium attained (L) will be independent of the specific sequence of tax–public good proposals (assuming L is unique). In contrast, given initial endowments and preferences, the final choice under the first procedure, G , is entirely dependent upon the order of public good–tax share proposals. Unless G and L happen to coincide, the equilibrium at G would be one in which both voters would prefer a different quantity of public good given their tax shares. Each is thus somewhat “frustrated” in that he is consuming either too much or too little of the public good *at his tax price for it*. If this were thought unfortunate, one would prefer the second procedure leading to the Lindahl equilibrium at which all indifference curves are tangent to the tax shares line. On the other hand, if one preferred to have the entire range of the contract curve capable of selection by the voting process, one would prefer the first. As McGuire and Aaron have shown (1969), however, no normative significance can be attached to any particular set of tax shares.

The unanimity rule leads to Pareto-preferred public good quantities and tax shares and is the *only* rule certain to do so, a feature that led Wicksell (1958) and later Buchanan and Tullock (1962) to endorse it. Two main criticisms have been made against it.

First, a groping search for a point on the contract curve might take considerable time (Black 1958, 146–47; Buchanan and Tullock, 1962, chap. 6). The loss in time by members of the community in discovering a set of Pareto-optimal tax shares might outweigh the gains to those who are saved from paying a tax share exceeding their benefits from the public good. An individual, who was uncertain over whether he would be so “exploited” under a less than unanimity rule, might easily prefer such a rule rather than spend the time required to attain full unanimity. The second objection to a unanimity rule is that it encourages strategic behavior (Black 1958, 147; Buchanan and Tullock 1962, chap. 7; Barry 1965, 242–50; Samuelson 1969b). If A knows the maximum share of taxes B will assume rather than go without the public good, A can force B to point C on the contract curve, by voting against all tax shares greater than Y . All gains from providing the public good then accrue to A . If B behaves in the same way, the final outcome is dependent on the bargaining strengths of the two individuals. The same is true of other Lindahl-type equilibria.⁶ Bargaining can further delay the attainment of the agreement as each player has to “test” the other’s willingness to make concessions.

One also might object to an unanimity rule on the grounds that even if attained, the equilibrium depends on the bargaining abilities and risk preferences of the individuals (Barry 1965, 249; Samuelson 1969b). Such a criticism implicitly contains the *normative* judgment that the proper distribution of the gains from cooperation should *not* be distributed according to the individuals’ willingness to bear risks. One can easily counter that they *should*. An individual who votes *against* a given tax share to secure a lower one risks under a unanimity rule not having the good provided at all. Voting in this

manner expresses a low preference for the public good in much the same way as does voting against the tax share because it “truly” is greater than the expected benefits. Someone not willing to vote strategically might be said to value the public good higher. We return to the question of how the gains from cooperation *ought* to be shared in Part Two.⁷

The Optimal Majority

The above considerations suggest that the time required to pass a bill increases with the size of the majority required to pass it. At one pole stands unanimity under which any individual can block any agreement until he has one with which he is satisfied. At the other, each decides the issue alone, and no delay need occur as with a pure private good.

With a less than unanimous majority required to pass an issue, the possibility exists of individuals being worse off as a result of an issue’s passage. If the issue is of the public good–prisoners’ dilemma variety and there exist reformulations that could secure its unanimous approval, a less than unanimity rule can be said to impose a cost on those made worse off by the issue’s passage. This cost is the difference in utility levels actually secured and those that would have been secured under unanimity (Buchanan and Tullock 1962, 63–91; Breton 1974, 145–48). The optimal rule is thus the one for which the expected gain in utility from redefining the bill to gain one more supporter just equals the expected loss in time from doing so.

Since these costs are likely to differ from issue to issue, one does not expect one voting rule to be optimal for all issues. *Ceteris paribus*, when opinions differ widely or information is scarce, large amounts of time may be required to reach consensus; and if the probable costs to opposing citizens are not too high, all might favor a less than full unanimity rule—if the identity of those bearing the costs was unknown *ex ante*. Issues for which large losses can occur are likely to require higher majorities, e.g., Bill of Rights–type issues (Buchanan and Tullock 1962, 111–16).

Majority Rule

The method of majority rule requires that at least the first whole integer above $n/2$ support an issue before it can be imposed on the community. Nothing we have said so far indicates why it should be the most frequently encountered voting rule. Indeed, a full treatment of majority rule requires a description of both its normative and positive properties. A number of the most recent and persuasive defenses of majority rule have been openly normative (e.g., May 1952; Downs 1961; Leibenstein 1962; Barry 1965, 312–16; Baumol 1965, 43–44; Rae 1969; and Taylor 1969). In discussing majority rule, therefore, we consider both its normative and positive properties. Since Rae’s arguments are most compatible with the discussion here, we focus on them.⁸

Rae approaches the question of choosing a decision rule in the same way as Buchanan and Tullock, from the point of view of an egoistic individual uncertain of his future tastes and position, and asks what rule minimizes the chances of a person supporting an issue that fails *and* opposing an issue that

passes. The rule that accomplishes this automatically maximizes the converse of these twin goals. The only rule that does so is the majority rule as Rae (1969) and Taylor (1969) prove.

If each issue promises an equal (or on average equal) change in utility, plus or minus, for each individual, this theorem becomes a plausible reason for an egoist, uncertain over future position, to favor majority rule. This equal intensity assumption is made explicitly by Rae (1969, 41, n. 6) and is implicit in other arguments favoring majority rule. The opposite assumption, that the losses of those opposing a decision by the majority may be greater than the losses of the majority when a nondecision is imposed by the minority, underlies the arguments against majority rule. This latter position arises from a view of the public choice process as one of revealing preferences for public goods. If the issue to be decided is one of providing a public good and if it is possible to devise a tax share–quantity combination that improves everyone's welfare, then it must be possible to obtain unanimous consent. If unanimity is not feasible, the issue must involve more than merely the attainment of allocative efficiency, i.e., it must involve redistributive considerations, and this takes it out of the set of decisions typically discussed by the positive public choice economists from Wicksell to the present in their discussions of the unanimity rule.⁹ If one only seeks allocative efficiency through the provision of public goods, unanimity must be possible given enough time and in the absence of continually disruptive bargaining, and we are back to the cost of imposing a decision on some–cost of decision time trade-off. In the absence of these decision costs an individual need never support a pure public good issue that failed, or oppose one that passed. All issues that involve only allocative efficiency would eventually pass, and the normative significance of the Rae-Taylor theorem disappears.

Thus, if the Rae-type defense of majority rule does not rest entirely on considerations of time and bargaining costs, it must implicitly consider decisions with both allocative or redistributive aspects, or distributive aspects alone. Indeed, the assumption that the individuals opposing a bill have as much to lose from its passage as those favoring it have to gain seems most plausible with respect to a simple redistributive bill. But why this should be true for a bill to build a school or penalize theft seems unclear. As a rule for achieving a *net* redistribution of wealth, majority rule, supported by the egalitarian assumption that the utility losses of the opponents equal the gains of the proponents, seems quite plausible. It is this difference in perspective that I think is at the heart of the debate over majority and unanimity decision rules.

Unfortunately, if majority rule is limited to choosing among points lying on some generalized Pareto frontier, a second problem arises: that of cycling.

Cycling

The possibility that an equilibrium does not exist under majority rule was recognized two hundred years ago by de Borda (1781) and has been a major focus of the public choice literature beginning with Black (1948) and Arrow

TABLE 1

Voters	Issues			
	X	Y	Z	X
1	>	>	<	
2	>	<	>	
3	<	>	>	
Community	>	>	>	

(1963). Consider the following three voters with preferences over three issues as in table 1 ($>$ implies preferred). Each voter has transitive preferences, but the community does not. Pairwise voting leads to an endless cycle. Majority rule can select no winner nonarbitrarily.¹⁰

If X , Y , and Z are sequentially higher expenditures on a public good, then voters 1 and 3's preferences can be said to be single-peaked in the public good–utility space (see fig. 2). Voter 2's preferences are double-peaked, however, and herein is the cause of the cycle. Change 2's preferences so that they are single-peaked, and the cycle disappears.

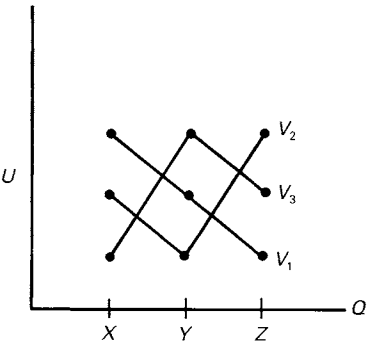


Fig. 2

One of the early important theorems in public choice was Black's proof that majority rule produces an equilibrium outcome when voter preferences are single-peaked (1969).¹¹ If voters' preferences can be depicted along a single dimension, as with an expenditure issue, this equilibrium lies at the peak-preference for the median voter. Figure 3 depicts the single-peaked preferences for five voters. Voters 3, 4, and 5 favor m over any proposal to supply less. Voters 3, 2, and 1 favor it over proposals to supply more. The preference of the median voter decides.

If all issues were unidimensional, multi peaked preferences of the type depicted in figure 2 might be sufficiently unlikely that cycling would not be much of a problem. In a multidimensional world, however, preferences as in

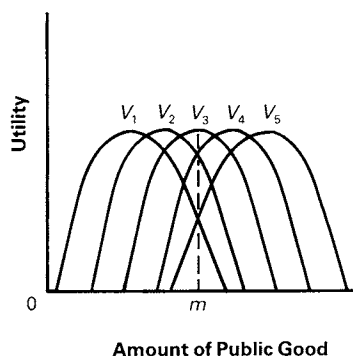


Fig. 3

table 1 seem quite plausible. Issues *X*, *Y*, and *Z* might, for example, be votes on whether to use a piece of land for a swimming pool, tennis courts, or a baseball diamond. Each voter could have single-peaked preferences on the amount to be spent on each activity, and a cycle could still appear over the issue of the land's use.

A great deal of effort has been devoted to defining conditions under which majority rule yields an equilibrium. Returning to figure 3, we can see, somewhat trivially, that *m* emerges as an equilibrium because the other voters are evenly "paired off" against one another regarding any move from *m*. This condition has been generalized by Plott, who proved that a majority equilibrium exists if it is a maximum for one, and only one, individual and the remaining even number of individuals can be divided into pairs whose interests are diametrically opposed (1967). This condition is obviously too restrictive to be very comforting.¹²

A second stream of literature has attempted to establish equilibrium conditions by placing restrictions on the preferences of the individuals voting as the single-peakedness condition does.¹³ Not all of this literature is particularly relevant to public choice, since the conditions proposed often do not lend themselves to straightforward interpretations as single-peakedness does, nor is it clear that they can be plausibly assumed to exist in reality.¹⁴ One of the most relevant contributions is that of Kramer (1973). He makes the same assumptions about individual utility functions as usually encountered in economics, that they are quasi-concave and differentiable, and proves that "the only obvious condition on individual preferences which will ensure single-peakedness in two or more dimensions is the condition of complete unanimity of individual preference orderings" (1973, 295; see also Craven 1971; and Slutsky 1977b).

And so we return to a unanimity condition. Recalling that what we seek at this stage of the discussion is a voting rule to reveal individual preferences on public goods, the options would appear to be as follows. A unanimity rule might be selected requiring a, perhaps infinite, number of redefinitions of the issue until one that benefited all citizens was reached. While each redefinition

might, in turn, be defeated until a point on the Pareto-possibility frontier had been reached, once attained no other could command a unanimous vote against it, and the process would come to a halt. The number of times an issue must be redefined before a passing majority is reached can be reduced by reducing the size of the majority required to pass an issue. While this “speeds up” the process of obtaining the *first* passing majority, it slows down, perhaps indefinitely, the process of reaching the *last* passing majority, i.e., the one that beats all others. For under a less than unanimity rule, some voters are made worse off; this is equivalent to a redistribution of wealth from the opponents of a measure to its proponents. But, as with any pure redistribution measure, it is generally possible to redefine an issue transferring the benefits among a few individuals and thus obtain a new winning coalition. The Plott “perfect balance” condition ensures an equilibrium under majority rule by imposing a severe equal intensity assumption on the distribution of preferences, which ensures that any redefinition of an issue always involves symmetric and offsetting redistributions of the benefits, leaving the winning coalition intact. The Kramer “identical utility functions” condition defines the condition under which a redefinition of an issue is certain not to produce any redistribution effects.

The redistributive characteristics of less than unanimity rules explain the similarities between the proofs and conditions establishing a social welfare function and majority rule equilibria (or the impossibilities thereof). Both flounder on their inability to choose among Pareto-preferred points, i.e., to handle the question of redistribution (see Sen 1970, chaps. 5, 5*).

