INSTITUTIONAL EFFECTS ON COMMITTEE BEHAVIOR: A GAME THEORY EXPERIMENT

Richard K. Wilson

Submitted to the Faculty of the Graduate School
in partial fulfillment of the requirement for
the degree Doctor of Philosophy in the
Department of Political Science
Indiana University
November 1982

Accepted by the faculty of the Graduate School, Department of Political Science, Indiana University, in partial fulfillment of the requirements for the degree Doctor of Philosophy.

Doctoral Committee:

Elinor Ostrom, Ph.D.,
Chairperson

Edward G. Carmines, W.D.

Byrum Carter, Ph.D.

James H. I^fklinski, Ph.D.

Arlington Williams, Ph.D.
(£Economics)

INSTITUTIONAL EFFECTS ON COMMITTEE BEHAVIOR: A GAME THEORY EXPERIMENT

by

Richard K. Wilson
Department of Political Science
Indiana University
Bloomington, Indiana

ABSTRACT

Chairperson: Elinor Ostrom

Variations in political organization are endemic to any democratic society. This study seeks to analyze the effects of structural changes on a particular form of a democratic collective decision-making arrangement — the committee. These structural differences include changes across the voting rules, information rules, and agenda rules employed in various committees. It is argued that the structural elements of a committee variously provide incentives for or constrain the strategies individuals employ when making decisions.

Formal models and game theoretic literature in political science are drawn on to outline a set of predictions as to outcomes under different committee structures. To test the claim that structure constrains individual behavior, a series of 5-person committee experiments were designed. These abstract committee games used student volunteers, with all participant interaction via a computer system. Analysis was then conducted on outcomes selected by these committees.

The results indicate that structure indeed has an effect on outcomes. An increase in the proportion of votes needed to pass a proposal increases the decision-making costs confronting individuals.

INSTITUTIONAL EFFECTS ON COMMITTEE BEHAVIOR:
A GAME THEORY EXPERIMENT

by

Richard K. Wilson
Department of Political Science
Indiana University
Bloomington, Indiana

ABSTRACT

Chairperson: Elinor Ostrom

Variations in political organization are endemic to any democratic society. This study seeks to analyze the effects of structural changes on a particular form of a democratic collective decision-making arrangement — the committee. These structural differences include changes across the voting rules, information rules, and agenda rules employed in various committees. It is argued that the structural elements of a committee variously provide incentives for or constrain the strategies individuals employ when making decisions.

Formal models and game theoretic literature in political science are drawn on to outline a set of predictions as to outcomes under different committee structures. To test the claim that structure constrains individual behavior, a series of 5-person committee experiments were designed. These abstract committee games used student volunteers, with all participant interaction via a computer system. Analysis was then conducted on outcomes selected by these committees.

The results indicate that structure indeed has an effect on outcomes. An increase in the proportion of votes needed to pass a proposal increases the decision-making costs confronting individuals.

A change as to the amount of information available to participants yields mixed results as participants use available institutional mechanisms to gain information in decision making. Finally, changes in the agenda rules benefit those gaining additional powers and disadvantage those with reduced agenda control. In general, the results are consistent with the predictions outlined in the dissertation. These results return to the initial observation that political organizations vary as to their outcomes, and that there are sound theoretical reasons for expecting this to be the case.

Doctoral Committee:

Elinor Ostrom, Ph.D. Chairperson

Edward G. Carmines, Ph.D.

Byrum Carter, Ph.D.

James H. Kuklinski, Ph.D.

Arlington Williams, Ph.D.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

PREFACE

While employing the tools of logical analysis and laboratory experimentation to uncover elements of a specialized democratic arrangement, this work does not stray far from the normative realm. Embedded in this work is the presumption that individuals are agents facing choices. The choices they face are constrained by institutions (artifacts) that mediate colleptive decision making. It is argued that these institutions yield different sets of outcomes. Thus the point to this work is quite simple: the design and structure of collective decision-making arrangements variously provides incentives or constrains the strategies individuals employ in reaching collective decisions. It is asserted this lies at the heart of the study of politics.

The work proceeds in seven stages. Chapter 1 develops the normative underpinnings of democratic decision-making arrangements. It also describes the logical anomolies suggested by formal social choice theory for an understanding of democracy. Chapter 2 discusses a variety of game theoretic solutions that have been suggested to transcend these anomolies. However, experimental evidence indicates that the search for general game theoretic solutions may be misdirected. Chapter 3 sketches the beginnings of a theory of institutional structure. Chapter 4 develops a set of formal predictions for outcomes of a simplified democratic decision-making arrangement. Chapter 5 describes an approach to testing these predictions. Chapter 6 analyzes results from these empirical tests. Finally, Chapter 7 offers a set of speculative conclusions about this research and the value of institutional analysis.

This work was supported by a grant by the National Science Foundation (SES81-04772). Further support was provided by the National Institute for Mental Health (PHS T32-MH-155222) to the Workshop in Political Theory and Policy Analysis at Indiana University. Timely support was also provided through a grant by the Graduate School, Indiana Univeristy. None of these agencies bear responsibility for the views presented herein. Their support is gratefully acknowledged. A strong debt is owed to Elinor Ostrom for encouraging me to undertake this project and to the many times she redirected my muddled thinking. Larry Kiser early on, and later, Roger Parks, listened and critiqued many outlandish ideas. Arli Williams was extremely helpful in developing aspects of the experiment. Tom Kirchman spent many sleepless nights ironing out gliches. My committee and its ex officio members were quite helpful and stimulating at various times. Steve Percy, Carol Lambert, John Mclver, Rick Scott, Susan Wynn, Jerry Wright, and Christi Barbour all served in their capacity as cheerful guinea pigs through many practice tests of the experiment. The professionalism of the Workshop staff — Patty Smith, Teresa Therrien, Barb Hassell, Carol Lambert, and Donna Crask — contributed beyond measure to this project. Above all, throughout my research, Pat Dupras remained my friend — something that was invaluable.

CHAPTER ONE

DEMOCRACY AND STRUCTURE; OR, THROUGH THE ALTERNATIVE SPACE, AND, ALAS, WHAT WAS FOUND THERE

If collective wisdom existed, it is likely only a few concepts might obtain general agreement. This short list might include: the virtue of wine for physical being, friendship for the soul, and democracy for the polity. While these concepts find general support, considerable debate encompasses the notion of democracy. Political philosophers with normative aims as different as John Stuart Mill and Karl Marx laud the role of democracy in achieving their aims. Likewise, modern observers as different as Joseph Schumpeter and Carole Pateman agree that democracy is fundamental for the health of the polity. Further, both regard democracy as a mixture of institutions that variously constrain or encourage citizen involvement in public affairs. However, differences in their positions accrue from different conceptions of the goals and necessary preconditions for a democracy.

While disagreement is present over what constitutes democracy and those values that it should emphasize, democratic theory is plagued by even a more fundamental threat. It derives from a mode of logical analysis finding that democratic theory is internally inconsistent and leads to unexpected results. Formal results indicate that no outcome is likely in a fully democratic institution. These results point to two possible consequences: either fundamental tenets of democracy must be abridged, or participants must face an endless cycling among alternatives. Yet casual empirical observation indicates that many institutions that satisfy fundamental democratic criterion do indeed allow decisions to be made. These outcomes are not counter to democratic practice, nor do they wander aimlessly through some "alternative space." Indeed, such outcomes seem to correspond well to democratic results. This chapter sketches some of the principle formal results on voting paradoxes and disequilibria. It then turns to addressing the question of why the outcomes of real-world decision-making arrangements achieve so much stability.

Fundamental Tenets of Democratic Theory

Two traditions frame the major conceptual differences in democratic theory. The first derives in a sense from Rousseau and can be characterized as communal democratic theory. The second has its roots in the classical liberalism of John Locke and can be characterized as liberal democratic theory. Each approach values different ideals and as a result espouses different democratic arrangements to attain those ends. Communal democratic thought principally focuses on the polity as a whole. Ideals relating to equality of condition, social justice, and a common good shared by the polity take precedence. Liberal democratic theory focuses on the individual and the nature of conflict in society. Here, ideals of equality of opportunity, liberty, and protection are stressed.

Each tradition focuses on a different conception of human nature. These models of man entail different assumptions about human behavior, which in turn stress different normative values and yield different prescriptions for political institutions. These assumptions can be reduced to differences between principles of holism and methodological individualism.

In this discussion, I take the position that individuals are the unit of analysis. This is coupled with an assumption that individuals form their own set of tastes, values, or preferences about the world. These are not imposed by any other will, but derive from the individual.* A multiplicity of wills gives rise to the potential for conflict of interest between individuals. This is an important implication derived from the liberal assumption of autonomous wills. Where many preferences are possible, conflict is likely. This is the central point to liberal contractarian thought. Hobbes early on recognized that unregulated individual wills lead to chaos and a life that can only be "poore, nasty, brutish and short." Locke, too, recognized the inevitability of conflict — primarily over property — though he tempered to some extent Hobbes's rational egoism. Likewise, the writers of The Federalist Papers accepted the existence of conflicting factions and sought to design institutions that blunted their effects on government. Diversity of interests, while not always portending conflict, can give rise to it. This especially may be so when individuals attempt to frame collective decisions that partition finite goods or services among the citizenry. Thus, a means for arriving at decisions is necessary. This implies some form of governance — some set of institutions that provides for collective decisions.[2] Institutional arrangements lie at the heart of liberal democratic theory, and that is the path taken here.-*

In this discussion, I focus exclusively on liberal democratic thought and familar decision-making arrangements in the United States. This is not an arbitrary choice. Hartz (1955) has noted at length that the United States is overwhelmingly "liberal" in its ideological predisposition. This point has been echoed by many others including Wills (1970) and Roelofs (1976). Moreover, even when cooperative and communal market structures are approximated, it appears that liberal values predominate (see Greenberg, 1981). Therefore, in the study of American political institutions and practices, it seems appropriate to take as a starting point liberal democratic theory.

In its simplest form, liberal democracy corresponds to "Rule By the People." However, this simple four-word stricture is subject to considerable dispute over meaning. The notion of "Rule" implies that alternate courses of action can be compared, selected, and obeyed. "By" implies that choices between alternative proposals are made through some direct or indirect fashion. Finally, "the People" implies some boundary as to who is involved or included in considering alternate courses of action. Philosophers vary as to the limits they choose to place on these basic building blocks. Yet this simple definition suggests a mechanism by which a polity makes collective decisions.

There is widespread agreement that democracy is a form of government, and that the form of government is characterized by various rules and procedures. An early exemplar of this view is Aristotle. In Politics (particularly Books IV and V), Aristotle generally characterizes a democracy as a "form of government in which the free are rulers . . . " (Book IV: 4). However, he admits this is only a loose definition, and proceeds to characterize five types of democracies. The differences among these pertain to differences in rules concerning who is entitled to make decisions, and the role of law in directing behavior (Book IV: 4). Aristotle further distinguishes these democracies on the basis of procedures for administering government — whether by open assemblies or elected officials (Book IV: 6). He regards the form of government as important for discriminating not only between various democracies, but between various other forms of government such as monarchy, aristocracy, tyranny, and oligarchy. However, rather than simply elaborating a typology of government, Aristotle is careful to point to the normative implications of each for the quality of life. Although democracies rank lower than monarchies for what they contribute to the quality of life, Aristotle does make a case that democracies are more flexible — given certain conditions relating to the distribution of wealth in society. Further, this flexibility contributes to the progress, expansion, and wealth of the democractic polity (Book IV: 11).

Modern theorists too begin with the view that democracy for a polity flows from the structure of its institutions — the rules and procedures that characterize the process of government. John Stuart Mill in Representative Government details a theory of democracy wedded to representation. While some disagreement exists whether or not Mill has a theory of democracy, his notion of representative government certainly describes a governing institution that characterizes a form of "Rule by the People."^ Mill postulates two goals for any government. The first relates to raising (educating) the citizenry. He comments:

> A government is to be judged by its action upon men, and by its action upon things; by what it makes of the citizens, and what it does with them; its tendency to improve or deteriorate the people themselves, and the goodness or

> badness of the work it performs for them, and by means of them (Mill, 1951: 262).

The second goal concerns participation in governance. This is crucial given Mill's two assumptions concerning the conduct of human affairs.

> The first is, that the rights and interests of every or any person are only secure from being disregarded when the person interested is himself able, and habitually disposed, to stand up for them. The second is, that the general prosperity attains a greater height, and is more widely diffused, in proportion to the amount and variety of the personal energies enlisted in promoting it (Mill, 1951: 279).

The means for attaining both goals is with representative government. Mill regards representative government as more than the relationship between principals and agents. Instead, it involves a multitiered government, allowing national leadership and expertise at one level, and at the other, relying heavily on local councils, juries, and open discussion. Such a form of government allows a constrained form of "Rule By the People," while at the same time encourages citizen growth and participation.

Many of Mill's writings focus on the types of institutions that enhance citizen development and participation. In On Liberty» he recognizes the latent tensions between individual freedom and restraint, arguing that only an educated, responsible citizenry could discriminate the boundaries demarcating mob rule and rule of law. To this end, Mill's long discussion of varying systems of proportional representation amounts to a structural means for ensuring competent rule and citizen involvement. Indeed, his discussion of weighting votes is important for understanding the goals sought by Mill from a particular institutional form of government.

Means and Ends: Democractic Institutions

Although democracy can be regarded as a form of government, this is not important in itself. Mill viewed government as "being only a means, the eligibility of the means must depend on their adaptation to the end" (1951: 248). The raison d'etre for a democratic government is to maximize particular values and to obtain particular ends. Mill regarded representative government as uniquely able to produce the dual goals of education and participation through a mixture of open discussion, protection of minority rights, and opportunities for learning in local governments. Representative government could satisfy these goals, while simultaneously ensuring competent national leadership through a system of national representation. While theorists may agree that democracy is a form of government, the particular form prescribed depends on the ends to be achieved. The constraints imposed on the simple notion: "Rule By the People" depends on the initial assumptions adopted by theorists.

Pennock (1979) details many of the conflicting (and often contradictory) values that democratic theory attempts to fuse. Pennock indicates that any democratic theory must strike some balance between liberty and equality, between minority rights and majority volition, and between individual participation and competence in decision making. An earlier theorist, Tocqueville, was well aware of these latent tensions. He noted the danger that full individual freedom could turn into untrammeled egoism. Likewise, strict equality could result in little achievement and stagnation (1969: 503-506). He observed that strict protection of minority rights could prevent important decisions being made, while rule by a majority could endanger the existence of minorities (1969: 250-252). Finally, he noted that open participation could degenerate to mob rule, while representation could degenerate to a ruling oligarchy (1969: 205-207).

In painting a picture of what he regarded as democracy in America, Tocqueville recounted the historical, geographical, and political circumstances that enabled Americans to strike a delicate balance between these tensions. More importantly, he elaborated the web of democratic institutions that enforced this balance — the role of representation in developing equitable legislation, the locus of citizen control in local politics and juries, and multiple levels of government in overcoming a tendency in large nations to centralization and bureaucratic intransigence.

Whether America in this period can be construed as democratic or not, Tocqueville points out the complicated mixture of social history, economics, and political institutions that fuse together the tensions confronting democracy. It appears from his discussion that a conception of democracy incorporates a set of preconditions necessary for establishing democratic government and a particular mixture of institutions that enable different normative goals to be attained. Prescriptions for various forms of democracy involve different goals — whether greater equality or more liberty, greater protection of rights or more responsiveness, or greater participation or more competence in decision making. These goals are attained through developing different institutional structures. In turn, the rules and procedures for decision making impose costs on citizens. Excellent examples of the relationships between institutional structures and normative goals are found in two modern political commentators: Joseph Schumpeter and Carole Pateman. Each develops a conception of democracy that requires particular institutional arrangements that either increase or decrease costs on particular forms of citizen behavior in order to achieve explicit normative ends.

Indirect Democracy

Written in response to the rise of totalitarian regimes in the twentieth century, Schumpeter's Capitalism, Socialism, and Democracy (1950) prescribes a set of institutions that aim for stability and tolerance. Schumpeter combines normative ideals with real-world processes to compare socialist and capitalist economic and political institutions. He concludes that limited citizen involvement and competitive leadership are fundamental to ensure stable regimes. This, he argues, is unlikely in a socialist state. Schumpeter's concept of democracy, combined with his empirical observations, has been influential for many empirical political scientists.

Schumpeter begins by explicitly noting that,

> Democracy is a political method, that is to say, a certain type of institutional arrangement for arriving at political — legislative and administrative — decisions and hence incapable of being an end in itself, irrespective of what decisions it will produce under given historical conditions. And this must be the starting point of any attempt at defining it (1950: 242).

With this as a starting point, Schumpeter elaborates two models of democracy. The first is the classical doctrine of democracy which he defines as an "institutional arrangement for arriving at political decisions which realizes the common good by making the people itself decide issues through the election of individuals who are to assemble in order to carry out its will" (1950: 250). Schumpeter is unconvinced that a common good exists that can be determined through mass expression. Pointing to historical examples of persecution of religious minorities, Schumpeter decries the infringement of individual rights brought on by the tyranny of majority rule. Further, he provides examples that the end to persecution and the introduction of religious tolerance in many nations was imposed by strong leadership in the face of popular will.

Schumpeter goes on to propose an alternate form of democracy that reduces to "free competition for a free vote" (1950: 271). The difficulties Schumpeter has with the classical conception of democracy drive him to suggest this alternative. Where classical theory ignores the value of leadership, competition for ideas, and individual freedom, Schumpeter contends these are fundamental goals to be maximized. Leadership, he contends, is crucial for competence in discussion, debate, and selection of alternative policies. Competition (for ideas) yields responsiveness to the will of individual citizens. Even if the citizenry does not have fully rational preference orderings over alternatives (and Schumpeter argues they do not), debate over alternatives can be framed by good leadership. Framing issues for the populace is important to reelection and for partitioning issues so that they may be understood by most. Finally, individual freedom can be heightened if all are free to present themselves for election. This reduces to introducing a particular issue to the public, in effect testing its "marketability" through discussion and election.

These goals — leadership, competition, and individual freedom — Schumpeter believes are enhanced through a particular institutional form of "Rule By the People." Such rule is reduced to voting between alternative leadership positions. The citizenry is constrained in its involvement, but Schumpeter argues this is essential to provide the cushion that good leadership needs for development. Further, an appropriate democratic form of government should provide many hurdles to leadership to ensure that only the most capable leaders and the best ideas find their way to the top. Equating democracy with a marketplace, where ideas and leaders are bought and sold, relies heavily on a particular form of government. Such a mechanism incorporates heavy constraints on citizen participation in decision making. The role of citizens is reduced to either voting or attempting to become a professional politician through standing for election. "Rule By the People" becomes a rather limited form of rule where few alternative policies are seriously considered, while policy choices are made only through representatives. While "all the people" may be enfranchised, their contribution is limited and indirect.

Direct Democracy

In a different vein, Carole Pateman (1970) provides a strong argument for a form of democratic governance where constraints on "Rule By the People" are relaxed. In contrast to Schumpeter, Pateman regards participation as an important goal for democracy. Rather than viewing "participation exclusively as a protective device" (1970: 20), Pateman regards it as fundamental for educating the citizenry and for

These goals — leadership, competition, and individual freedom — Schumpeter believes are enhanced through a particular institutional form of "Rule By the People." Such rule is reduced to voting between alternative leadership positions. The citizenry is constrained in its involvement, but Schumpeter argues this is essential to provide the cushion that good leadership needs for development. Further, an appropriate democratic form of government should provide many hurdles to leadership to ensure that only the most capable leaders and the best ideas find their way to the top. Equating democracy with a marketplace, where ideas and leaders are bought and sold, relies heavily on a particular form of government. Such a mechanism incorporates heavy constraints on citizen participation in decision making. The role of citizens is reduced to either voting or attempting to become a professional politician through standing for election. "Rule By the People" becomes a rather limited form of rule where few alternative policies are seriously considered, while policy choices are made only through representatives. While "all the people" may be enfranchised, their contribution is limited and indirect.

Direct Democracy

In a different vein, Carole Pateman (1970) provides a strong argument for a form of democratic governance where constraints on "Rule By the People" are relaxed. In contrast to Schumpeter, Pateman regards participation as an important goal for democracy. Rather than viewing "participation exclusively as a protective device" (1970: 20), Pateman regards it as fundamental for educating the citizenry and for providing control over the day-to-day affairs of their lives (1970: 42-44). Thus, the differences in normative goals between Schumpeter and Pateman are quite clear.

Pateman begins her exposition of participatory theory by claiming:

> The theory of participatory democracy is built around the central assertion that individuals and their institutions cannot be considered in isolation from one another (1970: 44).

Her point is that institutions affect the behavior of individuals (and vice versa). In such an instance, it is essential to focus attention on the ways in which these relationships are manifested. Pateman begins by claiming representative institutions at the national level are not enough. For participation to be enhanced (and subsequently to provide for greater citizen development and efficacy), maximum participation must take place in other spheres (1970: 42). An effective democratic form of government would ensure that "Rule By the People" extends to those environments where people spend the bulk of their lives — the workplace (1970: 43). In this case, democracy requires extending powers to all citizens for directly engaging in the formation, debate, and selection of alternative courses of action at some level of interest. This in turn,

> would enable the individual better to appreciate the connection between the public and private spheres. The ordinary man might still be more interested in things nearer home, but the existence of a participatory society would mean that he was better able to assess the performance of representatives at the national level, better equipped to take decisions of national scope when the opportunity arose to do so, and better able to weigh up the impact of decisions taken by national representatives on his own life and immediate surroundings (1970: 110).

The precise set of institutions needing change is unclear. Pateman poses a confusing system where a democratic polity can only exist if a participatory society exists. Yet, a participatory society is "where all political systems have been democratised and socialisation through participation can take place in all areas" (1970: 43). This schema is further complicated by the introduction of a recursive "participatory model" where,

> maximum input (participation) is required and where output includes not just policies (decisions) but also the development of the social and political capacities of each individual, so that there is "feedback" from output to input (1970: 43).

Although confusing, the point is clearly driven home where she asserts that unless political institutions provide greater "Rule By the People" in their day-to-day affairs, participation and its attendant values of education and efficacy will not be obtained. As limitations on citizen involvement are relaxed, greater participation will be forthcoming. At the core of achieving this end is restructuring the governing body by which people rule.

Necessary and Sufficient Conditions for Democracy

Recalling Tocqueville's assessment of democracy in America, it is apparent that democratic institutions are not sufficient to ensure that particular goals are satisfied. Tocqueville wrote at length concerning the unique circumstances that allowed democratic institutions to develop in America. These conditions were essential to the introduction of institutions bridging many of the tensions threatening the dual goals of equality and freedom that he stressed. Like Tocqueville, modern commentators of democracy are concerned with the preconditions that enable democratic institutions to survive.

Many political scientists, convinced that liberal democratic institutions yield valued goals, focus their attention on uncovering the set of empirical conditions that enable democratic institutions to flourish. Others are attracted to this question by recent examples of democratic nations that have been supplanted by undemocratic institutions. Specifying the set of necessary and sufficient conditions for democratic institutions, however, has not been fruitful.^ Barry Holden (1974) makes two strong points as to why this search has not been successful, indicating that the conditions necessary for a democracy may be variable with historical time and circumstance, and that the required "strength" of these conditions may vary. That is, under some circumstances, some conditions may be more necessary than others. Polities may also differ in their adherence to democratic conditions. Thus, the conditions for Athenian democracy may differ substantially from the industrialized United States (1974: 183-184).

Pennock (1979) contends that it is extremely difficult to say whether any set of conditions can be considered either necessary or sufficient. He reasons that political relationships are extremely complex. As such, a wide variety of conditions interact to produce an environment amenable to democratic arrangements. Given the variety of those conditions, a polity might substantially fulfill some conditions, which in turn makes others less necessary (1979: 206-207). Dahl (1971), too, raises a number of significant requirements for his particular notion of a polyarchal democracy. Surveying countries of the world to determine a minimum set of criteria, Dahl finds that a mix of preconditions exist, and various combinations result in varying democratic arrangements that yield different democratic goals. In general, it appears that a search for necessary and sufficient conditions for a democratic polity is a quixotic enterprise at best. In this discussion, only a few general conditions are touched on.[6]

One condition that is often stressed relates to a set of historical variables. Most important of these, as Pennock points out, is the sense of community for the polity. Generally, this is a minimal requirement for any social order to exist or for citizens to discuss policy alternatives and resolve conflict with one another (see Green, 1978). In an article lamenting the lack of genuine democratic behavior in urban areas (which are viewed as a foundation for democracy), Richard Dagger (1981) points to increasing growth and fragmentation of urban areas as detracting from a sense of community.[7] In turn, lack of a civic sense is seen as eroding democratic behavior. Historical circumstance also includes such elements as socialization to a national mentality and the adoption of a particular ideology by which problems are tackled and resolved (see Roelofs, 1976). Additionally, historical circumstance includes other elements that are important for assuring commitment to and a sense of sharing with other individuals.

A second general condition for democracy concerns social and economic elements of a polity. The argument for this condition extends at least back to Aristotle. Aristotle makes the point that a democratic constitution is most likely to survive where a large middle class exists that outweighs both the class of rich and poor. Montesquieu in <u>The Spirit of the Laws</u> later develops this point, arguing that a democratic constitution can only flourish in the midst of an active, commercial citizenry. Pointing to England at the time, Montesquieu extolls the active middle class of traders for jealously protecting its own rights (and subsquently the rights of others). Pennock and Holden both realize that substantial inequities in wealth, position, and power can only serve to disenfranchise a large body of citizens from setting policy and having a say in those policies that are implemented.

A third, final condition for a democratic polity relates to the political culture. This covers a multitude of elements ranging from trust, tolerance, and a willingness to compromise to widespread literacy and education among the citizenry. Dahl (1970) stresses that even the size of the polity precludes many forms of citizen involvement. For instance, direct involvement in debating policy alternatives is difficult (if not impossible) where large numbers of individuals hold diverse opinions. Similarly, developing expertise with particular policies is time consuming and generally beyond the grasp of most citizens who have interests in their day-to-day personal affairs.

Recognizing the importance of preconditions for democratic institutions, this discussion sidesteps the issue of which are necessary and whether any are sufficient. The focus of this research is with the institutions per se, and not with what it is that enables the maintenance or development of those institutions. The context of the particular institutions of concern here is developed explicitly in Chapters 3 and 4.

Disputes over the conditions for democracy, forms of democratic governance, and the normative ends sought from democracy have contributed to understanding democratic theory. Occasionally, these differences equally have contributed to obfuscating the concept. However, one point stands out: democracy is concerned with institutions which variously constrain or unfetter "Rule By the People." While general agreement exists that democratic arrangements do enable the aggregation and selection of alternative policies, a recent mode of analysis questions whether a fully democratic institution can succeed in its basic mission — to make collective decisions. This work has been conducted at an abstract level using formal logic and mathematics to illustrate that the notion of democracy may be problematic, yielding either contradictory or undesired results. First, this work is surveyed. Later, it is suggested that these observations are unduly pessimistic. The design of institutions that impose costs on particular forms of behavior may enable collective decision making. Further, the price of these institutional modifications may be normatively acceptable. In a sense, this approach returns to the point observed by Aristotle that there are many forms of democratic governance. It also enforces the point that various forms of democracy are concerned with tradeoffs among normatively desired goals.

The Paradox of Democracy

Political science has not produced many clear-cut results. One of the few is the well-known General Possibility Theorem (GPT) elaborated by Arrow (1963). As Riker (1980) in his survey of equilibria results indicates, Black (1958) rediscovered what

Condorcet, Lewis Carroll, and others had earlier developed — that under particular situations, it is possible that no single outcome will be selected. Arrow refined and developed this notion to show that the lack of a decisive outcome is the essence of disequilibrium. Further, any outcome may be in disequilibrium under any fair voting method (Riker, 1980: 437).

Arrow's formulation of a General Possibility Theorem for a voting model is straightforward, building on the tools of formal logic.8 Arrow is not concerned with simply laying out a convenient logical model of a process of voting. Instead, Arrow focuses on developing a set of components that are viewed as crucial elements to democracy within a model of a generic decision-making arrangement. The components of this institution are viewed as reasonable features that are seemingly acceptable to most practitioners of democracy. Further, Arrow carefully develops assumptions compatible with the liberal conception of the individual — that preferences are located within the individual, and that individuals have specific, well-internalized goals. The value of this formulation lies in the clarity with which essential features of a decision-making institution are laid out, and the nonobvious deductions that follow from the model.

Arrow provides two general sets of conditions. The first relates to assumptions concerning the individual, while the second concerns the decision context itself. For ease in exposition, only a finite (limited) number of alternatives and participants are considered. Extending these conditions (and the deduced results) to a greater number of alternatives or participants is straightforward.9

Individual Conditions:

1) Connectedness and Transitivity.

a) There exists some set of alternatives: m = {x,y,z}. Also, a set of participants exists: n = {a,b,c}. (Note: If m = |2|, the problem is trivial since either x defeats y or vice versa. Similarly, if n = 111, the result is straightforward since the m preferred by the lone participant is enacted.)

b) Participants are able to order a set of alternatives placed before them. In this sense it is possible to say alternatives are connected, since any set of alternatives have one of the following relationships:

$x \ P_i \ y$ —> ith participant prefers x to y

$x \ L_i \ y$ —> i is indifferent between x and y

$x \ R_i \ y$ —> x is at least as good for i as is y (but y is never better than x).

c) Transitivity holds that an individual's connected alternatives have a consistent pattern. That is, if:

$xP_i y$ and $y \ P_i \ z$, then $x \ P_i \ z$ and not $z \ P_i \ x$.

2) Unlimited Domain.

This condition simply points out that all orderings of preferences are admissible. That is, for a set of alternatives: m = {x,y,z}, there are six possible orderings that a participant might have (taking into account only strongly dominated alternatives). A participant can then have any of these orderings for preferences.

3) Independence of Irrelevant Alternatives.

This condition has met with the greatest disagreement by researchers. However, the point is that if a participant has a preference ordering ($x \ P_i \ y \ p_i \ z$) and one of the alternatives becomes infeasible (y drops out as a viable alternative), then the remaining alternatives retain their connected order (that is, $x \ P_{i \ z}$ and not $z \ p_{i \ x}$) . . This seems a reasonable extension when participants maintain sincere preference orderings, and do not anticipate the preferences of others.

These conditions all relate to the autonomy of the individual in arriving at a preference ordering. They are consistent with liberal democratic conceptions that only individuals are capable of making decisions. Further, the ordering of preferences over various alternatives is internal to the individual. These preferences are not imposed exogenously to the individual through some other mechanism. These first conditions outline a model of individual decision making.

The second set of conditions point to the structural mechanisms by which people rule. These conditions are concerned with the means by which alternatives are compared and selected.

Social Conditions:

4) Positive Responsiveness.

In this case, if a set of individuals have well-defined preferences over alternatives, and a single individual changes their preferences, then the social decision either remains as it is or changes in the direction of the individual's change. That is, the outcome (social decision) is dependent on the orderings that individuals have. As an example, suppose participants have the following preference orderings:

a: $x\ P_a\ z\ P_a\ y$
b: $_b\ y\ P_b\ x$
c: $_c\ x\ P_c\ y$

In this case, z would be the outcome (both b and c have z as their first choice). Now, suppose c changes their mind and the new ordering is:

a: $x\ P_a\ z\ P_a\ y$
b: $z\ P_b\ y\ P_b\ x$
c: $x\ P_c\ z\ P_c\ y$

Now c prefers x to z (and y). The alternative x would now be the choice, since a and c both prefer it to any other alternative. Further, the change in the "social outcome" is consistent with the change by c.

5) Citizen Sovereignty.

This condition very simply states that the outcome cannot be imposed. In other words, an outcome cannot occur regardless of the preference orderings held by individuals. Such a condition is quite consistent with the notion of democracy used above — that it is individuals who make decisions, and outcomes are dependent solely on those individuals.

6) Nondictatorship.

   This condition is related to citizen sovereignty in saying that no single individual can impose his will (select an outcome) irrespective of the preference orderings of all others.

Those conditions build in many institutional features. First, it is the aggregate of individual preferences that decides among alternate proposals. The aggregation rule is deliberately left general. Second, no outcome can be imposed contrary to the aggregate wishes of the citizenry. Third, all citizens have an equal say — that is, no individual's preference ordering counts for more than another's. The institution, then, is quite simple and on the surface satisfies the dictum "Rule By the People." "The People" are well-defined — they are simply some set of individuals. This could easily be all individuals, or some limited set of people. However, in the general case it includes everyone. "Rule" obtains from comparing various proposals. All alternatives are compared, with the most preferred alternative becoming the collective decision. Finally, "By" is rule by all the people. No single individual has extraordinary powers to dictate the collective decision.

In some respects, this abstract model is similar to a fully democratic institution. Individual preferences are taken as givens, participants are weighted equally in their votes, and finally, no individual is entitled to impose their will on the will of others. Like all democratic institutions, the model requires that the alternative accepted by the members be most preferred to all other alternatives. In at least one important respect, this model varies from a traditional democratic institution, such as the New England Town Hall meeting sketched by Tocqueville. No provision for open debate is included in the model. Debate can be important for two reasons. First, it serves as a vehicle to compromise. Where disagreements exist, debate and discussion is commonly perceived as a means for reducing disagreement and breaking deadlock. Second, debate is regarded as a means for altering preferences. Debate involves presenting arguments to convince an opposition of the untenability of their position and the soundness of one's own position. In short, the aim is to sway the preferences of others. With this model, preferences are assumed fixed. That is, each participant has well-defined preferences over all alternatives. The aim of the model is not to understand how participants strive to change these orderings — although this is important — but rather to understand the outcomes derived from a manifestly democratic institution.

Arrow's General Possibility Theorem

Once general boundaries are placed on an institution, preference orderings are well-defined, and the decision procedure is established. Arrow's results are a simple exercise in logic. Rather than repeating Arrow's proof, it is only sketched here for a 3-person, 3-alternative case.[10] The point by Arrow is that for certain distributions of preferences, there is no manner of selecting an outcome without violating one of the conditions outlined above.

The proof relies on two features related to the conditions elaborated above. First, the proof holds that some subset of alternatives may be pareto optimal, such that:

> If $x P_i Y$ for all i members of n, then it follows that $xP_n y$ (x is preferred to y by all members of the decision-making arrangement).

second, the proof relies on a decisive set. A decisive set contains a group of individuals V such that for two alternatives {x, y}, x P_V y. That is, x is preferred to y by the de lecisive set V is in the set ~v which holds a strictly opposite preference ordering y P x (this stands to reason since the comparison is between x and y). Further, V is decisive since the number of participants in V is greater than the number in ~v.

Suppose three individuals have the following preference orderings:

V_1 x P_a y P_a z
V_2 z P_b x P_b y
-V: y P_c z P_c x

The decisive set V - {$V_{1>V2}$} and the members of V prefer x to y. Meanwhile, ~v prefers y to x. Note that in this case it is impossible for the collection of the individuals in the decision-making arrangement to prefer z to y since only b has that preference ordering, and for such to be the case, b would be the dictator, violating the condition of nondictatorship. As a result, then, y R z. Further, we know that x P y, so by the condition of transitivity it follows that the members of the decision-making group prefer x to z. However, and this is the crux of the proof, this makes a single individual decisive — the dictator — in violation of the nondictatorship condition. Thus, the contradiction is established. Of course, the proof has further complexities, and here it has only been sketched for the weak case. Yet, the results are quite general.

Paradoxical Democracy and Extensions

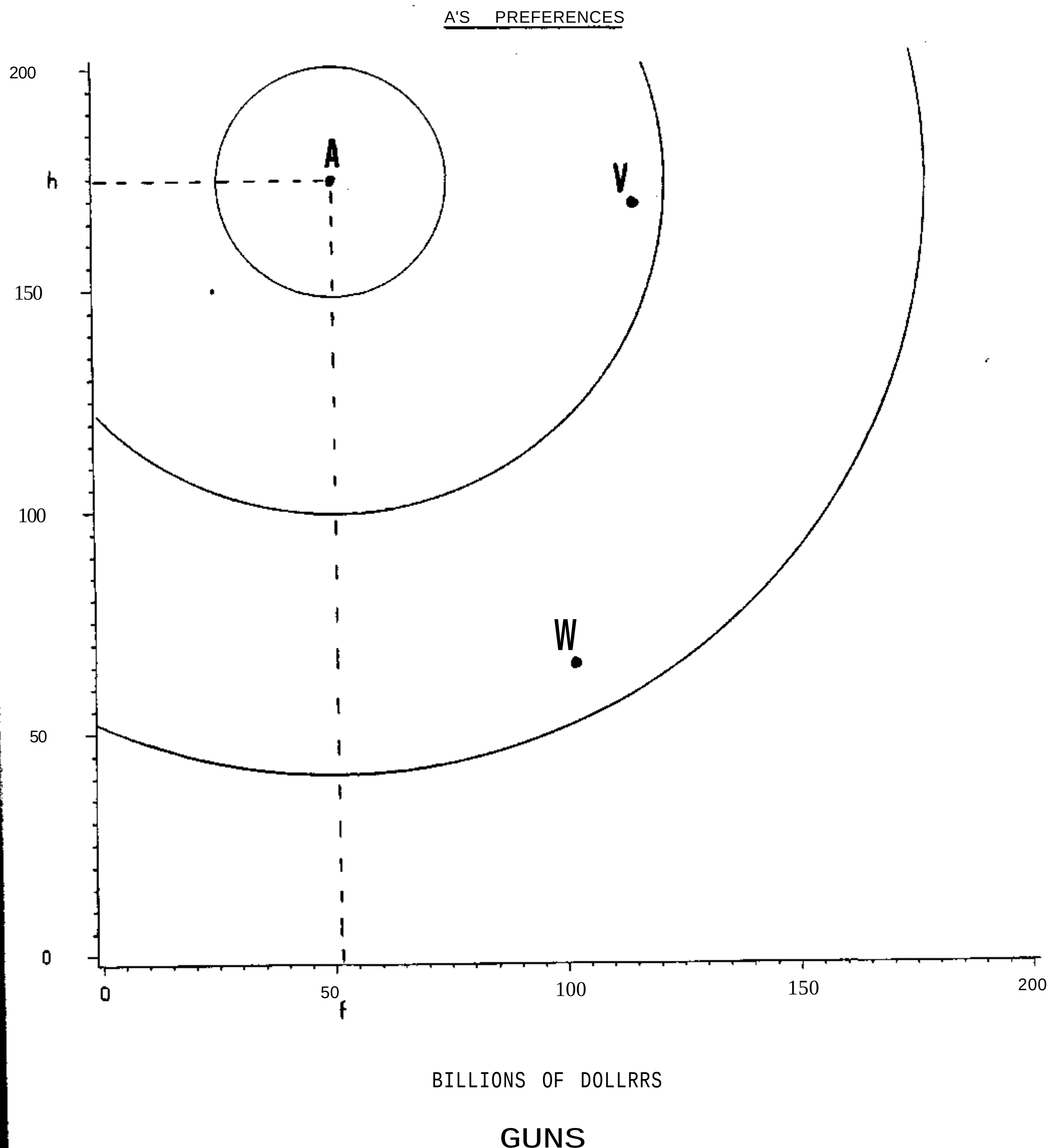
A large amount of work on the General Possibility Theorem has been done.[11] Much of this work turns to weakening Arrow's assumptions in order to avoid those contradictions derived by Arrow. A somewhat different approach concentrates on the likelihood that a voting paradox will occur. For the relatively simple 3-person, 3-altemative case alluded to above, the probability of a voting paradox is small (p = .056). This assumes all preference orderings are equiprobable. As the number of alternatives increases, the likelihood of a voting paradox slowly increases to a limit of one. However, this rise is extremely slow. On the other hand, as the number of alternatives remains small and the number of individuals increases, the probability of a paradox rises to a limit of .09 (May, 1971). The implication, then, is that a voting cycle is relatively uncommon, and in this respect outcomes from decision-making arrangements ought to regularly appear. While this point does not counter the logical results derived by Arrow, it is optimistic in its hope for the likelihood of empirical outcomes.

Vote Cycling and Multidimensional Space

A reasonable supposition is that individuals generally do not confront decisions pertaining to a single alternative, but rather they face clusters of interrelated alternatives. Most policies are characterized by complexity involving a large number of varied issues. Decisions on defense spending should not be regarded separate from foreign policy, unemployment policy, or social policy. With a finite budget, money put into defense represents money that might be put into social welfare (or roads, or a multitude of other problem areas). So, individuals might be regarded as making comparisons across a wide number of dimensions for any single policy alternative. A simple example may suffice. Suppose there are three individuals and they are to select an outcome. To take a traditional case, each individual is confronted with choices between guns and butter (only two ways in which money is to be allocated). They must agree on some allocation of money for both guns and butter. The comparisons that a representative individual, Mr. Alright, makes is illustrated by Figure 1-1. Mr. A has a point that he prefers the most — point A. This is Mr. A's ideal division of guns and butter. In this particular case, Mr. A prefers that "f" amount of dollars go to buy guns and "h" amount of dollars go toward buying butter. Mr. A prefers point A to all other alternatives (he believes this division is the best possible division). As alternatives move away from this ideal point, Mr. A prefers those alternatives less and less. In fact, the further the alternative from the point A (in any direction), the less Mr. A prefers it. With three points in the two-dimensional policy space (guns and butter), m = {A,V,W}, Mr. Alright has the following preference ordering: $A \; P_a \; v \; P_a \; w$. Meanwhile, the circles on Figure 1-1 are representative indifference curves. That is, any alternative lying on the same curve has the same value (utility) for Mr. Alright. From Figure 1-1, it is apparent that there are a large number of alternatives with which Mr. A must be concerned.