Out of the frustration of seeking formal proofs for the existence of majority rule equilibria, a large number of studies have explored, using simulation techniques, the probabilities that cycles would occur in practice. If all possible preference orderings are assumed to be equally likely, the probability of a cycle occurring is very high.¹⁵ As one introduces single-peakedness assumptions (Niemi 1969; Tullock and Campbell 1970) or assumes simply that some rankings are more likely than others (Williamson and Sargent 1967), the probability of cycles occurring declines.

Logrolling

When voter preference intensities on each issue are not the same, the gains of a winning majority may be less than the minority’s losses. To avoid this, “intense minorities” may engage in logrolling or vote trading.¹⁶

TABLE 2

Voters	Issues		
	<i>X</i>	<i>Y</i>	<i>Z</i>
<i>A</i>	–2	–2	–3
<i>B</i>	5	–2	6
<i>C</i>	–2	5	–1

To understand the process, consider table 2. Each column gives the utility changes to three voters from an issue's passage; defeat produces no change. Assume first that only issues X and Y are being decided. If each is decided separately by majority rule, both fail. Voters B and C have much to gain from X and Y 's passage, however, and can achieve this if B votes for Y in exchange for C 's vote for X . Both issues now pass to B and C 's mutual benefit.

The existence of beneficial trades requires a nonuniform distribution of intensities. Change the two 5's to 2's and B and C gain nothing by trading. The equal intensity condition that guarantees majority rule's optimality would then also be satisfied, and it is this situation that proponents of majority rule have typically had in mind.

The numbers, as presented, depict the situation usually envisaged by logrolling's proponents. Without trading, the majority tyrannizes over the relatively more intense minority on each issue. Through vote trading these minorities express the intensity of their preferences, just as trading in private goods does, and thus improve the community's net welfare.

This result depends crucially on the total potential gains from voting being positive. Change the 5's to 3's or the -2 's of A to -4 's, and the same trades emerge as before. The sum of utilities for the community with trading is then negative, however. The pattern of trades depends only on the *relative* intensities of preferences of the voters. Since exchange increases the likelihood of the participants winning on their relatively more important issues, it tends to increase their realized gains. These increases *can* increase the utility gain for the entire community. Trading also imposes externalities on the nontraders, however (Rothenberg 1969, 215; Taylor 1971, 344; Riker and Brams 1973). If these are negative and large, they can outweigh the gains to the traders.

Tullock's argument that majority rule *with trading* can lead to too much government spending is of this type (1969). Let X be a road for farmer B , Y a road for C . If the gross gains to a farmer from an access road are 7 and the cost of 6 is shared equally, we have the figures of table 2. With these costs and benefits, total welfare is improved by logrolling. But a bill promising a gross gain of 5 at a cost of 6, equally shared, also passes. Such a bill lowers community welfare by excessively constructing new roads. The problem arises because under majority rule the two bills involve both allocation (the construction of roads with gross benefits of 5 at costs of 6) and the redistribution of wealth from A to B and C , and the latter is sufficient to pass them.

One important difference separating logrolling's critics and proponents is their views as to whether voting is a positive or negative (at best zero) sum game. If the latter, the game is obviously bad to begin with, and anything that improves its efficiency worsens the final outcome. The examples logrolling critics usually cite are tariff bills, tax loopholes, and pork barrel public works. The best a community can hope for is the defeat of all these issues. The obvious reform is to eliminate logrolling (Riker and Brams 1973).

Logrolling's proponents usually use parks, schools, defense, and other public goods as examples of issues and view vote trading as a potential method for better revealing preference intensities and establishing an equilibrium. They suggest reforms to improve the trading process (e.g., by introducing fungible votes) and/or eliminate its potentially negative side effects by restricting the issue set, in order to remove zero and negative sum games (Tullock 1969; Coleman 1966a; 1967; 1970; Haefele 1971; Mueller, 1971; Mueller, Tollison, and Willett 1975).

Logrolling can also be plagued by cycling, however. Indeed, when issues are decided in pairs, the same preference orderings that make trading attractive make cycles possible (Park 1967; Bernholz 1974b; 1974c). If Z is added to the issues in table 2, the preference orderings become nearly the same as in table 1, and an intransitive social ordering exists ($X=Y>Z>X$). The only condition under which a potential logrolling situation cannot produce a cycle is when a unanimity rule is imposed (Bernholz 1973). Logrolling is also vulnerable to strategic behavior (Mueller 1967).

The problems of cycling and strategic behavior are reduced if informal vote trading via forming coalitions is replaced with either formal markets for exchanging fungible votes (Coleman 1966a, 1966b; Mueller 1967; Wilson 1969; Mueller, Philpotts, and Vanek 1972) or by point voting, in which each voter allocates a stock of votes over the issue set (Musgrave 1959, 130–31; Coleman 1970; Intriligator 1973; Mueller 1973). In the former case, the cycling problem is replaced by the possibility of multiple or nonstable vote-price equilibria¹⁷; under point voting it disappears entirely. The *normative* properties of an equilibrium rest on the ethical justification of the voting process itself, the initial distribution of votes, choices of issues, etc. (Mueller 1973), as also is true of equilibria reached under private goods trading.¹⁸ Both vote trading and point voting are vulnerable to individual strategic behavior, which can limit their attractiveness as procedures for revealing individual preferences (Philpotts 1972; Mueller 1973).¹⁹ Wilson's proof that, under certain assumptions, a citizen's optimal vote-trading strategy is "sincere" voting is comforting in this regard (1969).

General Fund Financing

The most straightforward method for allowing voters to reveal their preferences for public goods would be to present each issue along with a tax formula for financing it, a procedure recommended by Wicksell (1958). While some expenditures are financed by "earmarked" taxes, most are financed out of general revenue.²⁰ For expenditures of this type, it is more realistic to view the voter as confronting two decisions: (1) the allocation of the total budget among competing expenditures and (2) the total budget's size. Replacement of direct voting on individual issues with this two-step procedure sufficiently complicates the decision process, however, so as to remove the direct relationship between voter preferences and the voting outcome. In general, one cannot predict the relationship between the level of government expenditures that would result under an earmarked taxing formula and under general fund

financing. Nor can one predict, under general fund financing, the effect on expenditures of a change in voter preferences. The possibilities of indeterminate logrolling and strategizing also exist (Buchanan 1963; Goetz 1968). The work in this area brings into serious question the possibility of adequately revealing individual preferences on public expenditures when general fund financing is employed.

Public Choice in a Representative Democracy

The presence of intermediaries between the citizen and the outcome of his vote raises new issues about the characteristics and efficiency of the voting process. The public choice approach assumes that representatives, like voters, are rational, economic men bent on maximizing their utilities. The latter is tied to their being elected, or more formally to their vote plurality over other candidates.²¹ Downs was the first to explore the implications of these assumptions, and the literature has developed around and from the framework he built (1957).

While many of the ideas in public choice have been developed in the context of a model of committees, the committees in mind are often assemblies of representatives, the coalitions parties. Many of the conclusions and problems discussed above carry over into the area of representative democracy. Thus, the median outcome, cycling, and logrolling all reappear.

The Median Voter

Harold Hotelling first presented a median voter theorem as an outcome of two-party representative democracy (1929).²² Hotelling depicted political opinion as lying along a single liberal-conservative dimension. If everyone votes for the candidate closest to his favored position, then the candidate choosing the optimal position of the median voter wins. The logic of the argument is the same as that demonstrating the victory of the *issue* favored by the median voter, for as Hotelling depicts it, there is only one issue to be decided: how far to the left or right the winning candidate will be.

The assumptions underlying the theorem are so unrealistic (one issue dimension, all individuals vote, two candidates) that it naturally led to extensive examination of the consequences of relaxing them. 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 (alienation). Alienation raises the cost of moving away from a voter and pulls the candidate toward the peak of the voter distribution. If the distribution is unimodal and symmetric, alienation has no effect. If it is single-peaked and skewed, the optimal strategy is pulled toward the mode (Comanor 1976). If the distribution is multi peaked, alienation *can* move the optimal strategies of the two candidates toward the separate modes. But, if weak, it also can either leave the median outcome unchanged or produce no stable set of strategies (Smithies 1941; Downs 1957, chap. 8; Davis, Hinich, and Ordeshook 1970; McKelvy 1975). A spreading out of candidates may also occur if elections are in two steps: competition for nomi-

nation within parties and then 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. A Cournot strategy game results with equilibria generally falling between the party and population medians (Aranson and Ordeshook 1972; Coleman 1971, 1972).

The implications of relaxing the single-dimension assumption of the Hotelling-Downs model have been exhaustively examined.²³ The results of the previous section concerning the instability of majority rule equilibria carry over directly. The problem a candidate faces choosing a multidimensional platform that defeats all other platforms is the same as finding an issue in multidimensional space that defeats all other issues. To establish such equilibrium strategies, one must introduce highly restrictive assumptions, including single-peakedness (see Rae and Taylor 1971; Riker and Ordeshook 1973, chap. 12); when equilibria exist, they are at the mean (Davis, Hinich, and Ordeshook 1970, 439–43).

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 candidate taking median positions on all. When this happens, a minority that 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 (Downs 1957, 132–37; Tullock 1967*a*, 57–61; Breton 1974, 153–55).

Unfortunately, the tendency for logrolling to produce cycles persists. Consider, again, the voter preferences in table 2. Suppose that two candidates vie for election on the 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 an issue's defeat. 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.²⁴

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 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 appears as the continual defeat of incumbents (Downs 1957, 54–62).²⁵

Multiparty Systems

An important determinant of the number of parties is the mode of representation (Rae 1967; Tullock, 1967*a*, 144–49). A candidate guarantees himself a seat in a single member district by capturing 50 percent of the vote. This forces candidates to appeal to broad groups of voters and adopt positions near the median. If several representatives can be chosen from a district, candidates can “win” with fewer votes. Multiple representation thus allows for the existence of several parties.

Intuitively, one expects candidates in a multiparty system to spread out, and much of proportional representation's appeal comes from the expectation that they do (Downs 1957, chap. 8; Tullock 1967*a*, chap. 10; Mueller, Tollison, and Willett 1975). The lure of the center is sufficiently strong, however, so that the stability of a set of spatially separated strategies cannot be demonstrated (Hinich and Ordeshook 1970, 785–88). Full analysis of multiparty systems requires a game-theoretic approach, and has still to be developed (but see Lindeen 1970).

One interesting application of game theory is Riker's theory that all single and multiparty systems converge to two coalitions of equal size (1962). It assumes that politics is a zero sum game, as would occur, e.g., if all issues involved basically zero sum redistributions of wealth. In such a game, the optimal strategy is to allow the opposing coalition to be as large as possible, while remaining a losing-paying coalition. Under majority rule this implies two coalitions of equal size.

If one views collective choice as a process for revealing preferences for public goods, Riker's depiction of politics as a zero sum game would seem to be highly restrictive, for it implies that there are no *net* benefits from the passage of any bill, or the formation of any coalition. The theory has more apparent applicability, however, if one views politics as a dynamic process of redefining issues and coalitions. Suppose, reversing the steps presented above, a polity started with a public-good issue defined so that all participants benefit and unanimity could be forthcoming. If, however, only a simple majority were required to pass a bill, nearly half of the votes would be "wasted." It would be advantageous to some to redefine the bill so that others paid more for the good, and one could envisage a continual redefinition of the issue so as to benefit an ever-shrinking winning coalition until the coalition was just large enough to win. If this process consisted solely of changing the cost shares of the bill, allocational efficiency would be preserved, and only the distribution of income would be changed. If the transfers were made by expanding the quantity of the public good, forcing the losing coalition to cover a disproportionate share of the costs, one has Tullock's overexpenditure argument (1969, 1970). If the transfers are made by adding additional public-good bills as riders, with the losers again paying a disproportionate share of the costs, one has the Riker and Brams inefficient logrolling argument (1973). Thus, when issues and coalitions can be continually redefined, majority rule may convert positive sum prisoners' dilemma games into zero sum games, making Riker's analysis more general than first might appear. Combining the tendency of majority rule to result in redistribution with the median voter theorem leads to Director's Law, that redistribution in a democracy is from the tails of the income distribution to its center (Stigler 1970; Tullock 1971*b*).

The Behavior of Voters

When a consumer purchases a private good in the market his "dollar vote" leads directly to the desired end. When a voter "purchases" a public good, however, the result of his vote is dependent on the actions of other voters and,

in a representative democracy, on the process of representation. These differences create the potential for a large discrepancy between the behavior usually assumed of consumers and that characteristic of voters.²⁶

Two aspects of citizen behavior have received considerable attention: information gathering and direct participation. The latter can range from simply voting to running for office. The voter's decision function can be represented as follows:

$$R = BP - C + D. \quad (1)$$

Where

- R = the voter's reaction (vote, gather information),
- B = the potential public-good benefits from the action,
- P = the probability these benefits accrue if the action is undertaken,
- C = the action's cost, and
- D = private benefits complementary to the action.

(Refer to Downs [1957, chaps. 11–14], Tullock [1967*a*, 110–14], and Riker and Ordeshook [1968]; and for a critique see Barry [1970, 13–19].)

In terms of information gathering, B represents the potential gain from picking the *best* candidate, P the probability that the citizen's choice matters, C the cost of gathering the information, and D its extra benefits (psychic income, status with peer group). Although B and P may change as information is acquired, it is plausible to assume they soon become constant. If D diminishes on the margin and C increases, then the utility from gathering political information is maximized by equating its marginal private benefits and cost. Political information's likely impact on election results does not affect its acquisition (Tullock 1967*a*, chaps. 6 and 7).

Similar arguments have been made about voting. If P is the probability of a single vote being decisive, then it obviously must be very small in a large constituency. To the extent that two-party competition brings candidate positions together, elections are close, raising P , but lowering the benefits from the best candidate's winning (B). Thus, B and P vary inversely and their product is probably small, implying again that participation's private returns and costs dominate. For most people the outcome of an election is a public good and political participation is vulnerable to free riding (Olson 1965, 86, 159–67). The greater participation rates of high income and high education groups may be explainable on these grounds (Frey 1971; Russell, Fraser, and Frey 1972; Tollison and Willett 1973). The higher turnouts in close elections suggest that the lefthandside variables are also important, however (see Riker and Ordeshook 1968; Barzel and Silberberg 1973; and Rosenthal and Sen 1973).

On some issues a voter's benefits from electing one candidate over another may be very high. Tariffs, tax loopholes, and a nearby bridge are

examples of bills with large benefits for some voters. The costs of acquiring information about these bills is typically low. Thus, the probability of a citizen's voting for a candidate who supports issues promising special, narrow benefits for him may be much greater than for a candidate who supports "general interest" legislation with equal total benefits for the citizen (Olson 1965, 141–48). This reinforces incentives to form coalitions of minorities, each lured to the polls by promises of legislation with special interest to them (Downs 1957, chaps. 12 and 13; Tullock 1967*a*, 122–23, 142). It can lead to overexpenditures on special interest bills (Tullock 1970), and underexpenditures on general interest legislation (Downs 1960).

Deciding the Quantities of Quasi-Public Goods

For pure public goods, characterized by both nonexcludability and jointness of supply, a collective *voice* process for revealing preferences is required to achieve Pareto efficiency. For private goods, the entry and exit of buyers and sellers suffices. Between the poles of pure public and private goods lie a range of *mixed* goods, which one intuitively expects are most efficiently allocated by a mixture of exit and voice processes (Hirschman 1970).

Voting-with-the-Feet

We examine first the consequences of dropping the joint-supply (economies of scale) property. Consider a public good with no production costs: the proportion of tulips in the public square (bulbs are free). If the dimensions of the polity coincide with the population, the preference revelation problem persists. Assume more than one polity can exist, however. Within any polity all must consume the same public good (flower bed), but there are no spillovers between communities. With this *limited* degree of exclusion, people can reveal their preferences by moving into the community providing the most desirable fraction of tulips. Considering only the whole percentile options, 101 communities suffice to achieve Pareto optimality. No ballots need be cast. All preferences are revealed through the silent voting-with-the-feet of individuals exiting and entering communities, a possibility first noted by Tiebout (1956).

The Tiebout model rests on a number of extreme assumptions (Buchanan and Wagner 1970; Buchanan and Goetz 1972; McGuire 1972; Oates 1972; Pestieau 1974). It is not clear, for example, how the initial options are presented to "voters," without some central auctioneer who establishes communities and informs the population of them, an assumption contradicting the decentralized spirit of the model (Pauly 1970; McGuire 1972). More serious are the consequences of introducing a second public good: the proportion of oaks in the square. This issue's resolution requires further separation of individuals into groups of identical preferences, now with respect to *both* flowers and trees. The number of communities needed to ensure Pareto optimality leaps to 101 squared. If the number of public goods is very large, one reaches a solution in which the number of communities equals the size of the popula-

tion. Each community-individual becomes a polity with a basket of public-private goods (garden, woods) tailored to his own tastes (Pestieau 1974).

Voting-with-the-feet achieves Pareto optimality by grouping individuals together in polities of homogeneous tastes. In the extreme, it satisfies Kramer's severe homogeneity of indifference map condition (1973; McGuire 1974), through the imposition of a silent unanimity rule. It can realistically be assumed to come close to satisfying this goal when, relative to the size of the population, (1) the number of public goods is small, and/or (2) the number of distinct preferences for combinations of public goods is small. Since *the* task of public choice is the revelation of (differing) individual preferences for public goods, voting-with-the-feet, in part, solves the public choice problem by significantly limiting its scope.

The Theory of Clubs

Assume next that exclusion is possible, but addition of a new member lowers the average costs of a good, i.e., there are economies of scale. If average costs fall indefinitely, optimal club size is the entire population, and the traditional public good problem exists. If they eventually rise, either because scale economies are exhausted or from the additional costs of crowding, an optimal club smaller than the population may exist.

Buchanan was the first to explore the efficiency properties of voluntary clubs using a model in which individuals have identical tastes for public and private goods (1965a). This assumption is important. As in the Tiebout model, it is inefficient to have individuals with differing tastes in the same club, for then some must consume a quantity of public goods different from that which would maximize their welfare. At a Pareto optimum each club has a membership with homogeneous tastes, and a unique public good quantity and club size exists at which the marginal benefits a club member receives from adding another equals the additional costs the extra member brings (Buchanan 1965a; McGuire 1974).

If the population is large relative to optimal club sizes, efficient allocation of these quasi-public goods through the voluntary association of individuals of homogeneous tastes can be envisaged. In such an equilibrium, each individual receives the same benefits as other members of his club, since efforts to discriminate will induce exit and formation of new clubs. If optimal club sizes are large relative to the population, discrimination is possible, and stable equilibria may not exist. With an optimal club size of $\frac{2}{3}$ of the population, for example, only one such club can exist. If it forms, those not in it have incentives to lure members away by offering disproportionate shares of the benefits gained from expanding the smaller club. But, the remaining members of the larger club have incentives to maintain club size and can attract new members by offering the full benefits of membership in the big club. No stable distribution of club sizes and benefits need exist (see Pauly 1967, 1970). Analytically the problem is identical to the cycling problem confronted earlier. The two farmers forming a winning majority constitute an

optimal sized club, but the farmer left out has an incentive to try to form an optimal club too.

We thus are brought to a conclusion similar to the voting-with-the-feet model: The voluntary formation of clubs to allocate public goods is efficient only when the optimal club size is relatively small, i.e., when the quasi-public goods have a limited degree of publicness. Despite this qualification, the voluntary formation of clubs is at least *conceptually* a more promising means for revealing individual preferences for public goods than voting-with-the-feet, for it does not require geographic proximity of club members.

Voting-with-the-Feet in the Presence of Jointness of Supply

When public goods are produced with economies of scale, it is even more unlikely that individual mobility suffices to achieve Pareto optimality. It is then necessary that there be “just the right number of individuals” with identical preferences to satisfy the optimality conditions for each public good.

Pareto optimality in a global sense requires that the incremental change in net benefits to the community an individual joins equal the incremental loss to the community he leaves

$$\sum_{i=1}^n \Delta U_A^i = \sum_{i=1}^m \Delta U_B^i . \quad (2)$$

The change in utility of the n^{th} individual to join community A is his total utility from being in A (U_A^n), just as his loss from leaving B is his total utility in B , U_B^m . Equation (2) can thus be written as

$$U_A^n + \sum_{i=1}^{n-1} \Delta U_A^i = U_B^m + \sum_{i=1}^{m-1} \Delta U_B^i . \quad (3)$$

In a world of pure competition without market failures, the marginal product of an individual is the same in all activities and areas, and the welfare of others is not affected by his location. All ΔU^i are zero except for the moving individual, and he naturally locates in his most favored community. With public goods present, the ΔU^i for individuals in a community are positive for an additional entrant, as its total costs get spread over a larger number of individuals. A new entrant thus confers positive externalities. With crowding, he can produce negative externalities. In either case, since the individual compares only his utility levels in the two communities and ignores the marginal effects of his move on others (the ΔU^i 's in A and B), voting-with-the-feet does not, in general, produce Pareto optimality.²⁷

Pareto optimality can be achieved through a combination of voting-with-the-feet and ballot. If the externalities for community A from in-migration were positive, it could offer a subsidy to newcomers equal to

$$\sum_{i=1}^n \Delta U_A^i,$$

and levy an identical tax on out-migration. If *B* did the same, all individuals would be forced to internalize the external costs their moving entailed, and Pareto efficiency would be obtained (Buchanan 1971; Buchanan and Goetz 1972). Alternatively, a central authority could levy taxes and offer subsidies equal to the $\sum \Delta U^i$ terms (Flatters, Henderson, and Mieszkowski 1974; McMillan 1975).

While these alternatives have identical efficiency outcomes, they differ both in spirit and equity properties. The former weds Tiebout's decentralized voting-with-the-feet with the theory of exclusive clubs to produce a decentralized solution to the population allocation problem. The enacting of such taxes and subsidies by local communities immediately provides communities favored by natural characteristics, population size, income, etc. with a valuable property right, which they exercise by taxing individuals outside of their community (*i.e.*, those who would have entered in the absence of the tax subsidy scheme). The centralized solution vests the entire population with a property right in both communities and achieves allocational efficiency by taxing *all* members of the favored community to subsidize the disfavored community. In either case, the problems of ballot voting to reveal individual preferences again arise once the assumption of homogeneous preferences is dropped.

Despite these problems and qualifications, voting-with-the-feet provides a useful, perhaps essential substitute for the ballot, for those whose intensity of preference is significantly misstated by the latter.

The Theory of Revolution

When neither the ballot nor the feet constitute adequate modes of expression, there is still Chairman Mao's barrel of the gun. Given its role in real world politics, one might expect more to be said about revolutions than has been. Gordon Tullock has, however, gotten the discussion underway (1971a, 1974). He proposes to explain a revolutionary's behavior with a model resembling the one used to explain voter behavior. If *R* is a potential revolutionary's reaction, *B* the new government's public good benefits (possibly negative), *P* the probability that the individual's participation brings about success, *D* the private gains from participating in the revolution, and *C* the private costs, we have equation (1').

$$R = BP + D - C \quad (1')$$

If *R* is positive he participates in favor of the revolution, if negative against it. Since *R* can take on any value, the equation can also explain the degree of participation.

As with voting, one assumes that the typical citizen considers the fruits of the revolution a public good and the probability of affecting the outcome

near zero and then makes his decision on the basis of the private gains and risks of participation. For most, this calculation will lead to apathy or occasional participation in a large rally; for a few, to commitment with the hope of a high position in the new regime.

While there are problems in extending the public choice paradigm to the study of revolutions, the theory fills an analytic gap in the literature. In a closed polity, an individual is always in danger of being “exploited” or “tyrannized” by a majority or minority of his fellow citizens. His choices in such situations are: to continue to rely on voice in the hope that outcomes change; to seek a new polity by migration; or to create a new one by revolution.

Empirical Public Choice

An increasing amount of attention has been devoted in recent years to testing various hypotheses from the public choice literature. This work generally explores what might literally be called “political economy,” i.e., the two-way causality between dollars and votes. One set of models focuses on the determinants of campaign expenditures and their immediate effects (Crain and Tollison 1976). There is now empirical evidence that dollars do buy votes (Palda 1973; Welch 1974). A second set of models tries to explain the level of the vote or government popularity as a function of what it does in office. So far these studies have related government popularity chiefly to macroeconomic variables, e.g., unemployment and inflation rates (Goodhart and Bhansali 1970; Kramer 1971; Frey and Garbers 1972; Miller and Mackie 1973; Crain, Deaton, and Tollison 1975).