Mr. A's preferences are well-defined over this space. Given the large number of alternatives available in the policy space elaborated above, we need to identify where other participants (Mr. Best and Ms. Checkered) are located. It is extremely rare when individuals have exactly the same preference orderings — especially where a large number of alternatives are possible. Therefore, it seems reasonable

FIGURE 1-1


A'S PREFERENCES
200
h
150
100
50
0
A
V
W
0
50
f
100
150
200
BILLIONS OF DOLLRRS
GUNS

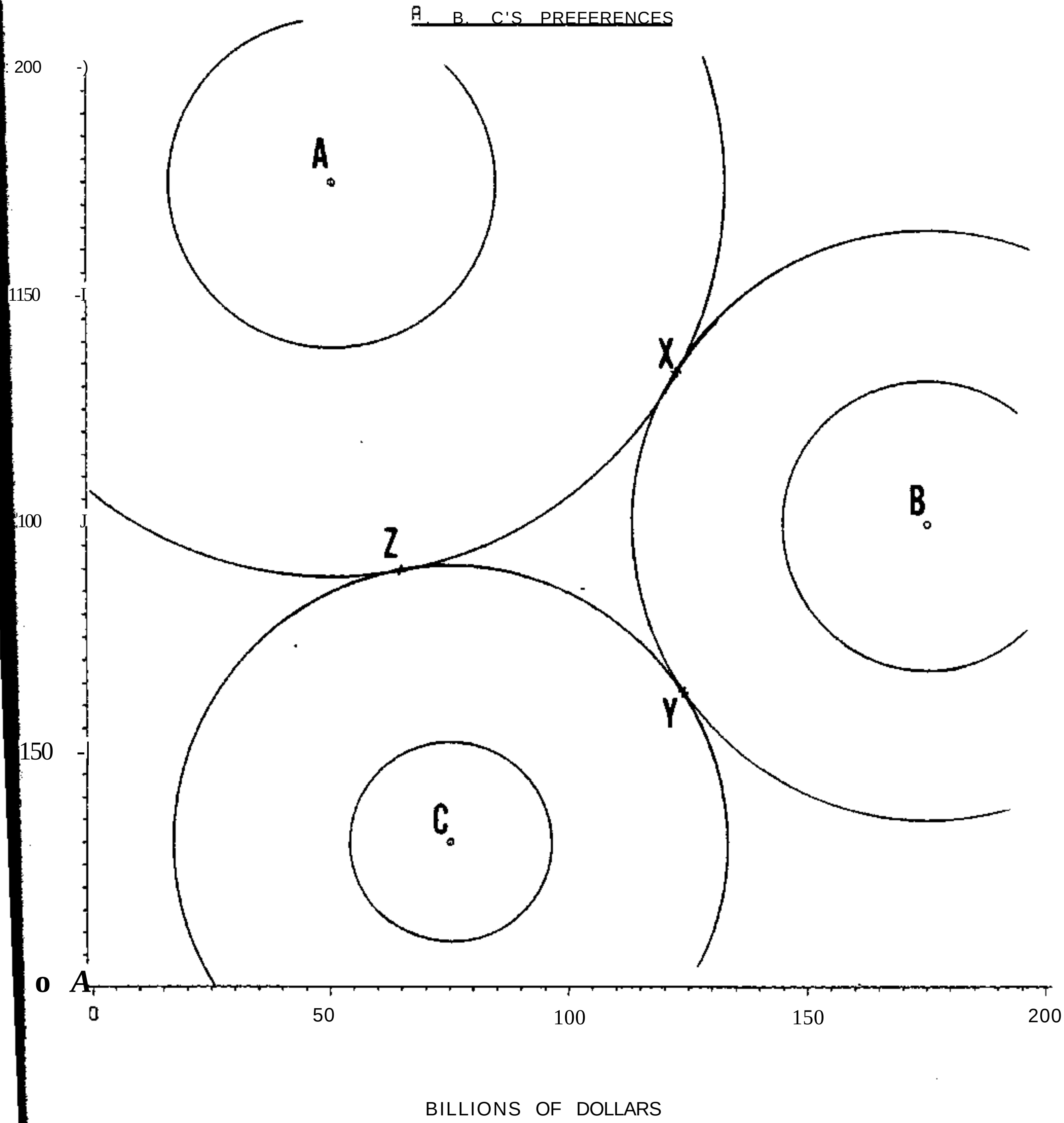
to represent the policy space with all three participants as in Figure 1-2. This figure repeats Figure 1-1, but now all three participants are located in the space. Each individual also has a representative set of indifference curves drawn on the figure.

This figure indicates that if individuals have differences in preferences (which is a reasonable assumption), then agreement is difficult. It is quickly noted that Ms. Checkered does not prefer either Mr. Alright's ideal point nor Mr. Best's ideal point. They are both at a considerable distance from Ms. C's own ideal point. The same holds true with the other participants. However, a few points have quasi-stable properties. In Figure 1-2, these are points X, Y, and Z. They are quasi-stable in the sense that the participants hold the following preference orderings:

Mr. A: $X\ I_a\ Z\ p_a\ Y$
Mr. B: $Y\ I^a_b\ X\ P^a_b\ Z$
Ms. C: $Z\ I^D_c\ Y\ P^D_c\ X$

Further, these points all have the property that at least one of them can defeat any alternative different from that set of points.12 A problem, however, is that no single alternative is an equilibria outcome. That is, participants face an endless cycle of voting. The alternative X is an alternative that both A and B can agree on. However, C prefers either Z or Y (Ms. C is indifferent between the two). Alternative Z is one that Mr. A finds as acceptable as X. On the other hand, Mr. B prefers Y to Z, but Mr. A prefers Z much more to Y, which results in alternative Y to which both Mr. A and Ms. C can agree. However, B prefers . . . and so on. There is no single outcome to which these individuals can agree. With single-dimensional alternatives, the voting paradox appears infrequently. With

FIGURE 1-2


A, B, C'S PREFERENCES
200
150
100
50
0
A
B
C
X
Y
Z
0
50
100
150
200
BILLIONS OF DOLLARS

multidimensional alternatives, the paradox (and accompanying Arrow results) are ubiquitous.

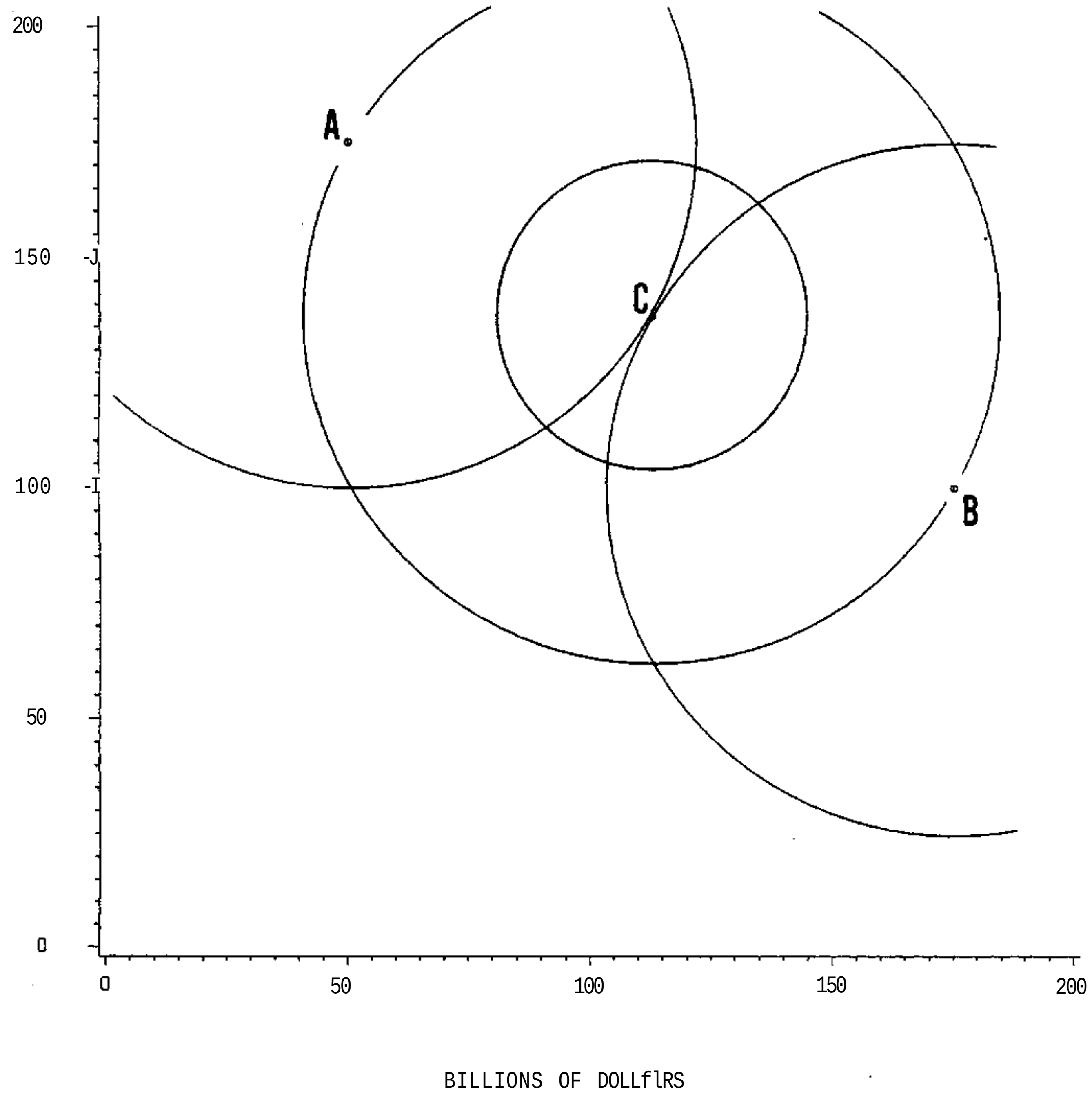
Niemi (1969) suggests a means for examining individual choices in a multidimensional space using unfolding techniques that reduce preference orderings to a comparable scale. In doing so, he finds that as more indviduals are added to consider a small number of alternatives, the likelihood of a voting cycle decreases. However, reducing the complex array of alternatives over which individuals commonly make decisions to a single scale, may also be overly simplistic.

A number of scholars have indicated that the problem of cycling endlessly in a multidimensional policy space is a very real problem. Plott (1967) is one of the first to point out that an equilibria can be located only under very rare circumstances. Extensions of this work by Kramer (1973), Sloss (1973), McKelvey and Wendall (1976), Cohen (1979), and Cohen and Matthews (1980) generalize Plott's work, showing — unlike the Arrow results where endless cycles occur in relatively rare circumstances — that cycling is ubiquitous and that an equilibrium outcome is extremely rare. With the 3-person example, an equilibria only emerges when one of the participants has an ideal point which is a median (and colinear) of the other two individuals. This is represented in Figure 1-3.

Further, results by McKelvey (1976) indicate that where no equilibria exists, a single individual skilled in manipulating an agenda (or with sole control over the agenda) can always have their own ideal point chosen. The fundamental problem is that any alternative can defeat (or be defeated by) any other alternative via some agenda.

FIGURE 1-3

EQUILIBRIUM FOR A, B, AND C



For two alternatives s and y, it is possible to introduce another set of alternatives {t,u} to an agenda such that:

s P t P u P y.

But, a different set of alternatives also exists {v,x} such that:

y P v P x P s.

From this, two contradictory results are obtained:

s P y and y P s.

Obviously, this indicates that a multitude of cycles are possible. While majority rule cycles present a threat to democratic outcomes, McKelvey's findings that an agenda setter can always have their way is doubly threatening to notions of democratic rule.

It appears that cycling among alternatives is a pervasive problem. Indeed, the lack of equilibrium results in a multidimensional policy space has driven Riker (1980) to declare the study of politics to be "the dismal science," dismal in the sense that precise predictions of outcomes are unlikely. This is contrary to the confidence Riker originally placed in the logical study of politics where he argued that "If we know [the mathematical solution to a game], then, if also we can assume players are rational maximizers of utility, we can predict the political future with some confidence" (1967a: 642). However, others have also turned their attention to the lack of equilibrium results, arguing that the formal results are not as serious as we are led to believe. In the next section some of these arguments are laid out.

Empirical Work

While the formal results found by the researchers noted above are unquestionable, some have questioned their usefulness. As Tullock

(1967; 1980) argues, decision mechanisms do yield decisions, individuals do not endlessly cycle, vacillating between various proposals — in short, real world institutions yield outcomes. Further, many of these outcomes are regarded and accepted as "democratic." Many different interpretations are tendered to account for such an observation. Tullock initially claims outcomes are confined to a relatively narrow subspace (1967).13 Tullock (1980) later argues that the dynamics of logrolling may contribute to very stable outcomes, when a large number of individuals are involved in making decisions across a multidimensional space. McKelvey and Ordeshook (1978) argue that cycling may occur with some frequency, but the number of alternatives is relatively small, as is the number of possible coalitions. Empirical work using laboratory experimental procedures appears to substantiate this point (McKelvey, Ordeshook, and Winer, 1978). Other laboratory experimental work by Fiorina and Plott (1978) also indicates that some mechanism is at work that results in outcomes converging to smaller subspaces. Work by Ferejohn, Fiorina, and Packel (1980) illustrates a different convergence property as participants face a decision-making situation.

The empirical work indicates that where equilibria do not exist, some patterns of regularity do occur. In a way, such patterns of regularity lessen the threat posed by voting cycles. Fiorina and Shepsle (1982) provide four examples that illustrate the regularity of outcomes where no equilibria exists. The first case derives from Riker's (1962) notion that looking solely at outcomes may be misleading, and that researcher's attention should turn to the dynamics of the coalitions that form. Coalitions are regarded as fundamental for the exercise of power in a democratic decision-making arrangement. Thus, understanding the composition of a coalition and the interaction among coalitions should enable an understanding of the outcomes of decision processes. Fiorina and Shepsle also point to the work by Ferejohn, Fiorina, and Packel (1980) which examines "in a systematic way the relative 'difficulty' of moving from one (typically unstable) point to another, and the constraints such relative difficulties might place on the majority decision process" (1982: 59). Third, Fiorina and Shepsle point to the work by Kramer (1977; 1978) on the minimax set, which details dynamic games, whereby any outcome is simply part of a trajectory leading to the minimax set. Further, it is thought this set is generally a small part of the set of feasible alternatives (1982: 59). Fourth, Fiorina and Shepsle point to the work by Shepsle (1979) on structure-induced equilibrium, in which institutional arrangements are viewed as constraining the decision-making process in such a way as to limit the set of feasible alternatives. In each of these examples, disequilibrium results are not seen as serious threats to democratic decision making. Instead, various constraints on the set of feasible alternatives are viewed as ways in which decision-making arrangements cope with the problems that formal work has pointed out.

Structure and Outcomes

The notion that institutions are designed to enable decision-making outcomes is not unusual. Liberal theorists from Hobbes to Hume regard political institutions as a means for constraining individual action to prevent the anarchy feared in a state of nature. The arguments contained in The Federalist Papers are couched in similar terms — designing institutions to prevent the natural rapacity of individuals from destroying the polity. V. Ostrom (1980) points out that these thinkers view institutions as artifacts that control and are subject to control by their artifacers (members). When confronting collective choices, artifacers are quite adept at constructing mechanisms that enable them to deal with conflicts. Further, these thinkers share the view that the structure of decision-making mechanisms is important for the ways in which alternatives are put before a deliberating body, and the way decisions are made. Indeed, the reform movements of the early twentieth century turned to institutional tinkering to rid urban areas of the pernicious effects of "bossism." Practitioners of politics are fully aware of the importance of the "rules" of a decision-making body, and the important role those rules play in completing the task of deliberation. Therefore, one way to exorcize the "impossibility" results noted above may be to turn to the structure of decision-making mechanisms.

This "institutional" approach is relied on extensively in the remainder of this work. Using game theoretic tools and specifying a generic decision-making arrangement, it is then possible to compare the relative costs that particular institutional structures place on participants. These formal conjectures are then subjected to empirical tests using laboratory experimental methods.

Conclusion

This chapter raises the point that while democracy can be reduced to "Rule By the People," the make-up of the institutions that yield collective choices varies. Different rules and procedures are prescribed in order to ensure that particular normative goals are met. Further, some institutional arrangements that satisfy democratic criterion may depend on particular historical, social, economic, and political preconditions in order to survive. The framework of political institutions, then, may vary, as will the outcomes derived from those institutions. Differences between institutional arrangements are based on the costs to citizens for engaging in particular types of collective behavior.

Democracy as a pattern of rules and procedures governing behavior is well accepted. The consensus is that most forms of democratic arrangements yield satisfactory outcomes and fulfill some valuable goals. However, work in social choice theory suggests that democratic institutions will not yield regular outcomes. By abstracting crucial elements of an institution that allows full "Rule By the People," and tracing the logical relationships between these elements, it is possible to show such an institution is likely to fail. Since the institution is fully compatible with most democratic criteria, the implication is that democracy is likely to fail. Either some outcome will be imposed by a single person — thereby violating a fundamental tenet of democratic theory — or else no outcome will be selected.

Decisions <u>are made</u> in societies that approximate democracies. By and large, collective decision making is enhanced through institutional rules and procedures that impose costs on different forms of behavior. As political scientists, institutions are of fundamental importance. Democratic governments are not autonomous of the citizenry, but rather the fundamental premise of democracy is that its institutions rest on the people. Further, the rules and procedures of these institutions are subject to change. This study concentrates on a limited set of institutional elements. It is argued that collective decisions do emerge — contrary to the predictions found in social choice theory — and that these decisions have identifiable patterns. The succeeding chapters develop a notion of constraints imposed by specific institutional rules and tests whether differences in these rules result in different outcomes.

FOOTNOTES FOR CHAPTER ONE

[1]Of course, this brief characterization omits questions about the way in which values or preferences are learned. However, Lockean psychology indicates people enter the world with a tabula rasa, and that their unique experiences teach them about the world. From these learned experiences comes knowledge. Likewise, with knowledge comes an understanding of the world, and an understanding of how to order alternatives in the world. Locke's Essay Concerning Human Understanding (particularly the sensationalist psychology in Book II) explicitly spells this out. Contrast this with Rousseau's position in Emile.

[2]For an alternative argument, see Mansbridge (1980). Mansbridge's point is that not all collective decisions are characterized by conflict. She refers to the liberal democratic position as "adversarial democracy." Instead, at some levels of society where substantial common agreement exists, alternative institutions might be possible enabling "unitary democracy," which is characterized by common interests, equal respect, consensus, and face-to-face contact.

[3]Aside from simply accepting the assumption that individuals have autonomous wills, there are other reasons for explicitly examining liberal democratic theory. The primary concern here is with American institutions.

[4]See Duncan (1973) and Ryan (1972). Also see the excellent survey by Thompson (1976) on Mill's conception of democracy and the place of Representative Government.

[5]See, for instance, Pateman (1970), Dahl (1970; 1971), and Joseph (1981).

[6]The general conditions mentioned here are related to elements of the decision situation discussed in Chapter 3. Much of my thinking on these points stems from work by V. Ostrom (1979; 1980) and Kiser and Ostrom (1982).

[7]Dagger's point relating to the decline of civic sense is well taken. However, his argument relating the role played by the fragmentation of a metropolis to a proposal to consolidate metropolitan areas is contradictory. For a criticism of this view of consolidation, see V. Ostrom (1973).

[8]Aside from the original exposition by Arrow, there are numerous places where a reader can be enlightened about the GPT and the numerous extensions and developments. One of the most readable works is that by Abrams (1980). More technically oriented surveys include: Sen (1970), Fishburn (1973), Kelly (1978), and MacKay (1980).

[9]Much of the discussion here relies extensively on Arrow (1963) and Abrams (1980).

[10]The reader interested in the formal proof is referred to Arrow (1963) or any subsequent commentators listed in Footnote 8.

[11]F[11]For surveys of this work, as well as extensions, see Sen (1970), Harsanyi (1976), Fishburn (1974), Kelly (1978), and MacKay (1980).

[12]Those familiar with game theory will quickly recognize that Figure 2 is a two-dimensional representation of the von Neumann-Morgenstern V-set and the Aumann and Maschler Bargaining Set. No further detail is offered on this point. Interested readers are referred to Luce and Raiffa (1957) or Rapoport (1970) for excellent surveys on these solution sets.

[13]See the article by Simpson (1969) that comments on Tullock's argument. This article extends some of Tullock's results, and shows that the expected convergence of outcomes to a small subspace is unlikely except under special conditions.

CHAPTER TWO

THE SEARCH FOR ORDER

"All mimsy were the borogoves . . ."
- Jabberwocky

A basic tenet of liberal democratic theory holds that outcomes are a function of individual wills. This implies two points. First, collective decisions must be derived from individuals and not imposed by others. Second, some set of rules and procedures exists whereby a defined set of individuals make decisions. If these points hold, then it follows that well-defined preference orderings yield regular collective outcomes. This is precisely Arrow's point, although his finding is that regular outcomes fail to occur under some circumstances. This undermines the fundamental premise of democratic theory that decisions will be made. Yet, it is apparent that collective decisions are made, and that these decisions do not wander aimlessly in n-dimensional policy space. This turns the table, asking why, if the logic of formal democratic theory holds, do well-defined preferences and well-understood arrangements yield regular outcomes?

Determining whether outcomes form patterns of regularity in democratic institutions is the primary concern in this chapter. While casual observation serves as an excellent heuristic, detailed empirical work is more convincing. Considerable empirical work examining the nature of outcomes in a collective decision-making arrangement has been conducted with much of this work concentrating on small group processes and relying on game theory as a theoretical foundation. This chapter is a survey of empirical work that indicates regular patterns of outcomes do occur. The succeeding chapters extend some of this work, focusing on the effects of institutional costs on behavior and the relation of costs to outcomes.

Is Regularity a Figment of Our Collective Imagination?

While the formal conjecture that equilibria should be rare or vary considerably is well-established, evidence corroborating or contradicting this conjecture is not. Real-world empirical studies of outcomes in democratic decision-making arrangements are well-reviewed (see Browne, 1973; Murnighan, 1978; Hinckley, 1981). Yet, those studies do not precisely address the question of whether patterns of regularity appear. These studies have focused on various legislative systems and have generally turned toward explaining patterns of coalition formation (see particularly Leiserson, 1968; Dodd, 1976). From the way competing groups coalesce, inferences are made concerning the types of policy outcomes likely to be adopted. One of the primary concerns is with testing Riker's seminal model of coalition behavior — the minimum winning coalition. Studies generally conclude that while the model is powerful in its logical formulation, it is rarely satisfied in the real world. More recent work has produced other explanations of the coalition formation process, finding some support for a model that coalitions form and distribute largesse (primarily ministry seats in parliamentary systems) based on the proportional strength a party candidate contributes to a winning coalition (Browne and Frendreis, 1980). Generally, however, this work concentrates on coalition activity and not on outcomes.

However, political scientists are not dissuaded from the study of outcomes. A tradition of experimental research in political science provides unique opportunities for such study through including, controlling, and manipulating various influences on outcomes. Experimental research allows for ready comparisons across different decision-making contexts and allows precision in defining outcomes for those contexts. It also provides the opportunity for inexpensive testing and replication of well-specified hypotheses. In short, as Plott (1979) notes, experimental methods provide a unique opportunity for examining relationships between preferences, institutions, and outcomes. The conceptual assertion that outcomes should be rare, and the empirical observation that some regularities do occur, seems particularly susceptible to empirical evaluation within an experimental framework.

Since the mid-1960s, numerous experimental studies have been conducted attempting to uncover patterns of regularity in the context of small-group decision making. Although researchers generally agree that some regularities exist, as Riker (1980) remarks, the research has been marked by a fundamental dichotomy — that between the study of values which individuals bring with them in framing decisions and the institutional rules that provide incentives or constrain the collective decisions that individuals make. This point is also noted by Hinckley (1981) who characterizes the study of values as "social-psychological" experimentation and the study of institutions as "empirical."[1] However, these differences are important only for the questions they ask and the relationships with which they are interested. The aim of these different research programs is with apping different components contributing to decision making. The focus on values has led social scientists to ascribe influences on outcomes to differences in the resources individuals bring with them when making decisions. The focus on institutions has turned toward understanding those external constraints on individuals that appear to "induce" regularities into decision-making outcomes.[3]

In this discussion I take Riker's advice that "we cannot leave out the force of institutions" in studying decision making (1980: 432). To do so first requires the careful description and elaboration of those elements that constitute an institution. Second, it requires linking behavior to those institutional components. Game theory provides a natural tool, indirectly allowing this second step through describing strategies available to individuals within particular decision-making contexts. This is accomplished through describing a solution (or set of solutions). However, in order to uncover solutions, the decision-making context — including the structure of institutions — must be fully elaborated. Game theory provides such a tool for linking behavior to institutions.

In addition, game theory is relied on since it is particularly adept at bridging the gap between conceptual and empirical work. The experimental study of group processes in political science relies extensively on game theoretic processes. By and large, the application of game theory to decision-making situations has the effect of deducing solution concepts (outcomes) from some central set of assumptions. These solution concepts, as von Neumann and Morgenstern argue, are "plausibly a set of rules for each participant which tell him how to behave in every situation which may conceivably apping different components contributing to decision making. The focus on values has led social scientists to ascribe influences on outcomes to differences in the resources individuals bring with them when making decisions.[2] The focus on institutions has turned toward understanding those external constraints on individuals that appear to "induce" regularities into decision-making outcomes.[3]

In this discussion I take Riker's advice that "we cannot leave out the force of institutions" in studying decision making (1980: 432). To do so first requires the careful description and elaboration of those elements that constitute an institution. Second, it requires linking behavior to those institutional components. Game theory provides a natural tool, indirectly allowing this second step through describing strategies available to individuals within particular decision-making contexts. This is accomplished through describing a solution (or set of solutions). However, in order to uncover solutions, the decision-making context — including the structure of institutions — must be fully elaborated. Game theory provides such a tool for linking behavior to institutions.

In addition, game theory is relied on since it is particularly adept at bridging the gap between conceptual and empirical work. The experimental study of group processes in political science relies extensively on game theoretic processes. By and large, the application of game theory to decision-making situations has the effect of deducing solution concepts (outcomes) from some central set of assumptions. These solution concepts, as von Neumann and Morgenstern argue, are "plausibly a set of rules for each participant which tell him how to behave in every situation which may conceivably arise" (1944: 31). The solution, then, is nothing more than a prescriptive rationale for individual action informing a person how to order available strategies within the context of a defined decision situation. The result of this melding of institutions and behavior is represented by an abstraction — the solution. Riker (1967a) illustrates one application of this abstraction to political science by raising two questions.

1. What is the mathematical solution to a game?
2. What are the strategies which will ensure players of achieving the solution?

Riker then argues:

> An answer to the first question indicates what may be anticipated as the outcome of political events. If we know it, then, if also we can assume players are rational maximizers of utility, we can predict the political future with some confidence. An answer to the second question (about strategies) permits political engineers to give advice to politicians about how to behave successfully (1967a: 642).

In seeking order, political scientists appear to have taken Riker's advice, using experimental studies to uncover a game theoretic solution which provides <u>the best fit</u> to the data. Yet, as shown below, the results of many tests are less than conclusive. Rather than a single solution concept serving to "predict the political future with some confidence," it appears a variety of solutions work. The implication of this, I suggest, is that predicted solutions vary with the specific components modeled into an institution.

Equilibrium Solutions

A principal result of game theoretic literature is the dominance of an equilibrium concept — the Core. As a solution concept, the

Core is an excellent starting point for discussing patterns of regularity. The Core requires individual preferences to be distributed such that at least one individual's preferred alternative is the median of all other individuals. Where the Core exists, no strategy by any participant can better it.[4] Experimental research indicates that where the relatively strong (and rare) conditions for an equilibria are met, outcomes occur there with some frequency. This finding is especially pronounced in the work by Berl, et al. (1976). This experiment is discussed at length here, since many of the experiments discussed later utilize a similar format. Berl, et al., use a procedure that places either three or five persons into a simple majority rule committee structure. The committee is charged with reaching majority agreement on a single point in a well-defined two-dimensional policy space. Individuals introduce proposals (points) in that space until a majority of the committee votes to pass a single proposal.

In its bare form the committee consists of five basic elements:

1. Individuals select a policy from a set of clearly defined alternatives;

2. Every participant has well-defined preferences over the set of alternatives;

3. Sidepayments are not allowed;

4. A defined aggregation rule exists for committee decisions; and

5. Deliberations are made in face-to-face discussions with all members present.

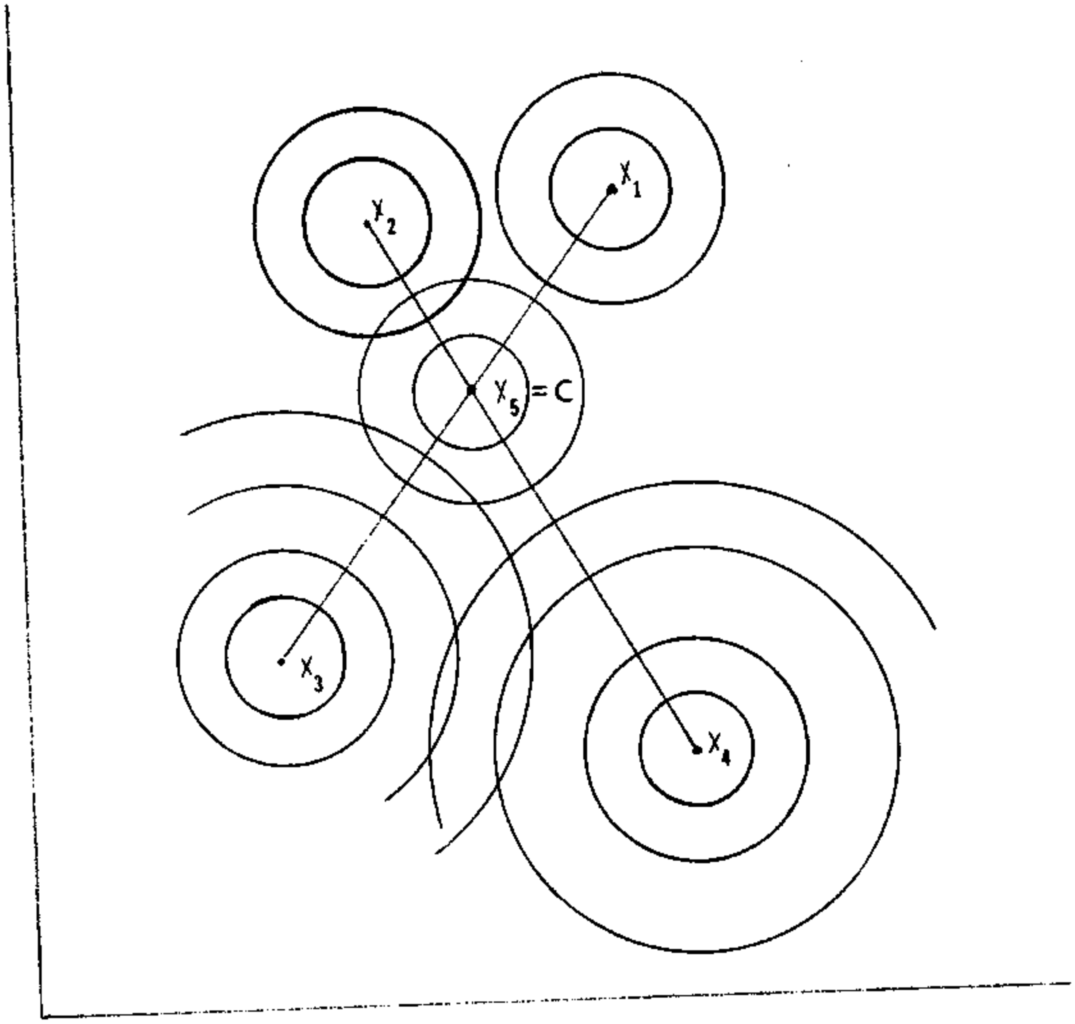
The set of alternatives is contained by a simple two-dimensional Euclidian space, with axes labeled X and Y and marked off in discrete numerical units. This space is displayed on a blackboard before the full committee. All points in the space are real-valued, with each individual assigned a different maximum point among the alternatives. Further, each individual is given a payoff index that duplicates the proposal space before the committee, and includes a set of indifference curves with corresponding payoffs for those curves. Payoffs are a monotonically decreasing function of distance radiating out from the maximum point. The experiment does not allow participants to discuss personal payoffs during negotiation, since, as Berl, et al., argue, "the transferable utility assumption in particular limits the social relevance of the resultant research" (1976: 454). No player is excluded from a payoff in the experiment (even if they vote against a winning proposal), although the structure eliminates the possibility of sidepayments. Proposals are voted on one at a time, and a proposal passed by a simple majority vote is the winning proposal. Finally, all discussion takes place in a face-to-face context. The only limit on this discussion is mention of payoffs.

Figure 2-1 illustrates one of the proposal spaces (with individual ideal points and a set of sample indifference curves) used in the experiment. This example is that of a 5-person game with the equilibria solution at C (which is committee member 5's ideal point).[5] Berl, et al., use this configuration of preferences and two related configurations to test the power of an equilibrium to attract and retain votes. Their results indicate that the Core, in fact, serves as a good predictor of outcomes. First, they find that the Core serves as the focal point for proposals and negotiation. While the set of proposed points tends to be scattered across the space, the

Figure 2-1

Proposal Space Used in
Berl, et al., Experiments

Y Axis



X Axis

Adapted from Berl, et al. (1976), Figure 1 , p. 459.

proposals passed are nearer the Core than other proposals (1976: 468). Roughly 65 percent of the final proposals appeared in the 95 percent confidence interval for the true mean (i.e., the Core — assuming these outcomes are bivariate normally distributed, 1976: 467).

As Berl, et al., note, some participants thought it might have been possible to better their payoffs, even though they were at the Core. As they argue, the results "illustrate the power of the Core in that even when players did not understand the theoretical properties of the game they were playing, they tended to end up near it anyhow" (1976: 478). The Core, then, appears to be a good predictor — when it exists. Although Berl, et al., note that deviations away from the Core apparently are a function of "bargaining skill or intelligence" (1976: 470), this does not detract from the observation that empirical outcomes focus on this equilibrium concept, when it exists. An experiment conducted at about the same time by Fiorina and Plott (1978) also provides evidence that when an equilibrium exists, decision-making outcomes tend to focus on it. This study uses the format described by Berl, et al., with the exception that proposals are voted on according to parliamentary procedure, with a status quo proposal serving as an initial starting point. Fiorina and Plott also are concerned with specific conditions, the first being whether or not participants are able to discuss alternate proposals. In either case, there is little apparent difference (see Table 2-1). The null hypothesis that there is no difference between the mean outcomes under different communications conditions cannot be disconfirmed using two-way analysis of variance. This second concern is with the size of payoffs individuals play for. Here, they differentiate between high

Table 2-1

Analysis of Fiorina and Plott Data

	High Payoff	Low Payoff
Communication	Core = (39,68) Mean Outcome = (37,68) Mean Distance from Core = 4.70 σ^2 = 7.28 n = 10	Core = (39,68) Mean Outcome = (47,72) Mean Distance from Core = 14.25 σ^2 = 344.49 n = 10
No Communication	Core = (39,68) Mean Outcome = (38,69) Mean Distance from Core = 5.76 σ^2 = 34.539 n = 10	Core = (39,70) Mean Outcome = (36,70) Mean Distance from Core = 12.30 σ^2 = 182.46 n = 10

Statistics for Two-Way ANOVA:

H_01: $\mu_{Communication} = \mu_{No\ Communication}$
$F_{(1,36)} = .0413$ sig $<.001$

H_02: $\mu_{High\ Payoff} = \mu_{Low\ Payoff}$
$F_{(1,36)} = 7.373$ sig $>.025$

H_03: Interaction Effects:
$F_{(1,36)} = .586$ sig $<.001$

Data analyzed from that presented in Fiorina and Plott (1978, Table 1: 584).

and low payoffs. As shown in Table 2-1, differences do occur (see $H_0 2$). With low payoffs to participants, proposals tend to scatter, while high payoffs yield outcomes which cluster around the Core. Further, no significant interactions occur between the communication and payoff conditions.

While this experiment also points to the usefulness of the Core as an equilibria solution, a second test was conducted using a series of committee games without a Core. The results obtained from these series indicate that where an equilibria is absent, proposals adopted by the committee do not wander throughout the alternative space. As Fiorina and Plott note, "the pattern of experimental findings does not explode, a fact which makes us wonder whether some unidentified theory is waiting to be discovered and used" (1978: 590). Formal examinations of equilibria concepts note that they rarely exist (Plott, 1967; Sloss, 1973). When they do exist, they must meet extremely stringent conditions as to the distribution and configuration of participant preferences. Generally, this means that the equilibria must be the median proposal for all committee members. Such a notion is extremely limiting, especially given the variety of preferences observed in the world. Uncovering regularities where no equilibria exists, then, is a fundamental concern.

Nonequilibrium Solutions

Since the existence of an equilibrium is a rarity, work has turned to situations where no Core exists. Since few collective decisions meet equilibrium conditions, experimental work should examine such cases. The rationale behind this stems from the casual observation that collective decisions exhibit patterns of regularity. Determining what these patterns are and what drives them is of fundamental concern. However, defining solutions for nonequilibrium contexts is more problematic than contexts with an equilibrium. A large number of nonequilibrium solutions have been proposed that abstract the processes at work within group decision making. Three are dealt with here: the von Neumann-Mor gen stem V-set, the Bargaining Set, and the Competitive Set. These are discussed primarily because of the attention paid to them in experimental research. Many other solutions have been described and tested, with the limit to the number of solutions apparently confined only to imagination in changing assumptions about the decision-making context.6

The V-Set

One of the earliest experimental studies of nonequilibrium solutions in political science was conducted by Riker (1967a). For this experiment, three participants were placed in a context requiring them to:

1. Form a 2-person coalition, and
2. Agree to divide a fixed amount of money.

In this "divide-the-dollar" experiment, the odd person left out received nothing. Only two individuals could agree to a monetary split. Negotiations were allowed between all pairs of participants, and the experiment ended when the experimenter separately asked each participant how they wished to split the money and with whom. If two participants privately agreed on a division, they were paid accordingly. If no agreement was reached, they received nothing.

Riker defined the payoffs for the various coalition pairs to be:

(12) = $4.00 (13) = $5.00 (23) = $6.00

Using the simple V-set as a solution, this meant that players could be expected to divide the money as follows:[7]

		Player 1	Player 2	Player 3
Coalition	(12)	$1.50	$2.50	$.00
	(13)	$1.50	$.00	$3.50
	(23)	$.00	$2.50	$3.50

Accordingly, the first division involved a split between the coalition pair (12) with player 1 receiving $1.50, player 2 receiving $2.50, and player 3 nothing. The other possible coalitions are read likewise.

Riker's data indicates that players selected a division belonging to the main simple V-set 23.7 percent of the time. Players agreed on an equal split only 11.8 percent of the time. While Riker (1967a) discusses the outcomes of 93 trials, a paper coauthored with Zavoina (1970) expands this set of observations to 206 trials. No longer examining divisions that exactly matched the V-set, but taking into account how the final divisions clustered around the V-set, they report that 20 of 21 pooled observations fell within the 95 percent confidence estimate of the V-set divisions. In fact, deviations for all 21 sets of pooled observations averaged only 28 cents from the expected V-set divisions (see the data in Riker and Zavoina, 1976, Table 1: 54). Even though players were often oblivious to the V-set solutions, Riker notes that the V-set,

> was always a severe constraint on behavior in the sense that outcomes seemed to vary randomly around it. This fact should give political scientists confidence that, when it is possible to specify the solution of a political situation, participants are very likely to behave as if they are trying to achieve it or something very close to it (1967a: 655).

Support for the V-set with these experiments appears to be strong.

A similar simple majority rule game by Westen and Buckley (1974) supports this conclusion. In this experiment, Westen and Buckley tested the adequacy of the V-set for 4-person games. Testing a broader array of V-set solutions, they found that participants deviated from the V-set 17.5 percent of the time (see Table 2-2). This experiment demonstrates somewhat more forcefully the utility of the V-set in predicting solutions.

Table 2-2

Outcomes from Westen and Buckley (1974)

Set of V-Set Solutions	71.2%
Outcomes Outside V-Set	17.5%
No Coalition	11.3%
	100.0%

Total n outcomes = 97

The Bargaining Set

An alternative solution concept that has received some attention is the Bargaining set.? Riker (1967b), using a 3-person simple majority rule structure, found the Bargaining set is also a good predictor. As can be noted from Table 2-3, 21.2 percent of the outcomes fell directly in the Bargaining set (which coincides in this case with the main simple V-set). If the Bargaining set solutions are taken as a mean, then the remaining values are scattered around this set of solutions, and all fall within a 95 percent confidence interval around the mean. Using a 5 percent test of significance, then it is not possible to reject Riker's claim that these experimental results are statistically different from the Bargaining set.

Table 2-3

Outcomes in the Bargaining Set

Deviations from the Bargaining Set (in absolute $ amounts)	0	7	Bargaining set divisions
	.01 - .10	4	[1.50, 2.50, 0; (1,2)]
	.11 - .25	7	[1.50, 0, 3.50; (1,3)]
	.26 - .50	14	[0, 2.50, 3.50; (2,3)]
	no coalition	1	
	n =	33	

Adapted from Riker (1967b, Table 3.2: 64).

Buckley and Westen (1976) reach a similar conclusion, although they directly compare solutions outside the main simple V-set with the Bargaining set. They provide, then, a clear test of nonoverlapping solutions for 4- and 5-person simple majority rule games. Taking grouped observations, 69.1 percent to 95.2 percent (an average of 75 percent) of the outcomes for 4-person games fell in the Bargaining set. For 5-person games, the group observation range was slightly higher, extending from 72.7 to 100 percent (an average of 86 percent).** They conclude that the Bargaining set performs well in comparison with many of the V-set predictions, and they further speculate that as the number of players increases, the predictive power of "the bargaining set will remain the same but the best prediction made by the von Neumann and Mor gen stern stable set will decrease because the number of solutions will increase" (1976: 494-495).