Turning the causality around, one can try to explain the choice of government policy, level of expenditure, and level of economic activity by the desire to win votes. The median voter hypothesis was one of the first used to explain government expenditures (Barr and Davis 1966; Davis and Haines, Jr. 1966), and a number of studies have either tested or employed this hypothesis (Kasper 1971; Borchering and Deacon 1972; Bergstrom and Goodman 1973; Pommerehne and Frey 1975). More generally, Wright (1974) and Nordhaus (1975) have linked government macro policies and aggregate economic activity to party efforts to be reelected. The logical extension of this work is a full “politico-econometric” model integrating the economic and political “sectors” of society (Frey and Lau 1968; Frey 1974). Initial attempts to estimate one such model give promising results (Frey and Schneider 1975).

This recent empirical work undoubtedly represents but the tip on an emerging iceberg. Space does not allow adequate review of even this tip, however. Fortunately, most of it is ably covered in the Frey and Schneider survey (1975).

Part Two: Normative Theories of Public Choice

While one can speak of *the* positive theory of public choice based upon economic man assumptions, one must think of normative *theories* of public

choice. For there are many views of what the goals of the state *should be* and how to achieve them. This potential multiplicity of views has been the focus of much criticism by the positivists, who have argued for a “value free” discipline. For the bulk of economics, it might be legitimate to focus on explanation and prediction and to leave to politics the explication of society’s goals. For the study of politics itself, in toto, to take this position is less legitimate. Thus the interest in how the basic values of society are expressed through the political process arises. The challenge normative theory faces is to develop theorems about the expression and realization of values, based on generally accepted postulates, in the same way that positive theory has developed explanatory and predictive theorems from the postulates of rational egoistic behavior.

Rawls’s Theory of Justice

One of the most ambitious normative theories of choice is that of John Rawls (1971). His theory rests on the same rational, egoistic man assumptions as public choice and explicitly eschews assuming altruism (pp. 183–92).

Rawls compares participation in society with participation in a game of chance. Each individual is born to a generation, culture, social system, family, and set of personal attributes that largely determine his happiness. If he accepts this information as given, social choice consists entirely of attempts to reach the Pareto frontier and of struggles for position along it—the subject matter of Part One. If position in society is by chance, however, the distribution of these assets and resulting happiness may be arbitrary or unfair. By posing life as a game of chance, Rawls argues that individuals ought to adopt the position of a potential entrant rather than their actual positions, and consider the social institutions and distribution of assets that would emerge if actual positions were unknown. The establishment of just institutions rests in part, therefore, on determining what information is *morally* relevant to a participant in the social contract uncertain of his specific position. To answer this question, individuals are asked to step behind a *veil of ignorance* and shed all knowledge of a specific nature (pp. 136–42). From this *original position*, they choose the rules and institutions that constitute the social contract (pp. 11–22). Since specific information about individuals is missing, the contract cannot favor any one individual or group. The rules are fair. From this springs the important notion of *justice as fairness*.

Rawls extends this idea to derive two principles as the core of the social contract: (1) “Each person is to have an equal right to the most extensive basic liberty compatible with a similar liberty for others” (p. 60), and (2) “social and economic inequalities are to be arranged so that they are both (a) to the greatest benefit of the least advantaged and (b) attached to offices and positions open to all under conditions of fair equality of opportunity” (p. 83). The second involves a lexicographic ordering of states of the world according to the utility levels (primary goods bundles) of the worst-off citizens. Rawls also argues that the two principles themselves are lexicographically ordered,

the first over the second (pp. 150–61, 175–83, 541–58). Not surprisingly perhaps, given economists' fondness for trade-offs, these principles have come under attack.²⁸

What is important to the theory of public choice, however, is not the principles Rawls arrives at, but the process by which he gets there (Buchanan 1972). To the extent that the ideas of justice as fairness, the original position, etc. have intuitive appeal, individuals might be led to make decisions as if they were behind a veil of ignorance. Rawls's theory as a contribution to normative public (social) choice thus has the potential of achieving the unanimous agreement sought in much of the literature. And Rawls, in responding to his critics, has focused on justifying the process by which the principles are derived, more so than on the principles themselves (1974a, 1974b).

The Constitution as a Social Contract

Buchanan and Tullock draw a distinction between the constitution, containing the basic decision rules of the polity, and the day-to-day decisions made (1962). The basic rules are assumed to change infrequently. Thus, in making a constitutional choice, an individual selects a rule that affects his welfare for a long time. He is, therefore, *assumed* to be uncertain about the impact of the rule upon him because he is uncertain about his specific position, tastes, etc., in the future. Buchanan and Tullock thus assume, as a behavioral postulate, that individuals choose constitutional rules (out of rational self-interest, given the uncertainty surrounding these long-run choices) by placing themselves in the envisaged positions of all future citizens (1962, 78–80, 95–96). They describe a process of constitution making quite analogous to Rawls's description of the social contract's formation. Although the tone of Buchanan and Tullock is clearly positivist, while Rawls's is normative, the similarities between the two approaches are so strong that they could be combined. That is, if one accepts Rawls's notion of justice as fairness and the Buchanan-Tullock assumption that individuals actually would make constitutional choices by weighing their impacts on all because of rational self-interest under uncertainty, actual constitutions formed under unanimity rules become just political contracts.

The degree to which individuals will, evenly weigh the impact of a constitutional choice on all future citizens is obviously an open question. The long-run nature of these decisions certainly moves the individual calculus in this direction. A fully equal weighing of future utilities is doubtful, however, for it is difficult to envisage individual uncertainty over color of skin, sex, native tongue, and so on. On the other hand, to the extent that institutionalized discrimination is greatest against individuals with these easily recognizable characteristics, one has indirect evidence that just (nondiscriminatory) rules are chosen when real uncertainty over positions exists.

If there is not sufficient uncertainty at the constitutional stage to produce just rules, one might ask how the required uncertainty might be introduced into the process. While some possibilities come to mind (Mueller 1973;

Mueller, Tollison, and Willett 1975), the question has not received much attention. Indeed, despite its obvious importance in the theory of public choice, the constitutional stage itself has been essentially neglected. This is a pity, in my opinion, for it remains the most likely place both to obtain or approach the elusive unanimous agreement and to achieve an ethical underpinning to what otherwise are essentially amoral processes of collective choice.

The Constitution as a Social Welfare Function

J. C. Harsanyi has also discussed the ethical appeal of assuming individuals are uncertain over future positions (1953, 1969; see also Vickrey 1945, 1960; Leibenstein 1965). Building on a paper by John Marcus Fleming (1952), Harsanyi proved that if both individuals and social preferences satisfy the von Neumann and Morgenstern-Marschak postulates, and if each individual is indifferent between two states of the world implies social indifference between the states, then social welfare W is a weighted sum of individual utilities.

$$W = \sum_{i=1}^n a_i U_i. \quad (4)$$

This theorem is interesting in itself, for it creates a theoretical justification, from fairly weak postulates,²⁹ for the individualism and utilitarianism that underlie both the public choice and social welfare function literatures. Without a way to determine the a_i 's, however, equation (4) is too general to be of much value. This welfare function can be given an ethical content if individuals choose the weights by assuming they have an equal probability of being any other individual in the society, i.e., of being in his position, having his utility function, etc.³⁰ Such an equal weighting would emerge if individuals were uncertain about future tastes and positions, and if they adopted the principle of insufficient reason to assign probabilities. Again this uncertainty could be artificially created by mentally assuming a place in Rawls's original position, or be real, due to the long-run nature of the decisions affecting social welfare. In either event, the equiprobability assumption achieves the same uniformity of opinion and unanimity of choice that Rawls and Buchanan and Tullock achieve by the use of uncertainty. And, it allows the reinterpretation of the social contract and constitution as discussed in these works as collective choice embodiments of a social welfare function.³¹

Real Valued Social Welfare Functions

Having introduced social welfare functions, let us consider directly their relationship to public choice. We start with the Bergson-Samuelson social welfare function

$$W = W(z_1, z_2, \dots),$$

where W is a real valued function of all variables (z_i 's) that might affect social welfare (Bergson 1969; Samuelson 1947). The z_i 's and W are chosen to represent the ethical values of society or of the individuals in it (Samuelson 1947, 221). The objective is to define a W and set of z_i 's and the constraints thereon to yield meaningful first and second order conditions for a maximum W . The social welfare function literature has adopted the same assumptions about consumers, production functions, etc., that underlie the bulk of economics and public choice (Bergson 1969; Samuelson 1947). Add to these the Pareto postulate, and a set of *necessary* conditions for the maximization of W is derived, which limit social choices to points along the generalized Pareto frontier. The collective choice process by which these conditions are fulfilled is not considered in the social welfare function literature.

To answer the knotty question of how one selects among the various possible Pareto points, additional assumptions are needed. And, it would appear, these must implicitly or explicitly involve cardinality and interpersonal utility comparisons (Bergson 1938; Lerner 1944; Samuelson 1947, 1967; Sen 1970, 123–25; Harsanyi 1975). These in turn imply the introduction of value judgments or ethical postulates, and the possibility arises of there being as many social welfare functions as individuals in the community. This specter led most contributors to the “new welfare economics” to eschew interpersonal comparisons and confine their attention to deriving necessary conditions for a welfare maximum, to delineating the set of Pareto points.

To choose among these requires a set of ethical beliefs shared by the community, which converts the many possible social welfare functions into one (Little 1957). We have discussed attempts to accomplish this via the introduction of uncertainty over position. We turn to an alternative approach.

Arrow's Axiomatic Social Welfare

Postulates and Logic of the Proof

Kenneth Arrow began his search for a social welfare function by stating five axioms, which he argued every social welfare function should obey (1963).³² These axioms reflect both value judgments and assumptions of individual and collective rationality. Together, they express some of the basic postulates underlying individualism, utilitarianism, and consumer-citizen sovereignty. Viewed in the context of public choice, these axioms might be regarded as stating the basic value judgments of the community as imbedded in the social contract or constitution (Arrow 1963, 104–5; Kemp and Asimakopulos 1952). Briefly stated, they are:³³

1. Unlimited Domain. All possible orderings of individual preferences are allowed.
2. The Pareto Postulate.
3. Transitivity. The social welfare function gives a consistent ordering of all feasible alternatives.
4. Nondictatorship. No individual enjoys a position such that whenever he

expresses a preference between any two alternatives and all other individuals express the opposite preference, his preference is always preserved in the social ordering.

5. Independence of Irrelevant Alternatives. The social choice between any two alternatives shall not be affected by preferences over any other alternatives.

The theorem states that no social welfare function satisfies these five postulates. The logic of the proof runs as follows: The unlimited domain assumption allows any possible constellation of ordinal preferences. When a unanimously preferred alternative does not emerge, some method for choosing among the Pareto-preferred alternatives must be found. The independence assumption restricts attention to the ordinal preferences of individuals for any two issues when deciding those issues. But, as we have seen in our discussion of majority rule, it is all too easy to construct rules that yield choices between two alternatives, but produce a cycle when three successive pairwise choices are made. The transitivity postulate forces a choice among the three, however. The social choice process is not to be left indecisive (Arrow 1963, 120). But with the information at hand (individual ordinal rankings of issue pairs) there is no method for making such a choice that is not imposed or dictatorial.

Relaxing the Postulates

The theorem's significance rests upon the weakness of its postulates. Most individuals will want to place more stringent normative constraints on the social choice process, and yet the above five postulates are already too severe. To avoid the impossibility result, even these must be relaxed.

Space precludes a complete review of all modifications of the postulates that have been made to produce either possibility theorems or new impossibility results.³⁴ Instead, we focus on modifications of particular relevance to public choice.

Relaxing unanimity and nondictatorship seems hardly worth discussing if the ideas of individualism and citizen sovereignty are to be maintained (but, see Little 1952). Nevertheless, the popularity of elitist theories of collective choice from Plato to the present indicates the attractiveness to many of abandoning this postulate. Worthy of special mention here is Hobbes's defense of monarchy. For Hobbes, there was one issue upon which all preferences are identical: life under anarchy was terrible and inferior to life under a unanimously accepted dictator. If one made the other postulates part of the Hobbesian contract, one might construct a new defense of autocracy. And, of course, in practice the dictatorial solution to the uncertainties and deadlocks of social choice is very popular.

Transitivity can be relaxed, at the cost of a degree of arbitrariness or indecisiveness in the choice process. One might simply declare society indifferent to all choices along the Pareto frontier.³⁵ Any choice among them will be arbitrary, but perhaps fair. In practice, such rules favor the status quo,

although there is no reason why they must (Arrow 1963, 118–20). The status quo could be introduced as a choice along with new proposals with an equal likelihood of being chosen. Such a rule contains one set of implicit value judgments concerning the likely gains and losses from change; rules favoring the status quo contain another. If there is more general agreement concerning these decision rules than for transitivity, the problem is solved (Kemp 1954).

We have already discussed a number of collective choice results that rely on a restricted domain assumption. Single-peakedness ensures that majority rule produces an outcome, namely the median, and single-peakedness along with the other four assumptions produces a social welfare function. In the context of a public choice process, single-peakedness implies strict restrictions on both the rules by which issues are selected and on the voters who decide them (Slutsky 1977*b*). Issues must be of the one-dimensional variety—the number of guns, the number of school books; the voters cannot simultaneously consider both the number and kind of books. And their preferences must be single-peaked in this one dimension. If fate provides voters of this type, these issues can be resolved by majority rule without violating the other axioms, although we are still left with a plethora of multidimensional issues to resolve in some other way. If some individuals have multiple peaks, they must somehow be isolated and excluded from the community, or an impossibility result can emerge. More generally, ways of restricting membership in the polity to those with sufficiently homogeneous or complementary preferences to avoid the impossibility result can be considered. The theories of clubs and voting-with-the-feet describe processes by which such groups might form. In the absence of externalities across clubs (local communities), and perfect mobility, free entry, etc., such a process might avoid the Arrow problem. But, as we have seen, when spillovers exist, some decisions must be made by the aggregate population, and the impossibility problem will appear here, even when “solved” in the smaller ones. In such circumstances homogeneity of preferences can be brought about only if individuals adopt, or already have, a common set of values (Bergson 1954). Appeals to reason, *a la* Kant, or uncertainty, *a la* Rawls and Harsanyi, are along these lines.

The independence axiom eliminates the possibility of strategic misrepresentation of preferences. When a social choice process is not perversely responsive to an individual’s ranking of x and y , and depends on only his and other rankings of x and y , he can do no better than state his true preferences between them. If the outcome on x and y also depends on his ranking between y and z , however, he may be able to benefit from misstating one set of preferences if it increases his chances of winning on the other. This need not worsen the outcome of the social choice process, e.g., as when positive-sum-game logrolling occurs. But it might. And, it does introduce an element of uncertainty and dependency on bargaining abilities that might be considered undesirable. The independence axiom excludes these possibilities.³⁶

This axiom is stronger than it perhaps appears, and its relaxation provides a number of ways out of the paradox. By limiting the choice among any

subset of issues to the information on individual rankings for the issues in that subset, it rules out all information with which one might cardinalize and interpersonally compare utilities (Sen 1970a, 89–91). Indeed, it was the desire to establish a welfare function that was not based upon interpersonal utility comparisons that first motivated Arrow (1963, 8–11, 109–11). Once it is abandoned or relaxed, a number of voting rules can be considered. One is the rank order method of voting first discussed by de Borda (1781).³⁷ Here the alternatives are allocated points, inversely to their rankings in individual preferences, and the alternative with the most points wins. Logrolling, literal vote trading, and point voting can reveal individual intensities on issues and can have attractive normative properties when restrictions are placed on the issues admitted to the decision set. These procedures are excluded by the independence axiom since their outcomes are dependent upon the specific (and full) set of issues proposed. Thus, abandonment of the independence axiom raises the importance of the process that selects the issues to be brought to a vote in a way its acceptance does not.

From a public choice perspective, relaxation of either the independence or unrestricted domain axioms appear to be the most appealing ways out of the paradox. Each in turn raises questions as to what issues are to be decided, who is to decide, and of those who decide, which preferences shall be weighed. Such choices directly or indirectly involve interpersonal utility comparisons and must rest on some additional value postulates, which if explicitly introduced would imply specific interpersonal utility comparisons. The latter cannot be avoided (Bergson 1969, 1954; Hildreth 1953; Kemp and Asimakopulos 1952; Sen 1970a, 123–25).

Part Three

Normative and Positive Theories of Public Choice Compared

Rules for collective decision are needed, quite simply, because people live together. Their mere grouping into circumscribed geographic areas creates the potential and necessity for collective action. Some collective decisions can benefit all individuals involved; other decisions benefit some and harm others. These two categories correspond to the familiar distinction between moves from off the Pareto frontier to points on it, and moves along the frontier or to allocation and redistribution. Positive public choice, as positive economics, is most pertinent to decisions in the first group; normative welfare theory to decisions within the second.

The work on real-valued welfare functions indicates that if only the Pareto postulate is introduced, “normative” and positive theory lead to the same marginal conditions defining allocations along the Pareto frontier. The Arrow-type theorems imply further that to choose from among these allocations using a consistent, nondictatorial social choice rule, either restrictions must be placed on the preference domain or postulates introduced that directly

allow interpersonal utility comparisons, i.e., value judgments must be introduced.

As David Hume pointed out long ago, propositions concerning values cannot be derived from factual observations alone (1941; Sen 1970a, 56–64). Some intuitive conceptualization of right and wrong, of acceptable and unacceptable, is required. Thus, efforts to introduce values into collective choice in a nonarbitrary way become a search for a community's shared notions of justice and morality. Indeed, a community might easily be defined in terms of these shared values. Individualism, the Pareto postulate, the Arrow axioms, justice as fairness, and the golden rule are all essentially intuitive value statements, or notions of morality and justice. The social welfare function, or contract, or constitution embody and reflect these values.

Normative theory starts with the community and attempts to derive propositions based on its collectively held values. Treating the community as an "organic" body, as *the* starting point, follows logically from the necessity of there being a commonly held set of values for there to be any community. While consensual agreement on the underlying value postulates may be necessary, there is no logical reason why unanimity must emerge from this consensus as the social choice rule. Indeed, when choices are to be made from points along the Pareto frontier, unanimity cannot be the collective choice rule. The redistributive property of all less-than-unanimity rules thus makes them the logical choice for selecting among Pareto-efficient allocations. The downplaying of the unanimity rule in the normative literature is thus explained.³⁸

If normative theory studies processes for revealing commonly held values regarding interpersonal utility comparisons, positive public choice studies processes for revealing intrapersonal utility comparisons. For the bulk of the positive literature analyzes the implications of various collective decision rules given individual preferences and (often implicitly) a common value system. Thus, positive public choice focuses on decision making at the parliamentary or legislative stage under rules and values established in the constitution.

Given its focus on the revelation of *individual* preferences, much of positive public choice is implicitly, and sometimes explicitly as in the work of Buchanan and Tullock, in the contractarian tradition. If one starts with the individual, before the collective can be analyzed, it must, at least conceptually, be formed. The issues of which individuals make up the collective, what questions it can resolve, and what rights remain with the citizen must be faced. The positive literature's contractarian approach explains its emphasis on unanimous consent and Pareto optimality. If the polity is a union of individuals who, conceptually, have the option of not joining, then unanimous agreement on basic choices is required. But unanimity can only be achieved under individualistic—egoistic—assumptions for Pareto moves. Thus, Pareto efficiency and unanimity become ineluctably linked. In a voluntary association of individuals, unanimity is, potentially, always possible; all moves are latently Pareto-efficient.

The differences in starting points also explain the different approaches to the status quo apparent in the two literatures. The positivist works within a set of fixed rules and value consensus, and favors maintenance of the existing rules in the absence of clearly expressed preferences for change. The welfare theorist attempts to define the rules to be imbedded in an ideal (perhaps new) constitution and sees no reason to give previous rules preference.

The way constraints on the issue set are introduced is also revealing. When assumptions about the value consensus and domain of choice are made explicit in the positivist literature, they come at the beginning of the discussion. Given these assumed constraints, the positivist often evinces a lack of concern in, or downplays the importance of, the impossibility theorems (as, for example, Tullock 1967*b*). Sen's impossibility theorem (1970*b*) is disturbing to a positivist, only in that it presumes that one individual's preference that another read a book the latter thinks distasteful would even enter into the social choice process (Ng 1971; Peacock and Rowley 1972; Bernholz 1974*a*). The social welfare function texts, on the other hand, begin with an unlimited domain assumption and work back to consider restrictions on the set of admissible preferences, after deriving their impossibility results (Arrow 1963, 74–91; Vickrey 1960; Sen 1970*a*, 166–86). The suggestion that basic agreement on some ends must be part of the collective choice process comes after the exploration of the infeasibility of not assuming such consensus.

This contrasting of perspectives is an attempt to clarify the apparently differing conclusions and emphasis of the two approaches. It also may explain the interest in Rawls. For Rawls's theory is at once individualistic-contractarian and overtly normative. The unanimous agreement of all citizens for all time becomes *the* social preference ordering of the community, through the homogenization of tastes that occurs as individuals pass through the veil of ignorance into the original position, in the same way Harsanyi derives a unique-unanimous social welfare function.³⁹

In closing this comparison, some paradoxes and unresolved questions must be noted. Although the bulk of the positivist-contractarian literature discusses decision making within an agreed social contract or constitution, the process by which this agreement is reached is almost never discussed. Buchanan and Tullock's book, subtitled the *Logical Foundations of Constitutional Democracy*, devotes only a few pages to the constitutional stage and here argues the plausibility of assuming unanimity due to uncertainty over future positions (1962). Buchanan's recent book, although devoted to the social contract, does not discuss the *process* by which actual constitutions are drawn (1975*a*).

Nor does the social welfare function literature discuss how agreement is expressed on basic values, even though, under the present interpretation at least, this literature is directly concerned with the functional embodiment of these values. Quite to the contrary. Barry (1965, 242–45) and Samuelson (1969*b*) are openly critical of unanimity, even when applied to the constitutional stage. Arrow accepts an interpretation of the social welfare function as

a constitution, but seems not to feel it is literally agreed upon by citizens. Instead, he sees the implications of the social welfare function research as guiding ethically neutral public officials when making policy decisions (1963, 107). But this interpretation reopens all of the old questions of value judgments, interpersonal utility comparisons, etc., that the new welfare economics sought to avoid. Given Arrow's own results, it is clear that the policy maker cannot easily find a decision rule consistent with an obviously agreed upon set of normative axioms. New axioms must be found. But what (who?) guides the policy maker in this search, the economist? Unless there is a general consensus over the policy maker's or economist's choice of value postulates, the spectre of multiple social welfare functions reappears. But can the policy maker, or economist, determine if a consensus exists, and what it is, if it is not somehow literally expressed?

It is fitting that we close with this query. For the basic challenge facing a community is achieving a consensus or the dilemma of decision making in its absence. Public choice has shed light on these issues, but much remains to be done. The positive literature is riddled with demonstrations of the instability, inefficiency, or irrationality of various voting outcomes; the normative literature with impossibility proofs. But this should be neither surprising nor particularly discouraging. Indeed, it is precisely because it deals with some of the oldest and toughest questions a community faces, that public choice attracts so many fine scholars. And for this reason, one can remain optimistic about the field's future growth and development.

NOTES

1. For detailed justification of this postulate in the study of voting see Downs 1957, 3–20; Buchanan and Tullock 1962, 17–39; and Riker and Ordeshook 1973, 8–37. Schumpeter's early use of the postulate also should be mentioned (1950). One of the curiosities of the public choice literature is the slight *direct* influence Schumpeter's work appears to have had. Downs claims that "Schumpeter's profound analysis of democracy forms the inspiration and foundation for our whole thesis" (1957, 27, n. 11), but cites only one page of the book (twice), and this is in support of the economic man assumption. Most other work in the field makes no reference to Schumpeter.
2. For surveys see Sen (1970a) and Fishburn (1973).
3. This division of the literature also corresponds to a difference in views of the state as either an "organic" entity, or a union of individuals engaged in a quid pro quo exchange. The distinction was clearly drawn, and the subsequent development of the literature anticipated, in 1949 by Buchanan in an article that builds on Wicksell. See also Buchanan's article (1975b, n. 10).
4. Exceptions are Buchanan's book (1967) and articles by Greene (1970) and Klevorick and Kramer (1973). The general topic is reviewed and Wicksell's influence emphasized by Buchanan (1975b).
5. For a survey of this literature see Milleron (1972).
6. See Musgrave (1959, 78–80). The most rigorous discussion of this is by Drèze and de la Vallee Poussin, who show that honest revelation of preferences is a

minimax strategy (1971). With less conservative strategists, honest revelation of preferences cannot be assured.