The Competitive Solution

Yet a third solution concept has been proposed to uncover regularities in outcomes. This is the Competitive solution (K-set) developed by McKelvey and Ordeshook (1978). In experimental situations, the K-set has proven to be an embarassingly efficient predictor of outcomes. The primary set of published experiments are those by McKelvey, Ordeshook, and Winer (1978), Laing and Olmsted (1978), and McKelvey and Ordeshook (1979). The first two involve spatial majority rule committee games modeled on the game described in Berl, et al. (1976). The third set of experiments confronts players with 15 different proposals (this compares with the 28,000 potential proposals in the spatial committee game). Each player is given a set of well-defined preferences over each alternative together with a payoff schedule. A "winning" proposal is selected by a majority of the members of a committee. With the exception of limits on the number of proposals under consideration, the process of negotiation, voting on alternatives, and forming a committee is identical to the spatial committee game used by Berl, et al.

In all three groups of experiments the Competitive solution predicted outcomes quite well. McKelvey, Ordeshook, and Winer (1978) find that in only one out of eight experimental tests was there a significant deviation from the Competitive solution. In taking the absolute sum of the differences between the player's predicted payoffs under the Competitive set, and the player's actual payoff, outcomes from four of the experiments have a total average deviation of less than \$1.00. These deviations are fairly small given that payoffs to each coalition ranged from \$20.50 to \$24.75.[9]

Further, McKelvey, et al., are encouraged by the fact all of the external coalitions predicted by the Competitive solution formed at least once. This is contrary to predictions under the Bargaining set. Also, no outcome falls in the region satisfying various discriminatory V-set predictions (the main simple V-set does not exist) (1978: 612). They note that:

> Most subjects recognized the instability of the situation and a few noted after the game that their objective was to form a winning coalition as quickly as possible (despite the fact that several of the games ran for nearly an hour). Hence, in some cases a form of satisficing appears to have affected calculations and strategies (1978: 614).

Deviations from the Competitive set, then, appeared partially the result of binding players to a coalition. In fact, McKelvey, et al., more explicitly argue that "buying" off a third member of a coalition generally occurred at a "near-zero" cost to the partners in the coalition.

Laing and Olmsted (1978), in their study, required that each committee make a series of decisions under different preference configurations. Rather than each committee making a single decision and then disbanding, the committee made five decisions. Because of this "series" of choices facing each committee, Laing and Olmsted propose that equity criteria and consensus might be important. This follows from considerations of supergames which suggest that in repeated rounds of a game, individuals may be willing to face short-term losses in order to ensure long-term gains. This can be accomplished through accommodating other players and agreeing on "average" splits.*0

Laing and Olmsted find that 58 percent of the outcomes are based on competition while the remaining 42 percent appeared based on equity and consensus considerations (1978: 255-256). In keeping with this, Laing and Olmsted compared two types of outcomes: game-theoretic and split-the-distance solutions. The former, due to the structure of preference orderings, included both the Core and the Competitive K-set. The latter was based on even divisions among coalition members.

During the experiments, Laing and Olmsted observed that two different types of committees emerged. In the first, committee members behaved competitively, seeking outcomes close to their ideal points, and not readily compromising. In the second, committee members sought equitable or fair outcomes for the committee. Faced with these different types of committees, Laing and Olmsted performed separate analyses of outcomes. In committees characterized by competition, the game-theoretic results were far better predictors than the split-the-distance model. Almost three fourths of the outcomes in competitive commmittees were closer to the game-theoretic solutions. In committees characterized by equity considerations, the split-the-distance solution performed better. However, when pooling the results from all 80 committee outcomes, the game-theoretic solution outperforms the split-the-distance solution (see Laing and Olmsted, 1978, Table 8: 272). Accounting for variations among preference orderings and predicting the effects of a "supergame" is difficult. Yet, Laing and Olmsted's results are encouraging for the Competitive solution.

The third set of experiments (McKelvey and Ordeshook, 1979a) was intended as a "critical test" to determine which of a large set of possible solutions best predict the outcome of spatial committee games with limited alternatives. Except for a limit on the number of alternatives considered, the experimental set-up is identical to the spatial committee games previously discussed. In this experimental series, the Competitive solution correctly predicts the outcome 89 percent of the time.[11] With the null hypothesis that all proposals are equally likely, then from Table 2-4 it is apparent that the Competitive solution predicts quite well. First, that solution's actual success rate is far better than predicted. Second, in both experimental sets it is the only solution for which the null hypothesis may be rejected at the .01 level.

Table 2-4 shows that both the Pareto Optimal set and the Minimax set achieve a rather high success rate. For the Pareto set this is easily explained since all but two proposals are included in it. Further, all solutions are subsets of the Pareto Optimal set. On the other hand, the Minimax solution had a 71 percent success rate. Yet comparing the Competitive set and the Minimax set is difficult since they overlap 60 percent of the time. Meanwhile, the Competitive set does not overlap with the Least Vulnerable set, the V-set, or the Bargaining set.[12] Only 11 percent of the outcomes fall in any of these other solutions. Clearly, then, the K-set receives considerable support.

On the surface it appears that progress has been made in uncovering a solution concept that predicts regular sets of outcomes. However, the predictive success of the K-set is questioned by two different series of experiments conducted by McKelvey and Ordeshook (1979b). In these the Core exists, and as McKelvey and Ordeshook (1978) prove, the K-set is equivalent to the equilibrium. However,

Table 2-4

Outcomes from McKelvev and Ordeshook Experiments

Solutions:	Success	Failure	Expected Success	Actual Success	Likelihood	
Pareto Optimal Set	14	0	.933	1.00	.379	
Minimax Set	9	3	.600	.642	.486	
V-Set	2	12	.267	.142	.920	Experiment 1
Ordinal Bargaining Set	1	13	.267	.071	.987	
Competitive Solution	12	2	.333	.857	> .001	
Pareto Optimal Set	14	0	.941	1.00	.427	
Minimax Set	11	3	.529	.786	.046	
V-Set	0	14	.235	.000	1.00	Experiment 2
Ordinal Bargaining Set	0	14	.235	.000	1.00	
Competitive Solution	13	1	.294	.928	.001	

Adapted from McKelvey and Ordeshook (1979a, Table 3: 160).

their findings are at variance with previous tests for the Core and other solution concepts. Even so, this variance provides insight into the unanticipated effects of experimental structural components on deviations from proposed solutions. Using a simple majority rule committee game, McKelvey and Ordeshook's first series of experiments concern vote trading in which players are presented with a list of "bills" (for which they have different positive and negative payoffs). Players were to reach a majority agreement as to the bills that are passed and failed. Although the Core existed, it was chosen by players only 45 percent of the time.[13] This occurred when players disaggregated the choices through making pair-wise comparisons between alternatives. With a simple change in the procedural rules — where McKelvey and Ordeshook forced comparisons of bundles of passing and failing alternatives — the Core was obtained 100 percent of the time. The conclusion by McKelvey and Ordeshook is that the alternative space under this type of game was far too complex. Changing the structure of the game to allow consideration of bundles of alternatives (which simplified individual choices) resulted in outcomes which always fell in the Core.

In a similar game, McKelvey and Ordeshook found that where players have complete ordinal information over the preferences of other players (although not knowledge of their payoffs), the Core appeared only 43 percent of the time. However, where individuals do not have this information, the Core was obtained 74 percent of the time. McKelvey and Ordeshook argue that this interesting result is largely due to the complexity of the dominance relations between the alternatives they employ. Their claim is that:

> The effect of incomplete information seems to be that subjects are then forced to internalize the relevant preferences of other players and, in doing so, learn better the dominance relations in the game. They are forced to consider all alternatives in the process of collecting information and do not have the visual signal of alternative E [an obvious alternative to the Core] 'high' on the list for a majority (1979b: 15).

The tentative conclusion that they reach, although they admit it is not readily susceptible to theoretical consideration, holds that where individuals have a great deal of information about preferences, but no incentive to uncover dominance structures, the Core is less likely to occur. Where individuals do not have information concerning the ordinal preferences of others the game converges to outcomes in the Core.

The implication of these two experiments is that where changes in the decision-making context of the game occur, one might expect perturbations in outcomes (here — in and out of the Core). McKelvey and Ordeshook admit that they have no theoretical tool available to them which would explain this variation. A broader implication of these anomolous results is that no single game-theoretic solution is possible. That is, the search for a single underlying solution that predicts outcomes under all circumstances is not very useful. Instead, as is hinted by the McKelvey and Ordeshook experiments, the structure of the decision context may affect the outcomes. The argument presented later is that carefully detailing this decision context enables the deduction of regular patterns of outcomes that are tied to the costs that various institutional structures impose on the strategies that individuals adopt in making decisions. This approach might aid in explaining the anomoly that a variety of (often mutually exclusive) game-theoretic solutions are useful in predicting outcomes.

In general, there appears to be regular patterns to outcomes. That is, experimental evidence indicates that outcomes decision-making arrangements do not occur randomly. Instead, some process seems to drive decision making, yielding well-behaved outcomes. Game-theoretic tools capture some of the nuances of these processes and provide for observable predictions. However, these solutions often are mutually exclusive, with their corresponding game-theoretic models concentrating on different processes, and tied to different decision-making contexts. In short, a variety of solutions exist, each of which receive some support from different experiments (see Figure 2-2). Instead of searching for a single solution that fits all decision contexts, I concentrate on understanding the way in which institutional elements of the decision situation yield regular patterns of outcomes. In doing so, game theoretic-tools are employed to predict those outcomes.

Regularity and Structure

Experimental work provides unique opportunities for manipulating explanatory variables. Current game-theoretic experimental work illustrates this quite well, as research focuses on controlled changes over specific elements of the decision context. Research has focused on two different changes in simple majority committees. The first is concerned with variations as to individual agenda control powers. The second is concerned with different types of procedural rules used in making comparisons among alternatives and debating proposals. By controlling all other aspects of the committee and introducing changes only across these variables, researchers are providing insights as to the effects of structure on outcomes.

Figure 2-2

Experimental Support for Game Theoretic Solutions

	Core	V-Set	Bargaining Set	Competitive Solution
Berl, et al. (1976)	+	+	+	+
Fiorina and Plott (1978)	+	+	+	+
Riker (1967a)	-	+	+	+
Riker (1967b)	-	+	+	+
Westen and Buckley (1974)	-	+	~	+
Buckley and Westen (1976)	-	-	+	+
McKelvey, et al. (1978)	-	-	-	+
McKelvey and Ordeshook (1978)	-	-	-	+
Laing and Olmsted (1978)	-	-	-	-
McKelvey and Ordeshook (1980)	-	-	-	-

Support for various solutions:

+ = strong
~ = weak
- = no support

Agenda Control

Since McKelvey's formal work on agenda control theory (1976), a number of experimental studies have appeared testing McKelvey's claims that a skilled agenda setter can induce an outcome anywhere in an alternative space. Among this work is that by Plott and Levine (1978), Issac and Plott (1978), Miller (1980), and Eavey and Miller (1982). The formal work by McKelvey (1976) and Cohen and Matthews (1980) indicates that for any committee with a clearly defined alternative space, an agenda can be constructed that results in any point being selected. Other work by Schofield (1979) argues that the set of proposals is limited to a specific subspace of alternatives (in the voting theoretic literature, the top cycle set). However, as he also notes, this subspace generally is identical to the entire proposal space. The implication of this formal work is that if agenda power is placed solely in the hands of a single agenda setter, then the outcome is likely to be the agenda setter's ideal point.[1]

Experimental work by Plott and Levine (1978) tends to support the conclusion that outcomes are at the mercy of the skillful manipulation of an agenda. They provide a personal example demonstrating that understanding the structural constraints of an institution enables the imposition of a specific outcome. Their example involves an Aero Club (to which they belonged) deciding to replace worn equipment. Plott and Levine were able to use the Club's strict agenda rules to successfully set an agenda yielding their most preferred outcome over the objections of the Chairperson of the Club, and contrary to clear majority support of other Club members (whose preferences were distributed over a large number of alternatives). Observing (as participants) the importance of the role of an agenda, Plott and Levine argue that fixing an agenda has two effects. First, it limits the information available to decision makers about preferences held by other members of the group. Second, it determines the set of strategies available to individuals (since the agenda determines which strategies are available) (1978: 147-148).

Plott and Levine designed an experiment to test whether fixed agendas have a strong effect on outcomes. Providing participants a set of five alternatives, Plott and Levine preset the voting order over these alternatives to determine whether a particular outcome can be induced. One of the alternatives was a clear Condorcet winner, another could be unanimously defeated, while the remaining alternatives cycled among one another. Although four different experimental series were conducted, the initial three were designed to obtain probability estimates over various alternatives. In the final series, Plott and Levine constructed an agenda that they predicted would induce different alternatives (with the exception of the universal loser). Commenting that the a priori probability of a single alternative succeeding as the committee choice is .20, they note that their a posteriori observations were .94 (1978: 153). Such a finding far exceeds any traditional significance levels, and as such should not be regarded as accidental. Their brief conclusion notes "that within a range of circumstances the agenda can indeed be used to influence the outcome of a committee decision" (1978: 156). This finding, while perhaps not surprising to a political practitioner, lends credence to McKelvey's (1976) point as to the importance of an agenda.

A study by Isaac and Plott (1978) turns from the question of a fixed agenda and its effects to an institutional setting that empowers a single individual with agenda setting powers. The experiment involves a 3-person committee game with all participants having induced preferences over a finite set of alternatives. Isaac and Plott contend that empowering a single individual with agenda control is much like the process whereby a subcommittee acts for a larger decision-making body, "gathering information, debating the issues, and finally drafting motions for consideration and ratification by the committee of the whole" (1978: 283). In this instance, a single individual was granted sole power to introduce proposals. Once a proposal was introduced, it could not be amended by the other participants.

Three different experimental treatments were investigated. The first series empowered a single individual and allowed that person to send any proposal to the floor for consideration. Other committee members were required to simply vote on proposals, according to the way the "convenor" (agenda setter) arranged the agenda. The second series replicated the first, except that the convenor could send only a single proposal to the floor. In both series the Core existed, and of 13 experiments, all settled on the Core (which was the single undominated proposal out of 10 alternatives provided to the convenor). In neither case does it appear that the convenor gains any additional power (contrary to theoretical expectations), even though the convenor has proposals that are preferred to the Core.

The third series of experiments are more interesting, since in this case no individual has special agenda powers. This series also had a Core, although it occurred only four times. Two other alternatives occurred six times, both of which were close to the Core, and one of which had unnoticed (by the experimenters) "fairness" properties. The other proposal that occurred with some frequency was quite "close" to the Core in terms of the preferences of individuals. Finally, an alternative was selected that deviated substantially from the Core. It appeared to be selected on the basis of a dominant personality who was able to skillfully manipulate an agenda. In the process of discussion, this player assumed the role of a moderator, and was able to set an agenda which resulted in an outcome which was their maximum.

Isaac and Plott conclude that exclusive agenda control is important.

> Relative to the outcomes of a free proposal and amendment process, benefits accrue to an individual with the exclusive power to make proposals. While the advantage to the controlling individual is far short of dictatorship, it is definitely more than a single vote (1978: 305).

At the same time, the importance of dominance relationships are noted. In the experiment, the individual with agenda power could have been left worse-off by accepting proposals lying near the Core, and as a result, the Core became a reasonable outcome for the agenda setter. As noted, in the third experimental series, deviations from the Core occur with some frequency, and in most cases, individuals occupying a position equivalent to the agenda setter in previous experiments, is left worse off. Isaac and Plott conclude, then, that agenda control plays some role in the outcomes selected.

Gary Miller (1980) also investigates the case where individuals are granted agenda powers over other committee members. Using a 5-person committee game with a finite set of alternatives, Miller finds that where no Core exists, a single agenda setter is able to create an agenda which allows that individual to obtain a result quite close to their maximum. In effect, such a result supports McKelvey's

(1976) contention that a "strong" agenda setter can move close to their ideal point.

Miller then turns to a question concerned with oligopolistic control over an agenda. In this case, he turns toward a dynamic 3-person committee game in which two individuals have agenda control, while the third does not. The thrust of this research is to determine whether oligopolistic control over the agenda results in a net gain for either of the agenda setters. The results from this pilot study are not entirely clear. However, a few general points do emerge. The tentative conclusion that Miller offers is that a set of players "found their ability to extract favorable decisions from the committee to be <u>directly related to their influence over the agenda</u>" (1980: 22). However, individuals with agenda control were not able to have their maximal points accepted, since the need to form a coalition is crucial to the committee and the selection of a point. Nonetheless, individuals with agenda control powers were able to garner a better payoff than could be expected. These results were from a pretest, and some confusion was noted in the behavior of players. However, the results are illustrative of the importance of agenda powers, and appears to corroborate the Isaac and Plott conclusions that agenda powers are important. Unlike the Isaac and Plott experiments, the Core did not exist in Miller's set of experiments. Instead, a clear set of Competitive solutions were identified. In the course of the experiment, the proposals consistently deviated from Competitive solutions, and as remarked, settled on points closer to one or the other's agenda setter maximum.

A paper by Eavey and Miller (1982) does examine instances where the Core exists, and where agenda setters are capable of creating an agenda that moves outcomes away from the Core. Eavey and Miller replicated the procedures used by Isaac and Plott — although they changed preference orderings to overcome an alternative that displayed recognized "fairness" properties. Unlike the Isaac and Plott experiments, the Core was never selected. The convenor's most preferred alternative was selected four times, while alternatives that were considered "fair" by the committee were selected six times. Eavey and Miller note that in these experiments the Core — even though it exhibits a particular set of dominance relations — is vulnerable to the convenor's powers. Further, they argue that in the context of a 3-person experiment, unanimity is an important consideration. Although not all coalitions were unanimous, they did occur with some regularity.

A different series of experiments with substantially altered payoffs and no convenor yields outcomes that also appear outside the Core. In these 3-person experiments, the Core was obtained only twice, while an alternative with considerable fairness properties was settled on eight times. Unanimity again appeared to have a strong influence on the outcomes, since the fair alternative required only slight concessions by two players to give considerable benefits to the third participant.

A fourth experimental series increased the number of participants to five and included a single person who was granted agenda powers. Of five experiments, the Core was selected once, and three different alternatives were chosen in the remaining experiments. Eavey and Miller argue that,

> as we continue to increase the size of the group, we also increase the amount of variation in the outcomes of a game. This was the first time in fifteen convenor experiments (combining both the three person and five person games) that the core was selected by a committee. But it should be emphasized that three out of five times a particular alternative was picked for reasons of fairness and this result is consistent with the results of the 3-person experiments (1982: 19).

The indication is that introducing a convenor has some effect on outcomes. However, in these face-to-face experiments with competing "fair" outcomes, unanimity also is important, diminishing some of the agenda setter's powers.

Whether or not agenda power means absolute power is not resolved by these different experiments. However, it is clear that alternate processes occur that yield deviations from expected solutions. One obvious place to search for these differences centers on the rules and procedures of various decision-making arrangements.

Procedural Rules

Deviations from solution concepts also occur where changes in procedural rules appear. Hoffman and Plott (1980) and Hoffman and Packel (1980) investigate the effects of changes in the manner proposals are introduced. As with alternate agenda control rules, the way proposals are introduced, and how they are compared, makes a difference for outcomes. Further, these procedural rules are embedded in the structure of the institution.

Hoffman and Plott are interested in two changes in across procedural rules: whether the formation of proto-coalitions has an effect on outcomes, and whether the type of voting system makes any difference. Both of these effects are cross matched to allow for interaction effects. The first institutional effect tested a situation where committee members either were or were not able to meet prior to a debate. Allowing premeetings of participants enables coalitions to form and consolidate prior to a formal binding vote. In some respects this resembles the meeting of a caucus prior to a vote. The second institutional change concerned the manner in which proposals are voted on. One procedure — using Robert's Rules of Order, or the amendment procedure — presupposes the existence of a status quo (arbitrarily imposed by the experimenter). It follows a strict agenda rule, where in order to change the status quo an amendment must receive a majority vote. The status quo is accepted once a majority of the committee votes to accept it. The second procedure for introducing proposals is the agenda-free mechanism or "successive" procedure, in which proposals are introduced, and then voted either up or down by the committee. The proposal receiving a majority vote is declared winning and the committee disbands. Hoffman and Plott argue that by examining differences in the way proposals are introduced, they might isolate some of the differences in findings between the work by Fiorina and Plott (1978) that used an amendment procedure and that by McKelvey, et al. (1978), that used the successive procedure.

In this experiment, four different series were conducted (see Figure 2-3). In cell 1 of Figure 2-3, the concern was with two main effects, that of Robert's Rules and no premeeting caucusing. Comparisons across these two effects can then be made with cells 2 and 3 where one of the effects is missing.

Figure 2-3

Design of Hoffman and Plott Experiment

	No Premeeting	Premeeting
Robert's Rules	1	2
Agenda Free	3	4

The Hoffman and Plott data can be analyzed based on the mean distance of outcomes from the Core (which is the solution) and using simple T-test comparisons among cell means (see Table 2-5). The null hypothesis for each contrast is that there is no difference between the cell means. At the .05 level (using a one-tailed test of significance),[15] contrasts (1) and (2) indicate there is little difference between effects with an amendment and successive procedure or between premeetings and no premeetings when using an amendment process. However, with contrast (3), the means of premeeting and no premeeting outcomes are significantly different. Hoffman and Plott's observations are instructive as to differences in these institutional designs. They argue that differences in communications either limit or favor the accumulation of information. During premeetings, a proto-coalition will form and tentatively agree to a proposal. A successive procedure allows such a coalition to quickly terminate discussion and implement a previously agreed upon decision. The other combinations of institutional structures force committee members to search for more information, and the search drives the winning proposal closer to the Core. Even an amendment procedure with premeetings, which requires that debate not be closed off, serves to break up proto-coalitions, with the result that the game-theoretic solution — the Core — predominates (Hoffman and Plott, 1980: 25-26).

Table 2-5

Test Statistics (Contrasts) for the Hoffman-Plott Data

Contrast 1

H_0: $t = 1.417$ sig. $< .05$ df 36

Contrast 2

$H_0: \bar{x}_1 = \bar{x}_2$ $t = .346$ sig. $< .05$ df 36

Contrast 3

$H_0: \bar{x}_3 = \bar{x}_4$ $t = 1.82$ sig. $> .05$ df 36

Data adapted from Hoffman and Plott (1980, Table 6: 21).

A further type of procedural change concerns the presence of decision-making costs. Hoffman and Packel (1980) use a 3-person committee experiment with discrete (finite) alternatives and examine decisions in light of imposed opportunity costs on individuals for making decisions. This explicitly recognizes that decision makers generally do not have the luxury of unlimited time when making decisions. In the experiment, 5 committees faced no decision costs while 36 committees had decision costs imposed. Further, each committee contained a single undominated proposal (a Core).

Like the Hoffman and Plott study, the finding from this test indicates that the introduction of decision-making costs (a stopping rule) results in differences among outcomes. The Core is settled on in all five of the no-decision cost experiments. Where costs are introduced, the Core is settled on only 68.6 percent of the time. Further, they note that deviations from the Core, for the most part, appear consistent with strategies designed to avoid decision-making costs (1980: 24-25). Finally, Hoffman and Packel elaborate some of the strategies committee members employ to avoid decision-making costs when comparing proposals.

In sum, the work on agenda control and procedural rules indicates that patterns of outcomes do vary. While a solution (generally the Core) is imposed, a number of changes in institutional structure are noted that result in deviations from the solution. Further, these deviations do not appear to be random, but rather are tied to particular incentives or constraints on individual behavior introduced by changes in the decision-making arrangement. It appears, then, that institutional incentives and constraints deserve further investigation with regard to outcomes of decision-making arrangements.

Conclusion

Democratic institutions may vary considerably according to the ends a polity seeks. However, general agreement has it that any institution should enable decisions to be made. Social choice theory, adopting central elements to an ideal democratic institution, contends that under some circumstances no alternative will be selected. Recent formal work examining decision making under similar conditions in a multidimensional policy space indicates that if a decision is made, it may appear anywhere. By and large, the work with social choice theory is pessimistic for the likelihood of democratic institutions.

This pessimism is perhaps undeserved. Events in the world around us indicate that many institutions that approximate democratic mechanisms yield decisions. Further, when these decisions occur, they have a pattern — they are not random. Attempting to approximate the conditions set by social choice theory, experimental work has investigated whether the pessimism of social choice theory is warranted. The experimental work clearly shows that decisions are made and that patterns of decisions appear.

Borrowing from game theory, experimental research has attempted to uncover a set of solutions that predict regular outcomes. Many solutions have yielded fruitful results, yet it appears that many different solutions work in a variety of circumstances. Even so, experiments with different institutional mechanisms, yielding different outcomes, show remarkable patterns of regularity in their outcomes. Research that deliberately varies only a few institutional mechanisms notes that the patterns of outcomes also vary systematically. Further, this tends to support Riker's general point that failing in a search for general equilibria,

> there must be some institutional element in the regularities Cor actual equilibria) we observe. . . . [T]he ways the tastes and values are brought forward for consideration, eliminated, and finally selected are controlled by the institutions. And institutions may have systematic biases in them so that they regularly produce one kind of outcome rather than another (1980: 443).

A means for understanding outcomes, then, may be with understanding the effects of institutional structure on the behavior of individuals. If such is the case, understanding the effects of structure on behavior may have important points to make for democracy and the values derived for a democratic polity.

FOOTNOTES FOR CHAPTER TWO

^Rinckley's notion of empirical study reflects real-world study of events, processes, or relationships (1981: 31). Much of the experimental literature not included in this category or under "social-psychological" experimentation is contained in a third category — game theory. Murnighan (1978), too, in his survey of experimental research, differentiates between these three modes of research: social-psychological, political, and game-theoretic. Both regard the game-theoretic approach as overly theoretical. In truth, the game-theoretic approach is used both in social-psychological and institutional experimentation. For the former, see Rapoport, et al. (1979), which develops an "apex" model of coalition formation; while for the latter, see McKelvey, Ordeshook, and Winer (1978) on the Competitive solution.

^Riker (1971) is a good example, offering an institutional analysis to explain why an experimental committee consistently deviated from an expected solution.

[3]See Shepsle (1979) for a discussion of structure- versus preference-induced outcomes.

[4]In this section, game-theoretic solutions are glossed over. This is due first to the complexity involved in establishing the formal properties of each solution, and second due to many articles and books devoted to establishing various solutions. When discussing solutions, I provide an example of the solution congruent with material in later chapters. I also provide readers with citations to sources which are exclusively aimed at explaining the solution. For the Core, readable presentations can be found in either Rapoport (1970) or Abrams (1980). Figure 2-1 provides an illustration of the Core for a two-dimensional, 5-person case. In this instance, x_5 is the Core.

[5]In game-theoretic terms this is the Core of the game. As Fiorina and Plott (1978) note, in this circumstance the Core and the voting theoretic solution — the Condorcet set — match.

[6]For an excellent formal development of the V-set, see Guiasu and Malitza (1980), especially Chapter 3.

[7]The Bargaining set's stable solution is equivalent to the main simple V-set. This is proved in Robert Wilson (1971), Theorem 3. For a thorough, readable development of the Bargaining set, see Aumann and Maschler (1964).

[8]Buckley and Westen were also interested in testing the Kernal — a solution concept that is a subset of the Bargaining set. In the 4-person case, the solutions are identical. In the 5-person case, differences emerge when a coalition with more than a simple majority arises. See their discussion (1976: 484).

[9]Data taken from McKelvey, et al. (1978, Table 3: 613).

[10]For example, see the work by M. Taylor, Anarchy and Cooperation (1976), also Rapoport and Chammah Prisoner's Dilemma (1965).

[11]The experiments were performed over two series of games. These games differed only in the number of proposals under consideration, with the second series adding two additional proposals and changing the players' preference configurations.

[12]The Bargaining set, as previously demonstrated, is concerned primarily with games with transferable utility. As such, using the simple Bargaining set is probably inappropriate in these experiments — as McKelvey and Ordeshook correctly point out. Instead, they use the modified ordinal Bargaining set developed by Asscher (1976) in their test.

[13]In a sense, this in itself is of interest. As noted, where the Core exists it is generally selected, as it is a dominant strategy for any set of players.

[14]More recent work by Shepsle and Weingast (1981b) and Denzau, MacKay, and Weaver (1982) draws out some of these implications, arguing the outcomes will not necessarily be the agenda setter's ideal point, but under special conditions will fall into a more constrained region near that ideal point.

[15]In this case a one-tailed test is appropriate since the measure is based on the absolute distance from the Core which is hypothesized to be the true mean. As a result, alternative means can move only in a positive direction.

CHAPTER THREE

STRUCTURE FOR EVERYONE

> "I wonder now what the Rules of Battle are, . . . one Rule seems to be, that if one Knight hits the other, he knocks him off his horse, and if he misses, he tumbles off himself. . . ."
>
> \- Alice

Contrary to the expectations of well-formed models, decision making in democratic institutions does not result in endless cycles among many alternatives. Experience informs us that decisions are made with great frequency in institutions that allow "Rule By the People." However, the pattern of those decisions is of fundamental concern. The formal literature claims stable outcomes are rare and that when decisions are made, they are likely to settle anywhere. However, as Chapter 2 demonstrates, a good deal of experimental research indicates these formal results are unduly pessimistic. Patterns to outcomes emerge from decision-making arrangements, although what they may be seems to vary with the context in which decisions are made. There appears to be multiple patterns of regularity. However, finding the rationale for these differences is a perplexing problem.

This chapter tackles the problem by pointing to the context in which decisions are made. To understand this context, it is crucial to unfold the elements that make up the decision situation. Many have noted the complexity that envelopes any decision situation. Unraveling this complexity is what is important. This chapter then turns to a particular set of components to a decision situation — the institutional elements. This returns to the discussion in Chapter 1 which argued that the structure of a decision-making institution may have important effects on the ways people confront decision making.

Finally, this chapter lays out a set of structural rules that appear to be common to all institutions. The discussion in this chapter is at a very general level. Chapter 4 turns to a discussion of a specific set of institutional elements, and develops models that account for variations in patterns of outcomes. The remaining chapters develop a test for these models.

The Decision Situation

People constantly face situations where they must make decisions. The situations and decisions vary widely from a private decision to drink another beer to a public decision to drive after drinking one too many beers. The decision to have another beer is a relatively private decision, where consumption has little affect on others.[1] Meanwhile, the decision to drive while intoxicated is a public decision as it consequently endangers others. Decisions that have a consequence for others are of fundamental concern for political science. Public, or collective, decisions can involve the exercise of power, the allocation of goods, or the imposition of values. Whatever the decision, it is made within a particular context; an environment that is physically defined, historically dependent, and rule ordered. This context, for simplicity, is called the _decision situation_.

If all individuals were Robinson Crusoe, inhabiting separate islands, decision situations (and consequently decisions) would be fairly simple. In short, a decision to collect firewood and gather food would be contingent on only a few things. First, Crusoe would be limited only by the proximity of firewood and the type of food available (assuming both exist). Past experience would guide Crusoe as to the best means for collecting and gathering. The only rules limiting Crusoe would be his own rules of thumb developed over time. However, even with this simple decision situation, Crusoe still must account for another actor — Nature. Before deciding on an appropriate strategy to obtain firewood and food, Crusoe must take into account the potential wrath or beneficence of Nature. For instance, climbing trees to hunt for bird eggs might be an inappropriate strategy during a lightning storm. Even though the decision situation generally will be stable for Crusoe, contingent strategies are necessary to account for the whims of Nature.

If another individual, Friday, is added to the island, the decision situation changes character. Now Crusoe must anticipate both Nature and the actions of Friday. The decision to collect firewood and gather food may take on a different meaning. It may be the case that wood and food are both scarce. This may require a joint strategy of conservation. Likewise, there may be efficiencies derived from division of labor. In this instance bargaining might be a possible strategy. In either case, 2-person collective decisions of this type require that Crusoe and Friday can communicate. Any joint action by two or more individuals demands joint understanding. Further, the two examples above both require a set of rules that both will obey. If conservation is necessary to preserve a wood and food supply, then both need to establish how much each can take. With bargaining, both need to know how much firewood can be traded for how much food and vice versa.

This simple example illustrates how the decision situation changes once an individual confronts other individuals, each with sets of contingent strategies. Joint strategies or even collective decisions require a substantial and complex array of elements that enable communication, the assessment of strategies, and the implementation of strategies. The decision situation can be thought of as a set of givens that fully describe any context within which a decision takes place. Game theorists rely on the concept of a decision situation in order to specify the full range of strategies available to individuals. A strategy, as Rapoport notes,

> is essentially a statement made by a player specifying which of the alternatives he will choose if he finds himself in any of the information sets which are associated with his moves. It is shown in game theory that, once a strategy is chosen by each of the players, an outcome of the game is thereby determined (1970: 54).

As the examples illustrate, the strategies available to Crusoe change once Friday arrives. Without Friday, Crusoe has a broad set of strategies for collecting wood and gathering food that are constrained only by the whims of Nature. Once Friday is cast onto the island, Crusoe must also account for the potential actions of Friday. If wood and food are scarce, and both act independently, then some strategies for Crusoe (and Friday) are eliminated by the conflictual nature of the situation. With common understanding and well-established rules, new strategies are opened to Crusoe through the possibility of joint action.

Game theorists rely extensively on an ability to specify the decision situation. This allows a listing of the strategies available to individuals and allows predictions as to the outcomes. As Rapoport argues,

> The degree of 'conditionality of choice' is roughly the degree of dependence of a player's choices on the situation in which the choice is made. It is thus related to the degree of 'flexibility' which characterizes a player's performance. Usually one associates such flexibility with rational decisions, that is, decisions which take into account the special circumstance in which they are made (1970: 56).

Rapoport continues that specifying these special circumstances amounts to ascertaining the "rules of the game" — that is, those things which "specify the available alternatives and the several situations which can result from the players' choices" (1970: 56-57). Generally, game theorists make many simplifying assumptions when treating a particular decision situation. However, they are generally aware of the influence of the physical nature of the goods under consideration, the cultural rules defining behavior, and in particular, the structure of rules.

Plott (1979) suggests that outcomes can be analyzed through a simple equation where:

preferences @ institutions @ physical possibilities = outcomes.

The abstract operation "@" that Plott uses suggests an unknown relationship between these variables of the equation. This form of the equation appears to skip a step, and as E. Ostrom (1982) notes, outcomes might better be represented by the twin equations:

1. goods @ community @ rules = decision situation, and
2. decision situation @ individuals = outcome.

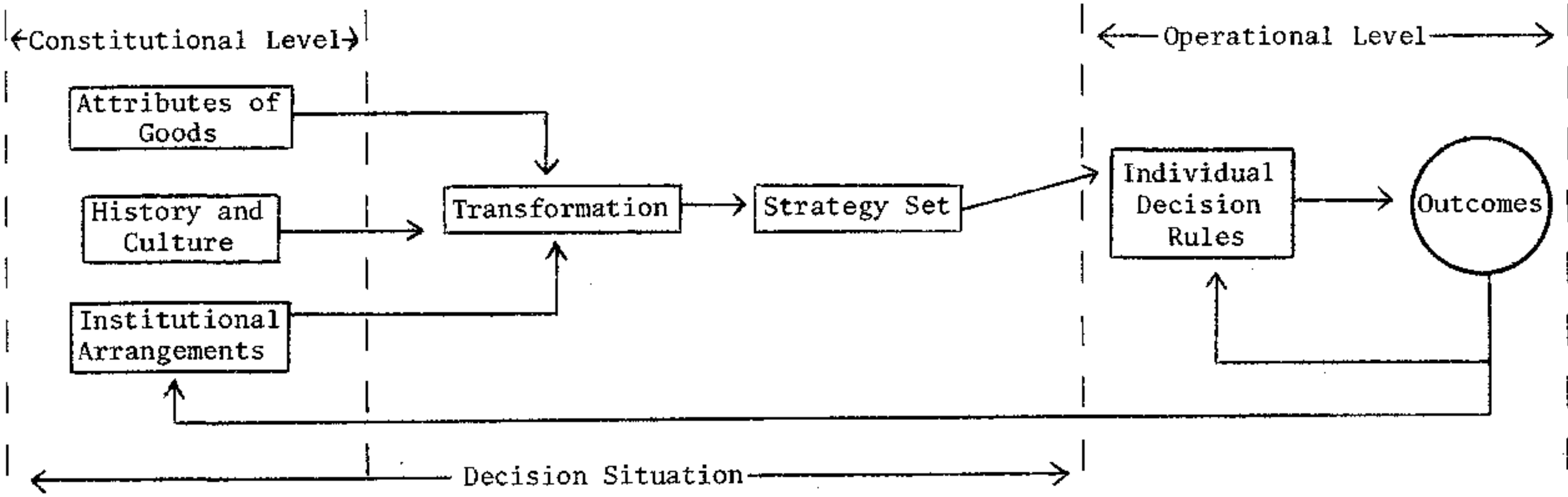
Again, the abstract operation @ signifies an unknown transformation of these variables. Elements of the decision situation may either constrain or enhance the set of admissible strategies through specifying those alternatives individuals may consider, enforcing particular modes of behavior, or by otherwise affecting the environment in which individuals make decisions. Whatever the case, the decision situation (and the available strategies) is generally treated as a given over which individuals have little control. Individuals, in turn, control their own set of choices from the set of admissible strategies.

Vincent Ostrom (1979) points to two different levels of analytic concern. The operational level has as a primary focus overt patterns of behavior within a given set of rules. The constitutional level "is concerned with alternative sets of rules used to structure different games or variations in a game and the effects that can be expected to flow from the different ways of ordering human activities" (1979: 1). While analysis at the operational level is important for predicting outcomes from a given situation, V. Ostrom (1980) later argues that institutions (a fundamental component of a decision situation) are designed and changed by individuals. If institutions are susceptible to change and manipulation over time, then it is crucial to understand how these constitutive elements at the constitutional level influence outcomes at the operational level. Outcomes, then, cannot be understood without accounting for those elements which are important for defining the decision situation.

These two levels can be schematically represented by Figure 3-1. The decision situation is treated as a given for any single decision. The array of elements in a decision situation is not subject to change during consideration and selection of an alternative. Any change of these elements occurs at the constitutional level. Of course, over time, outcomes may change the decision rules that individuals use and

Figure 3-1

A Decision-Making Calculus



This figure is adapted from Kiser and Ostrom (1982).

may affect the decision situation itself. Generally, such changes are not immediate, but evolve through the course of many decisions. However, to account for these changes, feedback loops are included on Figure 3-1.

Through determining the physical attributes of goods, the shared customs and understanding of a group, and describing rules that specify participants, their relative positions, the alternatives available, the processes by which decisions are made, the information about alternatives, and how decisions are adopted, one can begin to predict sets of outcomes. Recent work in game theory points to a specific conflict situation — the Prisoner's Dilemma — and draws parallels to many public good problems. Such situations are particularly relevant when individuals cannot be excluded from using the good, yet use of the good subtracts from use by others. This reflects the "commons" problem addressed by Hardin (1968).

On the other hand, von Neumann and Morgenstern (1944) stress the impact of culture on individual strategies. Their notion of an outcome (a solution) depends on the concept of an imputation (one of a set of possible strategies). They argue that imputations correspond to social "standards of behavior." By letting,

> the physical basis of a social economy be given — or, to take a broader view of the matter, of a society — according to all tradition and experience human beings have a characteristic way of adjusting themselves to such a background. This consists of not setting up one rigid system of apportionment, i.e., of imputation, but rather a variety of alternatives, which will probably all express some general principles but nevertheless differ among themselves in many particular respects. This system of imputations describes the 'established order of society' or 'accepted standards of behavior' (1944: 41).

Rather than a priori expecting individuals to order their strategies in a particular fashion, the norms of society are crucial for determining the choices individuals make.

Finally, the rules and procedures of decision-making arrangements are important for defining the decision situation. Without rules and procedures that impose limits on behavior and aggregate individual strategies, outcomes would be less regular. Hobbes, Locke, and modern social contract theorists like Rawls, argue that the central point to political institutions (decision-making arrangements) is the certainty they provide for interaction. While providing a foundation for authority, property, and/or justice, contractarian thought expects conflict between individuals. Institutions are regarded as ameliorating this potential for conflict. This point was noted in Chapter 2 where experimental work indicated that changes across institutional rules influenced patterns of outcomes.

In sum, these variables are crucial for defining the decision situation. Physical properties of goods, historical and cultural patterns, and rules and procedures bounding individual action all contribute to specifying the strategy set available to actors in a decision situation. Earlier an abstract operative "@" between those variables was noted. To understand how these variables interact, an abstract decision situation is developed, with different combinations of these variables as building blocks.

Imagine the instance where two individuals jointly share a pasture land. Each individual has a single cow, but both have an option to add another. However, the pasture is capable of sustaining only three cows. The addition of two extra cattle to the pasture will result in a barren piece of land incapable of supporting any cattle. In its simplest form, the situation can be represented in the following way: if both individuals keep only a single cow on the pasture, each receives a payoff from that cow (denote this by a single unit each). If Farmer Able adds an extra cow and Farmer Brown does not, the payoffs change, with Farmer Able gaining an extra unit, while Farmer Brown receives a single unit.[4] Finally, if both farmers add an additional cow, the pasture will be ruined, their cows will die, and their payoffs will be zero. This can be represented by the following matrix:

		Farmer Able	
		1 cow	2 cows
Farmer Brown	1 cow	(1,1)	(1,2)
	2 cows	(2,1)	(0,0)

In this very simple case, each farmer has two strategies. Since the situation only deals with two isolated farmers, each can remain with a single cow, or add another. No assumptions are made whether the farmers recognize the constraints imposed by Nature, know one another's payoffs, or whether they share common interests. In this case the decision is made independently. If the farmers are assumed to be rational maximizers (that is, they prefer more to less), then each would seek the additional gain, with the result that both would lose everything. The outcome would then appear in the lower right-hand cell of the matrix. Of course, this is a rather shortsighted strategy, but the decision situation requires nothing more than this: each rational farmer selects a strategy independent of the other.

If greater complexity is added to this simple case — a past history of interaction between these farmers and a recognition of the constraints of nature — then the outcome may change. If this historical pattern finds that both farmers raise only a single cow, then the outcome might remain in the upper left-hand cell of the matrix. However, if both farmers are rational maximizers, such a solution is unstable. Either farmer at any time may elect to add a cow, anticipating that the other farmer will continue to pursue a strategy of raising only a single cow. If only one farmer thinks in this way, then no problem arises. However, if both farmers think this way, then again the result is disaster for the farmers, the land, and the cattle.