7. At least two normative proposals for sharing these gains are dependent on the bargaining or risk preferences of the individuals (see Nash 1950 and Braithwaite 1955).
8. However, Rae explicitly rules out the legitimacy of such a comparison (1969, 43).
9. "If any public expenditure is to be approved, . . . it must generally be assumed that this expenditure as such . . . is intended for an activity useful to the whole of society and so recognized by all classes without exception. If this were not so . . . then I, for one, fail to see how the latter can be considered as satisfying a collective need in the proper sense of the word" (Wicksell 1958, 89). Black limits his discussion of unanimity to international agreements, where redistribution (other than of the Hochman and Rodgers Pareto-efficient kind [1969]) is out of the question (1958, 140–55). Buchanan and Tullock are positivist in approach.
10. See Sen's discussion (1970a, 68–77) of May's theorem (1952). May's theorem is more in the spirit of the Arrow welfare function taken up later.
11. Kramer has offered a rigorous proof (1972), and Slutsky an existence theorem based on a generalization of the result to more than one dimension (1977b). Kramer and Kelvovick establish a similar result for local optima (1974).
12. Although when buttressed by additional assumptions, it may become more plausible. See Tullock 1967b; Arrow 1969; and Simpson 1969b.
13. For the most general statement of single-peakedness type conditions see Sen 1966.
14. This literature is surveyed in Inada 1969; Sen 1970a; Plott 1971; and Taylor 1971. Slutsky examines the necessary and sufficient conditions for majority rule consistency and relates then to the collective choice process (1977b).
15. See Garman and Kamien 1968; Niemi and Weisberg 1968; and Demeyer and Plott 1970. This literature is reviewed by Niemi (1969) and Riker and Ordeshook (1973, 94–97).
16. The most extensive treatment of logrolling is by Buchanan and Tullock (1962). See also Tullock 1970.
17. Robert Wilson has explored the existence of an equilibrium with logrolling using a game-theoretic framework (1971a, 1971b).
18. The normative properties of vote trading can be enhanced by redistributing the initial stocks of votes in a manner analogous to redistribution of private wealth (Mueller, Tollison, and Willett 1974).
19. Simple majority rule can be too, however. A voter who thought that sincere voting would produce an undesirable, majority winner might misstate his preferences so as to produce a cycle, trusting to chance, or a known procedure, to break the cycle in a more favorable way (Taylor 1968; Farquharson 1969; Riker and Ordeshook 1973, 97–99).
20. Buchanan was the first to compare the properties of general fund and earmarked tax schemes (1963). His work has been extended by Goetz (1968); Goetz and McKnew (1972); and Browning (1975).
21. Other assumptions have been used, e.g., vote maximization, but plurality maximization yields either the same or superior results (Hinich and Ordeshook 1970).
22. Hotelling's article could be regarded as *the* pioneering contribution in public choice. It is both a direct application of economics to a political process and a clear intellectual antecedent of both Downs's and, more indirectly, Black's work. The argument is also found in Bowen's classic paper (1969).

23. In addition to the single dimension assumption, the whole spatial approach to political issues has been challenged on methodological grounds (Stokes 1963). This literature is admirably reviewed and partially defended by Ordeshook (1974).
24. Haeefele argues that *two-party* representative democracy both avoids cycles and maximizes voter utility gains (1971). The argument rests on questionable assumptions, however. Haeefele depicts representative democracy as strategic maneuvers between essentially monolithic parties. Their search for an optimal platform is described by a set of rules, which essentially seeks out the maximum possible utility gain, and not by a goal of winning. Haeefele can thus conclude, from a matrix similar to table 2, that PPP is a stable winning platform (1971, 358–62). I cannot see, however, why a party seeking victory would not choose PPF in response to another's PPP.
25. Defeating the incumbent party appears so easy that Wittman assumes parties are able to look beyond merely maximizing their votes and choose strategies that maximize their *expected* utility from being in office (1973).
26. Differences in behavior caused by the different nature of the *choices* facing voters and consumers were first discussed by Buchanan (1954).
27. See Buchanan and Wagner 1970; Buchanan and Goetz 1972; McMillan 1975; and Flatters, Henderson, and Mieszkowski 1974.
28. See Arrow 1973; Barry 1973; Alexander 1974; Dasgupta 1974; Klevorick 1974; Mueller, Tollison, and Willett 1974; Mueller 1974; Musgrave 1974; Sen 1974; and Harsanyi 1975a; for a defense, Buchanan 1976.
29. See, however, Diamond 1967; Wilson 1968; Sen 1970a, 142–44; and Harsanyi's reply (1975b).
30. The issue of how cardinal utilities can be measured is also raised. See Harsanyi 1955; 1975b; Little 1957; Vickrey 1960; Sen 1970a; and Goodin 1975. The importance of actually measuring cardinal utilities has probably been overstressed. If one thinks of interpersonal comparisons as being made to form a social contract or constitution, then the choices are of basic principles and rules (e.g., freedom of speech) and thus involve fundamental wants and values common to all.
31. The Harsanyi welfare function has been criticized by Pattanaik (1968) and Sen (1970a), on the same grounds as its utilitarian predecessors, for not taking into account the distribution of utilities over all individuals. This criticism has been challenged in Mueller 1973; Mueller, Tollison, and Willett 1974; and Harsanyi 1975b.
32. Arrow's definition differs from the Bergson-Samuelson definition of a social welfare function (1963, pp. 23–24).
33. For full statements of the axioms and proof, see Arrow (1963) and Sen (1970, 33–46). Vickrey presents a slightly different, easy to follow proof (1960).
34. Sen (1970a), Pattanaik (1971), and Fishburn (1973) all survey and extend this literature in important ways. See also Riker 1961; Rothenberg 1961; Arrow 1963, chap. 8; and Taylor 1971.
35. The weakest modification of this form is to replace transitivity with acyclicity; *i.e.* $(xPy \text{ and } yPz) \rightarrow (xRz)$. But this too introduces some arbitrariness (Sen 1970; 47–55).
36. Vickrey's speculation that immunity to strategy and the independence axiom are logically equivalent (1960, 517–19) has been rigorously proved by Gibbard (1973) and Satterthwaite (1975). For additional discussion of this axiom see Bergson 1954; Hansson 1973.

37. This voting procedure is consistent with a possibility theorem, a weaker statement of the independence axiom, and the other four Arrow axioms (Ray 1973).
38. Arrow 1963, 119–20; Barry 1965, 323–24; Baumol 1965, 43–44; Samuelson 1969*b*; Sen 1970*a*, 24–26.
39. Some criticisms of Rawls are also revealing. Buchanan (1972), the positivist-contractarian, objects to Rawls's extension of his theory of the social contract *process* to define actual outcomes of the process in terms of principles of justice. Welfare theorists Arrow (1973), Sen (1970*a*, 135–46; 1974), and Harsanyi (1975*a*) criticize only the form the principles take.

REFERENCES

- Alexander, S. S. "Social Evaluation through Rational Choice." *Quarterly Journal of Economics* 88, no. 4 (November 1974): 597–624.
- Aranson, P. H., and Ordeshook, P. C. "Spatial Strategies for Sequential Elections." In *Probability Models of Collective Decision-Making*, edited by R. G. Niemi and H. F. Weisberg. Columbus: Merrill, 1972.
- Arrow, K. J. *Social Choice and Individual Values*. Rev. ed. New York and London: Yale University Press, 1963.
- . "Tullock and an Existence Theorem." *Public Choice* 6 (Spring 1969): 105–11.
- . "Some Ordinalist-Utilitarian Notes on Rawls's *Theory of Justice*." *Journal of Philosophy* 70, no. 9 (May 1973): 245–63.
- Arrow, K. J., and Scitovsky, T., eds. *Readings in Welfare Economics*. Homewood, Ill.: Irwin, 1969.
- Barr, J. L., and Davis, O. A. "An Elementary Political and Economic Theory of the Expenditures of Local Governments." *Southern Economics Journal* 33, no. 2 (October 1966): 149–65.
- Barry, B. M. *Political Argument*. London: Routledge and Kegan Paul; New York: Humanities Press, 1965.
- . *Sociologists, Economists and Democracy*. London: Collier-Macmillan, 1970.
- . *The Liberal Theory of Justice*. London: Oxford University Press, Clarendon Press, 1973.
- Barzel, Y., and Silberberg, E. "Is the Act of Voting Rational?" *Public Choice* 16 (Fall 1973): 51–58.
- Baumol, W. J. *Welfare Economics and the Theory of the State*. 2d ed. Cambridge, Mass.: Harvard University Press, 1965.
- Bergson, A. "On the Concept of Social Welfare." *Quarterly Journal of Economics* 68 (May 1954): 233–52.
- . "A Reformulation of Certain Aspects of Welfare Economics." *Quarterly Journal of Economics* 52 (February 1938): 310–34. Reprinted in *Readings in Welfare Economics* (Arrow and Scitovsky 1969, 7–25).
- Bergstrom, T. C., and Goodman, R. P. "Private Demands for Public Goods." *American Economic Review* 63, no. 3 (June 1973): 280–96.
- Bernholz, P. "Logrolling, Arrow Paradox and Cyclical Majorities." *Public Choice* 15 (Summer 1973): 87–95.
- . "Is a Paretian Liberal Really Impossible?" *Public Choice* 20 (Winter 1974*a*): 99–107.

- _____. "Logrolling, Arrow-Paradox and Decision Rules—A Generalization." *Kyklos* 27 no. 1 (1974b): 49–62.
- _____. "The Paradox of Voting and Logrolling: Are They Logically Equivalent?" Mimeographed. June 1974c.
- Black, D. "The Decisions of a Committee Using a Special Majority. *Econometrica* 16 (July 1948): 245–61.
- _____. *The Theory of Committees and Elections*. Cambridge: Cambridge University Press, 1958.
- _____. "On the Rationale of Group Decision Making." *Journal of Political Economy* 56 (February 1948): 23–34. Reprinted in *Readings in Welfare Economics* (Arrow and Scitovsky 1969, 133–46).
- Borcherding, T. E., and Deacon, R. T. "The Demand for the Services of Non-Federal Governments." *American Economic Review* 62, no. 5 (December 1972): 891–901.
- Bowen, H. R. "The Interpretation of Voting in the Allocation of Economic Resources." *Quarterly Journal of Economics* 58 (November 1943): 27–48. Reprinted in *Readings in Welfare Economics* (Arrow and Scitovsky 1969, 115–32).
- Braithwaite, R. B. *Theory of Games as a Tool for the Moral Philosopher*. Cambridge: Cambridge University Press, 1955.
- Breton, A. *The Economic Theory of Representative Government*. Chicago: Aldine, 1974.
- Browning, E. K. "Collective Choice and General Fund Financing." *Journal of Political Economy* 83, no. 2 (April 1975): 377–90.
- Buchanan, J. M. "The Pure Theory of Government Finance: A Suggested Approach." *Journal of Political Economy* 57 (December 1949): 496–505.
- _____. "Individual Choice in Voting and the Market." *Journal of Political Economy* 62 (August 1954): 334–43.
- _____. "The Economics of Earmarked Taxes." *Journal of Political Economy* 71 (October 1963): 457–69.
- _____. "An Economic Theory of Clubs." *Economica* 32, no. 125 (February 1965a): 1–14.
- _____. "Ethical Rules, Expected Values, and Large Numbers." *Ethics* 76 (October 1965b): 1–13.
- _____. *Public Finance in Democratic Process*. Chapel Hill: University of North Carolina Press, 1967.
- _____. "Principles of Urban Fiscal Strategy." *Public Choice* 11 (Fall 1971): 1–16.
- _____. "Rawls on Justice as Fairness." *Public Choice* 13 (Fall 1972): 123–28.
- _____. *The Limits of Liberty: Between Anarchy and Leviathan*. Chicago: University of Chicago Press, 1975a.
- _____. "Public Finance and Public Choice." *National Tax Journal* 28, no. 4 (December 1975b): 383–94.
- _____. "A Hobbesian Interpretation of the Rawlsian Difference Principle." *Kyklos* 29, no. 1 (1976): 5–25.
- Buchanan, J. M., and Goetz, C. J. "Efficiency Limits of Fiscal Mobility: An Assessment of the Tiebout Model." *Journal of Public Economics* 1, no. 1 (April 1972): 25–43.
- Buchanan, J. M., and Tollison, R. D., eds. *Theory of Public Choice*. Ann Arbor: University of Michigan Press, 1972.
- Buchanan, J. M., and Tullock, G. *The Calculus of Consent*. Ann Arbor: University of Michigan Press, 1962.