If the historical relationship depends on reciprocity, with each farmer taking a turn at raising an extra cow, a long-term stable outcome might result. However, even this is no guarantee, since one farmer may unilaterally declare that he is going to raise an extra cow, regardless of the action of the other. This could upset a precarious balance between the two that had extended for many years. With the introduction of these different historical patterns of relations, it is easy to see that the strategies considered by the farmers change. In each case, the number of cows a farmer chooses to raise is contingent on the actions of the other. Each recognizes this, and in turn this gives rise to a strategy set of either raising a single cow; raising a single cow and bowing to a long history of both raising only one cow; alternating by raising a single cow some years and two cows other years; raising two cows, anticipating the other will raise only one; or unilaterally raising two cows. In any case, most of these strategies can quickly undermine past patterns of joint behavior.

To this point the pasture land is implicitly assumed to be a common good — that is there is no legal limit on joint use by the farmers. If the land is assumed to be partitionable (subject to fencing), then each farmer can make do with the pasture as he desires. In fact, such a transformation of common pasture land to private land took place in the United States during the 1870s and 1880s with the introduction of barbed wire as a cheap fencing alternative (a similar event occurred much earlier in England with the Enclosure Acts). In this event both farmers could split the land in half. However, such an action reduces the reasonable set of strategies to a single alternative — raising only a single cow. Since half the land can only support a cow and a half, no farmer can raise more than a single cow (raising calves or goats is not considered in this instance).

Finally, if a set of enforceable rules are added to this simple decision situation, the outcome could again change. In this case a formal arrangement could be established that alternated the number of cattle any farmer could raise during the year. However, establishing such rules would require a common understanding between the farmers allowing them to recognize the legitimacy and power of the agreement. Further, the agreement might only succeed where it has the authority to constrain action by one or both of the farmers. With such an agreement it is possible that outcomes would oscillate between the lower left cell and the upper right cell of the matrix, avoiding the destruction of the pastureland.

From this simple example it is possible to see how these various elements of the decision situation might interact to produce particular outcomes given the strategies available to individuals. To avoid the outcome in the lower right-hand cell of the matrix may require a very rich mileu of historical patterns of relationships and institutions. This mixture may involve a considerable number of elements, each of which contributes to common understanding and provides means for resolving potential points of conflict between Farmer Able and Farmer Brown. As the number of individuals increase, or as the type of decisions individuals make changes, the situation becomes increasingly complex. It is little wonder that with the extremely complicated decisions facing most collective decision-making arrangements that complexity thwarts most political analysis. The next section dissects a crucial element to the decision situation — institutional structure.

Institutional Structure[5]

Political science has many concerns, but few are more fundamental than the institutions that frame decision making. In Chapter 1 it was assumed that individuals form their own preferences. Conflict between individuals seems inevitable where many individuals have different experiences and concerns. Much of politics is concerned with the formation of rules which, if they do not ameliorate conflict, at least systematize the means for resolving conflict. These institutions do not materialize from thin air. As V. Ostrom (1980) argues, they are products of conscious design by individuals. As such they are susceptible to manipulation, adaptation, and occasionally conscious change. Institutions are artifacts that not only control a collectivity, but are subject to control by the collectivity (V. Ostrom, 1980). Institutional structure, however, does not impinge directly on behavior. Instead it constrains the strategy set available to individuals and likewise to a collectivity. Such an arrangement remains part of a decision situation. It interacts with other elements to yield an array of strategies for individuals and provides an important key for understanding a particular outcome. At this point, I step back to examine different configurations of institutional structure to understand different outcomes. The implication is that institutional structure has an effect on outcomes. Further, these effects can be understood by controlling for other aspects of the decision situation. Making comparisons between different elements of institutional structure requires examining differences between structure and outcomes at the constitutional level.

Kiser and Ostrom (1982) define institutional arrangements as:

> the sets of rules governing the number of decision makers, allowable actions and strategies, authorized results, transformations internal to decision situations, and linkages among decision situations (1982: 191).

It is important to note that institutions and organizations are not one in the same. Terms like "institutional structure" and "decision-making arrangements" refer to abstract entities that are composed of particular rule sets, not a particular class of organization. Organizations share many of the same underlying structural patterns — that is, the value of using the typology of rules discussed below. However, this distinction avoids confusion in treating general elements of institutions which may differ dramatically from organization to organization. In general, rules are the compositional elements of an institution. Organizations differ as to the rules they contain. As Kiser and Ostrom point out, rules variously identify:

> (1) the entry and exit conditions for participating in organizations; (2) allowable actions and allowable outcomes from interaction within organizations; (3) the distribution of authority among positions within organizations to take particular actions; (4) the aggregation of joint decisions within organizations; (5) procedural rules in complex situations linking decision situations together; and (6) information constraints within organizations (1982: 193-194).

Although these rules interact in complex ways in any organization, they are treated separately in the discussion below.

Modern democratic polities encompass thousands of political organizations at many different levels. On the surface most appear to differ tremendously. However, such an initial view is misleading. Most political organizations have an underlying pattern of commonality — a set of institutional rules. Even something as simple as the School Board of Elm Springs, South Dakota, and as complex as Congress share these elements. Both are embedded in and contribute to defining a decision situation. Both are characterized by a common set of rules pertaining to who may act, what can be considered, how proposals are compared, how proposals are selected, how information is transmitted, and variations in positions of actors. Although both organizations may vary substantially along these rules, the variance is one of degree rather than one of kind. In the discussion to follow, both organizations serve as examples of this variation of degree.

Before proceeding, a difficult point and a sticky point remain. The former concerns a view that underlying rule structures are nothing more than an arbitrarily imposed typology. First, typologies are useful when they point out distinguishing features of the types being classified. However, the value of a typology lies in the application of those differing features to understand and predict larger scale phenomenon. Explanation rather than listing is the thrust of this work.

The sticky point concerns comparing various organizations. Most political organizations are not autonomous, but rather they are bound up in a tight web of interrelationships with other organizations. This relates to the discussion of decision situations. Finding boundaries to a decision situation is difficult. Although the example of the farmers and their pastureland is well-defined, the decision situations of the Elm Springs School Board and Congress are less well-defined. Actors in the former are affected by actions of the latter. The polycentric order pervading political organizations in the United States makes specifying decision situations difficult. Interrelations between organizations are important, but in this discussion such fine points are ignored. Instead, political organizations and the decision situations within which they are embedded, are treated as self-contained units. Although this is a strong simplifying condition, it makes it possible to study a subset of elements that are regarded as important to decision situations — institutional structure. Meanwhile, more work needs to be done on the effect of these interrelationships. By the same token, the work by historians, anthropologists, sociologists, and economists must be integrated to fully understand the nature of decision situations. However, political science can make headway by focusing on the nature of decision-making arrangements that are important for bounding collective decisions.

Institutional Rules — An Enumeration

Institutional rules impose boundaries and constraints on individuals. These rules provide the basis for an organization that enables decisions to be made. Further, these rules are artifactual, created by the institution's participants. Finally, these rules constrain individual action to provide order in individual relationships. This harkens back to liberal contractarian theory where conflict between individuals is assumed inevitable, and that the mediation of an organization ameliorates conflict. Liberal theorists from Locke to Rawls point to tradeoffs between liberty and security brought about through political organization. They view individuals willing to give up some of their liberty to ensure security, protection of property, or other rights. In turn, rule-ordered behavior ensures some semblance of predictability among interpersonal interaction, which contributes to the regularization of (potential) conflict. In this respect, institutional rules are regarded as placing bounds on strategies available to individuals. In some instances this means eliminating some strategies and rewarding others.

The structural rules of concern here include:

1. Who can be considered "covered" by the arrangement (Boundary Rules);

2. What can be considered by individuals in the arrangement (Scope Rules);

3. The voting rule used to implement some decision (Aggregation Rules);

4. Channels available to transmit preferences, threats, etc. (Communication Rules);

5. The methods by which proposals are compared (Procedural Rules); and

6. Resource differences among players in considering, ordering, or implementing proposals (Position Rules).

These rules are common to all organizations. They are important for differentiating among particular classes of institutions. This set may not be exhaustive, although this may not be required. If these rules differentiate between organizations, and explain some of the processes leading to outcomes, then the full explication of an institution's structure may be unnecessary. These rules capture many of the processes important for understanding and predicting outcomes.

Boundary Rules

Boundary rules are basic to any institution in that they define the membership of the institution. Boundary rules simultaneously take into account both the requirements on membership for entering an institution and the limits on forfeiting (exiting) membership. Both serve to partition a set of potential participants into those that are eligible and those that are not. These distinctions are important enough to deal with separately. Entry rules broadly define the composition of membership within some institution. The point of closure established by entry rules has important implications for the distributions of costs and benefits among individuals within any institution. Membership can be defined by an assortment of variables ranging from paid fees (as with a private club) to cultural and historical distinctions (many older nation states have this characteristic). However membership is defined, the set of individuals who are regarded as members has important implications for the strategies available to individuals when making collective decisions. For instance, where entry is easy, the strategies available to an individual may be large. As more individuals enter the institution, the set of admissible outcomes may increase. This in turn increases the individual's strategy set. Such is clearly the ease where outcomes are public goods and require some minimal level of support before they can be provided. Conversely, where entry is difficult, the set of alternatives (and as a result, the strategy set) may be limited.

Exit rules are equally important for defining the boundaries of an institution. These rules concern both the ability of an individual to leave (exit) the institution, and the set of rules that enables a collectivity to strip membership from an individual. Tiebout (1956) and Hirschman (1970) point to the effect of exit on decisions made within institutions. The ease or degree with which individuals can withdraw their membership will affect the type of bargaining individuals use while making collective decisions. If exit is easy (and if other options exist), then individuals are unlikely to invest in bargaining. That is, all bargaining entails costs. If exit involves less cost, then individuals have little incentive to remain in the institution (see Tiebout). On the other hand, if exit is more costly than bargaining, then incentives exist for the individual to remain in the institution (see Hirschman).

The Elm Springs School Board and Congress differ considerably along this rule. First, each has a set of requirements establishing eligibility for members. Second, both institutions have electoral requirements for membership. For the School Board, eligibility rules are relatively difficult, since members must either reside or own property in a relatively small area of western South Dakota. School Board members are then elected from this limited set of participants. Congress is somewhat different, with eligibility defined first on the basis of United States citizenship, and secondly, on district residence. While citizenship excludes a large number of individuals in the world, it includes a far greater number than does the School Board. While almost all eligible members of the School Board are also eligible members of Congress, only a tiny fraction of the eligible members of Congress are eligible members of the School Board. Finally, Congressmen are elected from this large set of individuals. From this brief example, it is apparent that entry and exit rules for institutions can vary substantially.

Scope Rules

In a simple sense scope rules are concerned with the extension of authority to an organization. This includes both the domain of decision making and the "extent" of authority wielded by the organization. The domain of decision making concerns those matters upon which a decision-making arrangement is entitled to act. The domain of an organization is expressed by a set of rules that place boundaries on the set of admissible alternatives. Scope rules, then, may constrain decision makers to consider only a relatively narrow set of issues or may endow decision makers with discretion over a wide assortment of alternatives. For instance, the Elm Springs School Board is empowered to act only on issues pertaining to the school in that district. It is not empowered to act on site selection of MX missiles (even though some may be housed in the same territory as its jurisdiction). Meanwhile, Congress is empowered to act over a large set of issues — including MX missiles. However, in general, Congress cannot set standards for textbook selection at Elm Springs.[6]

The admissible extent of power wielded in an institution concerns the ability to coerce members (or sometimes nonmembers) to behave in accordance with particular rules. Coercion entails those sanctions that an institution may legitimately employ. While the Elm Springs School Board is able to dismiss teachers who do not meet contract obligations, Congress is able to use the ultimate sanction of taking life through broad legislative powers. Both the extent of domain and degree of coercion serve to differentiate decision-making arrangements. The extent of authority contained within an institution will influence the strategies individuals employ and the actions they take.

Aggregation Rules

Aggregation rules relate to the means by which individual decisions are transformed into collective decisions. Political scientists have devoted considerable attention to the effect of rules that aggregate preferences, and the outcomes that result from different rules for aggregation (see Riker, 1982). These rules are explicitly concerned with finding proportions of individuals necessary to ratify or reject some collective outcome. Aggregation rules vary from a single member to unanimity among the full membership. Most fire and police departments employ an "anyone" rule where any single individual may call on these services (enact a decision). Meanwhile, constitutional changes, while not requiring unanimity, require substantial agreement before enactment.

Differences in aggregation rules not only determine how many are necessary to enact a decision, but some decision rules are established to ensure that a subset of the membership can veto an alternative. All aggregation rules entail costs to members. As Buchanan and Tullock (1962) argue, they can be reduced to the costs associated with arriving at a decision, and the deprivation costs borne by an individual when a decision is enacted. A simple majority rule minimizes costs under particular assumptions about the shapes of those cost curves (see the formal generalizations of this point by Rae, 1969; Taylor, 1969; and Badger, 1972). Where potential deprivation costs might be high, extraordinary voting rules can be used to increase the costs to decision making. Meanwhile, extraordinary voting rules and quorum rules may skew the ability of some subset of individuals to veto or pass a proposal. A three-quarters voting rule to pass an alternative provides a subset of individuals equal to 25 percent of the membership with power to veto a proposal. Meanwhile, a 10 percent quorum rule (with a simple majority rule for decision reached by the quorum) may allow only 5 percent plus 1 of the membership to enact a collective decision.

The School Board and both houses of Congress have recourse to a number of aggregation rules. For some business (such as reading minutes), unanimity is required, That is, a single person's objection can cause the minutes to be subject to change. In the Senate, three fifths of the members must vote for a cloture petition to shut off debate. Numerous other special aggregation rules are used by those organizations, although the norm for each is a simple majority rule. However, this is not to say that the use of different aggregation rules does not affect the set of strategies available to individuals. This point is more fully developed in Chapter 4.

Communication Rules

Economists and game theorists have long been concerned with the effects of information on outcomes. Generally, models have focused on situations where individuals act with perfect information — that is, they know all possible outcomes and strategies. Simon (1957), however, argues that such a strong assumption fails to account for the paucity of information under which individuals make decisions. Simon attributed this to the incapacity of individuals to formulate and solve complex problems. This seems a reasonable point since most decisions take place in a decision situation far more complex than a chess game. Yet, even the strategies available in a chess game are beyond the capacity of most to calculate.[7] Simon, then, offered a notion that individuals operate under less than full knowledge, arguing for a concept of bounded rationality. Recent work, trying to come to grips with individual limits to full information, have developed elaborate models dealing with search strategies under incomplete information (see Radner, 1975, and Wilde, 1981). However, information is not only constrained by human incapacities.

Information is constrained via the communication rules governing an institution. Information does not materialize in the world. Instead, it is relayed to individuals through their own experiences and by communication channels that are defined by a set of rules.

The structure of communications within an institution is critical for relaying information to members. Clearly, the information available to individuals is crucial for them to choose among a set of strategies. Communication rules channel information in complex ways. First, these rules concern the language that a message is sent in — whether a set of easily ascertainable symbols (mathematics) or in language subject to vastly different interpretations in meaning (the ambiguities and misusages of English are quite apparent). Second, these rules create channels that relay information. These channels involve the way information is sent or limit the volume of information transmitted. Third, these rules specify the conditions under which communication channels are opened or closed.

While all individuals may be bounded as to the amount of information they are able to process, different communication rules can variously affect the amount of information available. Due largely to the small membership of the Elm Springs School Board and its open meeting rules, the communication channels are relatively open. As a result, information concerning strategies is fairly complete (even though the scope of alternatives is limited). With Congress, communication channels are very different. They are highly routinized, with formal hearings, constrained debate (once an alternative is presented on the floor, highly stylized rules limit debate in the House. The Senate differs on this point with unlimited

— to a point — debate), and dependence on staff research. Congressional committees, too, are designed to serve as communication channels to the full Congress by distilling large numbers of alternatives. As a result, the set of feasible strategies for any member may be constrained by the alternatives presented. However, the cost for limited strategies appears acceptable in order to enact decisions. In any case, communication rules differently constrain information, with the result of affecting the strategies available to individuals.

Procedural Rules

Procedural rules enable a description of the operative mechanism within institutions. Essentially procedural rules define the format followed by organizations in ordering, processing, and terminating decisions. While encompassing elements as varied as the access individuals have to the institution's decision-making mechanism or the number or points that must be hurdled before a decision is finalized, the more general conception for democratic organizations is with "the process whereby an outcome is selected as the result of voting" (Farquharson, 1969: 9). Indeed, the mechanisms that characterize the process of ordering, amending, and deleting proposals prior to a vote go to the heart of any decision-making arrangement. Other elements of the operative mechanism, such as decision points, serve to enhance the process by which proposals are restructured or added. Decision points concern the number of points at which proposals may be introduced or amended. The procedural rules of any institutional arrangement are fundamental for controlling the flow of proposals and, especially, for politicking. As to this latter point, Redman (1973) has carefully chronicled (as have many others) the opportunities for bargaining, reshaping, and deleting legislation in Congress prior to a vote.

Differences between procedural rules can be seen in the School Board and Congress. Both generally use Robert's Rules of Order as a means for ordering, amending, and deleting proposals. However, different procedures are possible. Instead of beginning with an identifiable status quo and amending it under a well-specified format, a series of successive alternatives could be introduced until one is settled on using a particular aggregation rule (see Farquhaurson, 1969). However, substantial differences emerge as to the number and type of decision points contained in each organization. Decisions by the School Board are not final, but can be changed at different levels — either by the State Board of Education or by State or Federal Courts. However, the decisions by the School Board are relatively final in comparison with Congress. There an alternative is not finalized until agreed to by some majority in both levels of Congress. Presidential veto power also plays an important role. Political scientists also point to the role of bureaucracy in interpreting a policy outcome, and there is always recourse to the courts. As a result, decisions of Congress appear more vulnerable to the decision points defined by procedural rules. Additionally, this set of decision points often constrain the alternative set that Congress considers, if it wishes an alternative to pass and be implemented.

Position Rules

The final set of institutional rules concerns position. Position is concerned with the authority granted to different slots in an organization. Generally, authority devolves to individuals based on their assignment to a particular position in an organization. In most democratic arrangements, authority is invested in individuals who are elected to a particular post. Representatives are granted special powers to introduce, debate, and enact proposals that far exceed those of their constituents. Aside from defining particular positions, position rules also specify the powers accompanying these positions. It is important to note that specific powers are assigned to positions, not individuals. Differences in resources, which also grant powers, are generally a function of historical happenstance, though clearly political organizations, as they are concerned with allocating values and goods, contribute to differences in resources between individuals.[8] More broadly, this is regarded as an integral part of the decision situation, and something that must be dealt with. Here position rules for most democratic institutions are not treated as consciously discriminating among groups of individuals, although it may well be that historical, social, and economic patterns do.

The authority relations assigned to particular positions in a political organization are a fundamental concern. In most decision-making arrangements this translates to who has control over particular aspects of an agenda. If the procedural rules are well-defined, and if a subset of individuals are able to add, order, or delete items to an agenda, then the set of alternatives is likely to be quite different than if all members have those powers. In most democratic organizations representatives are granted sole powers to introduce, change, and enact alternatives. However, there are differences in position even at this level. A chairperson of a committee, for instance, may have special positional powers that enable control over the alternatives considered by the committee. Depending, then, on the position rules, actors may vary considerably as to the authority they are invested with.

Both the School Board and Congress are composed of representatives. Differences between the two over this rule are small. Although representatives within both organizations have similar powers to add, order, and delete items from an agenda, it is obvious that the position of a Congressional representative is very different from that of a School Board representative. Here these differences are amplified by other rules — especially scope rules defining the alternatives that may be considered, and differences in communication channels between representatives and the represented.

Although it is the decision situation in its entirety that describes the strategy set available to individuals, the preceding discussion illuminates the effect of some elements to this context on framing available strategies. Organizations share a common set of institutional rules. These rules provide a structure for organizations — that is, develop a useful typology that enables organizations to be differentiated along a set of common dimensions. Moreover, institutional rules impose particular constraints (costs) on strategies — eliminating some and inducing others. This notion of constraints enables prediction of sets of likely outcomes. Further, an explanation of the process by which strategies are constrained can be developed from this typology of institutional rules. Chapter 4 provides such an explanation and develops a set of predictions for a group of well-specified organizations.

Notes on the Individual

To this point the constitutional level of analysis, which defines some of the mechanisms constraining sets of strategies, has been sketched. The operational level, where real outcomes are observed, is discussed in detail in Chapter 4. However, before ending the discussion of the decision situation some comments are necessary concerning the fundamental unit of both levels of analysis — the individual. So far the individual has largely been ignored. In many ways the decision situation has been presented as a mechanistic given, operating independently of the individuals it encompasses. Rather than simply choosing among options, individuals are the mechanics for such a machine. They start it, they keep it in repair, they redesign it, and generally they jury-rig it to keep it functioning. Therefore, a model of the individual is crucial to interpreting what is occurring within any decision situation.

Political theorists have long recognized the importance of a model of the individual for theory. All models of the individual are based on unobservable, but assumed, characteristics of behavior. These assumptions play an important role in detailing differences as to how situations should be approached. For instance, differences in assumptions about individuals allow John Locke and Peter Kropotkin to make contrary observations about political organizations. Locke regards organizations as important for judging disputes, while on the other hand, Kropotkin views organizations as imprisoning individuals and creating criminals and disharmony. Thus, the model of the individual is important for the role of politics.

A full model of the individual is not developed here. Only some aspects are touched on. Any full discussion of a model would treat subjects far beyond the scope of this study. Further, approaches to understanding individual behavior are as varied as the literature is voluminous. All approaches, whether economic, psycho-social, or psychological, rely on abstractions, and this discussion is no different. Here I sketch only a brief outline of a model. Chapter 4 further simplifies this sketch and delineates many of the properties at work.

The approach taken here follows a model of the individual that pervades neoclassical economics.[9] This choice is largely based on the similarities between these models and concepts of liberal psychology noted in Chapter 1. At its heart this model contains a regard for individual autonomy in action and thought. With this emphasis on individuals as the center of action in the world, Kiser and Ostrom point to three assumptions that must be made explicit:

1. The capacities of individuals to process and interpret information;

2. How individuals construct preference orderings over alternatives, and how they assign values to these orderings; and

3. The decision rules individuals use when choosing among strategies (1982: 184).

The first of these assumptions is hinted at above. Individuals are limited in their capacities to assess the strategies available to them. Both Simon (1957) and Leibenstein (1976) provide excellent discussions of "bounded rationality" where individuals act possessing incomplete information about the decision situation. The assumption here is that all individuals suffer similar informational problems when confronting an equally unknown decision situation.

The second assumption pertains to preferences. It is assumed that individuals prefer more rather than less of a valued good. Such a notion is elegantly presented by the concept of utility developed by von Neumann and Morgenstern (see the readable discussion by Luce and Raiffa, 1957). Further, individual's preferences can be thought of as transitive. That is, an individual values object A over B and likewise values B over C, then the individual also should value A over C. However, it is recognized that individuals value many other things besides goods. On occasion this may lead to peculiar intransitivities. Intransitivities are also likely when many combinations of goods are compared, especially if — as assumption 1 holds — individuals are limited in their capacities.

The third assumption pertains to the decision rules individuals adopt in selecting strategies. The assumption here is that individuals are "myopic maximizers." Essentially, individuals use systematic search processes in choosing between strategies in order to make a decision. However, due to incomplete knowledge about the range of strategies available, a global maximum will not always be selected. Differences in strategic choice also reflect different experiences individuals bring with them and different perceptions of the decision situation. Much of this notion is detailed in Ashby's cybernetic theory. Ashby's model points to internal decision rules that allow sampling many variables and adjusting choices until an equilibrium is reached. Individuals, then, develop decision rules over time based on reactions to an environment derived from empirical observation and abstractions about the events in the environment.

On the whole, this model of the individual portrays a confused individual adapting in a systematic manner to an incompletely known environment. While not a fully informed rational maximizer, neither is the individual a random actor. Patterns exist to individual choices, and they can best be summed up by the notion that individuals generally prefer more to less.

Conclusion

To this point a means of understanding the context within which decisions are made has been developed. Clearly, any decision situation encompasses a complex array of elements, all of which interact to define a set of admissible strategies. Depending on the decision rules that individuals use in making decisions, elaboration of the decision situation allows an enumeration of possible outcomes. This chapter concentrates on a subset of elements crucial to a decision situation — the institutional rules constraining an organization. This set of elements is doubly important for political scientists, since they not only describe the machinery which aggregate an outcome from individual decisions, but these institutional elements are also subject to conscious change and manipulation. In Chapter 1 it is suggested that understanding institutional rules might provide a means for understanding why the pessimistic results of formal theory do not occur. Instead, as a review of experimental work in Chapter 2 indicates, regular patterns of outcomes appear with some frequency. These patterns do not seem to be associated with the construction of a single game-theoretic solution, but rather seem to be tied to the constraints that institutional structure creates for individual decision making. A set of institutional rules concerned with those that can make decisions, what those decisions can entail, how decisions are made and aggregated, and the amount of information available, all seem to contribute to these constraints on decision making. In Chapter 4 these institutional rules are formally developed with respect to a generic decision-making organization. Later chapters put these formal models to empirical test.

FOOTNOTES FOR CHAPTER THREE

[1]The effect of purchasing another beer and its marginal contribution to total sales is ignored, as is the effect of consuming the beer before members of the local Temperance League.

[2]See particularly the work by Orbell and Wilson (1978). See also Frohlich, et al. (1975), and Schofield (1975). Somewhat related is the special volume of Public Choice (1977) that examines various demand-revealing mechanisms for public goods. Smith (1978) offers interesting experimental work regarding these mechanisms.

[3]See also the discussion by Ostrom and Ostrom (1978) for insights into common problems and the importance that attributes of a good have for a decision situation.

[4]I do not address the question of whether one individual gains or loses psychically due to changes in relative gains. Here I deal only with each individual's payoff from the cattle they possess.

[5]Discussion in this section relies heavily on work which has been ongoing in the Workshop in Political Theory and Policy Analysis at Indiana University for many years. In particular, it derives from Ostrom and Hennessey (1975), V. Ostrom (1979; 1980), Kiser and Ostrom (1982), and E. Ostrom (1982). Many other scholars have influenced this discussion, including Arrow (1963), Buchanan and Tullock (1962), Niskanen (1971), Olson (1965), Rawls (1971), Riker (1963; 1980; 1981), and Shepsle (1979). The short discussion offered here is incomplete. However, it develops many of the points which are considered useful in analyzing collective action within the constraints of institutions. The usual call for further research and thought needs to be trumpeted here.

[6] See Shepsle (1979) for a discussion of germaneness rules — rules which partition admissible outcomes in Congress. His formal discussion is very much related to the points made here.

[7]Chess has a finite set of strategies. Yet the first player's move contains 20 different plays. The second player has 20 moves associated with each move by the first. Thereafter, the number of moves increases even more dramatically. Each single player's move is an element of a strategy. The number of possible strategies quickly becomes astronomical. However, chess is a game with full information since each player knows the moves of the other. It is obvious that individuals quickly lose grasp of all possible strategies, even with such a well-defined and limited game.

[8]This political fact has often been ignored by liberal contractarian philosophers who regard political organizations as "neutral umpires" presiding over conflict between individuals. Marxist rightly point to the important role of the state in contributing to inequalities in resources. In particular, see Miliband (1977).

[9]Many political science examples adopt this model. The best known of these is by Downs (1957). Riker and Ordeshook (1973) offer an excellent discussion of this model of the individual with applications to politics.

CHAPTER FOUR

PREDICTING OUTCOMES

> ''The time has come,'' the Walrus said ''To talk of many things: Of shoes - and ships - and sealing wax - of cabbages - and kings - And why the sea is boiling hot - And whether pigs have wings.''
>
> \- The Walrus and the Carpenter

What strategies will a rational individual choose when participating in a simple committee with well-specified, but changing institutional rules? This chapter develops strategies that individuals might choose when acting in simple committees with particular configurations of rules. Much of the work examining spatial committee games is concerned with locating equilibria or demonstrating the conditions under which equilibria exist (see particularly Plott, 1967; Sloss, 1973; McKelvey, 1976; Cohen, 1979; and Cohen and Matthews, 1980). However, one observer, lamenting the rarity of equilibria results, remarks that ''politics is the dismal science'' (Riker, 1980). While equilibria may be elusive, the structural elements detailed in Chapter 3 are thought to affect the patterns of outcomes generated by collective action. The few formal studies explicitly focusing on structure contend that the solution space varies in predictable directions given particular structural configurations (see Shepsle, 1979; Shepsle and Weingast, 1981b; Denzau, MacKay, and Weaver, 1982). Elaborating how structure constrains the strategies individuals choose is the concern of this chapter.

The decision-making organization analyzed here is a simple committee. First, general attributes of the decision situation are established. This involves specifying a set of assumptions about the nature of goods and historical patterns of interaction among individuals, the preference orderings of individuals, and the structure of a simple committee, concentrating on those institutional rules outlined in Chapter 3. Second, sets of solutions are established for a 5-person, two-dimensional spatial committee game.* Using this game as a baseline model, changes are introduced one-by-one across each of three institutional rules: aggregation rules, communication rules, and position rules. Each change is compared with the simple majority rule committee used as the baseline model. A prediction is made for the likely outcomes to be achieved in each game. Chapters 5 and 6 address the question of how closely related laboratory behavior is to the outcomes predicted in this chapter.

An Abstract Decision Situation

A major thesis of this study is that institutional rules contribute to ordering behavior and in turn yield particular patterns of outcomes. Configurations of rules variously constrain or encourage the use of particular strategies by individuals. If an institutional configuration includes the means by which individuals transform their strategic choices into outcomes, then it should be possible to infer outcomes (solutions) from particular structural patterns. As elaborated below, few of the derived solutions yield explicit point predictions. Rather, they tend to narrow the space of outcomes.

While an outcome space may encompass a number of solutions, as Rapoport (1970) suggests, this is not a serious flaw. Indeed, reduction of the solution space to a subspace provides some insight into the effect of institutions for generating outcomes.

To simplify matters, this discussion focuses on a particular subset of organizations — a 5-person committee. Two reasons can be given for this choice. The first relates to theoretical considerations and the second primarily concerns expedience. In a democratic polity the committee is omnipresent. A committee typically implies a relatively small group involved with making decisions. At some levels these decisions affect only those involved, while at other levels committees serve to develop an agenda for a large group based on the expertise of the committee members, or serve as a time-saving device for the larger membership. In many respects, however, committees encapsulate many elements thought important for democratic institutions. They are small enough to allow face-to-face discussion, they allow each individual to clearly state and defend their preferred alternatives, and they encourage reasoned discourse and debate. As such, the structure of a committee should provide many insights into different democratic arrangements.

As to the second reason for concentrating on committees, it is apparent that they are generally small enough so as to be analytically and empirically manageable. Simplicity and manageability are critical when going from the abstract to the concrete. By the same token, much of the formal work relied on in following discussions focuses on committees. The rationale, when it is offered, is that committees are a microcosm of many types of democratic organizations.

The committee elaborated here is highly abstract. It is similar in many respects to spatial voting models developed by Hinich, Ledyard, and Ordeshook (1973) and McKelvey (1976) or to game-theoretic models developed by Berl, et al. (1976), and McKelvey and Ordeshook (1978). The simple committee under consideration resembles a club where members are concerned only with choices for themselves (see Buchanan, 1965). Outcomes (goods) are partitionable and subtractible. That is, discrete units of the good can be gained by each member and the more one individual gets (generally) the less others get. While committee members share a common means of communication, there is no assumption that these members share a past history of reciprocity or exchange. In fact, these members are treated as rational individuals pursuing their own gain through a collective decision-making arrangement, They are treated as strangers knowing nothing of the strategic choices of others. Each is assumed to act as if the others are advancing their own self-interest. Each individual has a set of defined preferences over all points in an n-dimensional policy space and an associated utility function. The committee structure is specified by a set of rules defining the set of members, the alternative space, and how alternatives are formulated, debated, and ratified.

These general points provide some insight into the background of this particular form of a committee. A note of caution was sounded in Chapter 3 regarding the necessity of fully specifying all elements to a decision situation. Much of a decision situation can be reduced to crucial sets of elements that are represented using a few simple notions of set theory and algebra of sets. This allows a detailed description of a committee, which in subsequent sections enables the deduction of solution sets tied to the structure of the committee.

Assumptions About the Decision Situation

Even a decision situation as simple as an isolated committee involves considerable complexity. To reduce complications in interpretation, a number of assumptions are introduced here to establish the basis for a simple majority rule committee. Subsequent discussion refers back to these assumptions.

Assumption 1

The committee contains $N = (1, 2, \ldots, n)$ members.

Assumption 1 restricts the number of committee members to n. This limits the number of people interacting in the committee to a finite range. In later analysis, and with all empirical work, N = 5.

Assumption 2

Alternatives lie in Ω where $Q \subset R^n$. R^n is an n-dimensional Euclidean space and Ω is closed and convex.

Assumption 2 restricts the set of alternatives to a subspace of the total possible alternatives contained in R^n. In effect, only alternatives belonging to Ω can be considered by the committee. Further, in being closed and convex, Ω has well-defined topological properties that are used later. Discussion later focuses on an alternative space such that $\Omega \subset R^2$.

Already Assumption 1 clearly establishes membership. It consists of a finite set of individuals characterized by N. In this discussion, neither entry nor exit is possible. The membership is arbitrarily imposed and extends no further than to those contained in the set. Likewise, Assumption 2 arbitrarily establishes the set of admissible alternatives. While containing special characteristics, such as being closed and convex, this assumption is intuitively plausible since practically all decision-making bodies have some limits on the extent of their domain. Hobbes set two upper bounds on the domain of the state in the hands of the Leviathan — taking an individual's life, and acts against God. To this list Locke added property. Here, all alternatives contained in the set Q are admissible.

Assumption 3

a) Individual preferences are represented by a utility function

$U_i: \Omega \subset R^n$

For any $i \in N$, there exists $X \in \Omega$ such that:

$U_i(X) = \lambda_i(||p^i - X||)$. where: $p^i = \max_{i \in N} U_i(X)$;

$||\bullet||$ is the standard Euclidean norm; and

λ_i is a monotone decreasing function.[3]

b) For any $X \varepsilon \Omega$ and $i \varepsilon N$, i$U_i(X)$ differentiable. Then for any vector of policies faced by the i^{th} individual — $U_i(X) = U_i(x_1, x_2, \ldots, x_n)$ — it is the case that:

$$U_i'(X) = \left.\frac{dU_i}{dX}\right|_{x_1}, \ldots, \left.\frac{dU_i}{dX}\right|_{x_n}.$$

This assumption provides a structure to individual preferences. Although Assumption 3a imposes a particular preference structure on individuals, other configurations are possible with no loss to generality (see McKelvey and Wendall, 1976). Differentiability provides further structure to the space Ω, holding that the space is continuous in the region. The advantage gained from such an assumption is that individuals have smooth preferences on Ω.

Assumption 4

a) A set of binary preference relations exist for each $i \varepsilon N$ such that: $>_i$ is defined on all $X,Y \varepsilon \Omega$. The ith individual has an ideal point p^i such that:

$$X >_i Y \iff U_i(X) > U_i(Y) \iff \lambda_i(||p^i - X||) > \lambda_i(||p^i - Y||).$$

b) Preference relations for any $i \varepsilon N$ can be expressed as dominance relations on $X,Y,Z \varepsilon \Omega$ where:

i) for $X,Y \varepsilon \Omega$; XD_iY if $[(i| X>_iY)] > [(i| Y>_iX)]$;

ii) for $X,Z \varepsilon \Omega$; XI_iZ if $[(i| X>_iZ)] = [(i| Z>_iX)]$.

c) These dominance relations exhibit transitivity for individuals — that is, for an $i \varepsilon N$ and $X,Y,Z \varepsilon \Omega$;

i) If XD_iY and YD_iZ, then XD_iZ; and

ii) If XI_iY and YI_iZ, then XI_iZ.

The relationships among alternatives noted in Assumption 4 characterize individual rationality. Simply stated, if an individual receives more utility from alternative X than alternative Y, then the individual prefers alternative X.

Assumption 5

Payoffs to individuals are not transferable nor are sidepayments allowed.

While goods are infinitely divisible, each unit is fully consumed by the individual. Trading these units once a division is achieved at is not allowed. This assumption characterizes the nature of the good. This ensures that the committee remains noncooperative, and as McKelvey, Ordeshook, and Winer (1978) note, it is more general than the special case of games with transferable utility.[4]

Assumptions 3, 4, and 5 are crucial for making statements about the nature of goods under consideration and the characteristics of individuals who comprise the committee. These assumptions define a set of constant elements to a decision situation. They remain unchanged in the discussion below and in all subsequent references to the simple committee. However, this shell of a decision situation lacks any transformational machinery allowing an individual to act on the set of alternatives and choose among strategies. The structure of the institution places limitations on membership, defines the set of admissible alternatives, details how alternatives are compared, establishes the proportion of individuals necessary to ratify an alternative, constructs the communication channels, and assigns positions to individuals concerning agenda powers.

Assumption 6

a) The committee always considers a status quo proposal: $\mathbf{Q} \in \mathbf{\Omega}$.

b) The committee has a binary choice procedure for comparing alternatives. For $\mathbf{X},\mathbf{Q} \in \mathbf{\Omega}$ this procedure is $\mathbf{P}(\mathbf{X},\mathbf{Q})$.

This assumption details a crucial element of the procedural rules. Alternatives are always considered in pairs. Further, any new proposal is regarded as an amendment to a status quo alternative. The winning outcome is compared with the next alternative for another vote (winning is outlined with Assumption 7). If there are m possible alternatives, then the alternative surviving the (m-1)th vote is the final outcome. Farquharson (1969) details this amendment voting procedure (see also Miller, 1977; 1980).

Assumption 7

$B = (C_1, C_2, \ldots, C_r)$.

Where: B is the set of all possible combinations of individuals varying from size 1 to n.

$|C_j|$ is the cardinality of persons in coalition C_j and

$(C_1 \cup C_2 \cup \ldots \cup C_r) = N$.

b) Winning coalitions are defined by the set W such that:

$W \subset B$; and

$(C_j \subset B | \; |C_j| \geq [^n/_k]) \in W$.

Where: k = a decision rule for aggregating votes, i.e., k = 2 for simple majority rule, and k = 1.5 for extraordinary majority rule.

c) For $X, Q \in \Omega$ and $P(X,Q)$, then one of the following holds:

i) $X \; D_{C_j} \; Q \;\; \forall \; i \in C_j$ and $|C_j| \geq [^n/_k]$.

ii) $Q \; D_{C_j} \; X \;\; \forall \; i \in C_j$ and $|C_j| \geq [^n/_k]$.

This assumption establishes the aggregation rule for the committee. Since alternatives are pairwise compared, all members can be partitioned into two disjoint coalitions, those preferring one alternative and those preferring the other. Further, a specific proportion of individuals are required to belong to a coalition before it can be considered winning.

Assumption 8

a) An ordered set of facts exist: $F = (f_1, \ldots, f_s)$.

b) A one-to-one onto mapping exists for $\Omega \longrightarrow F$.

c) Each f_j represents a distinct poll of all $i \in N$ over a distinct $X \in \Omega$. Knowledge over all polls yields perfect information. That is: $\sum_{j=1}^{s} f_j = 1$ where knowledge can be represented along an interval (0,1).

Then each f_j contributes $^1/_s$ amount of information concerning other's preferences (each f_j is weighted equally).

d) The communication rule establishes an upper limit on the number of polls which can be taken. This can be represented as a simple metric: μ where $0 \leq \mu \leq s$.

This metric constrains information as to other's preferences to: $\sum_{i=1}^{\mu} f_j = {}^{\mu}/_s$.

If $\mu = s$, then knowledge is perfect, otherwise, knowledge is only partial, since the communication rule constrains the number of polls which can be taken on the space Ω.[5]

Assumption 8 pertains to communication rules. Although such rules can affect information to the individual in many ways, the information set for this committee is relatively straightforward. Individuals already have information as to the alternative space and concerning their own preferences over alternatives. All that is lacking is information as to the preferences of other members of the committee. By Assumption 5 (nontransferable utility), this information is not directly available. As more alternatives are proposed, and coalitions form, information about other's preferences on Ω is increased. Increased information about other's preferences is presumed to improve each person's own strategic choices.

Assumption 9

a) A subset $C_i \subset$ is B empowered with selecting $F(\Omega) \subset \Omega$. In effect, a coalition can construct an agenda of alternatives from the set of admissible alternatives Ω.

b) Some $C_i \subset$ is B empowered with selecting $G(F(\Omega)) \subset F(\Omega)$. Some coalition can selectively eliminate proposals from a subset of Ω.

c) Some $C_i \subset$ is B empowered to select $H(G(F(\Omega))) \subset G(f(\Omega))!$ Some coalition can order the subset of proposals $G(F(\Omega))$ in any permutation of the elements contained in the subset.[6]"

This assumption assigns powers to a particular coalition subset to control the agenda. It grants three different powers:

1. Adding alternatives to the agenda;
2. Deleting alternatives to the agenda; and
3. Ordering the agenda.

If it is the case that the coalition granted these powers is C_i for all $i \varepsilon N$, or all members of the committee, then the members share equivalent powers of agenda control.

These assumptions generally characterize a simple committee structure. It is clearly the case that such a structure is abstract and lacks much of the institutional richness found in many such organizations. After all, procedural rules generally entail much more than a particular voting framework. Likewise, communication structures are more complicated, introducing rules that define an assortment of constraints on who may speak, how long, etc. Also, even the simplest committees have rules that assign special powers to a chair. Nonetheless, these assumptions highlight important aspects of many committees, and more crucially provide a well-specified description of the structure. Later sections deduce solutions from deviations in these structural rules (pertaining especially to Assumptions 7, 8, and 9).

A Baseline Model

Assumptions 1 through 9 frame an elemental decision situation for an isolated committee. Members are concerned with formulating, debating, and ratifying an alternative located in an n-dimensional policy space. Every individual has well-defined preferences over this space, and it is presumed that individuals seek to maximize their gain. However, to this point, some aspects of the committee's structure have been left amorphous. No mention is made of the value of the aggregation rule "k" (it could range from $0 < k \leq n$) or of the communication rule "μ" (which can range from $0 \leq \mu \leq s$). Nor is agenda control specified by a particular position rule.

At this point a baseline model is constructed that resembles the spatial voting models elaborated by Hinich, Ledyard, and Ordeshook (1973) or the game-theoretic models by Berl, et al. (1976). This model is relied on as a means of comparison with changes across specific institutional rules developed in later sections. The baseline model generally has the following form:

1. Boundary rules are limited to a set N of participants.
2. Scope rules restrict the set of alternatives to Ω.

3. Procedural rules follow an amendment procedure using binary comparisons among alternatives.

4. Aggregation rules require a simple majority $(k = 2)$.

5. Communication rules allow open communication channels. That is, full information is possible $(\mu = s)$.

6. Position rules reflect equal agenda control.

Two things have been observed about such a model. Where it is fully explicated (with an institutional structure implicitly or explicitly stated as above), the findings show:

1. Outcomes may appear throughout the alternative space unless highly constrained symmetry properties are met by individual's preferences; or

2. Outcomes converge to a game-theoretic solution. In other words, a quasi-stable set of outcomes emerge.

The first expectation is formally derived in many places (see Plott, 1967; Sloss, 1973; Cohen, 1979; Cohen and Matthews, 1980). This work explicitly lays out a committee structure, finding that either no simple solution exists or that the entire space of alternatives becomes a solution.[7] The second expectation is derived from game-theoretic experimental work. This work finds that individuals interacting in a committee structure do not select proposals that wander throughout the space of alternatives. As indicated in Chapter 2, some regularities in the outcomes achieved emerge. While generally not an equilibrium (except in rare circumstances), outcomes appear to converge to a set of identifiable points that exhibit certain uniformities in behavior. In this context, the Competitive K-set solution is focused on since it enjoys particularly good success in predicting outcomes for committee arrangements similar to the baseline model. The K-set, then, is a useful solution set with which to compare results in different committee configurations.[8] For now the more general results indicating that no solution set emerges are ignored.

The Competitive Solution

Because the K-set has been successful in predicting outcomes, and because the conditions for the Competitive solution resembles the baseline committee structure outlined here, it is discussed at length.[9] McKelvey and Ordeshook (1978) require that the Competitive solution's winning coalition be:

1. simple majority, and
2. minimally winning.

In other words:

$$W = (C_j \subset B|\ |C_j| \geq [^n/_k]\ ); \text{ and}$$

$$W = (C_j \varepsilon W|\ C_j - \{i\} \not\varepsilon W \quad \forall\ i\ \varepsilon\ C_j).$$

This provides two important elements that comprise a proposal pair — a winning proposal and a minimal winning coalition which selects that proposal. This gives $\rho(X,C_j)$ that associates with every coalition C_j ε W some X ε Ω.

From McKelvey and Ordeshook (1976), $\hat{\Omega}$ can be partitioned into a set of admissible alternatives τ_i for each C_j, where $\tau_j \subset \Omega$. This subset holds that for $X\ \varepsilon\ \tau_j;\ Y \not\varepsilon\ \tau_j$:

$$XD_{C_j}Y \quad \forall\ i\ \varepsilon\ C_j;\ C_j\ \varepsilon\ W.$$

A further property of this subset (which is the set of pareto optimal proposals for the winning coalition) is that for X, $Z\ \varepsilon\ \tau_j;\ Y \not\varepsilon\ \tau_j$:

$$XD_{C_j}Y;\quad ZD_{C_j}Y \quad \forall\ i\ \varepsilon\ C_j;\ C_j\ \varepsilon\ W.$$

However,

$$\tilde{X}D_{C_j}Z \quad \forall\ i\ \varepsilon\ C_j$$

since for some $j\ \varepsilon\ C_j$, $U_j(Z) > U_j(X)$.[10]

Only for the restricted case where $XI_{C_j}Z \quad \forall i\ \varepsilon\ C_j$ does there exist an equilibrium point, although this implies that X = Z since $\forall i\ \varepsilon\ C_j$:

$$U_i(X) = U_i(Z); \text{ and}$$

$$U_j(X) = U_j(Z); \text{ which means}$$

$$U_i(X) = U_j(X) = U_i(Z) = U_j(Z); \text{ or}$$

$$U_i(X) = U_j(Z).$$

By this discussion, τ_j, an admissible set of proposals for C_j, encompasses the set of pareto optimal proposals for C_j.

The combination of possible winning coalitions (using simple majority rule) can be set to:

$$\binom{n}{[n/_k]} = \alpha$$

which provides the number of partitions of Ω by all coalitions $(\tau_1,\ldots,\tau_k) = W$. Further, $\bigcup_{j=1}^{\alpha} \tau_j = \tau$. This space $\tau \subset \Omega$ is the set of pareto optimal proposals for all members of the coalition. In effect, it provides some notion of the structure of τ and the preferences of individuals in that space.[11]

Earlier it was noted that proposals falling in a subset of *x* do not strictly dominate one another (i.e., an equilibrium does not emerge except under rare circumstances. By extension, τ itself has no stability properties since its subsets lack equilibrium.). Hence, any point in a partition of τ may be acceptable. To remedy this problem, McKelvey and Ordeshook (1978) impose a set of stability conditions for proposals in order to narrow the set of outcomes.

First, consider three proposals:

$\rho_1 = (X, C_f);\ \rho_2 = (Y, C_g);\ \rho_3 = (Z, C_h)$.

The two stability criteria they impose requires:[12]

1. Internal stability = If $\rho_1, \rho_2 \in K$, then $\nexists\ \rho_1 I_i \rho_2$ $\forall\ i \in C_f \cap C_g$.
2. External stability = For $\rho_3 \notin K$, *if* $\rho_3 D_{C_h} \rho_2$ then $\exists\ \rho_1$ s.t.. $\rho_1 D_{C_f} \rho_3$.

Utilizing these notions of stability allows the derivation of the K-set. The K-set relies on notions of viability and balance. Proposals are <u>viable</u>:

> If for any set of proposals $\rho_i = (X, C_i)$ and $\rho_j = (Y, C_j)$, ρ_i is viable against ρ_j if it is not the case that $Y D_i Z$ $\forall\ i \in C_i \cap C_j$.

Proposals are <u>balanced</u>:

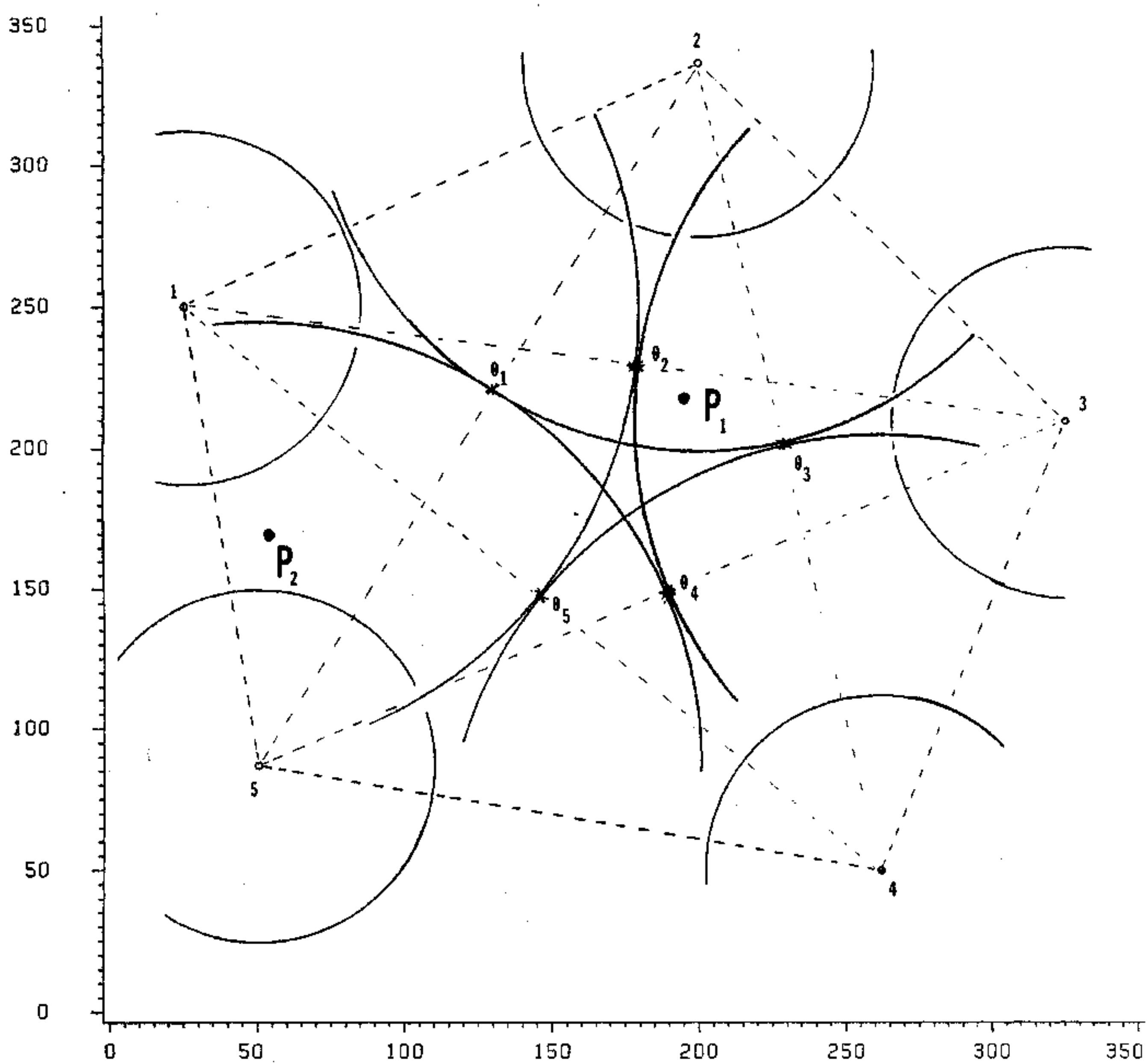
> If for all coalitions which form the K-set there is a $\rho_i = (X, C_i)$ and $\rho_j = (Y, C_j)$ such that ρ_i is viable in K and for $\rho_j \in K$, $\rho_i D_i \rho_j$ $\forall\ i \in C_i \cap C_j$.

Proposals which are both viable and balanced satisfy the K-set.

As an illustrative case, consider the 5-person committee with a two-dimensional policy space represented in Figure 4-1. In this case no Core exists, and the preferences of participants are roughly symmetric in the space (although a wide variety of preferences are equally possible). The Competitive solution contains the set of points $K = \{\theta_1, \theta_2, \theta_3, \theta_4, \theta_5\}$. First, it is simple to see that any point outside the Competitive set can be defeated by at least one point in it. Take for instance the point P_1 in Figure 4-1. While the coalition (345) prefers it to θ_2 the coalition (145) strongly prefers θ_5 to P_1. Meanwhile P2 is preferred by both players 1 and 5. However,

FIGURE 4-1

COMPETITIVE SOLUTION FOR A 5-PERSON GAME



ADAPTED FROM MCKELVEY, ORDESHOOK, AND WINER (1978) the coalition (234) prefers θ_3 to θ_2. The Competitive set is also internally stable since θ_1 and θ_3 are balanced by player 2's indifference, θ_3 and θ_5 are balanced by player 4's indifference, θ_5 and θ_2 are balanced by player 1's indifference, etc. This set of balanced proposals yields a cycle of proposals that are internally stable -— that is, no proposal strictly dominates another.

The baseline model used here closely resembles the simple committee modeled by McKelvey and Ordeshook. As such, it is reasonable to expect that the Competitive solution accurately predicts outcomes for the baseline model. Such a committee requires only simple majority rule, unlimited negotiation and exchange of information, and equal access to agenda control mechanisms. However, what happens as these three institutional rules are changed, one at a time, while all other elements of the decision situation remain the same?

Predicting Outcomes: Institutional Effects

To this point assumptions about the decision situation have been elaborated, a baseline model established, and the pareto subspaces of the admissible alternative space have been traced. These provide the tools to derive predictions for particular configurations of institutional structure. Each institutional rule is discussed with respect to changes to the baseline model. These changes are simple dichotomies along what could be conceived as a continuum of potential institutional rules. For instance, instead of examining all possible rules constraining communications, full communications is compared with limited communications, etc. In this manner, discussion is limited to a manageable and finite number of institutions. Generalizations and extensions for each rule await development.

Aggregation Rules

The treatment of aggregation rules begins a deviation from the simple baseline model. The configuration of institutional rules looks like:

1. Boundary rules are limited to a set N of participants.
2. Scope rules restrict the set of alternatives to Ω.
3. Procedural rules follow an amendment process.

4. (i.e., $W = (C_j \subset B| \; |C_j| \geq [^n/_2])$. ajority rule

4*. (i.e., $W^* = (C_j \subset B| \; |C_j| \geq [^2/_3 n])$. ary majority rule

5. Communication channels are open for all members.
6. Position rules reflect equal of agenda control powers among all members.

The interest, then, is with a model that contains institutional characteristics 1,2,3,4*,5,6 above, and differentiating it from the baseline model with characteristics 1,2,3,4,5,6. Two different committee structures are thus defined that resemble one another in all respects except the aggregation rule.

For the baseline model, it is predicted that the set of outcomes resulting would be those of the K-set. The first prediction, then, is:

P_1: Where a committee structure is characterized by a baseline model (with institutional elements 1,2,3,4,5,6 as above), committee members select points in the K-set.

When the aggregation rule is changed from simple majority to an extraordinary majority rule, the second case does not yield the same set of solutions. Since an extraordinary majority rule requires a greater number of members to pass a proposal, the set of outcomes converges to a stable set of points that are pareto optimal for all admissible coalitions. The second prediction, then, is:

P_2: Where a committee structure is characterized as the baseline model with a change in the aggregation rules (with institutional elements 1,2,3,4*,5,6 as above), committee members will choose outcomes falling in the stable set γ.

All results are established for cases where an equilibrium (the Core) does not exist.[13]

Sloss (1973), in generalizing Plott's (1967) conditions for equilibrium results, establishes a means for examining differences in aggregation rules. Sloss's formulation is relied on here in constructing a solution set. For formal proofs, the reader is referred to Sloss (1973). After laying out the logic of that work, the outcome γ is specified for the two-dimensional, 5-person committee game used later in this study.[14]

A useful way of understanding the effects of changes in aggregation rules on outcomes is through the use of quasigradients and hyperplanes through n-dimensional space. Gradients are used to transmit information about the space under consideration. Gradients are directional derivatives of a function that point in the direction of a maximum increase in a function (as well as a minimum).

Assumption 3 holds that individuals have a differentiable utility function $U_i(X) = \lambda_i(||X - p_i||)$, where $X \in \Omega$ and $X = (x_1, \ldots, x_n)$.

Imagine a small change from the point X is proposed. Let this be the vector $X^* = \{dx^*_1, dx^*_2, \ldots, dx^*_n\}$ representing a change from X to X^*. X^* to X

X^*. Inc $\left[\frac{\partial U_i}{\partial x_1}\bigg|_{dX^*} + \ldots + \frac{\partial U_i}{\partial x_n}\bigg|_{dX^*}\right] > 0$. to X if:

∂U_i ∂U_i

Let the $\Delta U_i = \left[\frac{\partial U_i}{\partial x_1}, \ldots, \frac{\partial U_i}{\partial x_n}\right]$. X^*

$\Delta U_i X^* > 0.$

The ith individual would be in favor of X^* over X if:

If $\Delta U_i X^* < 0,$

the ... ıl would be against such a movement. Finally, if

$\Delta U_i X^* = 0,$

the ith individual is indifferent.[15]

Sloss (1973) argues that differentiable utility functions are useful for finding an equilibrium point. However, reliance on them runs the risk of only identifying locally stable points, ignoring the possibility of a global maximum. Sloss introduces the stronger condition that preference relations be represented by pseudoconcave utility functions on the feasible set of alternatives Ω. Sloss then offers a definition of a quasigradient where:

> With a given convex preference relation D_i $\forall i$ and N points $X, X^* \in \Omega$, the vector $U_i(X) \in \Omega$ a quasigradient of D_i at X if:
>
> a) $D_i(X) = \emptyset \Longrightarrow U_i(X) = 0$
>
> b) $X^* \in D_i(X) \Longrightarrow U_i(X)(X^* - X) > 0$

In words, for $D_i(X) = \emptyset$, then $U_i(X)$ is orthonormal to a hyperplane through X such that $D_i(X)$ contained entirely on one side of this hyperplane. Further, the quasigradient behaves like a gradient in providing directionality for proposals preferred and not preferred by a particular member of a committee (Sloss, 1973: 25-26). By the same token, the quasigradient provides ''global information'' about a maximum.

A set of feasible directions of motion away from X can be established that distinguishes between directions preferred and not preferred by a coalition. Let M(X) be the set of feasible directions of motion away from X, while U(X) is the set of quasigradients of D_i at X for all $i \varepsilon N$. Or:

$$M(X) = \{X^* \varepsilon \Omega | \quad X + \lambda X^* \varepsilon \Omega\} \quad \text{where: } 0 \leq \lambda \leq 1$$

This set can be partitioned into subsets, the most important being:

$$M^+(X) = \bigcap_{U_i(X) \, \varepsilon \, U(X)} \{X^* \varepsilon M(X) | \, U_i(X)(X-X^*) > 0\},$$

that is, the set of feasible directions of motion away from X that is preferred by all possible quasigradients.[16]

Quasigradients are useful for establishing sets of stable points. This can be represented:

$$\bigcap_{i \, \varepsilon \, C_j} M_i^+(X) = \emptyset \iff \bigcap_{i \, \varepsilon \, C_j} D_i(X) = \emptyset \quad \text{where: } C_j \varepsilon W;$$

Further:

$$\bigcap_{C_i} M^+(X) = \emptyset \quad \forall C_i \varepsilon W.$$

Of course, the conditions here are stronger since $\{C_j\}$ is assumed finite, and the preference set $D_i(X)$ closed. Sloss constructs a proof for the more general case where these conditions do not hold. Basically, where there exist no intersection of points X^* that lie in the set of feasible directions of motion away from X, for all possible winning coalitions, the point $X \varepsilon \Omega$ is a global maximum. Further, this implies that such a point strongly dominates all other points as there is no possible direction toward which voters could move. This lies at the heart of the Plott (1967) and Sloss (1973) equilibrium conditions. Sloss (1973: 30) defines that $X \varepsilon \Omega$ is a uniform equilibrium if and only if for every voter i e N there exists a vector $U_i(X) \varepsilon U(X)$ such that for all $\tau_j \varepsilon W$:

$$\{X^* \varepsilon \Omega | \; U_i(X)(X-X^*) > 0\} = \emptyset.$$

Such a uniform equilibrium is shown to be an equilibrium point for the entire set of members. The note of caution raised by Sloss (1973), Plott (1967), Cohen (1979), and Cohen and Mathews (1980) is that such an equilibrium exists only under relatively special and rare conditions.[17]

A Two-Dimensional, 5-Person Game

Recognizing the rarity of a stable equilibria (a Core), consider the case where:

$$\{X^* \varepsilon \Omega | \; U_i(X)(X-X^*) > 0\} \neq \emptyset.$$

In this case the more narrowly conceived notion of a preference induced solution (i.e., the Core) is not examined. The concern is with cases where a Core does not exist and where the decision rule changes. Attention is focused on a relatively simple 5-person game in $\Omega \simeq R^2$. For simple majority rule, it is the case that for each i.e. τ_j, a vector can be chosen $\tau_i(\omega) \varepsilon U(X)$ such that

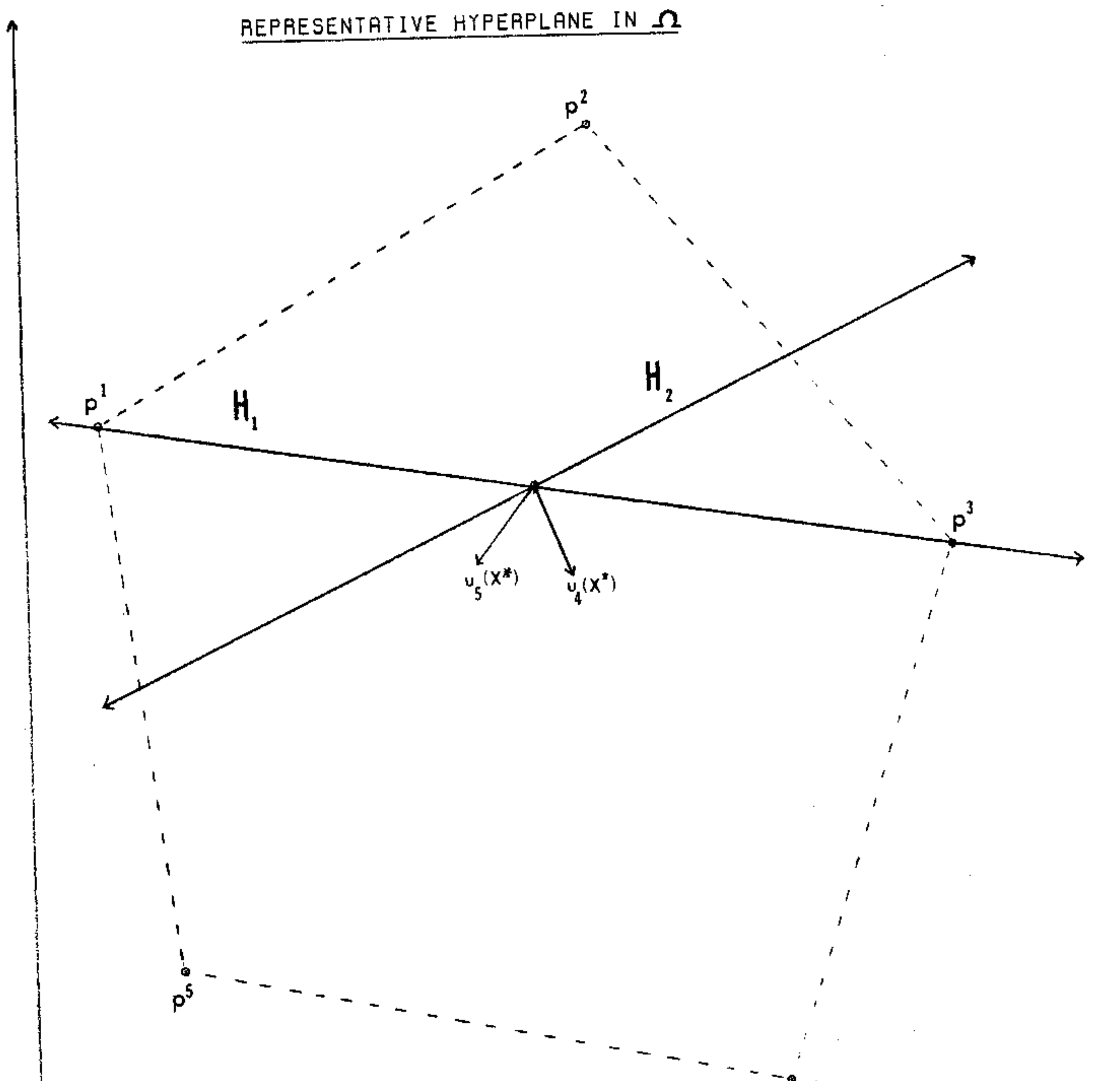
$$\mu\{i \varepsilon C_j | \; U_i(X)(X-X^*) > 0\} \leq 1/2 \quad \forall X^* \varepsilon \Omega$$

where μ is a cardinal measure of the number of quasigradients. This states that a median hyperplane through X can be selected which divides Ω into a closed ($M^-(X)$) and open halfspace ($M^+(X)$). The quasigradients pointing into the closed halfspace are voters not interested in moving in the direction X^*, where X^* is orthonormal to the hyperplane and pointing into the open halfspace. In Figure 4-2, the only median hyperplane that fits the property is H_1 which passes through two interior ideal points of the players (as noted above, a $U_i(X) = 0$, is assumed to point into the closed halfspace). For the coalition (123), a hyperplane extending through the line segment p^1p^3 and going through X satisfies the above condition. Since 1 and 3 both have a $U_i(X) = 0$ (their ideal points lie on the hyperplane, and they are considered having quasigradients lying inside the closed halfspace) and 2 lies in the closed halfspace Ω_{123}, X has some stability properties. Only players 4 and 5 lie in the open half-space. However, an infinity of hyperplanes exists which go through X destroying its stability. Take H_2 as a representative hyperplane. In such a case, there exists an X^*, combined with the $U_i(X)$ which is greater than 0 for more than one half of the players. If Ω_{123} is considered the closed halfspace, then an X^* exists in the open halfspace such that players 3, 4, and 5 have quasigradients pointing into the open halfspace $M^+(X)$ by which they prefer a movement into this space. The implication for this 5-person simple majority game is that no stable equilibrium exists. That is:

$$\mu\{U_i(X)(X-X^*) > 0\} > 1/2 \text{ for at least one } X^* \varepsilon\ \Omega.$$

This means that some hyperplane cuts through X such that greater than one half of the players prefer one other point to X (an $X^* \varepsilon\ M^+(X)$). There does exist, however, a quasistable set, the Competitive solution with some weak stability properties for a simple majority rule committee.

FIGURE 4-2



For the same committee with, a two-thirds majority rule, a set of points exists that do not strictly dominate one another. These are the points located in the interior pentagon labeled y in Figure 4-3. The two-thirds rule requires that there is no

$$\mu \{i \varepsilon C_j \mid U_i(X)(X-X^*) > 0\} < 2/3 \quad \forall X^* \varepsilon \Omega.$$

The set of hyperplanes running through the ideal points of interior members contain points that satisfy the above criterion.

However, these points are not a uniform equilibrium as there exist:

$$\bigcap_{i \varepsilon C_j} \{X^* \varepsilon \gamma \mid U_i(X)(X-X^*) > 0\} \neq \emptyset \quad \forall C_j \varepsilon W^*.$$

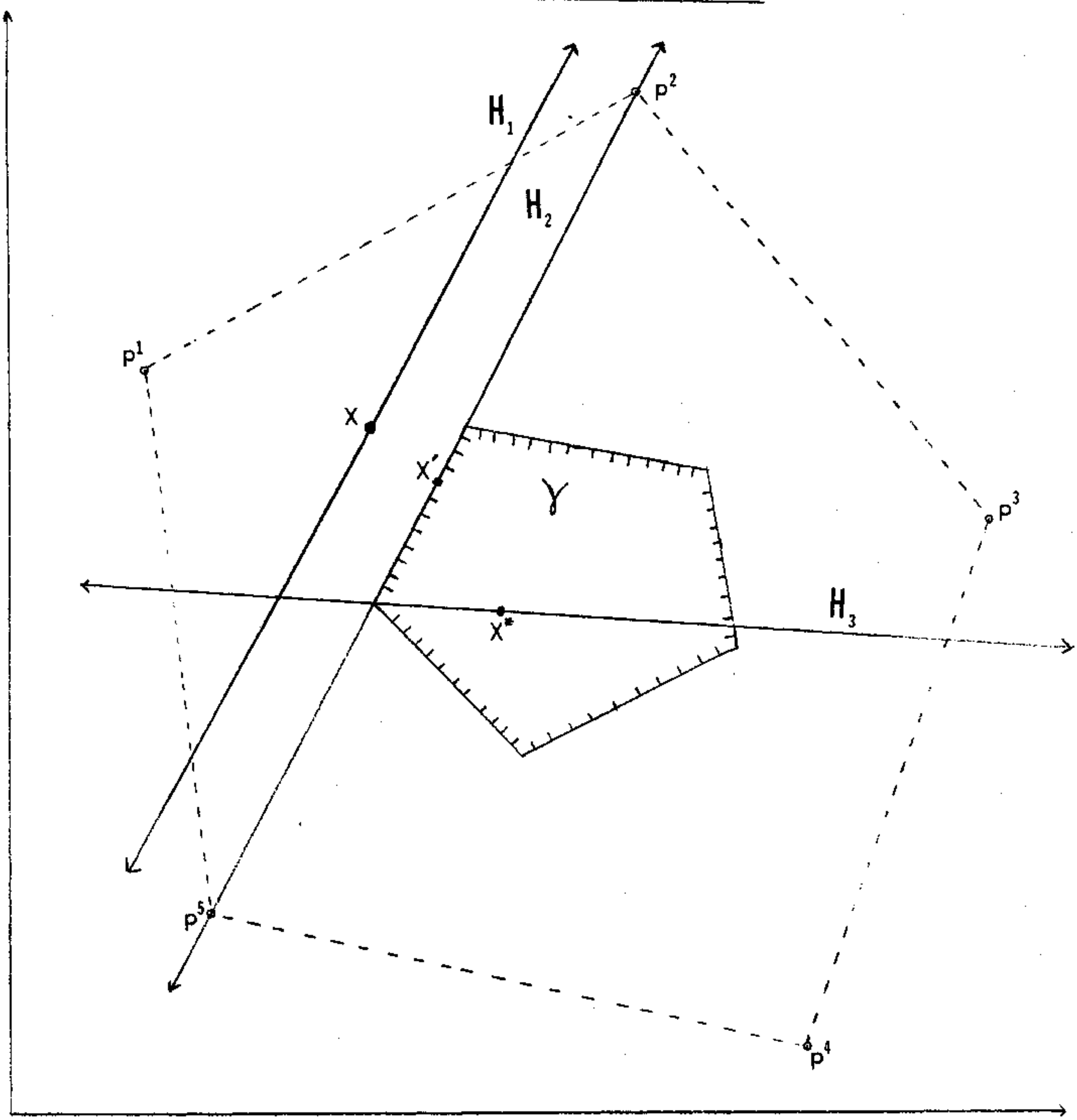
This set of intersections is the area $\tilde{\gamma}$.[18] Further, any point within γ satisfies the criterion that

$$\mu \{i \varepsilon C_j \mid U_i(X)(X-X^*) > 0\} < 2/3 \quad \forall X^* \varepsilon \gamma.$$

By example, taking an X lying outside $\tilde{\gamma}$, at least one separating hyperplane exists that does not satisfy the criteria. Note that at X, as one constructs an $\tilde{X}'$ (lying on the surface of $\tilde{\gamma}$) that is in the open halfspace of $\hat{\Omega}$, players 2, 3, 4, and 5 prefer such a movement (their gradients $U_i(X)(X-X') > 0$ for i = (2,3,4,5) and the |i| > 2n/3). At $\tilde{X}'$, no hyperplane can be constructed in which the criteria is not met. The closest is a hyperplane running through the ideal points of players 2 and 5. Even so the quasigradient for those members is $U_2(X') = U_5(X') = 0$. By assumption, they lie on the closed halfspace. However, the same is true with a point X^* which lies on the interior of γ. Any separating hyperplane through X^* satisfies the criteria and cannot be defeated by any other movement. All points in γ satisfy the criteria, and since no point in γ yields a single equilibrium, the set of points are cyclic. Further, all points

FIGURE 4-3

THREE POINTS AND HYPERPLANES IN Ω



in the space are stable against all points exterior to *y.* It appears, then, that as an aggregation rule increases the proportion of members necessary to pass a proposal, the basis over which individuals negotiate, vote, and formulate proposals, changes.

Communication Channels

Concern now switches to effects on outcomes of changes across communication rules. The institutional configurations of concern have as structural elements:

1. Boundary rules are limited to a set N of participants.
2. Scope rules restrict the set of alternatives to Ω.
3. Procedural rules follow an admendment process.
4. Aggregation rules require simple majority rule.
5. Communication channels are open for all members. The information set available to individuals is:
   $$F = \{f_1, \ldots, f_s\}.$$

5*. Communication channels are constrained for all members. The information set available to individuals is: $F_\mu \subset F$.

6. Position rules reflect equal agenda control powers among all members.

The first institution is the baseline model while the second has a configuration of elements **1,2,3,4,5*,6.** The difference between these two relates only to the number of communications that members of the committee may send. Under the baseline model, individuals are unlimited in the number of communications. Under the second model, individuals are constrained to a finite number of communications from which they may obtain information.

Economists have made the most use of the effect of communications on outcomes. As Hurwicz (1973) notes, communications yield information. Economists argue that information is presumed to enable consumers to selectively search for goods, while open information forces competitive bidding among producers. Many (particularly Simon, 1978; 1979) note that individuals rarely have full information about all actions and outcomes of a decision situation. Instead, that information is constrained. Individuals only gradually gain information through communication channels that allow for the exchange of information. Thus, it is expected that as communication channels change from an unlimited to a constrained set of facts, the strategies individuals employ also change.

Two predictions are offered. First, with the baseline model (with unlimited communication channels) outcomes are expected to have the weak stability characteristics of the K-set.

> P_1: **Where a committee structure is characterized by a baseline model (with institutional elements 1,2,3,4,5,6 as above), committee members will select points in the K-set.**

In the second case, where communications are limited, outcomes will occur in partitions of the space $\bar{\tau}$ of pareto optimal points, as individuals will not have enough information available to negotiate quasistable points. The prediction is:

> P_3: **Where a committee structure is characterized by a baseline model with a change which limits the number of communications (with institutional elements 1,2,3,4,5^*,6 as above), committee members will select points in τ_j for some $C_j \in W$ (a coalition specific subset of τ).**

Although individuals do not know the distribution of other individuals' preferences, they do not act under complete ignorance in the classical sense. Individuals know their own payoffs for any alternative in the policy space Ω. They gain information about the preferences of others as alternatives are suggested and voted on. Thus, information is limited by rules as to the number of alternatives that can be discussed. The strategies individuals employ are contingent on the information available, with important information provided by knowledge of other's preferences.

This leads to the proposition that:

> As the number of polls taken is reduced, so too is the likelihood of uncovering a quasistable point.

To show this, recall that for an n-person game, McKelvey and Ordeshook (1978) speculate the Competitive set contains n solutions (n-1 if n is even). Further, $n < s$ (where s is equivalent to the number of alternatives in Ω by the one-to-one, onto mapping of $\Omega \rightarrow F$ by Assumption 8b). The likelihood of uncovering a stable alternative with a single poll is $p(K) = {}^{n}/_{s}$. Since the number of polls is reduced, assume that $0 < \mu < s$. This reduces the probability of any poll appearing in F_μ to $p(F_\mu) = {}^{\mu}/_{s}$. Further, this reduction is independent of the likelihood of uncovering a stable alternative. Then, the likelihood of uncovering a stable alternative, given this reduced space is: $p(K|F_\mu) = p(K) * p(F_\mu)$. Since $p(K) \neq 0$ and $p(F_\mu) \neq 0$, then $p(K|F_\mu) = {}^{n\mu}/_{s}2$. For the case $0 < \mu < n < s$, it follows that ${}^{n}/_{s} > {}^{n\mu}/_{s}2$. Where $0 < \mu = n < s$, then ${}^{n}/_{s} = {}^{n\mu}/_{s}2$. Finally, for $0 < n < \mu < s$, it is the case that ${}^{n}/_{s} < {}^{n\mu}/_{s}2$. Each of these cases illustrates the effect of differing amounts of information on the likelihood of uncovering a stable alternative. Generally, it can be observed that as the number of polls (μ) **taken on Ω decreases,** the likelihood of locating a stable alternative decreases. The converse is also true.

Although the likelihood of settling on a stable point is low to begin with, locating one with a reduced sample space substantially lessens its likelihood. Consequently, under limited communication rules, it seems reasonable that committee members first attempt to locate alternatives with optimality properties rather than stability properties. This means that individuals first seek information about the surface of τ. If members have no knowledge as to other's preferences in Ω, then a myopic search strategy might best characterize an initial poll of the space Ω. In other words, the best poll any individual can take is of their own ideal point:

$$P(p^i, Q) \quad \text{for each } i \in N \quad \text{and } Q, p^i \in \Omega.$$

If so, the information set becomes:

$$F_{ni} \subset F \quad \text{with } F_{ni} = \{f_{11}, \ldots, f_{nn}\} \text{ where } n < \mu \text{ and } i \in N.$$

This information set provides a rough idea as to the surface of $\bar{\tau}$ for all members.[19] Subsequent alternatives proposed in Ω (which also serve as polls over each alternative) can focus on this set. However, where the total number of polls is limited, and where no points $X \in (\tau - K)$ exhibit stability properties, then the ith member can do no better than to agree to an alternative:

$$X \in \tau_j \quad \text{where } \tau_j \text{ is a coalition specific subset of } \tau \text{ and the } C_j \text{ coalition, and } i \in C_j;\ C_j \in W.$$

With the instabilities present in a pareto optimal subspace, the $i\overline{th}$ person runs the risk of having a proposal Y selected such that:

$$\text{For } Y \in \tau_m;\ X \notin \tau_m, \quad Y\, D_{C_m}\, X \quad \text{for } i \notin C_m \quad \text{and } C_m \in W.$$

The strategy of accepting an unstable alternative derives from two points. First, the communication rules constrain the total amount of information members can obtain about the preferences of other members of the committee. Second, where the likelihood of choosing (on a single move) a stable proposal is low under full information, under a reduced sample space it is even lower. If all choices were made, full information would provide information as to the location of these points. Under reduced information, this is not the case.

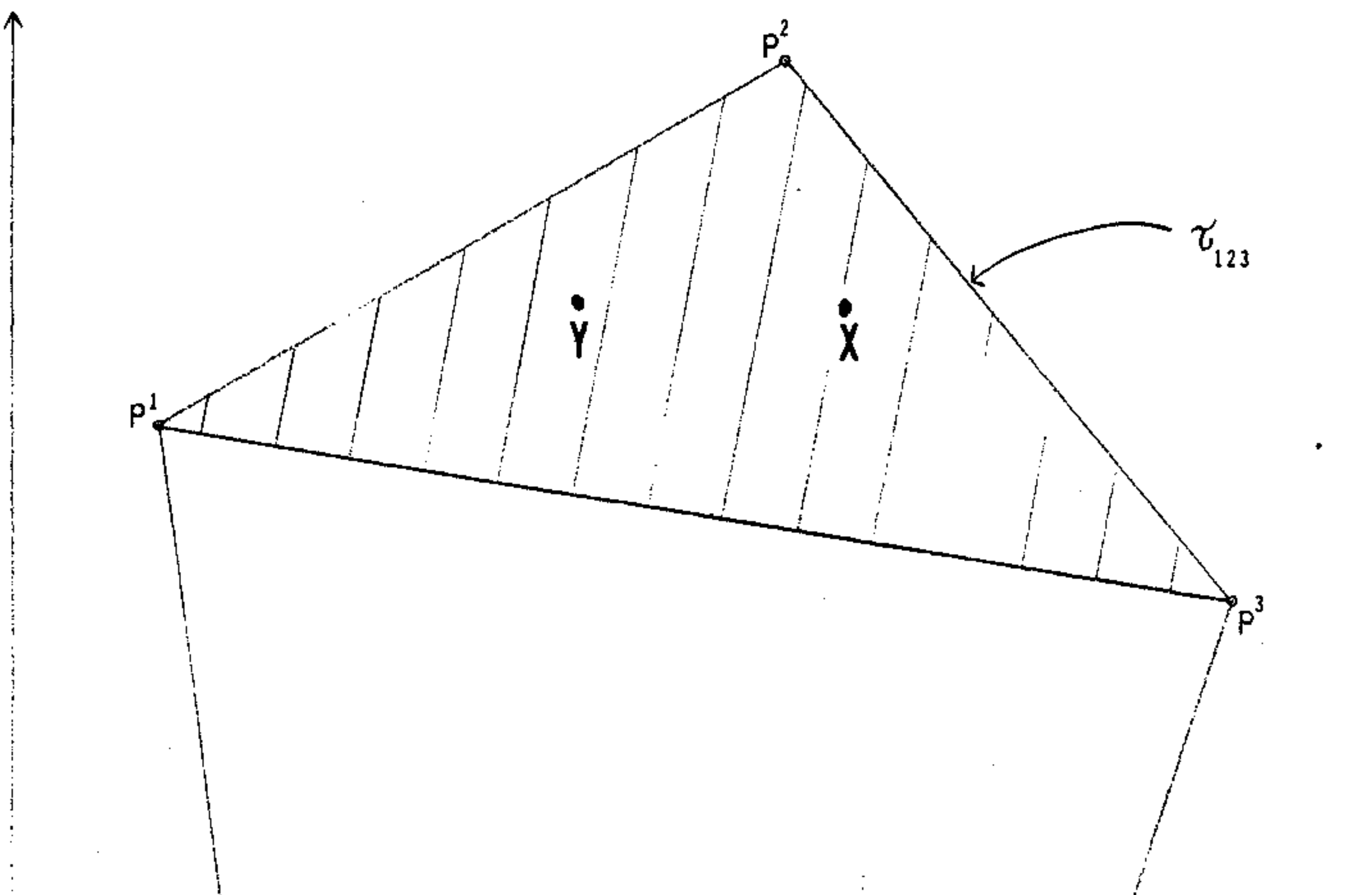
Figure 4-4 illustrates the solution set for such a two-dimensional case. The ideal points of the members $(p^1, p^2, p^3, p^4, p^5)$ are the vertices of the pareto set τ. The boundaries of the set are defined by line segments joining these ideal points. The interior of this bounded, convex set is the set τ. The shaded area τ_{123} is a pareto subset for coalition (123) and is a partition of τ. That this subspace is optimal, consider the points $X, Y \in \Omega$. Both are optimal for the coalition (123). However, movement from X to Y results in at least one member of the coalition being left worse off. The same is true with movement from Y to X. It seems reasonable to assume that with a limited communication rule that instead of searching for a stable point, once a pareto point is identified for a coalition, it will settle on it.[20]

Position Rules

Much of formal theory illustrates that the most pernicious effect of committee structure on outcomes results from agenda control power. McKelvey (1976), while on the one hand demonstrating that a simple committee (with equally dispersed agenda powers) can easily select a point anywhere in a policy space, also concludes that a single individual empowered with agenda control can ensure that their ideal

FIGURE 4-4

LIMITED COMMUNICATION RULE SOLUTION SPACE



point is selected. That this result is not without consequence, consider the Congressional uprising against Boss Cannon at the turn of the century. The bulk of dissatisfaction by members of Congress was with Cannon's seemingly unlimited agenda control powers. Political practitioners everywhere recognize the importance of agenda control for the manipulation, passage, and defeat of proposals.