- Buchanan, J. M., and Wagner, R. E. "An Efficiency Basis for Federal Fiscal Equalization." In *The Analysis of Public Output*, edited by J. Margolis, pp. 139–58. New York: National Bureau of Economic Research, 1970.
- Bush, W. C., and Mayer, L. S. "Some Implications of Anarchy for the Distribution of Property." *Journal of Economic Theory* 8, no. 4 (August 1974): 401–12.
- Coleman, J. S. "Foundations for a Theory of Collective Decisions." *American Journal of Sociology* 71, no. 6 (May 1966a): 615–27.
- . "The Possibility of a Social Welfare Function." *American Economic Review* 56, no. 5 (December 1966b): 1105–22.
- . "The Possibility of a Social Welfare Function: Reply." *American Economic Review* 57, no. 5 (December 1967): 1311–17.
- . "Political Money." *American Political Science Review* 64, no. 5 (December 1970): 1074–87.
- . "Internal Processes Governing Party Positions in Elections." *Public Choice* 11 (Fall 1971): 35–60.
- . "The Positions of Political Parties in Elections." In *Probability Models of Collective Decision-Making*, edited by R. G. Niemi and H. F. Weisberg. Columbus: Merrill, 1972.
- Comanor, W. S. "The Median Voter Rule and the Theory of Political Choice." *Journal of Public Economics* 5, no. 1 (January-February 1976): 169–77.
- Crain, W. M., and Tollison, R. D. "Campaign Expenditures and Political Competition." *Journal of Law and Economics* 19 (April 1976): 177–88.
- Crain, W.; Deaton, T.; and Tollison, R. "Electoral Outcomes and Macroeconomic Variables: Is There a Discernable Relation?" Mimeographed. Texas A & M University, 1975.
- Craven, J. "Majority Voting and Social Choice." *Review of Economic Studies* 38, no. 2 (April 1971): 265–67.
- Dasgupta, P. "On Some Problems Arising from Professor Rawls' Conception of Distributive Justice." *Theory and Decision* 4, no. 3–4 (February-April 1974): 325–44.
- Davis, O. A., and Haines, G. H., Jr. "A Political Approach to a Theory of Public Expenditure: The Case of Municipalities." *National Tax Journal* 19 (September 1966): 259–75.
- Davis, O. A.; Hinich, M. J.; and Ordeshook, P. C. "An Expository Development of a Mathematical Model of the Electoral Process." *American Political Science Review* 64, no. 2 (June 1970): 426–48.
- de Borda, J. C. "Mémoire sur les Elections au Scrutin." *Historie de l'Academie Royale des Sciences*, 1781.
- de Condorcet, M. *Essai sur l'application de l'analyse a la Probabilité des Decisions Rendues à la Pluralité des voix*. Paris: 1785.
- Demeyer, F., and Plott, C. R. "The Probability of Cyclical Majority." *Econometrica* 38, no. 2 (March 1970): 345–54.
- Diamond, P. A. "Cardinal Welfare, Individualistic Ethics, and Interpersonal Comparison of Utility: A Comment." *Journal of Political Economy* 75, no. 5 (October 1967): 765–66.
- Dodgson, C. L. "A Method of Taking Votes on More than Two Issues." Written 23 February 1876. Reprinted in *The Theory of Committees and Elections* (Black 1958, 224–34).
- Downs, A. *An Economic Theory of Democracy*. New York: Harper and Row, 1957.

- _____. "Why the Government Budget Is Too Small in a Democracy." *World Politics* 12 (July 1960): 541-63.
- _____. "In Defense of Majority Voting." *Journal of Political Economy* 69 (April 1961): 192-99.
- Dreze, J. H., and de la Vallee Poussin, D. "A Tâtonnement Process for Public Goods." *Review of Economic Studies* 38, no. 2 (April 1971): 133-50.
- Escarraz, D. R. "Wicksell and Lindahl: Theories of Public Expenditure and Tax Justice Reconsidered." *National Tax Journal* 20 (June 1967): 137-48.
- Farquharson, R. *Theory of Voting*. New Haven: Yale University Press, 1969.
- Fishburn, P. C. *The Theory of Social Choice*. Princeton: Princeton University Press, 1973.
- Flatters, F.; Henderson, V.; and Mieszkowski, P. "Public Goods, Efficiency, and Regional Fiscal Equilization." *Journal of Public Economics* 3, no. 2 (May 1974): 99-112.
- Fleming, J. M. "A Cardinal Concept of Welfare." *Quarterly Journal of Economics* 66 (August 1952): 366-84.
- Frey, B. S. "Why Do High Income People Participate More in Politics?" *Public Choice* 11 (Fall 1971): 101-5.
- _____. "The Political-Economic System: A Simulation Model." *Kyklos* 27 no. 2 (1974): 227-54.
- Frey, B. S., and Garbers, H. "Der Einfluss wirtschaftlicher Variabler auf die Popularität der Regierung." *Jahr. Nationalökon. Statist.* 186, no. 4 (April 1972): 281-95.
- Frey, B. S., and Lau, L. J. "Towards a Mathematical Model of Government Behaviour." *Z. Nationalökon.* 28 (1968): 355-80.
- Frey, B. S., and Schneider, F. "On the Modeling of Politico-Economic Interdependence." *European Journal of Political Research* 3 (December 1975): 339-60.
- _____. "An Econometric Model with an Endogenous Government Sector." Mimeographed. Konstanz, 1975.
- Garman, M. B., and Kamien, M. I. "The Paradox of Voting: Probability Calculations." *Behavioral Science* 13 (July 1968): 306-17.
- Gibbard, A. "Manipulation of Voting Schemes: A General Result." *Econometrica* 41, no. 4 (July 1973): 587-602.
- Goetz, C. J. "Earmarked Taxes and Majority Rule Budgetary Processes." *American Economic Review* 58, no. 1 (March 1968): 128-36.
- Goetz, C. J., and McKnew, C. R., Jr. "Paradoxical Results in a Public Choice Model of Alternative Government Grant Forms." In *Theory of Public Choice* (Buchanan and Tollison 1972, 224-35).
- Goodhart, C. A. E., and Bhansali, R. J. "Political Economy." *Political Studies* 18, no. 1 (March 1970): 43-106.
- Goodin, R. E. "How to Determine Who Should Get What." *Ethics* 85 (July 1975): 310-21.
- Greene, K. V. "Some Institutional Considerations in Federal-State Fiscal Relations." *Public Choice* 9 (Fall 1970): 1-18.
- Haefele, E. T. "A Utility Theory of Representative Government." *American Economic Review* 61, no. 3 (June 1971): 350-67.
- Hansson, B. "The Independence Condition in the Theory of Social Choice." *Theory and Decision* 4, no. 1 (September 1973): 25-49.

- Harsanyi, J. C. "Cardinal Utility in Welfare Economics and in the Theory of Risk-Taking." *Journal of Political Economy* 61 (October 1953): 434–35.
- . "Cardinal Welfare, Individualistic Ethics, and Interpersonal Comparisons of Utility." *Journal of Political Economy* 63 (August 1955): 309–21. Reprinted in *Readings in Welfare Economics* (Arrow and Scitovsky 1969, 46–60).
- . "Can the Maximin Principle Serve as a Basis for Morality: A Critique of John Rawls's Theory." *American Political Science Review* 69, no. 2 (June 1975a): 594–606.
- . "Nonlinear Social Welfare Functions." *Theory and Decision* 6 (August 1975b): 311–32.
- Head, J. G. "Public Goods and Public Policy." *Public Finance* 17, no. 3 (1962): 197–221.
- Hildreth, C. "Alternative Conditions for Social Orderings." *Econometrica* 21 (January 1953): 81–94.
- Hinich, M. J., and Ordeshook, P. C. "Plurality Maximization vs. Vote Maximization: A Spatial Analysis with Variable Participation." *American Political Science Review* 64, no. 3 (September 1970): 772–91.
- Hirschman, A. O. *Exit, Voice, and Loyalty*. Cambridge, Mass.: Harvard University Press, 1970.
- Hochman, H. M., and Rodgers, J. D. "Pareto Optimal Redistribution." *American Economic Review* 59, no. 4 (September 1969): 542–57.
- Hotelling, H. "Stability in Competition." *Economic Journal* 39 (March 1929): 41–57.
- Hume, D. A. *Treatise of Human Nature*. Oxford: Oxford University Press, 1941.
- Inada, K. "The Simple Majority Decisions Rule." *Econometrica* 37, no. 3 (July 1969): 490–506.
- Intriligator, M. D. "A Probabilistic Model of Social Choice." *Review of Economic Studies* 40, no. 4 (October 1973): 553–60.
- Johansen, L. "Some Notes on the Lindahl Theory of Determination of Public Expenditures." *International Economics Review* 4, no. 3 (September 1963): 346–58.
- Kasper, H. "On Political Competition, Economic Policy, and Income Maintenance Programs." *Public Choice* 10 (Spring 1971): 1–19.
- Kemp, M. C. "Arrow's General Possibility Theorem." *Review of Economic Studies* 21, no. 3 (1954): 240–43.
- Kemp, M. C., and Asimakopulos, A. "A Note on 'Social Welfare Functions' and Cardinal Utility." *Canadian Journal of Economics and Political Science* 18 (May 1952): 195–200.
- Klevorick, A. K. "Political Constraints on Contractual Redistribution: Discussion." *American Economic Review* 64, no. 2 (May 1974): 152–61.
- Klevorick, A. K., and Kramer, G. H. "Social Choice on Pollution Management: The Genossenschaften." *Journal of Public Economics* 2, no. 2 (April 1973): 101–46.
- Kramer, G. H. "Short-Term Fluctuations in U.S. Voting Behavior, 1896–1964." *American Political Science Review* 65, no. 1 (March 1971): 131–43.
- . "Sophisticated Voting Over Multidimensional Choice Spaces." *Journal of Mathematical Sociology* 2, no. 2 (July 1972): 165–80.
- . "On a Class of Equilibrium Conditions for Majority Rule." *Econometrica* 41, no. 2 (March 1973): 285–97.
- Kramer, G. H., and Klevorick, A. K. "Existence of a 'Local' Cooperative Equilibrium in a Class of Voting Games." *Review of Economic Studies* 41, no. 4 (October 1974): 539–47.

- Leibenstein, H. "Notes on Welfare Economics and the Theory of Democracy." *Economic Journal* 72 (June 1962): 299–319.
- . "Long-Run Welfare Criteria." In *The Public Economy of Urban Communities*, edited by J. Margolis, pp. 39–51. Baltimore: Johns Hopkins University Press, 1965.
- Lerner, A. P. *The Economics of Control*. New York: Macmillan and Co., 1944.
- Lindahl, E. "Just Taxation—A Positive Solution." Translated from the German in *Classics in the Theory of Public Finance* (Musgrave and Peacock, 1958, 168–76).
- Lindeen, J. W. "An Oligopoly Model of Political Market Structures." *Public Choice* 9 (Fall 1970): 31–37.
- Little, I. M. D. "Social Choice and Individual Values." *Journal of Political Economy* 60 (October 1952): 422–32.
- May, K. O. "A Set of Independent, Necessary and Sufficient Conditions for Simple Majority Decision." *Econometrica* 20 (October 1952): 680–84.
- McGuire, M. C. "Private Good Clubs and Public Good Clubs: Economic Models of Group Formation." *Swedish Journal of Economics* 74, no. 1 (March 1972): 84–99.
- . "Group Segregation and Optimal Jurisdictions." *Journal of Political Economy* 82, no. 1 (January–February 1974): 112–32.
- McGuire, M. C., and Aaron, H. "Efficiency and Equity in the Optimal Supply of a Public Good." *Review of Economic Statistics* 51, no. 1 (February 1969): 31–39.
- McKelvey, R. D. "Policy Related Voting and Electoral Equilibrium." *Econometrica* 43, nos. 5–6 (September–November 1975): 815–43.
- McMillan, M. L. "Toward the More Optimal Provision of Local Public Goods: Internationalization of Benefits or Intergovernmental Grants?" *Public Finance Quarterly* 3 (July 1975): 229–60.
- Miller, W. L., and Mackie, M. "The Electoral Cycle and the Asymmetry of Government and Opposition Popularity." *Political Studies*, 21, no. 3 (September 1973): 263–79.
- Milleron, J. C. "Theory of Value with Public Goods: A Survey Article." *Journal of Economic Theory* 5 (December 1972): 419–77.
- Mueller, D. C. "The Possibility of a Social Welfare Function: Comment." *American Economic Review* 57, no. 5 (December 1967): 1304–11.
- . "Fiscal Federalism in a Constitutional Democracy." *Public Policy* 19, no. 4 (Fall 1971): 567–93.
- . "Constitutional Democracy and Social Welfare." *Quarterly Journal of Economics* 87, no. 1 (February 1973): 60–80.
- . "Achieving the Just Polity." *American Economic Review*, 64, no. 2 (May 1974): 147–52.
- Mueller, D. C.; Philpotts, G. C.; and Vanek, J. "The Social Gains from Exchanging Votes: A Simulation Approach." *Public Choice* 13 (Fall 1972): 55–79.
- Mueller, D. C.; Tollison, R. D.; and Willett, T. D. "The Utilitarian Contract: A Generalization of Rawls' Theory of Justice." *Theory and Decision* 4, no. 3/4 (February–April 1974): 345–67.
- . "On Equalizing the Distribution of Political Income." *Journal of Political Economy* 82, no. 2 (March–April 1974): 414–22.
- . "Solving the Intensity Problem in a Representative Democracy." In *Political Economy and Public Policy*, edited by R. Amacher, R. D. Tollison, and T. D. Willett. Ithaca, N.Y.: Cornell University Press, 1975.
- Musgrave, R. A. *The Theory of Public Finance*. New York: McGraw-Hill, 1959.