In this section it is shown that expected outcomes differ under different forms of agenda control. The institutional structure includes:

1. Boundary rules are limited to a set of N of participants.
2. Scope rules restrict the set of alternatives to Ω.
3. Procedural rules follow an amendment process.
4. Aggregation rules require a simple majority.
5. Communication channels are open (for members empowered with agenda control).
6. Position rules reflect equal agenda control powers among members (here the number of individuals with agenda control equals the number of committee members, i.e., f = N).

6*. Position rules reflect an unequal dispersion of agenda control among committee mem(here $f \leq [n/k]$ th k as before).

Assumption 9 indicates that agenda control is concerned with adding, deleting; and ordering alternatives. In this discussion the ability of a set of individuals to add proposals to an agenda is focused on. In a sense this implies two points. First, although no ordered agenda exists, individuals empowered to add proposals construct an agenda through the alternatives that they propose. Second, the ability of individuals to add proposals to an unordered agenda implies that each individual is able to selectively delete (through their choices) other alternatives.

Again the prediction for the baseline model is that outcomes appear in the K-set. Specifically:

> P_1: **Where a committee structure is characterized by a baseline model (with institutional elements 1,2,3,4,5,6), committee members select points in the K-set.**

The alternative model, where a subset of individuals have power to add proposals, argues that outcomes will appear as solutions to a smaller (finite) set of games among those individuals. The prediction is:

> P_4: **Where a committee structure is characterized by the baseline model with a change in the position rules from n-persons having agenda control to f-persons having such control, where $f \leq [^n/_k]$ (with institutional elements $1,2,3,4,5,6^*$), committee members will choose an outcome δ, which is a minimax solution to an f-person game.**

Again, all results are for cases where an equilibrium (the Core) does not exist for the full committee.

It is possible to show as McKelvey (1976) demonstrates, that any individual can construct an agenda in such a way as to reach any point in the space of alternatives. McKelvey's point is that any proposal is feasible, and since individuals have smooth preferences over all points in the space, all points are cyclic. The result is that some agenda can be constructed which dominates any point. McKelvey notes that for a single agenda setter, that ~~ith~~ individual is likely to construct an agenda extending from $(A, \ldots, J, p^i)$ — from some initial point A to that individual's ideal point p^i. Although it may be the case that $A \; D_{C_j} \; p^i$ for some winning coalition, there is some $A_{+1} \; D_{C_j} \; A$ and so on. The penultimate proposal J in the agenda is then defeated (if the agenda is properly arranged) by $p^i \; D_{C_j} \; J$ according to the agenda setter's wishes. The ability to construct an agenda extends from an institutional rule which solely empowers the ith individual with adding proposals. These results are generally known, and the reader is referred either to McKelvey (1976), Miller (1977; 1980), or Shepsle and Weingast (1981b) for formal development.

Obviously, since a single individual empowered with agenda control is able to select any point in the space of alternatives, the same is the case for two individuals. However, in the case where $2 < [^n/_k]$ (the aggregation rule), then these players are forced to compete with one another to attract majority agreement on a proposal. Since two individuals both contribute to building an agenda, it is unlikely the outcome will be either of the individual's ideal points.

Returning to an earlier discussion of hyperplanes and quasigradients, there is:

1. **A row vector $U_i(X) \varepsilon \Omega$ which is a quasigradient for the ith person and $U(X)$ the set of all quasigradients.**

2. **$M(X)$ = the set of all feasible directions of motion away from X.**

3. **$H_i(X)$ = the ith hyperplane through X.**

It was noted that

$$M(X) = \{X^* \varepsilon \Omega | \quad 0<\lambda\leq 1 \quad s.t. \; X + \lambda X^* \varepsilon \Omega\}$$

which allows the description of a set of feasible directions of motion away from X that are preferred by a subset of individuals:

$$M^+(X) = \bigcap_{U_i(X) \; \varepsilon \; U(X)} \{X^* \varepsilon \Omega | \quad U_i(X)(X-X^*) > 0\}.$$

Finally, there is a metric μ which provides a measure on the set of quasigradients pointing into $M^+(X)$:

$$\mu\{i \; \varepsilon \; C_j | \; U_i(X)(X-X^*) > 0\} \quad \text{for } C_j \; \varepsilon \; W.$$

Suppose two individuals — i,j ε N — have agenda powers. For any $X \varepsilon \Omega$ and $X \neq p^j$ proposed by i, j can propose an alternative X^* which is better for j (i.e., $||X^* - p^j|| < ||X - p^j|| \;\; \forall \; X,X^* \varepsilon \Omega$, $X \neq p^j$). Further, such a movement X^* is majority preferred by a coalition of players such that:

$$\mu\{\forall h \in C_j \mid U_h(X)(X-X^*) > 0\} > [^n/_k].$$

Likewise, for any $Y \in \Omega$ and $Y \neq p^i$ proposed by player j, i can propose an alternative X^{**} which is better for i (again:

$$||X^{**} - p^i|| < ||Y - p^i||).$$

Such an X^{**} can be proposed that is majority preferred by a coalition of players such that:

$$\mu\{\forall m \in C_i \mid U_m(Y)(Y-X^{**}) > 0\} > [^n/_k].$$

Both instances follow directly from proofs by Plott (1967) and Sloss (1973) for games without an equilibrium. In other words, some point can always be proposed, where no equilibrium exists, that is always preferred by a majority to the current point.

Players i and j, then, are engaged in a 2—person game, since they are the only individuals adding proposals to an agenda. Other members are only able to side with one agenda setter or the other. The game, then, reduces to a 2-person game concerned with constructing an optimal proposal. From Nash (1950) it is known that for every finite strategy, 2-person game, there exists an equilibrium strategy (see Luce and Raiffa, 1957). The outcome, then, for such a game is

$$\delta = \max_i \min_j u_{ij}(Z) = \max_j \min_i u_{ji}(Z).$$

For the special case of two players, δ is a median point such that:

$$\delta = \frac{||p^i - p^j||}{2}.$$

By extension, for any set f of players, $f = (i, \ldots, m) \leq [^n/_k]$, a point 8 can be calculated for all f based on a system of linear equations:

$$\delta = \max_i \min_{(j\ldots m)} u_{(i\ldots m)}(Z)$$

$$= \max_{j} \min_{(i,k\ldots m)} u_{(i\ldots m)}(Z)$$

$$\begin{matrix} \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \end{matrix}$$

$$= \max_{m} \min_{(i\ldots m-1)} u_{(i\ldots m)}(Z).$$

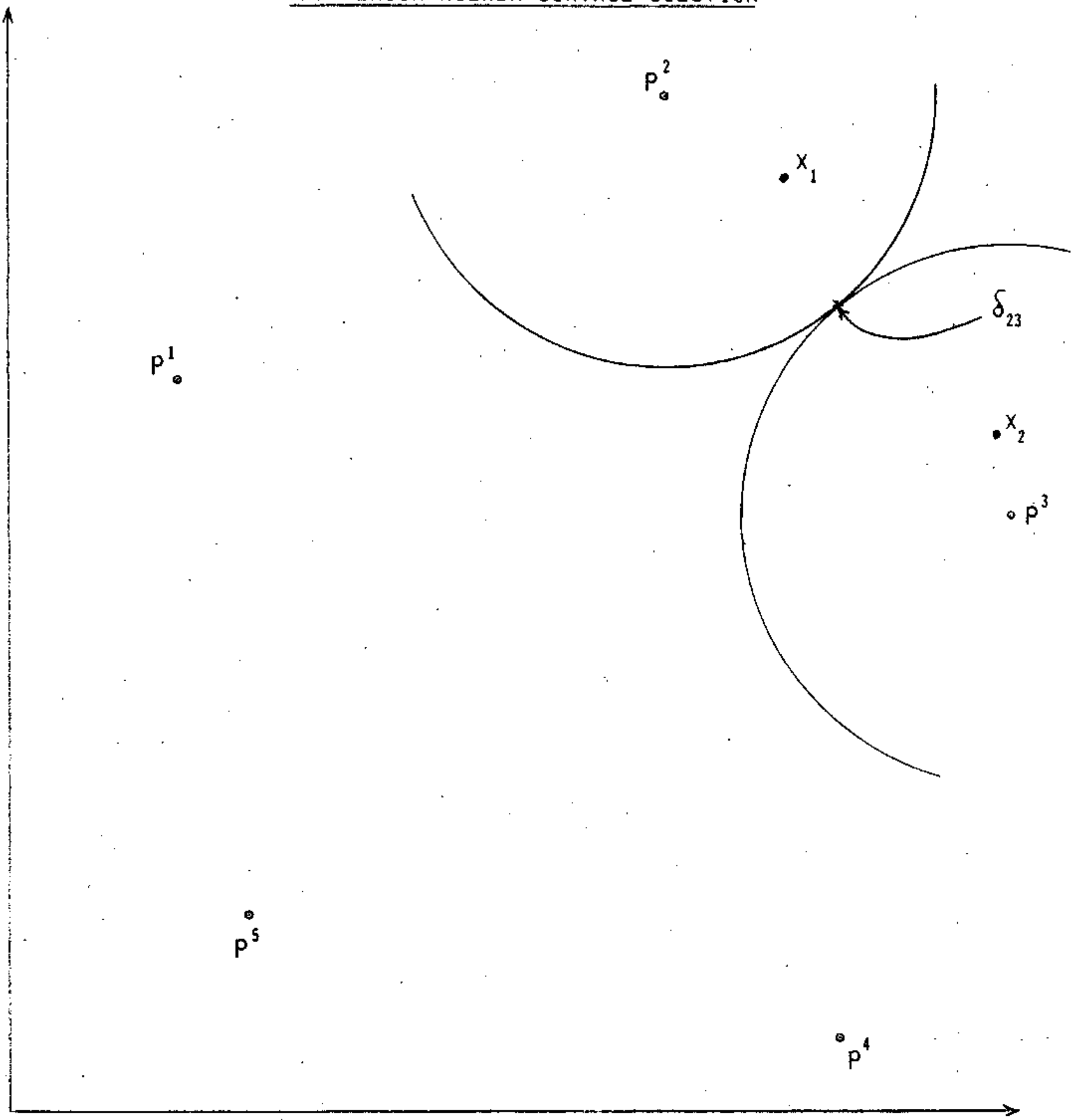
Any other point in the space is highly unstable. I speculate that for the case with $[\overline{n/_k}] \leq f \leq N$, the game returns to a competitive coalition game with f-persons. Here, alternative solutions, such as those discussed in Chapter 2, come into play.

It appears to be the case, then, that as agenda control is shifted, outcomes differ. For games where agenda powers are equally dispersed among all members (f = N), outcomes are expected to be in the Competitive solution. As agenda power is concentrated, actors in the committee narrow the set of outcomes to a point $\bar{\delta}$ with minimax properties. Intuitively, this makes sense. Powerful, contending individuals (factions, etc.), if unable to construct a majority on their own, tend to draw agreements between themselves in order to avoid being left out altogether.[21]

Figure 4-5 illustrates this process for a 5-person, two-dimensional case. Here committee members 2 and 3 are granted exclusive agenda control powers. A number of agendas exist that provide a trajectory into the ideal points of either 2 or 3. However, for any point proposed by 2, member 3 has an alternative that defeats it, and betters 3. For instance, if 2 proposes $\bar{X}_1$, 3 has a counter-proposal X_2, that defeats X_1 via the coalition (345). However, at δ neither member 2 or 3 has any incentive to move from the point. $\bar{\delta}$ is their minimax strategy, and such a strategy cannot be bettered for

FIGURE 4–5

TWO-PERSON AGENDA CONTROL SOLUTION



either player 2 or 3. Any deviation from such a strategy creates instabilities which can result in one or both players gaining less than expected from δ.

Summary

To this point three pairs of predictions have been established, each with a set of outcomes linked to a particular institutional configuration. Central to this linkage is the influence that structure has for the strategic choices individuals make. Examining three different structural elements, and comparing these elements with changes across a baseline model, provides four different sets of outcomes. By limiting these changes to changes across a single rule at a time, interactions between rule sets are ignored. However, logically unfolding constraints imposed on rational strategies by a single rule enables the prediction of fairly narrow solution concepts, and it enables comparisons between similar institutional structures. The particular 5-person committee game in two-dimensional policy space that is the focus of empirical study in this work easily yields sets of solutions to the institutional rules noted above.

Conclusion

In this chapter individual strategic behavior is introduced to the context and structure of a spatial committee game. The primary concern is with deriving a set of solutions for four different institutional structural configurations. Beginning with a baseline model which has been the object of intense modeling efforts and experimental work (see McKelvey, 1976; Fiorina and Plott, 1978; McKelvey, Ordeshook, and Winer, 1978; and McKelvey and Ordeshook, 1978), a quasistable set — the Competitive solution — is described. With a change in institutional rules from simple majority to extraordinary majority rule, the basis over which individuals reach agreements shifts from a set of competitive, coalitionally specific points, to a larger set of cyclic points. With a change in institutional rules defining the number of communications, committee members are expected to shift from specific quasistable points for full communications to points that are pareto optimal under limited communications. Finally, a change in position rules from dispersed to discriminatory agenda control powers results in a shift from the Competitive solution to a smaller minimax sub game among committee members.

These changes imply that structure does have an impact on the choices among strategies individuals use when selecting outcomes. Given the wide variation among solution sets for different institutional configurations, it appears that this impact of structure is not trivial. However, the models presented here are a far cry from behavior in the real world. To begin to bridge this gap, a means of operationalizing and testing these committee structures is turned toward.

FOOTNOTES FOR CHAPTER FOUR

[1]Many of these solutions have some basis in formal social choice literature. Appropriate sources are pointed to and sketches of proofs for the general case are provided.

[2]See Mansbridge (1980) and her discussion of small group processes. Pateman, too, stresses the value of this form of participation, while Tocqueville and Mill point to juries as an ideal forum for bringing together citizens to make public decisions. In many respects, juries can be considered committees charged with a special task. While members of committees in this discussion are narrowly conceived as making decisions for themselves, and not acting as agents on behalf of principals, the mechanics of committees that decide for themselves and those deciding for others are very much the same.

[3]That λ_i is decreasing ensures that $U_i(X)$ is concave. See McKelvey and Wendall (1976) on general classes of utility functions.

[4]As Riker (1971) demonstrates, once sidepayments are introduced, individuals have greater latitude in adjusting the institutional rules to a decision-making arrangement.

[5]This discussion ignores a number of elements that could also be modeled. For instance, a cumulative information loss function β could be included, where $0 < \beta \leq 1$. This could represent Simon's (1957) point that individuals are incapable of processing large amounts of information. Assumption 8d could then be represented:

$$\beta\sum_{j=1}^{\mu} f_j = \beta(^{\mu}/_{s}).$$

However, for now the simple case is analyzed where individuals have the capacity to process information based on a poll of other's preferences.

[6]This way of representing agenda control is from Shepsle and Weingast (1981).

[7]Miller (1977; 1980) indicates circumstances where carefully considering procedural rules does not yield the entire alternative space as a solution. Likewise, Shepsle and Weingast (1981b) examine agenda setting powers and reach conclusions concerning limits on the space of solutions.

[8]For formal development of the K-set, see McKelvey and Ordeshook (1978).

[9]See McKelvey, Ordeshook, and Winer (1978) for the design of an experimental committee structure which is modeled by the K-set. For a more systematic and formal development of the K-set, see McKelvey and Ordeshook (1978).

[10]$\widetilde{DC}_j$ means: does not dominate for a coalition C_j.

[11]Another way of uncovering this space τ is to regard it as the convex set defined by committee members whose ideal points form the vertices of the set.

[12]These stability criteria are based on the von Neumann-Morgenstern stability criteria for the V-set. The major difference is that the internal stability criteria for the Competitive solution is weaker, requiring that the domination relation between proposals needs to be satisfied only for pivotal players. The criteria for external stability requires that not all proposals outside the K-set be dominated, but only those proposals which dominate a proposal in K.

[13]Of course, if the Core existed, then all results converge to it. First, the K-set is equivalent to the Core where it exists (see the proof by McKelvey and Ordeshook, 1978). Second, the result established for the stable set γ, finds it too converges to the Core where the Core exists.

[14]Work is proceeding to generalize the result to n-dimensional space and for n-individuals. While Sloss's work is generalized, her concern primarily is with showing the uniqueness of equilibrium results. An alternative construction of the proof currently under development concerns analyzing the structure of convex bodies and the intersecting properties of simplices of a convex set with a large number of linearly dependent combinations of affine spans.

[15]Plott (1967) assumes that indifferent voters always vote against a change.

[16]Sloss establishes and proves a set of lemmas which hold:

i) every preference relation has a quasigradient at every point $X \varepsilon \Omega$.

ii) the set $M^+(X)$ is a minimal set in the sense that any point preferred to X can be reached by moving in a direction which is in $M^+(X)$.

[17]Plott shows that for the case using simple gradients, a system of inequalities described by a ΔU_i and some row vector r, yields a solution only if strong assumptions are made about the matrix formed by the ΔU_i.

[18]This seems to generally hold for the case where no member's ideal point lies interior to the convex hull of ideal points of members. Where one member's ideal point lies on the interior, it becomes the unique solution.

[19]This of course assumes individuals are not acting strategically, choosing points other than their ideal point for an initial poll.

[20]Of course, the ideal points of each member belong to the pareto set. However, if all ideal points are initially proposed, it is clear that they are cyclic, since each forms a different coalition basis. Once alternatives move into the pareto region, many cyclic proposals are possible. However, the balanced set of cyclic alternatives is much more difficult to locate.

[21]To some there may seem to be an analogy with the work by Downs and others who contend that competing parties set agendas that gradually move toward a median position, if votes are regarded as payoffs. In a sense this is correct. For Downsian-type models, with a limited number of parties, parties do converge toward a median position in order to maximize votes. However, in this instance, the case is slightly different. First, there is no winner-take-all system of payoffs. Agenda setters try to settle on the best point possible, while accounting for the need to obtain a majority of other players.

CHAPTER FIVE

ORGANIZING AND OPERATIONALIZING

"And a 'borogove' is a thin shabby-looking bird with its feathers sticking out all around — something like a live mop."
- Humpty Dumpty

The preceding chapters develop the background to a decision situation, establish the basic structural components to a generic committee structure, and predict a set of outcomes. At this point this amalgamation of decision situation and individual action can be put to empirical test. It is possible to uncover committees in the real world that exhibit very similar institutional configurations to those of concern in this project. However, problems emerge if one is to use "real" committees to undertake empirical study of different institutional structures. The first problem is that it is unusual to observe institutional rule changes of any committee during the course of a relatively short research project. A notable point about the structure of most collective decision-making mechanisms is the gradualness of change. Transformations of organizations are typically slow and in general constitute piecemeal adaptations to specific problems. If committee structural changes are unlikely, it is difficult to find a real empirical setting in which to study the effects of structure on outcomes.

This leads to the second stumbling block, whether comparisons between committees are possible. Committees encompass different historical and cultural experiences for members, confront different policies and goods, and involve individuals with different preferences and valuations for policies. To return to the ubiquitous School Board example, making comparisons between the actions of board members in Elm Springs, South Dakota, and Omaha, Nebraska, would be difficult due to differences of local political, economic, and social factors; differences in the scope of the jurisdictions; and a host of other differences.[1] Attributing differences in outcomes to institutional mechanisms is extremely difficult since many alternative explanations are plausible. Given that the focus of this study is with the effects of structural rules on outcomes, it is crucial to develop a design testing these factors while controlling for other variables that might also contribute to differences in outcomes. To this end, I turn to an artificial committee structure that is controlled under strict laboratory experimental conditions. While removed from the real world, this enables the design and replication of a specific committee structure. Controls over a wide variety of exogenous variables can be imposed, while planned comparisons between endogenous variables are made through ordered changes over these variables.

In this chapter a general overview of the experimental apparatus is developed. First is a short discussion on the usefulness of experimental research. Second, threats to experimental research are discussed. Finally, a description of the experimental format is presented, on the one hand, to illustrate how threats to internal and construct validity are dealt with; and on the other hand, to show how the artificial committee structure used here approximates the models presented in Chapter 4. A discussion of predicted outcomes and strategies for statistical testing is deferred to Chapter 6.

Experimental Research

Since 1976 there has been considerable concentration on experimental work as a tool for testing particular configurations of preferences, institutions, and outcomes. The primary use of experimental data has focused on testing variations in game-theoretic solution set concepts and an attempt at developing new concepts. The experiment described below builds on the 5-person committee games first reported by Berl, et al. (1976), and refined in McKelvey, et al. (1978). Its general form closely parallels that established in the preceding two chapters. The experiment has the general form of a majority rule committee game.

The experiment is not a simulation of the way rational actors would behave under a set of conditions. Simulations are extremely useful when modeling previously identified behavior and subsequently approximating that behavior under various conditions (see particularly the work done by Ferejohn, Fiorina, and Packel, 1980). However, in this case, the behavioral patterns are not entirely clear. A set of structural constraints on behavior are noted in Chapter 4. Likewise, a set of rational strategies and likely outcomes are detailed. Nonetheless, it is impossible to know whether these elements fully capture the behavior of individuals when exposed to such a decision situation. For this project, letting real participants engage in an abstract committee is a useful means for putting the predictions of Chapter 4 to the test. This study relies on human actors within a highly stylized environment to examine the effects of that environment on the behavior and interaction of individuals.

In large part, experimental work provides researchers with controls over variables that are not of theoretical interest and enables flexibility in treating variables of interest. This flexibility also enables a researcher to explore a wider array of questions through planned changes over controlled variables. In the standard reference on experimental design, Campbell and Stanley (1966: 1) turn to W. A. McCall's early work How to Experiment in Education to drive home the point that the primary function of experimental research is to ensure "methods of securing adequate and proper data to which to apply statistical procedure." Although Campbell and Stanley focus on educational research, there is no need to imagine that their rationale for experimentation need not apply to other research endeavors. They claim the experiment is:

> the only means for settling disputes regarding educational practice, as the only way of verifying educational improvements, and as the only way of establishing a cumulative tradition in which improvements can be introduced without the danger of a faddish discard of old wisdom in favor of inferior novelties (1966: 2).

While lavish in praise, Campbell and Stanley also strike a note of caution, directing researchers to eschew grandiose generalizations and "critical" tests. Further, if experimental research is to have value, it must be carefully designed and subject to considerable replication before inferring sets of relationships from accumulated data. Experimental research, then, like other forms of social science research, is based on a solid foundation of design and conceptualization. Some of the more important problems facing experimental design are discussed in the following section.

Commenting on research in political science, Richard Synder (1962) notes four advantages accruing from the use of experimental methods. The first is as a heuristic procedure. Experiments, he argues, "provide us with a simplified universe of observation and an opportunity for manipulation of what we suspect are crucial factors" (1962: 115). In other words, experimentation provides useful insights into specific sets of relationships. Second, experimentation tends to force precision in theory construction (1962: 117). This arises largely from the need to specify particular sets of relationships and manipulate variables prior to their testing. Third, experimentation allows for "probing" of specific elements to a theory (1962: 118). Synder claims here that political science is faced with an imposing variety of variables and relationships. Experiments have the facility for weeding out less important variables and isolating those that appear important under particular contexts. Finally, experimentation has the potential to encourage the dynamic study of events (1962: 121). Much of political science research is static and cross sectional. Experimentation allows situations to be repeated and differently sequenced in order to assess the effects of many different factors on outcomes.

Synder, like Campbell and Stanley, also recognizes the dangers inherent in experimentation, primarily from overgeneralization, but similarly from improper design and execution. Although favorably inclined toward experimentation as a tool of political science. Synder is not as strong in praise as Abraham Kaplan's claim that:

> Experimentation is the consummation of the marriage between reason and experience, and though it is not in itself the life of the mind, it is the most passionate and fruitful expression of our intellectual life and loves (1964: 147).

Charles Plott (1979) also has turned to the question of the applicability of laboratory experimental methods. Plott claims that laboratory experimental methods are particularly valuable for public choice research. This follows from his twofold characterization of such research as concerning:

1. The "choice between alternative modes of social organization and institutions"; and

2. A view of the individual "as strategically applying powers and information afforded by the institutional structure in accord with his own independent preferences rather than as having his preferences follow endogenously from the social position, organizational structure, or role in which he finds himself" (1979: 137-138).

Arguing that the existence of meaningful data is a chronic problem for public choice research, Plott echoes Campbell and Stanley by noting that laboratory experimentation can provide useful data for research.

In order to successfully study the relationships between preferences, institutions, and outcomes, Plott argues that two basic axioms must be accepted. The first holds that the behavior of "various modes of organization is independent of the <u>sources</u> of preferences as long as the preferences themselves remain unchanged" (1979: 139-140). The second axiom declares "that the relationship between outcomes, preferences and institutions is (supposed to be) independent of the nature of social alternatives" (1979: 140). Given these axioms, which are central to most social choice models, Plott contends it is possible to induce preferences on individuals by providing them with a function that yields payoffs over some abstract set of alternatives. As long as individuals prefer more of the payoff to less, and as long as sidepayments are not possible, the individual's preferences will be well-ordered and transitive.*[3]

Plott goes on to argue that the value of laboratory experimentation lies in, first, the ability to test competing principles. He explains that there are innumerable explanations in the social sciences. Laboratory experiments provide a unique opportunity to devise many different types of tests to compare different explanations (1979: 141). While it may not be possible to indicate which explanation is correct, it is possible in some circumstances to reject some explanations. Plott's argument is that if an explanation does not work in a context which is abstracted and designed to allow it a maximal chance to work, then the explanation should not be expected to work in the real world (1979: 151). Finally, Plott also argues that laboratory experiments are valuable in allowing the opportunity for structuring "synthetic" processes -- processes which have only historical antecedents, or which have never existed (1979: 155). Plott, then, contends that laboratory experimentation can be valuable when dealing with relationships between preferences, institutions, and outcomes.

Laboratory experimental research is not a panacea for all research concerns in political science. Clearly, it has its limitations, as many critics have pointed out. Most particularly, as a research tool, it forces an oversimplified abstraction of the world, it cannot encompass all of the complexity of the world, and generalizations about the world are difficult to derive from experimental research. However, some of these limitations also point to the strength of experimental methods. First, abstractions allow particular sets of relationships to be singled out for manipulation and test. Second, relationships that are not of theoretical interest can be controlled, again to isolate what is important for the researcher. Third, given a narrow focus, special insights can be derived from this type of research. Fourths many tests can be structured to test many different explanations. Finally, experimentation provides a relatively inexpensive and replicable means of collecting data. As Kaplan notes:

> The meeting place between theory and experiment is one of those dangerous intersections at which neither vehicle is allowed to proceed till the other has gone by; the remarkable thing is that traffic moves most freely only when both roads are well traveled (1964: 161).

While experimental methods have these virtues, poorly designed and executed experiments can be said to have no virtues at all. With regard to Kaplan's metaphor, poorly designed experiments tend to create havoc at the intersection.

Experimentation and Design[4]

The design and execution of experiments is critical for enabling their interpretation. Since the primary task of an experimental setting is to provide for the collection of data subject to analysis, and since experimental settings enable reseachers flexibility in controlling exogenous variables, it is imperative experiments be properly designed and executed. Interpretability is primarily assured in two ways. First through eliminating alternative explantions for experimental outcomes through statistical controls or through design. Second, interpretability is assured through replicability. If an experiment is carefully detailed, and procedures explained so that others can use the same design, then retesting those results is possible. This assures that the initial set of results is not due to special circumstances. This condition is further discussed in the next section when elaborating this particular experiment.

While the proper design of experiments enables interpretation of results, generalization of those results presents an entirely different problem. By its nature and intent, experiments abstract particular contexts in order to test specific sets of relationships. Generalizing from a relatively constrained and controlled environment to a real-world situation requires either isomorphism with the situation being modeled, or the strict satisfaction of specific criteria relating to external, validity. Isomorphism is practically impossible to achieve given the contextual complexity of real-world situations. The experiment detailed below lacks the rich context of real-world committee processes and cannot be considered isomorphic with real committees. However, this is intentional since the theoretical concern of this project focuses on a specific set of variables and relationships.

Additionally, this experiment does not meet the rigid standards for external validity established by Campbell and Stanley (1966). They define external validity as the generalizability of findings, or being able to extend findings to the full population (1966: 2). In general, to satisfy claims for external validity, a researcher must be certain that the findings hold across a wide context. Of course, meeting the canons of external validity is no guarantee for generalizability given problems of induction (see Campbell and Stanley, 1966: 17). Most experiments that rely on a small, unrepresentative sample rarely meet such standards. This in itself does not undermine the thrust of experimentation. Although generalizations from experimental results cannot be extended too broadly, it is still possible that those results are valuable for corroborating a particular model. In turn, that model may provide insights as to structures with similar properties in the world. At the very least, failure or success in testing specific sets of relationships may direct future research efforts — whether experimentally or in the world. As such, experiments are useful, although what can be generalized is limited.

Since experiments do not meet rigid external validity criteria, and because they strive to control rather complex influences of exogenous variables, it is crucial that experiments meet rigid standards relating to internal validity and construct validity. Internal validity is concerned with curbing possible contaminating influences to the experiment. The set of possible influences, then, must be accounted for _prior_ to conducting an experiment and the experiment designed to minimize variation through planned controls, through statistical design, or through randomization. Threats to internal validity can emerge from individuals learning over the course of the experiment. This may take such varied forms as participants picking up behavioral cues from tests, from the researcher, or may be a function of events and time transpiring between observations. Other threats can emerge from the attributes of individuals. Differences among those selecting into or those dropping out of an experiment can easily threaten interpretation of data. Finally, interpretation is threatened by events beyond the control of the researcher. Often it is difficult to stop diffusion of a treatment, since control over participants outside the experiment is generally impossible. Likewise, unanticipated events during the course of an experiment (such as a fire alarm) can detract an individual's attention to a treatment. Many different contingencies can be planned to grapple with different circumstances. However, experiments follow social laws as well as do day-to-day affairs. When all contingencies are planned, Murphy's Law takes effect.

Construct validity concerns the specification of clear, testable relationships that are not subject to alternate interpretations. With proper specification and controls, alternative explanations can either be rejected outright or be subjected to empirical test. Since experiments primarily test prespecified sets of relationships, and since experimentation allows flexibility in specification of treatments as to time, quantity, and quality, it is incumbent on the researcher to encourage the formulation of explicit, testable propositions. Meeting conditions of construct validity contributes toward assuring that the explanation under test is capable of falsification or corroboration.

From this brief catalogue of threats to validity, it is apparent that to guarantee reliability and replicability, experiments must avoid a wide variety of problems. Fortunately, given the unique opportunities for controls over a large assortment of variables, this is not difficult. The rewards for overcoming these threats to validity are manifold. Statistical reliability is increased, tests of competing models are improved, and confidence in inferences about treatment effects is heightened. With these threats to validity in mind, the next section details the experiment used in this study. At appropriate places, threats to validity are pointed out, and the means for lessening those threats are elaborated.

COMMITTEE: A Computer-Controlled Experiment

The experiment is designed to accomplish three things. First, to approximate the committee structure outlined in Chapter 4. Second, to meet threats to internal validity. And third, to simplify empirical analysis. It is similar to the committee discussed in Chapter 2 and outlined in Chapter 4. Members are charged with selecting an alternative from a two-dimensional policy space. Each individual has induced preferences over all points in the space (the set of alternatives) while a subset of individuals (a majority) must collectively select an alternative from the policy space. Typically this involves participants introducing proposals (according to some pre-established procedure) until agreement is reached. Although similar to other committee games, participants do not have face-to-face contact. Instead, participants are seated at individual computer terminals. From their terminals, each member is able to learn specific and controlled information about the experiment, is in contact with other committee members, and is able to vote on different proposals. All committee interaction is mediated by a computer system that displays the alternative space, various proposals, calculates values, and tallies outcomes.

Face-to-face participation has been integral for many of the committee experiments performed to date. However, this format entails serious threats to internal validity because communications may exhibit considerable (uncontrolled) variation. While transcripts of most experiments are available, they do not capture inflections in tone, strident refusals, or threatening demands.[5] The intricacies of discussion may provide clues as to committee behavior and may be important variables for predicting committee outcomes. By the same token, nonverbal communication may be important as committee members indicate their willingness to join a coalition, cajole others into an agreement, or impress other members with the earnestness of their threats. Nonverbal communication is difficult to decipher. Inadequate documentation of these modes of communication is generally the rule since it requires either highly skilled unobtrusive observation and detailed notes, or thorough video-taping of each experiment. By routinizing and mediating communication with a neutral umpire — a computer — these threats to validity are lessened. It is hoped that the gain from extra controls (where these exogenous variables are not of direct theoretical concern for the project) will override any of the attendant difficulties with removing the "soul" (unconstrained discussion and debate) from committee behavior.

Recruitment

The experiment uses participants responding to an advertisement in the student newspaper. Respondents telephoned to volunteer for the experiment and were read a short statement characterizing the experiment. No cues were given as to who was conducting the experiment (many thought it was a psychology experiment) nor as to the operation of the experiment. This was to lessen hypothesis guessing and other expectations on the part of participants. The primary focus of the telephone exchange was to assure individuals that all data collected would be kept strictly confidential, inform them they would make decisions within a committee, and stress that they would receive compensation in cash at the conclusion of the experiment. Discussion of the amount of compensation was deliberately kept vague, but if pressed, some minimum and maximum ranges were suggested to ensure participant recruitment.

Accepting volunteers on a first call, first accepted basis presents two problems to the experiment: the randomness of the population, and the ability to function with a highly technical piece of machinery (PLATO). Randomness is an important way of lessening important threats to internal validity. Randomness assures that the participant population is well mixed, and that no serious group effects are found between treatments. Because participants chose the day they wished to participate, some threat to internal validity may be posed by self-selection. To minimize this effect, more individuals than required for each experiment were recruited. At that point friends were sorted out, in an attempt to minimize the possibility of pre-play strategies. Also, while the number of treatments was limited, these treatments were randomized over groups. This randomizing element should weaken threats of maturation, self-selection, testing, instrumentation, statistical regression, and interactions with selection.

Once volunteers appeared for the experiment, and five participants were selected, they were seated before different computer terminals. To control for the possibility that coalitions might develop associating each member with a particular terminal, the letter identifying players was randomized during the course of the experiment. On the one hand, this prevents participants from making choices based on knowledge of others in the game. This includes developing patterns of reciprocity, since identities change from round to round. On the other hand, this contributes to individuals pursuing self-interested behavior — in accordance with the models developed in Chapter 4. Since individuals remain anonymous and all payoffs are privately made, few incentives exist to act in a non self-interested manner.

To ensure that participants were equally prepared for the experiment, instructions appeared in a packaged "lesson" prior to beginning the experiment. The computer-controlled lesson is self-paced, providing full instructions about the mechanics of the terminals and the workings of the experiment. The instructions are worded to provide only information relevant to play, and avoid providing information about experimental hypotheses. This lessens threats to validity derived from researcher expectancies and hypothesis guessing. The lesson includes examples of situations participants might face and instructs them in various means of responding without evaluating their performance (see Appendix 5-1 for instructions). These lessons served two purposes. First, by presenting standardized instructions delivered via the "neutrality" of the machine, all participants are treated to the same materials. Second, it allows participants to acquire necessary skills prior to playing the game. In general, participants are well-drilled before beginning the experiment. A relatively small proportion of participants complained of having problems following the instructions (20 percent).[6]

In order to lessen confusion and to provide hands-on experience, participants played a practice round with one another before starting the experiment. While similar to other rounds, this practice round had a shorter time limit and had the Core as an expected solution. Such a solution is known to converge and so is thought to be a good, brief introduction to the mechanics of the experiment.

By randomizing treatments within groups, randomizing player's identities, and limiting information as to the nature of the experiment, a number of threats to validity are lessened. Recruitment and initial contact with an experiment are important sources of threats to validity, since it is at these junctures participants develop their initial expectations about an experiment. Considerable care was taken not to inflate or otherwise contribute to these expectations.

Experimental Structure

The experiment is conducted on the PLATO interactive computer system. The system is extremely flexible and adaptable to such research.[7] The PLATO system provides a number of benefits to research.[7] One advantage is derived from the high resolution graphics capabilities of PLATO. This enables simple, straightforward displays of the policy space, preference curves, and locations of proposals. Any information participants require is at their fingertips. Fast plotting and constant updating of information make presentation of the experiment relatively simple.

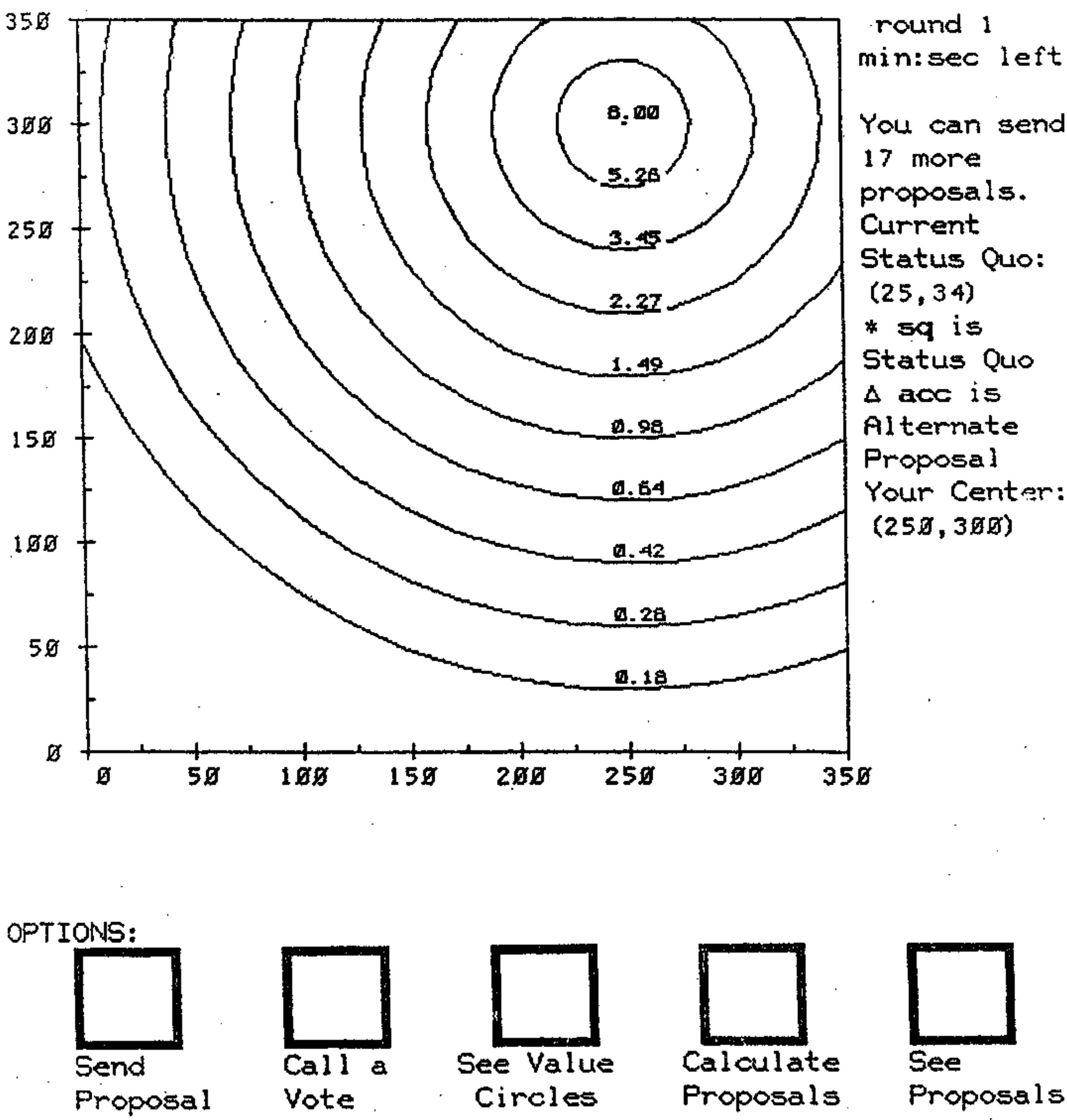
Second, at the heart of the experiment is communications among players. Since participants are not allowed to speak with one another, a means for communicating on proposals is necessary. PLATO is a highly interactive system that not only allows fast turn-around between the terminal and the mainframe, but enables individuals to access information common to the group. This feature allows specification of information shared by the groups and that which is unique to the individual. Third, data storage, handling, and interpretation is simplified.

While the experiment is conducted over a computer, and involves considerable programming complexity, task complexity is reduced for participants. Participants face a proposal screen over which all proposals are plotted. The screen includes the two-dimensional policy space that proposals are mapped onto, and a set of boxes providing individuals with five different options (see Figure 5-1). These include options to: send proposals, bring a proposal to a vote, display preference curves, operate a calculator giving specific point and value readouts in the policy space, and see a full list of proposals. These options are activated by touching the appropriate box drawn on the PLATO screen. This interrupts a light grid, in turn activating a subroutine. Such a touch mechanism substantially reduces task complexity, and makes the experiment less formidable for those unfamiliar with computers.[8]

The major component of the experiment concerns the proposal screen. This screen represents a two-dimensional policy space. It has two axes each with 350 distinct units, marked off by increments of 25 points. The screen is blank, except for the axes. Each axis represents an arbitrary policy, with no identifying characteristics. This is to provide as few exogenous cues as possible to the experiment.[9] The proposal screen provides visual cues to individuals

Figure 5-1

COMMITTEE: Main Screen



as to where their own proposals lie and the proposals of other committee members. When a proposal is sent it appears as a point on the policy space. It is identified by a number indicating the sequence of the proposal and a letter identifying who sent it.

The first option on the proposal screen allows participants to propose alternatives. After choosing this option, participants must enter coordinates of the proposal they wish to send. Once the coordinates are selected, the value of that proposal is calculated for them and displayed. Members then decide whether they wish to send this proposal. If sent, it appears on the screen for all to see. During the experiment, each player is limited to a maximum of 20 proposals per round. The upper limit for data storage is 72 messages per round. However, this was no serious constraint to most experiments. Only one experimental round ever reached the maximum.[10]

The second option brings proposals up for a vote. The voting procedure in the experiment follows an amendment procedure, where an initial status quo proposal is arbitrarily imposed. The current status quo is always displayed as such on the proposal screen. As with most committees, no proposal can be voted on without a seconding motion. Individuals then have two seconding options. The first allows a committee member to second an alternative proposal (not that member's own). This alternative is then compared with the status quo using a binary voting procedure. If the alternative beats the status quo by a majority vote, it becomes the new status quo. Otherwise, there is no change. The second option allows any member to call the current status quo to a vote.[11] The status quo is then voted either up or down. If a majority votes to accept the status quo, then the round ends. Otherwise, the round continues.

Once a vote is called, members are warned that a vote is impending. They are provided information as to the proposal number, its coordinates, who sent it, who seconded it, and its value. Additionally, its location is displayed on the proposal screen. After 30 seconds, all members are shifted to a display where they cast their vote. Voting is by touch input on the screen, with each alternative and its value to the individual clearly identified. Once the vote is complete, all players are given information about how the committee voted, including individual player's votes.

If no agreement is reached on a proposal during a round, the current status quo becomes the final proposal. This implies a stopping rule enforcing a time limit on each round. During the experiment, each round was limited to 20 minutes. A countdown clock was included showing the amount of time remaining in the round. During voting the clock stopped, resuming following restart of the round. Such a stopping rule is familiar in most real-world institutions, where unlimited debate on a decision is a luxury. Additionally, such a rule was necessary to make efficient use of computer facilities and to keep total participant time in the experiment to a reasonable length. On the whole, the stopping rule did not appear to constrain participation in the experiment. The average time taken to arrive at a decision was 14*3 minutes.[12]

The third option on the proposal screen enables individuals to view an overlay of their preference curves. It draws a set of representative preference curves on the policy space that encircle the ideal point of the individual player. Players see only their own preference curves, and not those of others. Further, they know only their own ideal point and not those of others. As a result, players have no knowledge of payoffs to other players, nor their preferences. The only information available to them is complete information as to their own preferences.

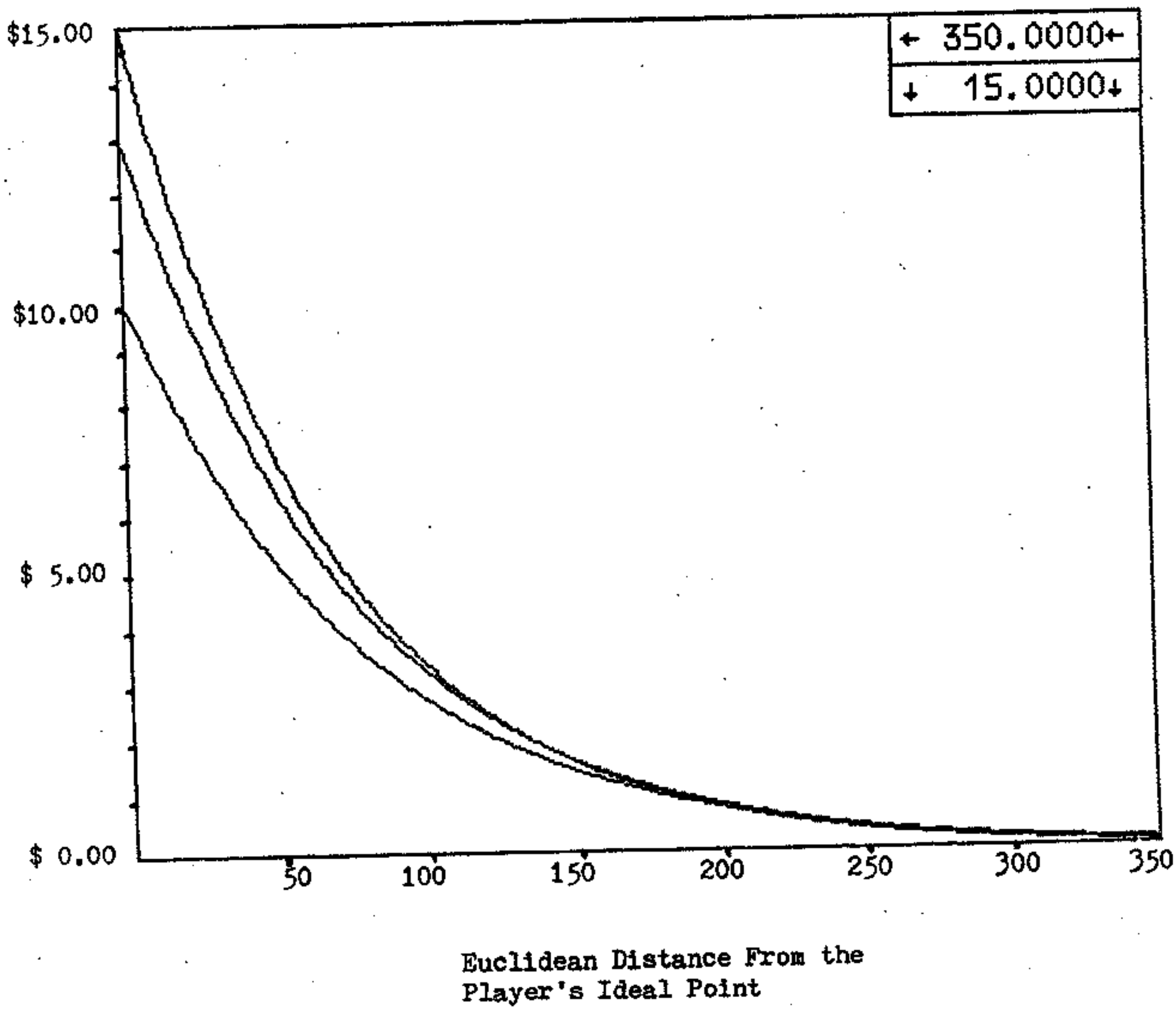
Every individual has an ideal (''bliss'') point that is their highest valued point in the policy space. Valuations for other proposals drop off as a function of distance away from the player's ideal point. Further, the shape of these valuations are circles whose radius is the distance from the ideal point. Participants are indifferent among proposals that lie on the ball of points defined by the distance radius from the ideal point. In other words, an individual receives the same payoff for any point that lies some $\|p^i - X_n\|$ distance away from their ideal point p^i.

Preferences are not something participants bring with them to the experiment. Instead, committee members are assigned specific ideal points. Those points change during each round. Further, each player is provided with a specific payoff function: λ. Like ideal points, these payoff functions vary with players and across rounds of the experiment. In order to lessen boredom with the experiment, and in order to preserve limited funding for payoffs, these payoff functions λ are not linear with distance. Instead, they are based on logged values. Figure 5-2 illustrates the payoff functions used during the course of the experiment.

While it is difficult to entirely separate individuals from their own valuations for objects, the structure of the experiment tries to induce valuations over outcomes. Smith argues that induced valuation only depends on the postulate of nonsatiation, where:

Figure 5-2

Sample Payoff Functions



> Given a costless choice between two alternatives identical except that the first yields more of the reward medium (usually currency) than the second, the first will always be chosen (preferred) over the second, by an autonomous individual, i.e., utility is a monotone increasing function of monetary reward. . . (1976: 275).

Smith qualifies this postulate, pointing to instances where subjective costs are associated with decision making, when a "game value" is attached to experimental outcomes, or where individuals may not be "autonomous own-reward maximizers." The first case entails boredom with the experiment, such that rewards do not sufficiently offset tasks involved with the experiment. In this instance, rewards can be substantial. Participants were informed that the amount they made for the experiment depended only on the decisions made by a majority of the committee. Payoffs could range from a low of $.04 to a high of $48.00 for roughly 2 hours in the experiment. The expected value for each participant ranged around $7.50. The potential rewards were considerable in the experiment. Further, an overwhelming majority (96 percent) indicated they were willing to participate again, if they were given the opportunity. By the same token, many stressed their enjoyment in participating. Thus, it seems that subjective costs for the bulk of the participants were low.

The second qualification concerns individuals attaching a value to participating in the experiment rather than for the reward medium. Smith points primarily to participant satiation with "point" profits. In this experiment, all outcomes are real-valued, and not a function of point accumulation. Individuals did not have to estimate distance and peruse a table to calculate payoffs. These were constantly given in dollar amounts. While one participant indicated she would play again "even without money," most were quite eager to carry off their winnings. The design of the experiment apparently overrides this qualification.

The third qualification concerns cases where individuals act with regard to the gain by others, or what Smith characterizes as "[interpersonal utility criteria" (1976: 278). In this experiment, however, individuals know nothing of the payoffs to others, or even who other participants are during any round. Similarly, changing maximal payoffs and payoff functions further contributes to individuals acting for themselves rather than seeking equitable outcomes — especially given that they have no idea as to the amounts others are earning. In all, it appears this experiment meets the objections to the satiation postulate, and that the reward structure is sufficient to expect some form of induced valuation over proposals in the alternative space.

The payoff function defining valuations and player's ideal points changes throughout the course of the experiment. Laing and Olmsted (1978) employ a number of different preference configurations in order to test the applicability of the Competitive solution and to examine dynamic processes across many rounds of an experiment. Their use of face-to-face procedures, and the inability to mask players, force them to employ many different preference configurations throughout the game to ensure that individuals played "different games." In this experiment, this is largely unnecessary, since individual identities, payoff valuations, and ideal points are readily manipulated. Further, this experiment is primarily concerned with testing changes across structural variables, and not with uncovering solution set concepts.

An important fourth option on the proposal screen is the calculator. This option enables the use of a cursor to identify the precise location and value of any point in the alternative space. Once the calculator is engaged, either touch input, or a set of keys, can move the cursor to any location in the policy space. Rather than estimating locations and values for alternatives using the preference curve overlay, this option provides a quick method for establishing precise locations and values. Many participants used this option almost exclusively, rather than dealing with preference curve overlays.

The final option enabled individuals to view a sequential listing of all proposals. By selecting the "See Messages" option, participants are provided a sequential listing of proposal numbers, who sent the proposal, its coordinates, and the value to them. Since many proposals are usually sent, only the most recent five proposals are displayed. However, pressing a key lists all proposals sent during the round. The same is true with proposals displayed on the main proposal screen. Whenever returning to the proposal screen, only the most recent 10 proposals are displayed. However, pressing a key plots all proposals sent during the round.[13]

Retrospection

The key to COMMITTEE is that participants make a series of decisions under well-specified committee structures. During each round, player identities change, individual preferences change, and on occasion, the structural rules to the committee change. The reason for designing this experiment is to test the four committee structures outlined in Chapter 4. The technology of PLATO allows replication of important aspects of these structures, while at the same time reduces task complexity for participants. Here, in Chapter 4, changes in the experimental committees occurred only with respect to aggregation rules, communication rules, and position rules. All other aspects of the experiment are held constant in order to test only for the effects of structure on outcomes.

Elements Held Constant to the Committee Decision Situation

Considerable care was taken to control for the effects of individual differences within and between committees. Although individuals may vary in the attitudes they bring with them, their preferences are well-defined through inducing valuations for the experiment's abstract policy space. Learned patterns of behavior, too, are controlled since only first time participants are allowed. Given the unique nature of the experiment, it is unlikely mixed groups of participants had experience in similar situations, especially given the abstract nature of the committee structures within which they participated. By and large, it is doubtful that the individual's past experiences dictated strategic behavior without regard to the structure of the experiment itself.

As to constant structural elements of the committee, the first concerns boundary rules. Only five individuals participated in any experiment. No one dropped out during any of the experimental rounds. The scope of the committee is clearly defined since members are charged with reaching majority agreement on a point in the alternative space. This space is fixed in two-dimensions with 122,500 unique alternatives. Because of the density of alternatives in this policy space, individual preferences can be considered nearly continuous. Finally, procedural rules are equally well-defined. A decision is made once a majority agrees to the current status quo. If agreement is not forthcoming, then the current status quo becomes the decision once time is up. Comparing alternatives and sending proposals is routinized by explicit rules (and enforced by PLATO) as to who can second a motion and send a proposal. These constant elements to the experiment approximate Assumptions 1 through 6 in Chapter 4.

Structural Variations

The primary purpose of the experiment is with testing predicted outcomes derived in Chapter 4. While the bulk of the committee structure remains constant throughout the experimental series, variations do occur both within and between experimental groups. These variations focus on aggregation rules, communication rules, and position rules. Aggregation rules are simple to impose. They require either a 3-person or a 4-person majority vote. This rule applies to votes seeking to change an alternative to the status quo, or votes to end the round by passing the status quo. This closely parallels the distinction in Chapter 4 between simple and extraordinary majority rule.

As to the communication rules, participants are constrained to sending either 3 or 20 proposals. This variation in the rule concerns the exchange of information between players. Participants confront an enormous policy space with an excellent understanding of their own preferences, but with no idea as to the shape of other's preferences. Sending proposals is regarded as serving two functions. First, it advertises the participant's preferred policy space. Second, it enables bargaining and negotiation. Since no alternative proposal can be brought to a vote without a seconding motion by another player, players' proposals usually must move away from their ideal point to uncover majority support. As the number of proposals increases, players have greater latitude in negotiating a decision. Belonging versus not belonging to a winning coalition can mean a difference in payoffs ranging between $1.50 and $4.50 per round. While sending 20 proposals is generally sufficient to search through the policy space, a rule constraining participants to sending only 3 proposals strongly limits bargaining and negotiation. This limitation resembles that modeled in Chapter 4.

Finally, with position rules, constraints focus on agenda control. A particular concern is whether individuals share similar agenda powers or whether a subgroup of participants are assigned special powers. Returning to the importance of sending proposals, position rules are conceived as either the power for all participants to send proposals, or the power of two participants to send proposals. In this experiment, the agenda can only be formed where alternatives are proposed to the status quo. Where all are able to send proposals, then position rules do not assign specialized powers. Where agenda control is placed in the hands of a limited subgroup of the participants, then position rules do assign specialized powers.

Again, this variation across structure approximates the model discussed in Chapter 4.

To ensure that participants clearly understand the structure of the committees, at the outset of each round participants are given basic information about the round. They are told which committee member they are. given an ideal point with representative preference curves labeled in dollar amounts, told the number of votes required to pass a proposal, and informed as to whether they can send proposals (and how many) during the round. Also, a short quiz is given before beginning to determine whether they understood the constraints imposed during the round. The information and quiz are given by PLATO, and participants cannot begin the round until responding correctly to each question.

Conclusion

Aside from a few adjustments — such as queuing proposals that are voted on and setting a maximum time limit on a round — these experimental committees resemble those developed elsewhere in the formal literature. It should be kept in mind that these experimental committees are abstractions of the models developed in Chapter 4.. Likewise, those models are subsets of generalized meta-rules discussed in Chapter 3. Although these structural components could be represented in many different ways, this should not jeopardize empirical work concentrating on a narrow question of whether structural differences induce different sets of outcomes. Since the experiment is an abstraction of a complex system of relationships, if any meaningful empirical relationships are to be uncovered, threats to construct and internal validity must be lessened. This has been done through specifying the outcomes and structural components under consideration and through careful randomizing and masking procedures. The discussion in this chapter sets the stage for the discussion of empirical results in Chapter 6.

FOOTNOTES FOR CHAPTER FIVE

[1]A properly constructed "most similar systems" design would enable controls over many of these variations. However, two major problems face such designs. First, there is a problem of locating "similar" systems. Given the wide variation among research contexts, it is a difficult task to select a proper research sample. Second, the researcher has little control (if any) over variations once the research samples are selected. Whether these variations are crucial for hypothesis testing is something the researcher must anticipate. However, research often obeys Murphy's Law.

[2]As to testing solution concepts, see Berl, et al. (1976), Fiorina and Plott (1978), and McKelvey and Ordeshook (1979a). For the development of new solution set concepts, see McKelvey, et al. (1978), Ferejohn, Fiorina, and Packel (1980), and Hoffman and Packel (1980).

[3] For an excellent discussion of the concept of "induced preferences," see Smith (1976).

[4]The discussion of various types of validity criteria which need be met follow from discussions by Campbell and Stanley (1966) and Cook and Campbell (1976). Other works which have informed this particular section include Kaplan (1964) and Kerlinger (1969).

[5]In many cases tape recordings are available. Even so, coding problems emerge in differentiating between an express and implicit threat conveyed by inflection when committee members are debating a proposal.

[6]This data is taken from a post-experiment questionnaire. Percentages are based on a total n of 105. A smaller proportion (10.5 percent) complained of having difficulty in participating in the game. Many opportunities were provided for individuals to ask questions and to use the options connected with the experiment. After an initial period of frustration, most seemed very comfortable with the tasks facing them during the experiment.

[7]For examples of the usefuleness of PLATO and its general applicability to experimental literature, see Williams (1980); also Murnighan and Roth (1982).

[8]An initial version of this experiment did not use the touch input mechanism. Instead, participants typed in options. Confusion and complaints about using the equipment dropped dramatically once the touch mechanism was employed.

[9]Smith (1976) argues that in presenting goods or policies across which individuals will have induced preferences, that it is best not to provide extra cues to detract from the purpose of the game. Labeling the axes with a traditional policy tradeoff such as "guns and butter" might potentially influence individuals regardless of their payoffs. Participants with an aversion to military accoutrements, or

their counterparts with an aversion to useful production when it threatens military strength, might bring a set of values to their play that transcends the payoffs they receive.

[10]An experiment was run with no time or proposal limits. Members participated in a single round with substantial payoffs. Participants familiarized themselves with the experiment by playing a number of practice rounds. During this experiment, no player sent more than 10 messages, and a point was settled on and agreed to in under 10 minutes.

[11]There is a limit on bringing the status quo to a vote. The same member cannot bring the same status quo to a vote twice in a row. Another member must bring it to a vote or a different proposal must be voted on before an individual can bring the same status quo to a vote again. This rule was imposed to provide a queuing method for the experiment. During pretests it was discovered that individuals quickly learned to use the "seconding" option as a filibustering technique. That is, they would wait until a status quo was settled on close to their ideal point, then continue to have it voted on until time ran out. This unanticipated rule effect points to the use individuals make of rules when choosing their strategies.

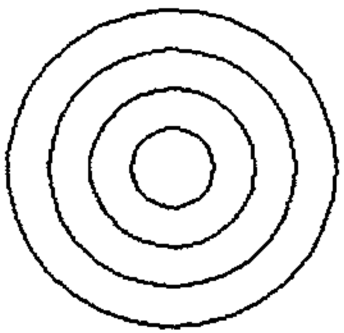
[12]This excludes games with extraordinary majority rules. Here the average time was substantially higher, taking 18 minutes. This was due to the difficulty in moving the status quo. This dynamic is discussed in Chapter 6.

[1]During pretests all proposals were displayed. Participants complained that the screen became too cluttered, and that it was difficult to decipher what was going on. Once this change was made, complaints stopped.

APPENDIX 5-1

Appendix 5-1

Welcome to
COMMITTEE

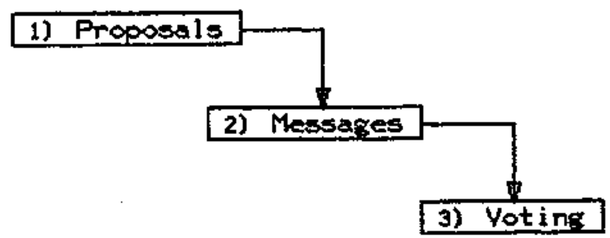


An Interactive

Committee Decision Making
Experiment

COMMITTEE

This is COMMITTEE, a decision making experiment. You do not need to know anything about PLATO in order to participate. The instructions are simple. If you follow them carefully and make good decisions, you might earn a considerable amount of money. You will be paid in cash at the end of the experiment. This experiment has three distinct steps.



A majority of the Committee members (the other people in this room) must reach a decision. The amount of money you make in this experiment depends only on the decisions that are made.
To reach a decision you suggest proposals to the committee; you communicate with others via your computer terminal; and, you vote on proposals.

Press NEXT to Continue

COMMITTEE

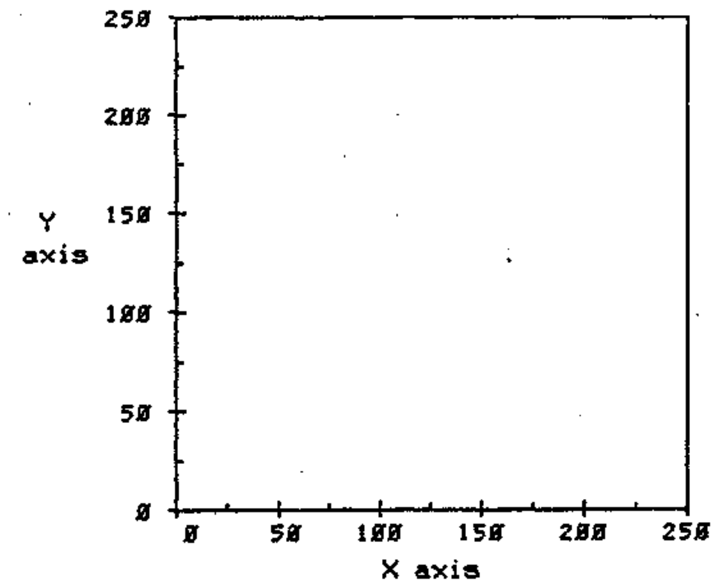
You go through the process of selecting and passing a single proposal only a few times. Each time a proposal is passed, your payoff from that proposal is recorded by PLATO.

You will now review the steps to finding proposals, sending messages, and voting on proposals. Once you have finished the review session, the experiment will begin.

If you have any questions at any time, please raise your hand and ask the experimenter. Good Luck!

Press NEXT to Continue

Proposal Screen

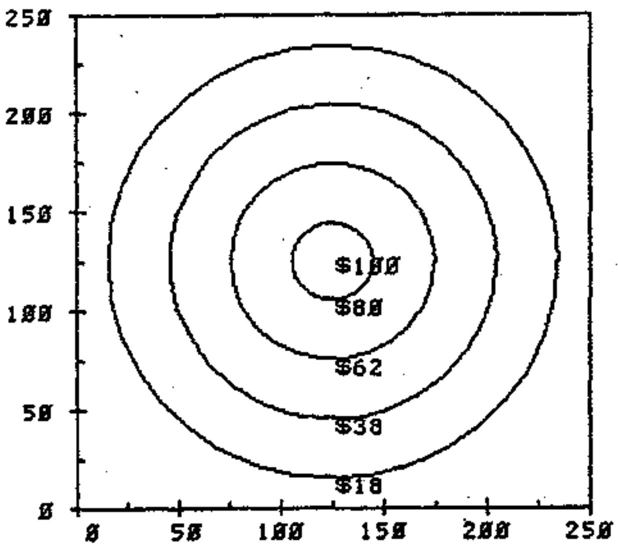


This is a proposal screen. You will see the proposals offered by other members on a screen similar to this. This screen has both X and Y axes with values ranging from 0 to 250. A proposal is a point appearing on the screen with an X value and a Y value.

Proposal = The Point (X,Y)

Press NEXT to Continue
Or BACK to Review

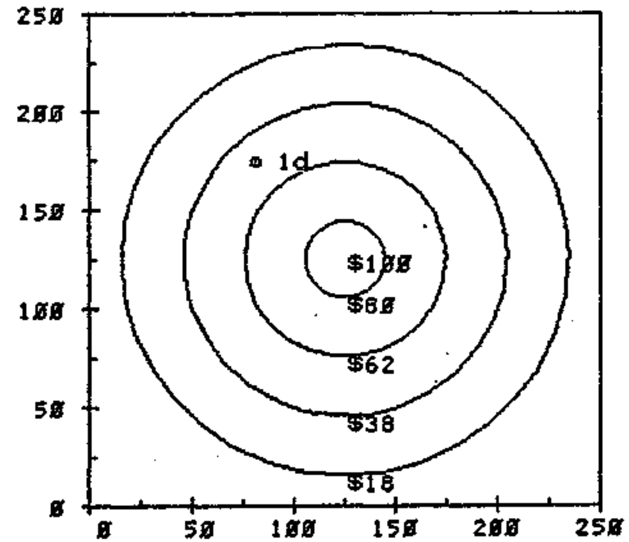
5



The circles on this screen give you some idea how much every proposal is worth to you. Notice that your center point is worth the most to you, and that as you move away from that point, proposals are worth less to you. Your center point will not always be in the center of the Proposal Screen. It is different every round.

Press NEXT to Continue

6

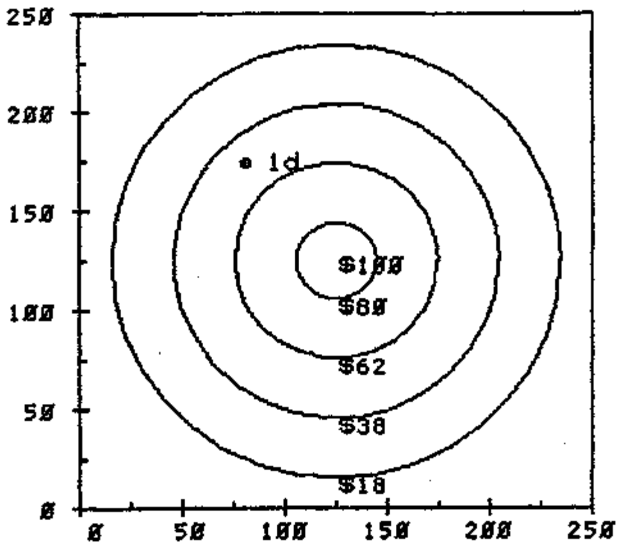


Suppose Committee member -d- sends the proposal (8Ø,173).
It appears as -• 1d- on the Proposal Screen
-•- indicates where the point is located
-1- indicates it is proposal # 1
-d- indicates member d sent this proposal.

Notice that it falls between two value circles. You can estimate that it is worth about $5Ø. If the commitee voted to pass this proposal, that is what you would receive.

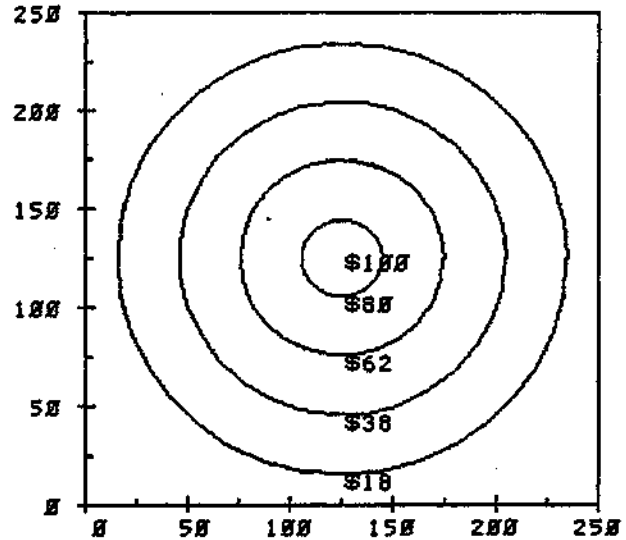
Press NEXT to Continue

7



Now you get the chance to send a practice proposal.
Press NEXT

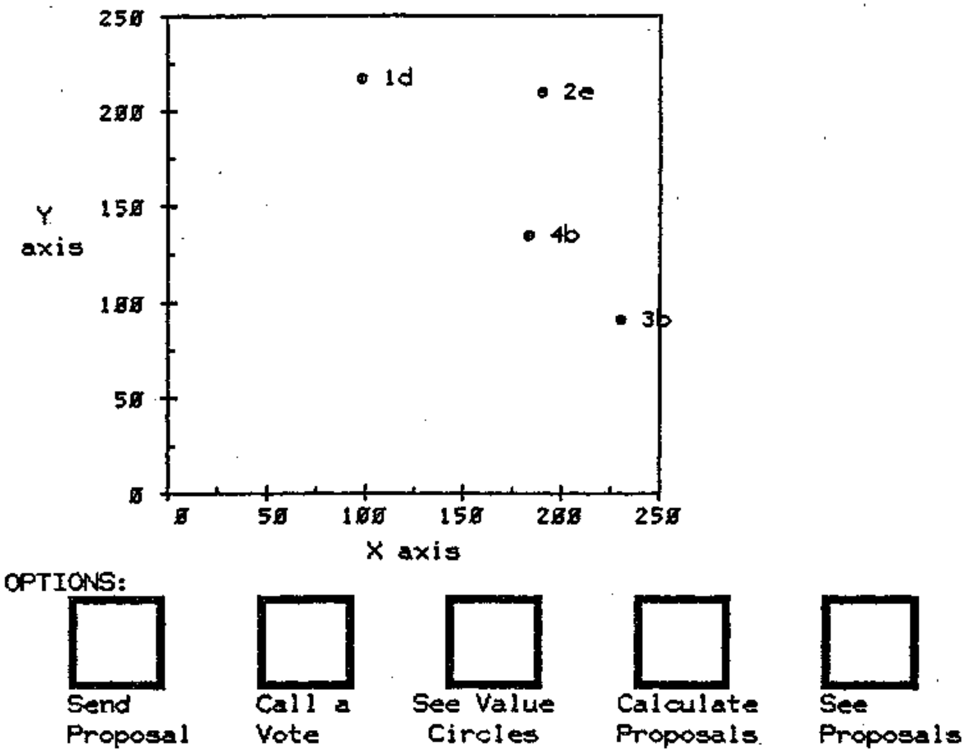
8



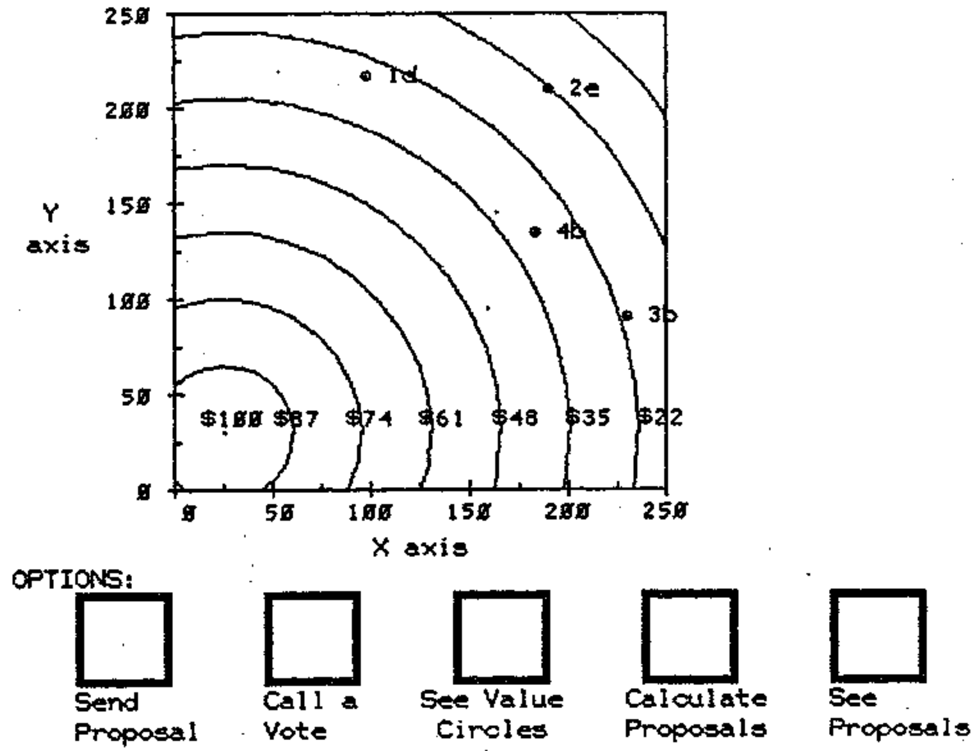
Enter a proposal (make it close to $80).

Proposal ≫ ______
(x) (y)

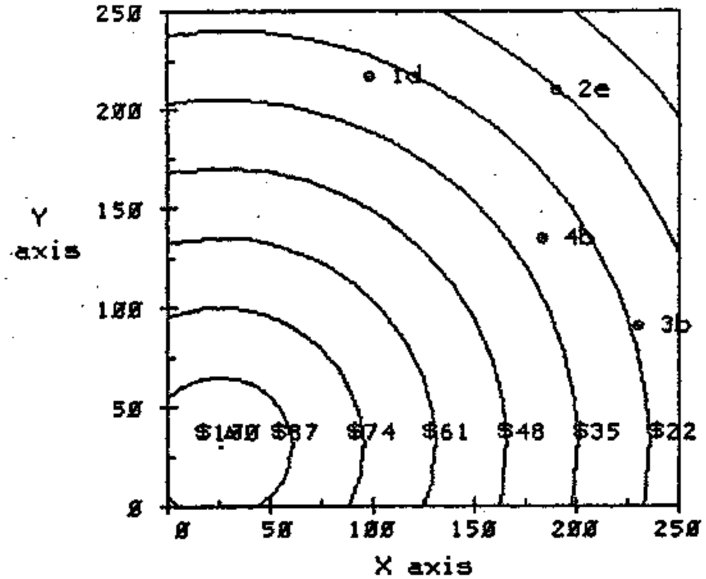
First enter the x coordinate at the arrow.
Then press NEXT



From the Proposal Screen you have five options. Touch the box letting you "See Value Circles".



The Value Circle option draws in your value circles. This allows you to estimate the value of proposals. Now, touch the box giving you the "Calculate Proposals" option.



CALC

Pointer
Location:
25 3Ø

It is
worth
$*****
to you.

Press BACK
to leave.

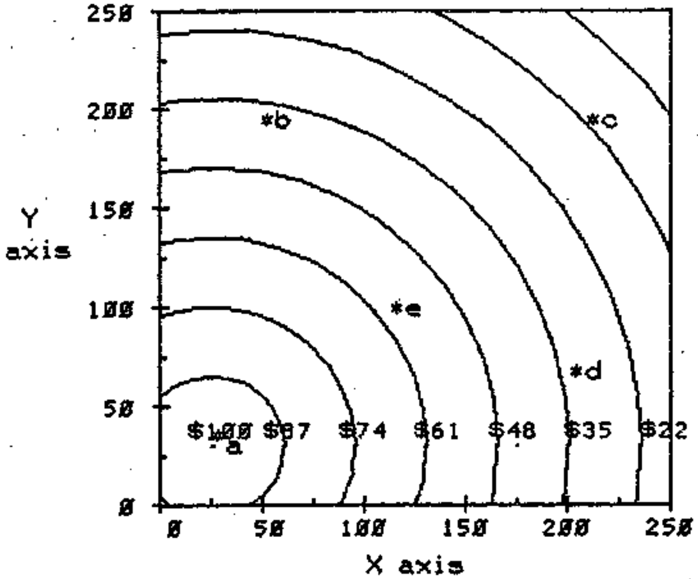
The CALCULATION option allows you to find the value of any point on the proposal screen. You simply move the flashing point anywhere on the screen, and it tells you how much any point on the screen is worth. To move the flashing point, either touch the screen, or use the keys: a,q,w,e,d,c,x,z (which have directional arrows above them telling you which way to move). Practice moving the pointer around the screen. To stop, press BACK.

The amount of money you make depends **only** on the proposal that a majority of the committee votes to pass.

Every proposal is worth some amount to you.

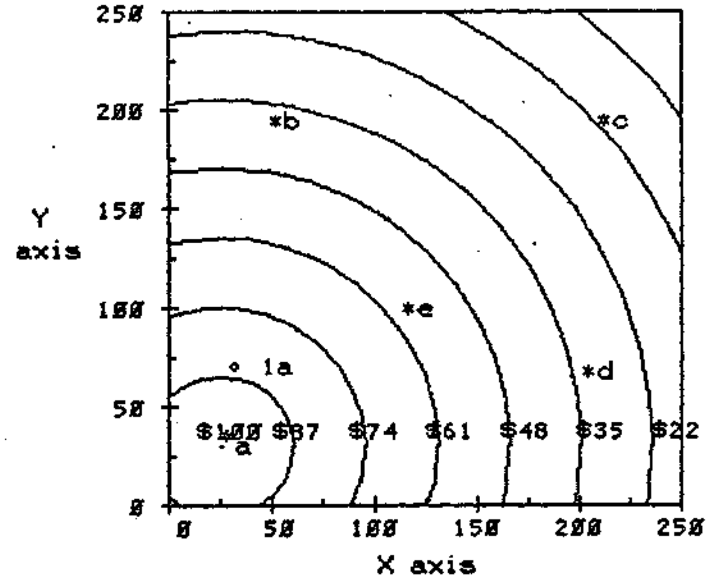
Every proposal is worth a **different** amount to the other committee members.

Press NEXT to Continue



Suppose you are committee member a. Your center point is *a (25,30).
The other committee members b,c,d, and e have different center points (they are indicated by the *'s)
They also have different value circles.

Press NEXT



You propose (29,70), which is indicated by • 1a. This proposal is worth $85 to you. However, this is worth different amounts to the other members. For instance:
(29,70) is worth $10.00 to b
(29,70) is worth $ .52 to c
(29,70) is worth $ 1.23 to d
(29,70) is worth $17.00 to e

Press NEXT

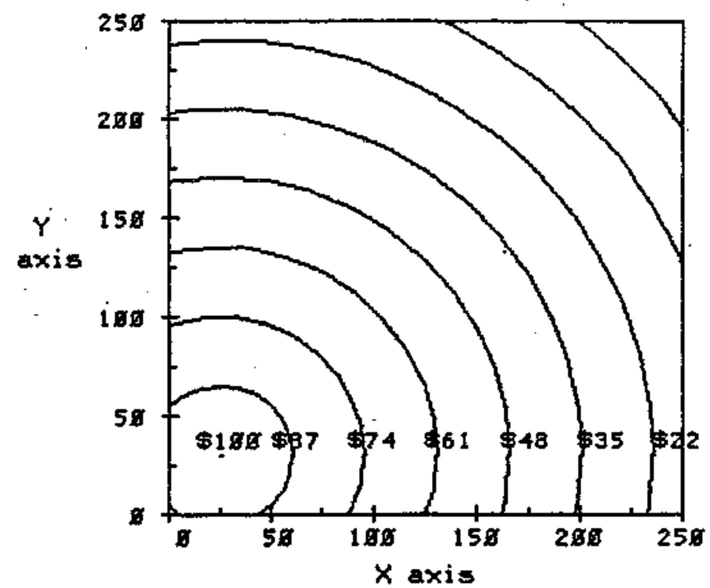
Every proposal is worth something different to other committee members. You will only know how much a proposal is worth to you. Also, they will not know how much a proposal is worth to you.

You will not know who the other players are, since all committee members are identified by a letter. Also, your letter changes every round. No one will know who you are during any round, nor will you know who anyone else may be.

You should bargain with other committee members to find a proposal which is acceptable to a majority of the committee (and to yourself).

You communicate with other members by sending proposals and calling other proposals to a vote.

Press NEXT



OPTIONS:

Send Proposal | Call a Vote | See Value Circles | Calculate Proposals | See Proposals

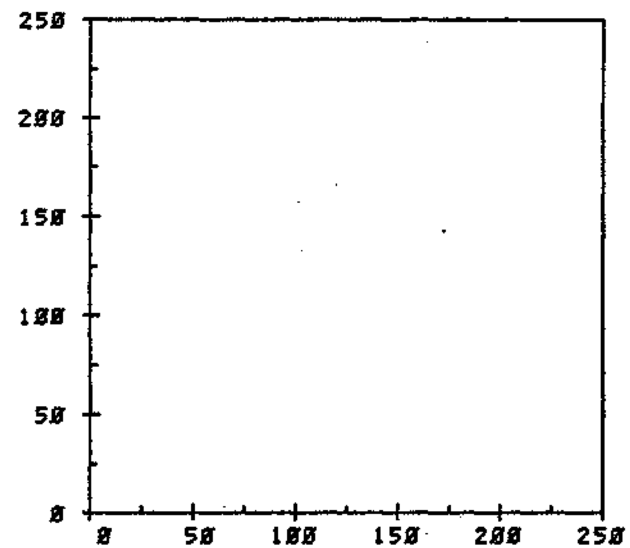
Now touch the box giving you the "See Proposals" option.

PROPOSAL PAGE

Proposal Number	From	To	Type Message	Proposal Point	Your Payoff
1	d	you	general	(93,211)	$28
2	e	all	general	(185,2Ø3)	$13
3	b	all	general	(225,84)	$22

This is the message screen. Here you can see the proposals listed. Other details are also provided concerning who sent the proposal, who it is sent to, and the type of message.

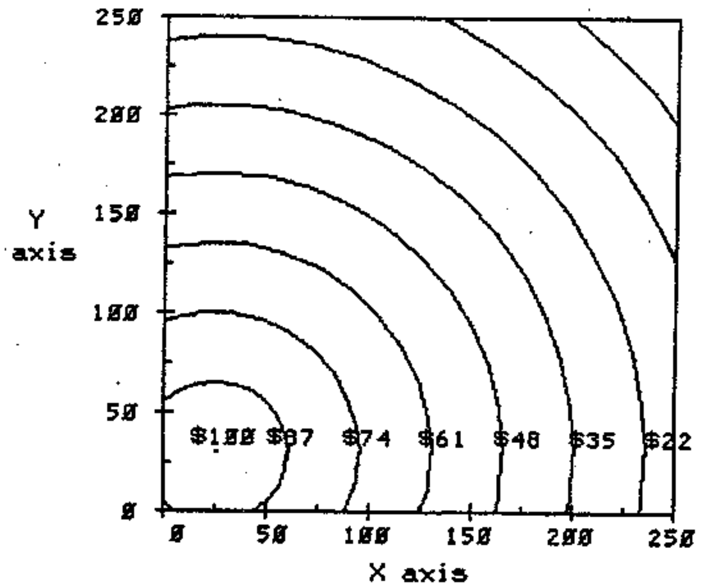
Press NEXT to Return to the Proposal Screen.



OPTIONS:

Send Proposal | Call a Vote | See Value Circles | Calculate Proposals | See Proposals

Now you need to learn how to send proposals. Touch the box which lets you "Send Proposals".



You send proposals to all committee members.
You use this option to tell other committee members the proposals that you prefer. You do this by entering a pair of X,Y coordinates. This proposal is then sent to all committee members.