- . "Symposium: Rawls' *A Theory of Justice*: Maximin, Uncertainty, and the Leisure Trade-Off." *Quarterly Journal of Economics* 88, no. 4 (November 1974): 625–32.
- Musgrave, R. A., and Peacock, A. T., eds. *Classics in the Theory of Public Finance*. New York: St. Martin's Press, 1958.
- Nash, J. F. "The Bargaining Problem." *Econometrica* 18 (April 1950): 155–62.
- Ng, Y. K. "The Possibility of a Paretian Liberal: Impossibility Theorems and Cardinal Utility." *Journal of Political Economy* 79, no. 6 (November–December 1971): 1397–1402.
- Niemi, R. G. "Majority Decision-Making with Partial Unidimensionality." *American Political Science Review* 63, no. 2 (June 1969): 488–97.
- Niemi, R. G., and Weisberg, H. F. "A Mathematical Solution for the Probability of the Paradox of Voting." *Behavioral Science* 13 (July 1968): 317–23.
- Nordhaus, W. D. "The Political Business Cycle." *Review of Economic Studies* 42, no. 2 (April 1975): 169–90.
- Oates, W. E. *Fiscal Federalism*. New York: Harcourt Brace, 1972.
- Olson, M., Jr. *The Logic of Collective Action*. Cambridge, Mass.: Harvard University Press, 1965.
- Ordeshook, P. C. "The Spatial Theory of Elections: A Review and Critique." Presented at the ECPR Workshop on Participation, Voting, and Party Competition. Strasbourg, 1974.
- Ostrom, V. *The Political Theory of a Compound Republic*. Blacksburg, Va.: Public Choice Society, 1971.
- Palda, K. S. "Does Advertising Influence Votes? An Analysis of the 1966 and 1970 Quebec Elections." *Canadian Journal of Political Science* 6, no. 4 (December 1973): 638–55.
- Park, R. E. "The Possibility of a Social Welfare Function: Comment." *American Economic Review* 57, no. 5 (December 1967): 1300–1304.
- Pattanaik, P. K. "Risk, Impersonality, and the Social Welfare Function." *Journal of Political Economy* 76, no. 6 (November–December 1968): 1152–69.
- . *Voting and Collective Choice*. Cambridge: Cambridge University Press, 1971.
- Pauly, M. V. "Clubs, Commonality, and the Core: An Integration of Game Theory and the Theory of Public Goods." *Economica* 54, no. 135 (August 1967): 314–24.
- . "Cores and Clubs." *Public Choice* 9 (Fall 1970): 53–65.
- Peacock, A. T., and Rowley, C. K. "Pareto Optimality and the Political Economy of Liberalism." *Journal of Political Economy* 80, no. 3 (May–June 1972): 476–90.
- Pestieau, P. "The Optimality Limits of the Tiebout Model." Mimeographed. Ithaca, N.Y., 1974.
- Philpotts, G. "Vote Trading, Welfare, and Uncertainty." *Canadian Journal of Economics* 5, no. 3 (August 1972): 358–72.
- Plott, C. R. "A Notion of Equilibrium and Its Possibility Under Majority Rule." *American Economic Review* 57, no. 4 (September 1967): 787–806.
- . "Recent Results in the Theory of Voting." In *Frontiers of Quantitative Economics*, edited by M. D. Intriligator, pp. 109–27. Amsterdam: North-Holland, 1971.
- Pommerehne, W., and Frey, B. S. "Two Approaches to Estimating Public Expenditures." Mimeographed. Konstanz, 1975.

- Rae, D. W. *The Political Consequences of Electoral Laws*. New Haven: Yale University Press, 1967.
- . "Decision-Rules and Individual Values in Constitutional Choice." *American Political Science Review* 63, no. 1 (March 1969): 40–56.
- Rae, D. W., and Taylor, M. "Decision Rules and Policy Outcomes." *British Journal of Political Science* 1 (January 1971): 71–90.
- Rawls, J. *A Theory of Justice*. Cambridge, Mass.: Harvard University Press, Belknap Press, 1971.
- . "Some Reasons for the Maximin Criterion." *American Economic Review* 64, no. 2 (May 1974a): 141–46.
- . "Reply to Alexander and Musgrave." *Quarterly Journal of Economics* 88, no. 4 (November 1974b): 633–55.
- Ray, P. "Independence of Irrelevant Alternatives." *Econometrica* 41, no. 3 (September 1973): 987–91.
- Riker, W. H. "Voting and the Summation of Preferences: An Interpretive Bibliographical Review of Selected Developments During the Last Decade." *American Political Science Review* 55, no. 4 (December 1961): 900–911.
- . *The Theory of Political Coalitions*. New Haven and London: Yale University Press, 1962.
- Riker, W. H., and Brams, S. J. "The Paradox of Vote Trading." *American Political Science Review* 67, no. 4 (December 1973): 1235–47.
- Riker, W. H., and Ordeshook, P. C. "A Theory of the Calculus of Voting." *American Political Science Review* 62, no. 1 (March 1968): 25–42.
- . *An Introduction to Positive Political Theory*. Englewood Cliffs, N.J.: Prentice-Hall, 1973.
- Rosenthal, H., and Sen, S. "Electoral Participation in the French Fifth Republic." *American Political Science Review* 67, no. 1 (March 1973): 29–54.
- Rothenberg, J. *The Measurement of Social Welfare*. Englewood Cliffs, N.J.: Prentice-Hall, 1961.
- . "The Process of Group Choice in a Legislative Context." In *La Decision: Aggrégation et Dynamique des Ordres de Preference*, edited by G. T. Guilbaud, pp. 205–24. Paris: Centre National de la Recherche Scientifique, 1969.
- Runciman, W. G., and Sen, A. K. "Games, Justice and the General Will." *Mind*, October 1965, pp. 554–62.
- Russell, K. P.; Fraser, J.; and Frey, B. S. "Political Participation and Income Level: An Exchange." *Public Choice* 13 (Fall 1972): 113–22.
- Samuelson, P. A. *Foundations of Economic Analysis*. Cambridge, Mass.: Harvard University Press, 1947.
- . "Arrow's Mathematical Politics." In *Human Values and Economic Policy*, edited by S. Hook. New York: New York University Press, 1967.
- . "The Pure Theory of Public Expenditures." *Review of Economic Statistics* 36, no. 4 (November 1954): 387–89. Reprinted in *Readings in Welfare Economics* (Arrow and Scitovsky 1969a, 179–82).
- . "Pure Theory of Public Expenditure and Taxation." In *Public Economics*, edited by J. Margolis and H. Guitton, pp. 98–123. New York: St. Martin's Press, 1969b.
- Satterthwaite, M. A. "Strategy-Proofness and Arrow's Conditions: Existence and Correspondence Theorems for Voting Procedures and Social Welfare Functions." *Journal of Economic Theory* 10, no. 2 (April 1975): 187–217.

- Schumpeter, J. A. *Capitalism, Socialism, and Democracy*. 3d ed. New York: Harper and Row, 1950.
- Sen, A. K. "A Possibility Theorem on Majority Decisions." *Econometrica* 34, no. 2 (April 1966): 491–99.
- . *Collective Choice and Social Welfare*. San Francisco: Holden-Day, 1970a.
- . "The Impossibility of a Paretian Liberal." *Journal of Political Economy* 78, no. 1 (January–February 1979b): 152–57.
- . "Rawls versus Bentham: An Axiomatic Examination of the Pure Distribution Problem." *Theory and Decision* 4, no. 3/4 (February–April 1974): 301–9.
- Sherman, R. "Experimental Oligopoly." *Kyklos* 24, no. 1 (1971): 30–49.
- Siegel, S., and Fouraker, L. E. *Bargaining and Group Decision Making: Experiments in Bilateral Monopoly*. New York: McGraw-Hill, 1960.
- Simpson, P. B. "On Defining Areas of Voter Choice: Professor Tullock on Stable Voting." *Quarterly Journal of Economics* 83, no. 3 (August 1969): 478–90.
- Slutsky, S. "Equilibrium Under Plurality Voting." Mimeographed. Cornell University, 1975.
- . "A Characterization of Societies with Consistent Majority Decision." *Review of Economic Studies* 44 (June 1977a): 211–25.
- . "A Voting Model for the Allocation of Public Goods: Existence of an Equilibrium." *Journal of Economic Theory* 14 (April 1977b): 299–325.
- Smithies, A. "Optimum Location in Spatial Competition." *Journal of Political Economy* 49 (June 1941): 423–39.
- Stigler, G. J. "Director's Law of Public Income Redistribution." *Journal of Law and Economics* 13, no. 1 (April 1970): 1–10.
- Stokes, D. E. "Spatial Models of Party Competition." *American Political Science Review* 57, no. 2 (June 1963): 368–77.
- Taylor, M. J. "Graph Theoretical Approaches to the Theory of Social Choice." *Public Choice* 4 (Spring 1968): 35–48.
- . "Proof of a Theorem on Majority Rule." *Behavioral Science* 14 (May 1969): 228–31.
- . "Review Article: Mathematical Political Theory." *British Journal of Political Science* 1 (July 1971): 339–82.
- Tiebout, C. M. "A Pure Theory of Local Expenditures." *Journal of Political Economy* 64 (October 1956): 416–24.
- Tollison, R. D., and Willett, T. D. "Some Simple Economics of Voting and Not Voting." *Public Choice* 16 (Fall 1973): 59–71.
- Tullock, G. *Toward a Mathematics of Politics*. Ann Arbor: University of Michigan Press, 1967a.
- . "The General Irrelevance of the General Impossibility Theorem." *Quarterly Journal of Economics* 81, no. 2 (May 1967b): 256–70.
- . "Problems of Majority Voting." *Journal of Political Economy* 67 (December 1959): 571–79. Reprinted in *Readings in Welfare Economics* (Arrow and Scitovsky 1969, 169–78).
- . "A Simple Algebraic Logrolling Model." *American Economic Review* 60, no. 3 (June 1979): 419–26.
- . "The Paradox of Revolution." *Public Choice* 11 (Fall 1971a): 89–99.
- . "The Charity of the Uncharitable." *Western Economic Journal* 9, no. 4 (December 1971b): 379–92.

- _____. *The Social Dilemma: Economics of War and Revolution*. Blacksburg, Va.: Center for Study of Public Choice, 1974.
- Tullock, G., and Campbell, C. D. "Computer Simulation of a Small Voting System." *Economic Journal* 80, no. 317 (March 1970): 97–104.
- Vickrey, W. S. "Measuring Marginal Utility by Reactions to Risk." *Econometrica* 13 (October 1945): 319–33.
- _____. "Utility, Strategy, and Social Decision Rules." *Quarterly Journal of Economics* 74, no. 4 (November 1960): 507–35.
- Welch, W. P. "The Economics of Campaign Funds." *Public Choice* 20 (Winter 1974): 83–97.
- Wicksell, K. "A New Principle of Just Taxation." *Finanztheoretische Untersuchungen*. Jena, 1896. Reprinted in *Classics in the Theory of Public Finance* (Musgrave and Peacock 1958, 72–118).
- Williamson, O. E., and Sargent, T. J. "Social Choice: A Probabilistic Approach." *Economic Journal* 77 (December 1967): 797–813.
- Wilson, R. "The Theory of Syndicates." *Econometrica* 36 (January 1968): 119–32.
- _____. "An Axiomatic Model of Logrolling." *American Economic Review* 59, no. 3 (June 1969): 331–41.
- _____. "A Game-Theoretic Analysis of Social Choice." In *Social Choice*, edited by B. Lieberman. New York: Gordon and Breach, 1971a.
- _____. "Stable Coalition Proposals in Majority-Rule Voting." *Journal of Economic Theory* 3, no. 3 (September 1971b): 254–71.
- Wittman, D. A. "Parties as Utility Maximizers." *American Political Science Review* 67, no. 2 (June 1973): 490–98.
- Wright, G. "The Political Economy of New Deal Spending: An Econometric Analysis." *Review of Economic Statistics* 56, no. 1 (February 1974): 30–38.