Press NEXT

VOTING

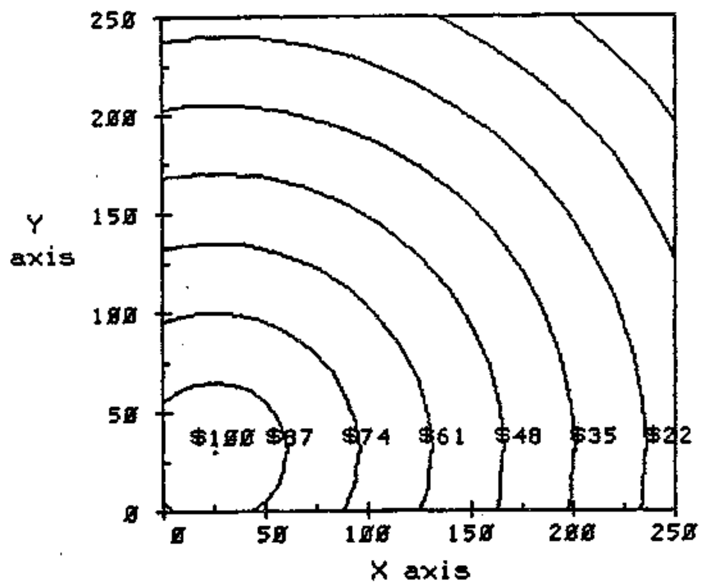
To earn money a majority must vote to pass the current Status Quo. There is always a Status Quo.

There are two ways to vote.

The first compares an alternate proposal to the current Status Quo. If the Status Quo receives a majority vote, it remains the Status Quo. If the Alternate proposal receives a majority vote, the alternate becomes the new Status Quo.

The second way of voting causes the current Status Quo to be voted on. If a majority votes to pass it, you receive only the amount it is worth to you.

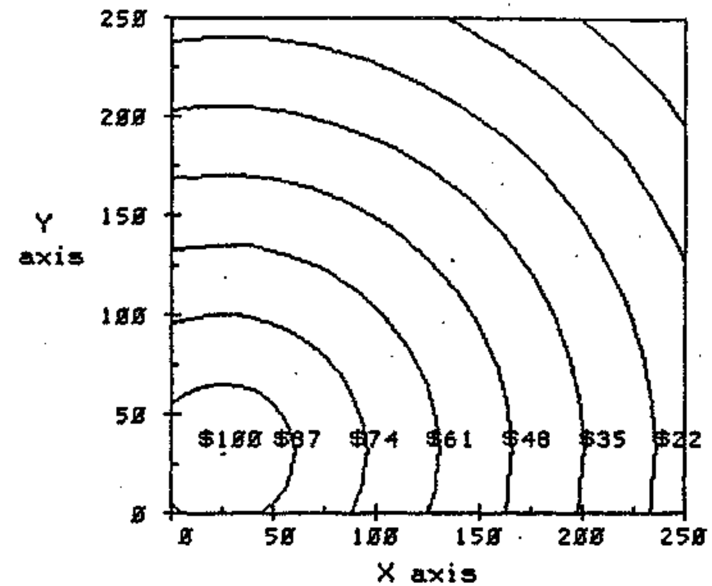
Press NEXT to Continue



OPTIONS:

Send Proposal | Call a Vote | See Value Circles | Calculate Proposals | See Proposals

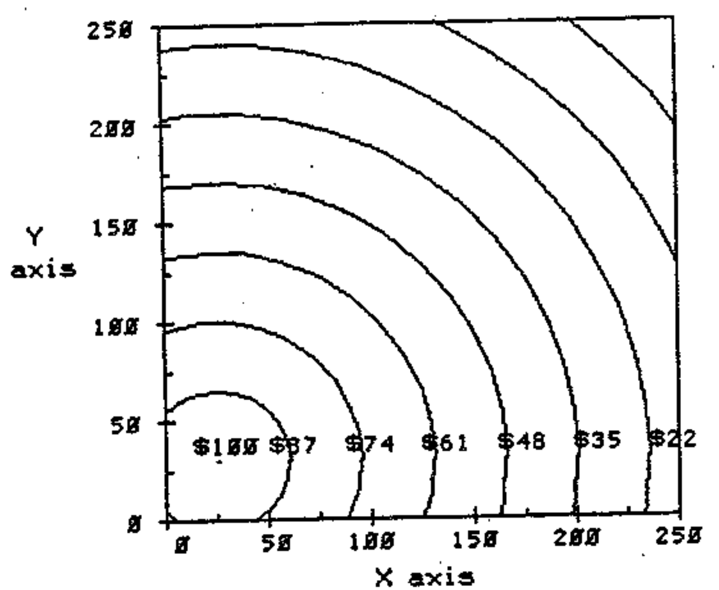
To make the committee vote on either the Status Quo or an Alternate proposal, you must choose the "Call A Vote" option. Touch the box allowing this option.



OPTIONS:

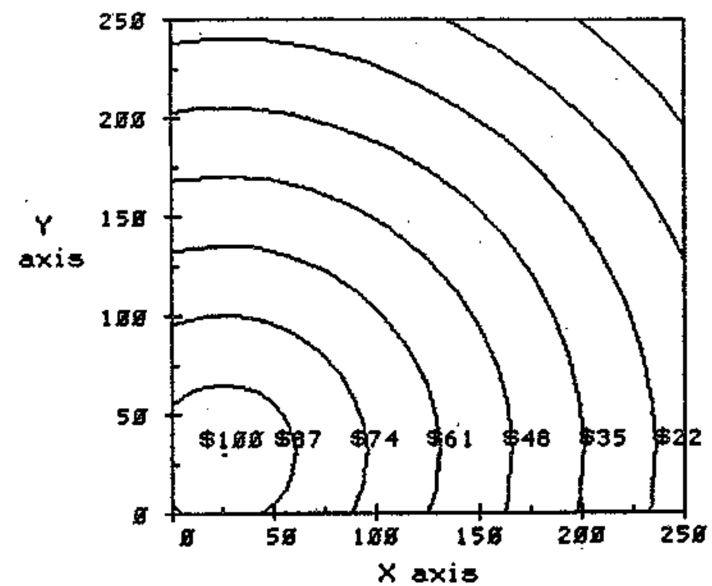
Accept Alternate | Accept Status Quo

The "Accept Alternate" option allows you to "second" someone's proposal. Touch this option.



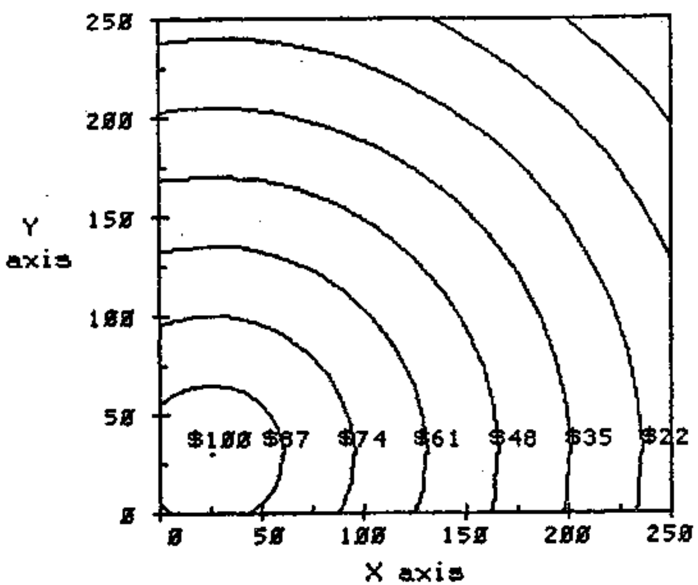
With the "Accept Alternate" option you may second any proposal. Once you have done so, it forces the committee to compare the proposal you accepted with the current Status Quo. If a majority of the committee votes for the Alternate proposal, it becomes the Status Quo. Otherwise the Status Quo does not change. **You receive no money for this vote! But you can change the Status Quo!**

Press NEXT



OPTIONS:

The "Accept Status Quo" option lets you vote on the current Status Quo. This option allows you to make money! Touch this option.



The "Accept Status Quo" option forces the entire committee to vote for or against the current Status Quo. If a majority of the committee votes for the Status Quo, you receive the amount it is worth to you. Also, the round is finished. Otherwise, the round continues.

Press NEXT

What you want to do is find a Status Quo Proposal which is acceptable to a majority of the committee.

You do this by introducing proposals and calling for a vote proposals which are acceptable to you.

Once a Status Quo proposal is found which is acceptable to you, bring it to a vote.

Remember, other committee members do not receive the same amount as you for a proposal!

Press NEXT

Once one of the two "ACCEPT" options are used, a vote is called.

When a vote is called, you receive a message in the lower portion of your screen. It looks like this:

```
*4    c ACCEPTED (125,70)   IT IS WORTH $51. TIME TO VOTE
```

This indicates message 4 was accepted by member -c-. The proposal is the point (125,70) and it is worth $51 to you.

After 30 seconds you are automatically taken to the voting screen. Use this time to see which proposal is to be voted on.

Press NEXT to Continue

REVIEW

You now know how the experiment works. It involves a couple of things. First, you are given a center point with value circles around it. This tells you how much you get paid for various proposals.

Second, when proposals are sent they appear on your proposal screen with a number telling you which proposal it is, and a letter indicating who sent it. The closer a proposal is to your center point, the more it is worth.

Third, you can usually send proposals to committee members. This tells them which proposals you would like passed.

Fourth, only the Status Quo proposal can earn you money. However, you can introduce Alternate proposals to change the Status Quo. The current Status Quo may be voted on at any time.
YOU ONLY RECEIVE MONEY FOR THE PROPOSAL THAT IS PASSED.

Press NEXT to Continue

Remember:

Everyone makes a different amount of money from a proposal.

Committee member letters are randomly changed each round. This means no one knows who you are from round to round.

The amount of money that you make depends only on the current Status Quo adopted by a majority of the committee members.

The first way of voting has the effect of changing the Status Quo proposal. The second way brings the Status Quo to a vote. Only this second way can directly result in you earning money.

The amount of money you earn is your own business. No one else will be told!

Press NEXT

COMMITTEE

This concludes your introduction to COMMITTEE.

If you have any questions please ask the experimenter before beginning.

During the experiment, carefully follow the instructions. If you need help during the experiment, ask the experimenter.

Do not speak with anyone during the experiment!

If you follow the instructions and make good decisions, you could make a considerable amount of money. **The only money that you make comes from the proposal that is passed during a round, and only a few rounds are played!**

Support for this experiment is from the National Science Foundation.

Press NEXT to Begin!
Or BACK to Review.

COMMITTEE

Round 1

This Round is a Practice Round.
You Receive NO Payoffs During This Round.

You are Committee Member: b

3 committee members are needed to
pass a proposal.

You are able to send 2Ø proposals.

Use this round to familiarize yourself with the experiment.
If you have a question about how to do something, ask
the experimenter during this round.

Press NEXT to Continue

In this round which player are you?
b ok

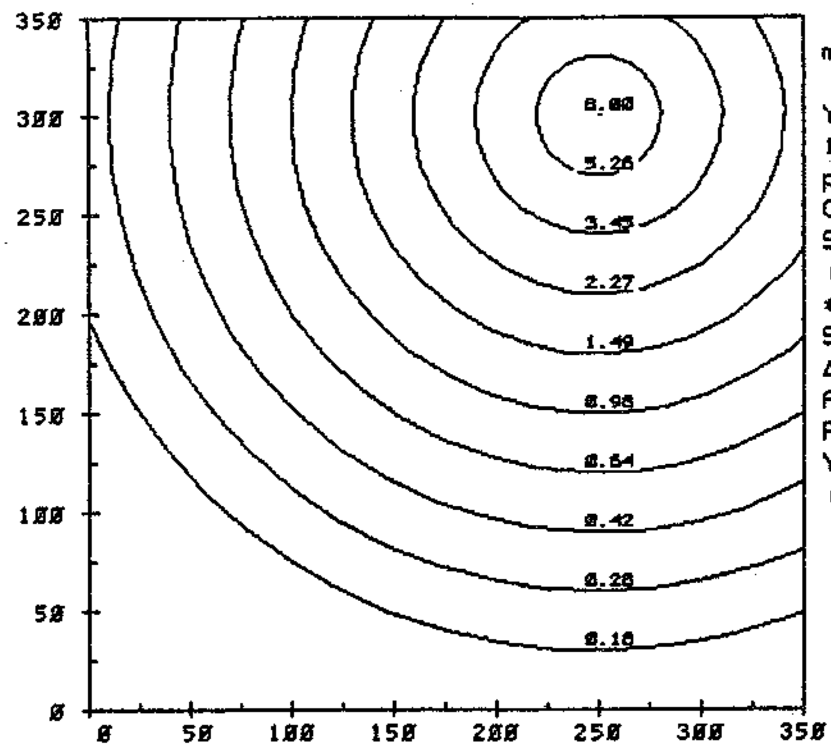
Can you send proposals in this round?
yes ok

How many proposals can you send in this round?
2Ø ok

How many members must vote for a proposal
for it to pass?
3 ok

Great! Now get ready to play.

Press NEXT to continue



round 1
min:sec left

You can send
17 more
proposals.
Current
Status Quo:
(25,34)
* sq is
Status Quo
Δ acc is
Alternate
Proposal
Your Center:
(250,300)

Your value circles are shown above. Your
center point is (250,300), which is worth $ 8.00.
If no agreement is reached you get the current Status Quo
The Status Quo proposal is (25,34).

If you are ready to start round 1, press SHIFT-NEXT.
(Hold SHIFT down and Press NEXT)

CHAPTER SIX

EMPIRICAL RESULTS: PATTERNS OF COMMITTEE OUTCOMES

''She can't do substraction,'' said the White Queen. "Can you do Division? Divide a loaf by a knife — what's the answer to that?"
- Alice

College students facing an abstract committee in an experimental setting spend little time ruminating on the vicissitudes of collective action. Instead, they appear to single-mindedly push ahead to earn as much as possible. While they appear to be little constrained by reflections, the empirical evidence suggests they are constrained by the institutional features of the committee in which they participate. Indeed, elements of those institutional features outlined in Chapter 4 appear to constrain individual strategic action in predictable ways.

This chapter presents results from a series of experiments using volunteer participants and played over the PLATO interactive computer system. The primary thrust of the experiment is to test for differences in outcomes between committees with different institutional features. Thus, this chapter returns to the discussion raised in Chapter 1 concerning the effects of structure on democratic outcomes as well as the issues raised in Chapter 3 relating to institutional arrangements and collective action. Finally, the empirical results are designed to test the models outlined in Chapter 4.

In this chapter a few general observations are first made about the experiments and those who participated. Second, each institutional variation and its attendant prediction is discussed at length. Finally, a general discussion and interpretation of this set of results is offered. The relation between this experimental series and the points raised in Chapter 1 concerning the role of structure and democratic theory is reserved for Chapter 7. This set of experiments, like all experiments, is a simplification — in this case of a particular collective decision-making situation. Yet, the results discussed here have significance. They capture aspects of real behavior and provide insights into the effects of structure on that behavior.

General Observations

The series of experiments analyzed in this chapter were conducted from May through June 1982. All data from the experimental series was collected and stored on the PLATO computer system. Subsequent analysis was conducted on the computer facilities provided by the Department of Political Science Data Laboratory and the Workshop in Political Theory and Policy Analysis. During the experimental series, a total of 105 individuals participated in 21 separate experiments. Although each experiment was designed to last 2 hours, with one practice round and four rounds with payoffs, only 96 distinct rounds were run. Because some groups took longer in studying the instructions and used more time when reaching decisions, not all groups participated in five rounds. As noted below, this is not a serious threat to comparisons relying on pooled group data, and explains subsequent differences in sample sizes as comparisons are made.

All participants were recruited through the student newspaper published over the summer sessions at Indiana University. Because of this, seniors, matriculated students, and graduate students tended to predominate, constituting 60.9 percent of the participant population.[1] Self-recruitment did not result in any strong gender differences, with 49.5 percent of the experiment population being male. Minorities, meanwhile, constituted 13.3 percent of the experiment population.

These variables are generally regarded as important in accounting for within group differences. Arguments are made that more educated college students tend to be more sophisticated in their strategic calculations than their less educated counterparts, females tend to be more reticent in their participation, and cultural differences in problem solving may be related to race. Also, if participants did not understand instructions or had difficulty using PLATO, these factors might also account for within group differences. These conjectures are tested using multiple regression techniques.[2]

The dependent variable — IND — is the mean distance from the participant's ideal point to the final outcome for the round. This measure is calculated only for rounds in which there is a payoff.[3] The independent variables were standard. The gender variable needs no explanation. Since the number of minority participants was small, race is a composite variable accounting for blacks, Hispanics, and Orientals. Education (EDUC) accounted for class standing in college (although it also captured a few participants with only a high school education). The dichotomous variable, USTAND, is also included. It is based on a question asking participants whether they had difficulty understanding the instructions to the experiment. A similar question asked whether participants had problems using PLATO during the experiments. The yes or no response to this constitutes the other independent variable, USE.[4] The standardized results are presented in Table 6-1.

Table 6-1

Standardized Regression Results

	B	Beta	r^2 change	SE	$F_{(1,99)}$
SEX	2.317	0.123	0.014	1.849	1.570
RACE	0.589	0.052	0.003	1.114	0.279
EDUC	1.085	0.142	0.032	0.784	1.916
USTAND	1.802	0.077	0.005	2.591	0.484
USE	-5.673	-0.184	0.025	3.297	2.961
Constant	7.239				
Overall $F_{(5,97)}$	1.662				

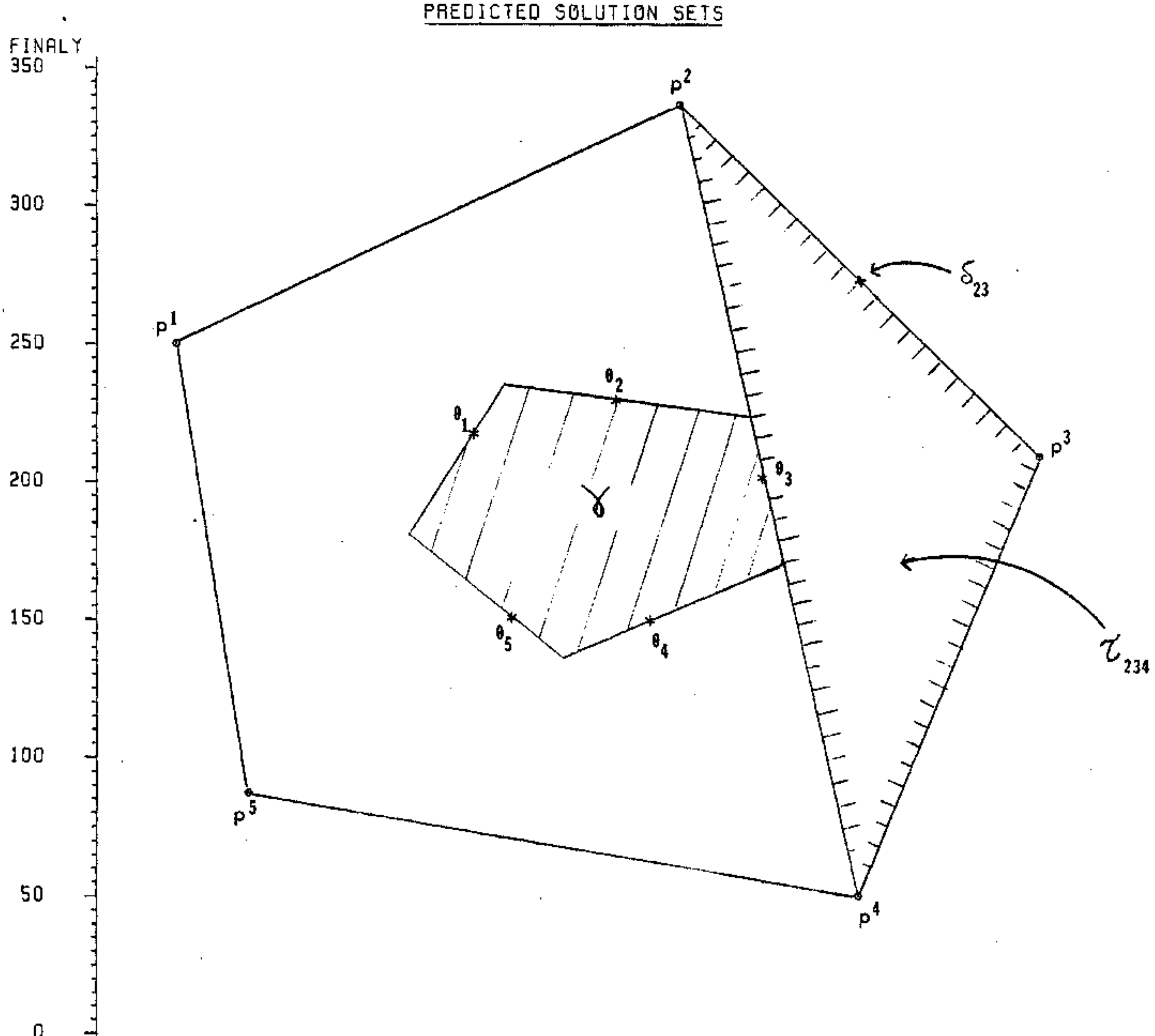
These results do not support the contention that social characteristics differentiate participant performance during the experiment. Examining the standardized coefficients in Table 6-1, it is apparent that problems with using the equipment, education level differences, and sex differences contribute the most to how individuals performed during the experiment. However, none of these coefficients are very strong. The contribution of these three variables to explaining variations in the dependent variable is a small r^2 = .071. The remaining variables contribute even less to explaining individual variations. From these results, it can be inferred that these variables only minimally differentiate participants as to their performance. Subsequent analysis, thus, disregards these variables and turns to the structure of the committee within which participants make decisions.

Predictions and Outcomes

In Chapter 4, a baseline model and three variant structures are discussed and predictions developed for the likely outcomes of each structure. In Chapter 5, the method for operationalizing these structures is described. At this point, behavior in a laboratory setting is analyzed to determine whether institutions constrain participant choices to particular sets of outcomes. These predictions and their associated values are given in Figure 6-1.

The focus of analysis in this chapter is with instances where participants are motivated (i.e., are playing for cash) and where no stable equilibrium exists. Individual preferences are considered heterogeneous, with individual ideal points for all experiments represented by the set of points $\{p^1, p^2, p^3, p^4, p^5\}$ in Figure 6-1. The first prediction relies on the Competitive solution developed by McKelvey and Ordeshook (1978). This prediction involves a baseline committee structure with a predicted solution containing the set of points: $\{\theta_1, \theta_2, \theta_3, \theta_4, \theta_5\}$.[5] As the baseline committee is transformed so that a 4-person aggregation rule is employed, the predicted solution changes to encompass the space γ. Meanwhile, for a committee structure with a change from substantial communications to

FIGURE 6-1


PREDICTED SOLUTION SETS
FINALY
350
300
250
200
150
100
50
0
0
50
100
150
200
250
300
350
FINALX
p^1
p^2
p^3
p^4
p^5
θ_1
θ_2
θ_3
θ_4
θ_5
γ
δ_{23}
τ_{234}

limited communications, predicted outcomes fall in partitions of the space τ. This space is a convex set with its vertices the player's ideal points, and it also constitutes the pareto space for all participants. Like the predicted solution for the changed aggregation rule, it encompasses a large set of points. The final predicted solution entails a committee structure with limited agenda powers. During these experiments, only players whose ideal points were p^2 or p^3 were granted full agenda control. This convention was used to facilitate empirical comparisons. The predicted solution, then, contained the single point: δ_{23}.

The discussion that follows analyzes empirical results for each type of committee structure. Analysis is performed only for those instances where the Core does not exist and participants face real cash incentives. This reduces the number of cases under consideration is 72 (see Table 6-2).[6] Because the expected solutions vary, a single test for differences between all committee variations is not possible. The real concern of this analysis is with the baseline model and comparing structural variations from it. This yields three distinct tests between the baseline committee and committees with a change in either the aggregation, communication, or position rule. Before beginning these comparisons, outcomes are examined for baseline committees.. Since later analysis relies on comparisons from the baseline committees, understanding these patterns of outcomes is useful.

Table 6-2

Totals of Experimental Treatments

Committee Structure	Number of Cases (Rounds)
Baseline Committee	18
Aggregation Rule Changed	18
Communication Rule Changed	19
Position Rule Changed	12
Total	72

The Baseline Committee

Although the Competitive solution has been an efficient predictor for many committee experiments, in this series it does not perform exceptionally well. Figure 6-2 plots experimental committee outcomes with respect to the set of points constituting the Competitive solution. The Competitive solution not only predicts a set of quasistable points, but also predicts the coalition that forms around each point. Figures 6-3A through 6-3E plot committee outcomes from specific coalitions and focus on the corresponding Competitive solution. Examining these figures, it is apparent that outcomes of specific coalitions tend to focus near the appropriate solution set.

However, as Figures 6-3A and 6-3C indicate, there is considerable variation from the Competitive solution. Twenty percent of the outcomes appear in the central pentagon interior to the pareto space. Further, three coalitions form that are not contained in the Competitive set. These deviations may be due to peculiarities in the

FIGURE 6-2

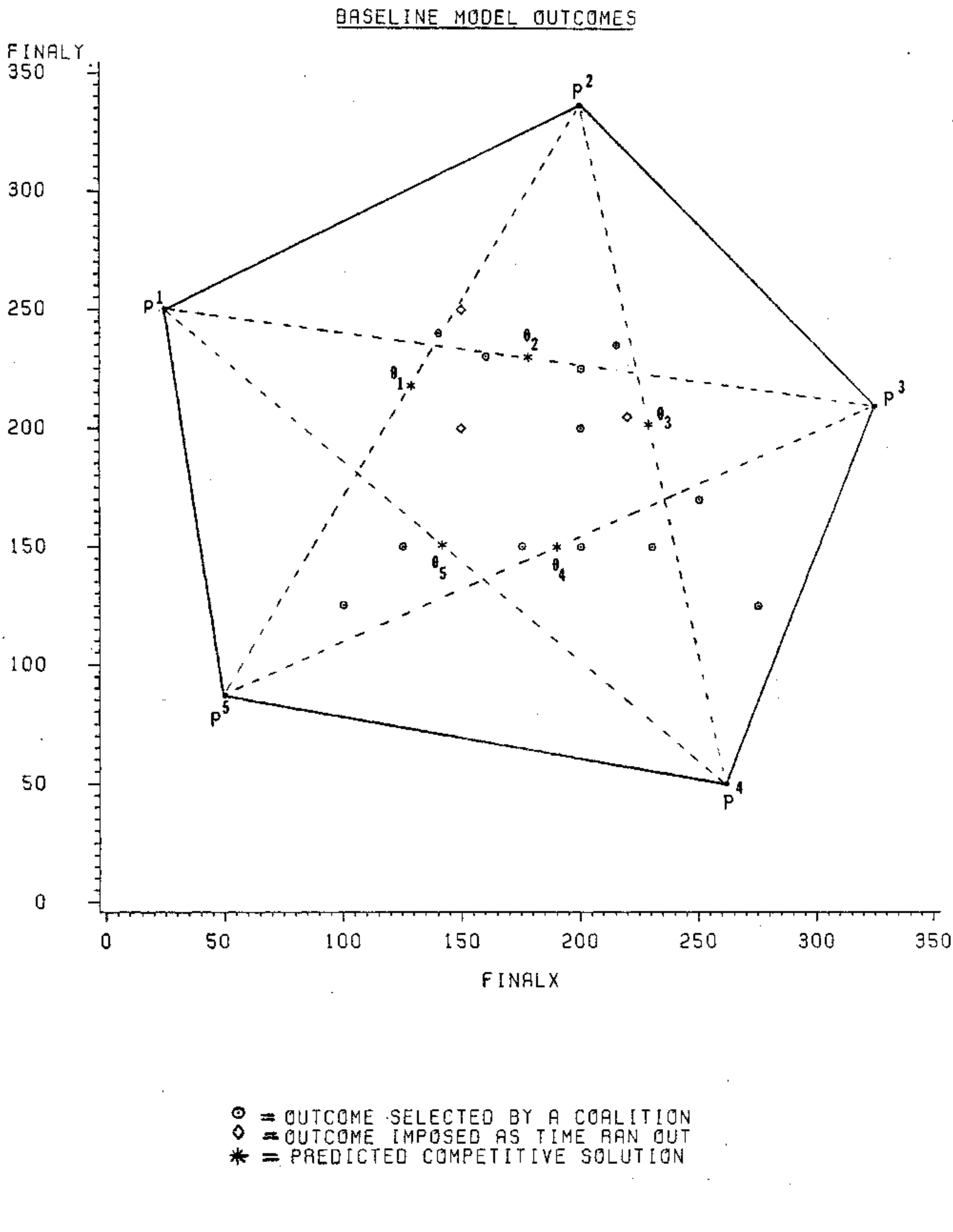

BASELINE MODEL OUTCOMES
FINALY
FINALX
350
300
250
200
150
100
50
0
0
50
100
150
200
250
300
350
P1
P2
P3
P4
P5
θ1
θ2
θ3
θ4
θ5
⊙ = OUTCOME SELECTED BY A COALITION
◇ = OUTCOME IMPOSED AS TIME RAN OUT
✱ = PREDICTED COMPETITIVE SOLUTION

FIGURE 6-3A

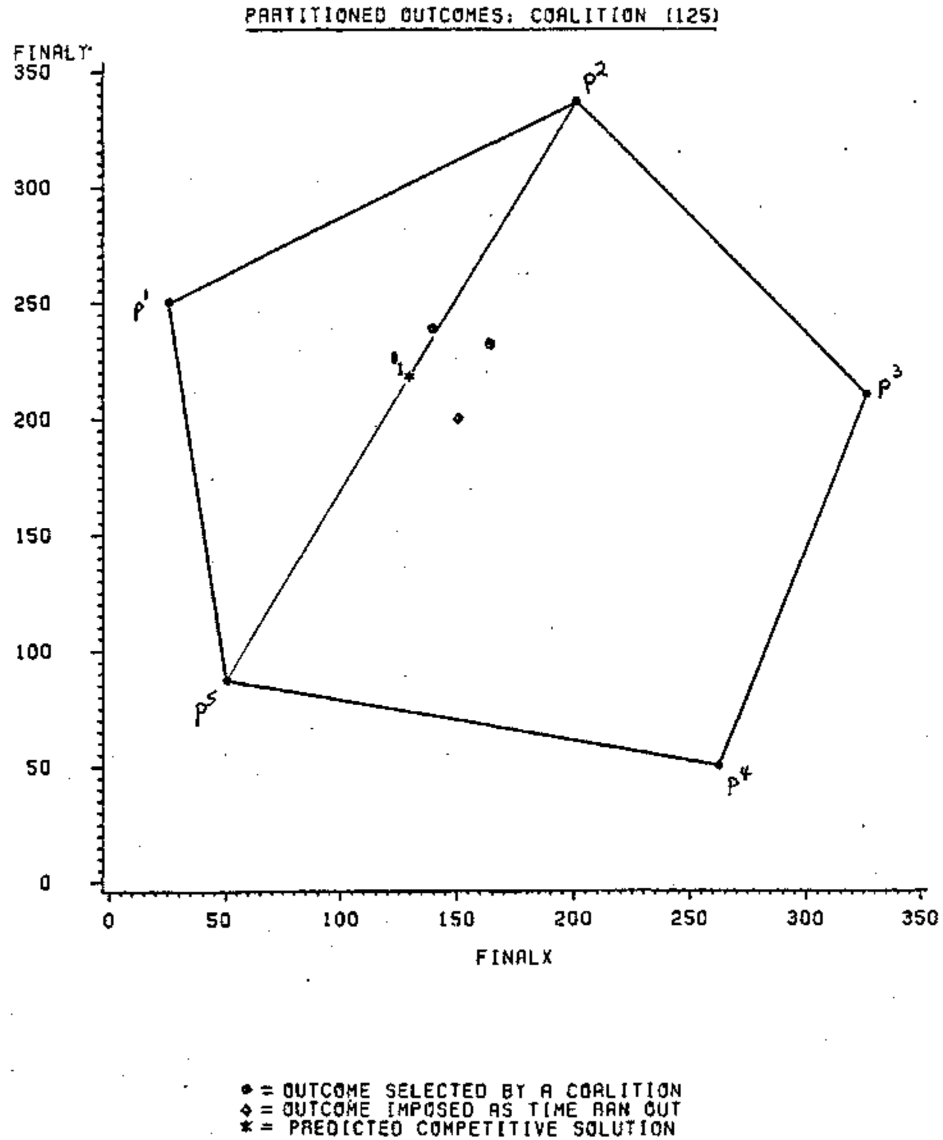


FIGURE 6-3B

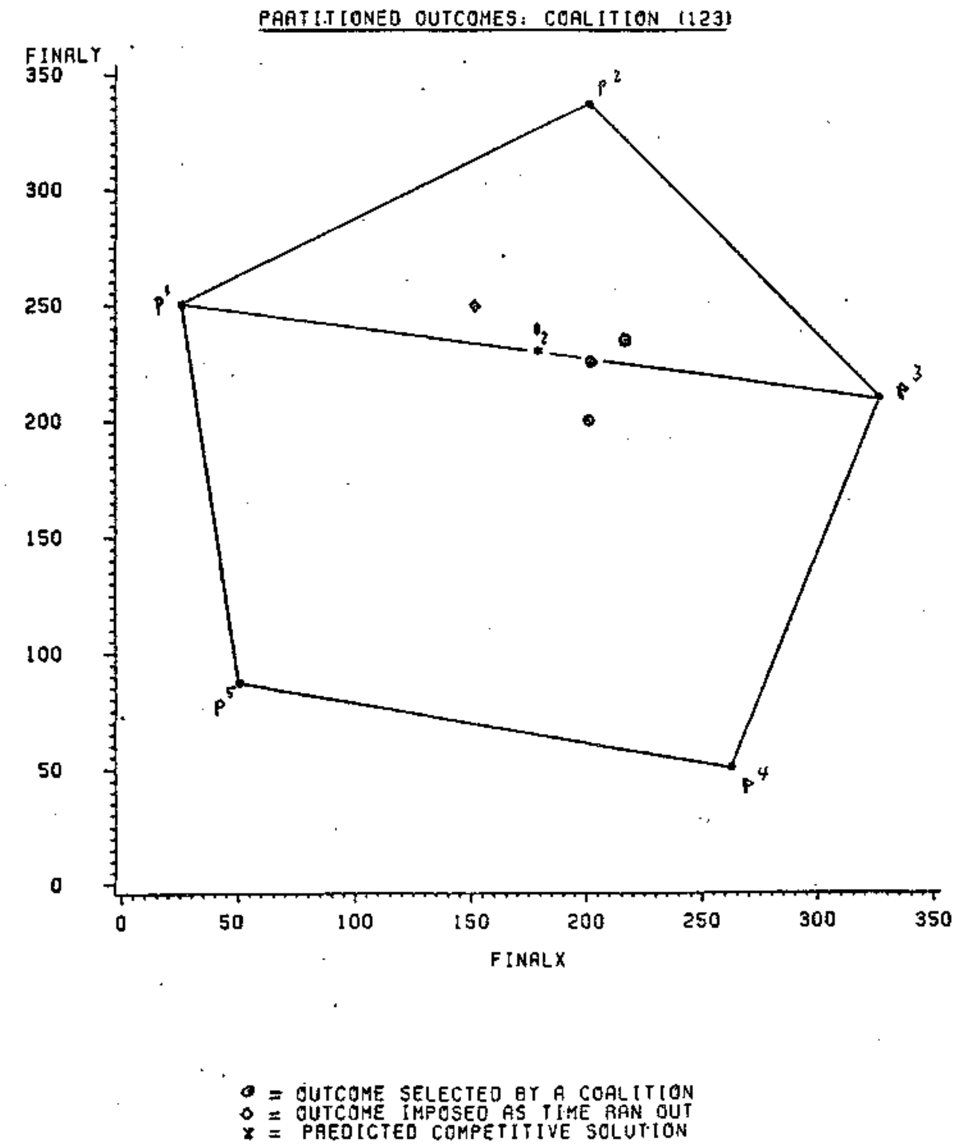
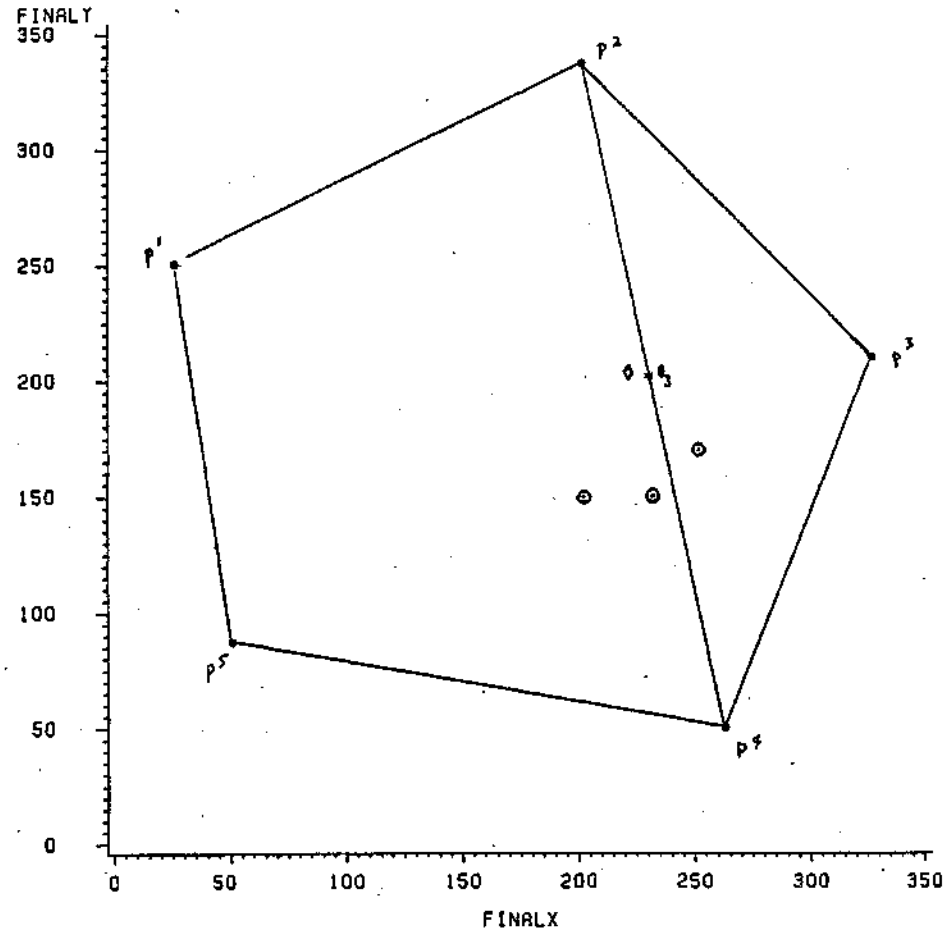


FIGURE 6-3C

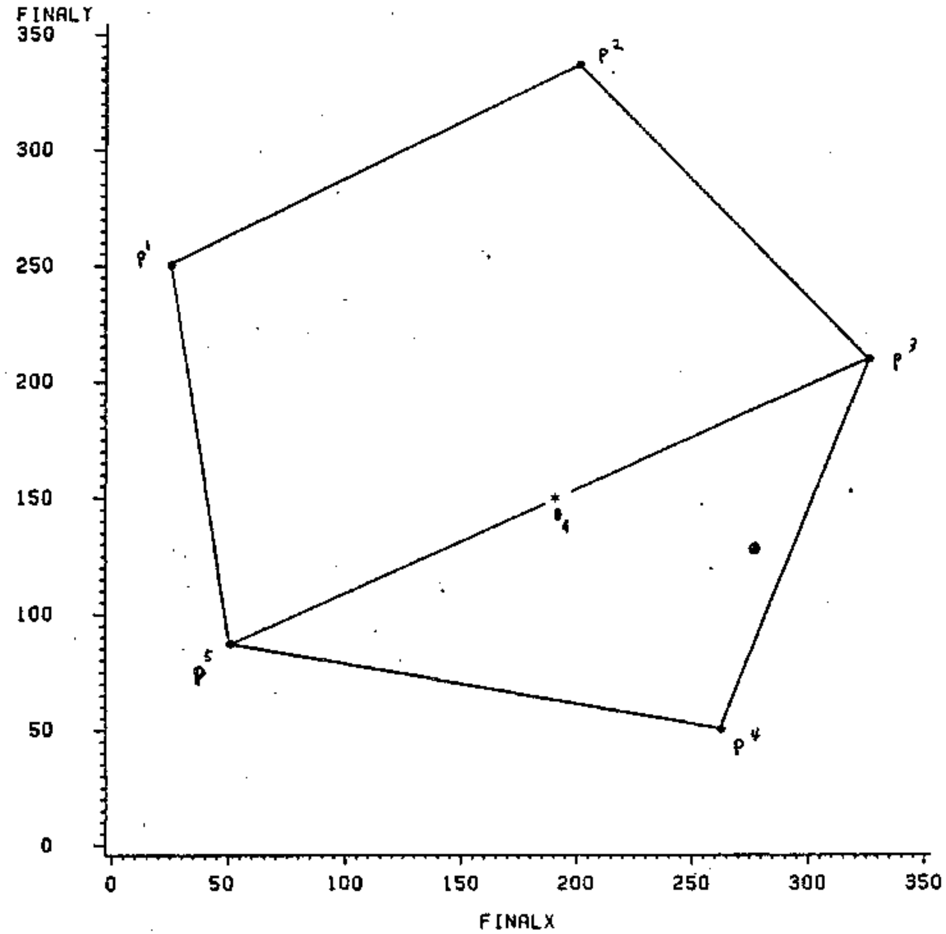
PARTITIONED OUTCOMES: COALITION (234)



⊙ = OUTCOME SELECTED BY A COALITION
◊ = OUTCOME IMPOSED AS TIME RAN OUT
* = PREDICTED COMPETITIVE SOLUTION

FIGURE 6-3D

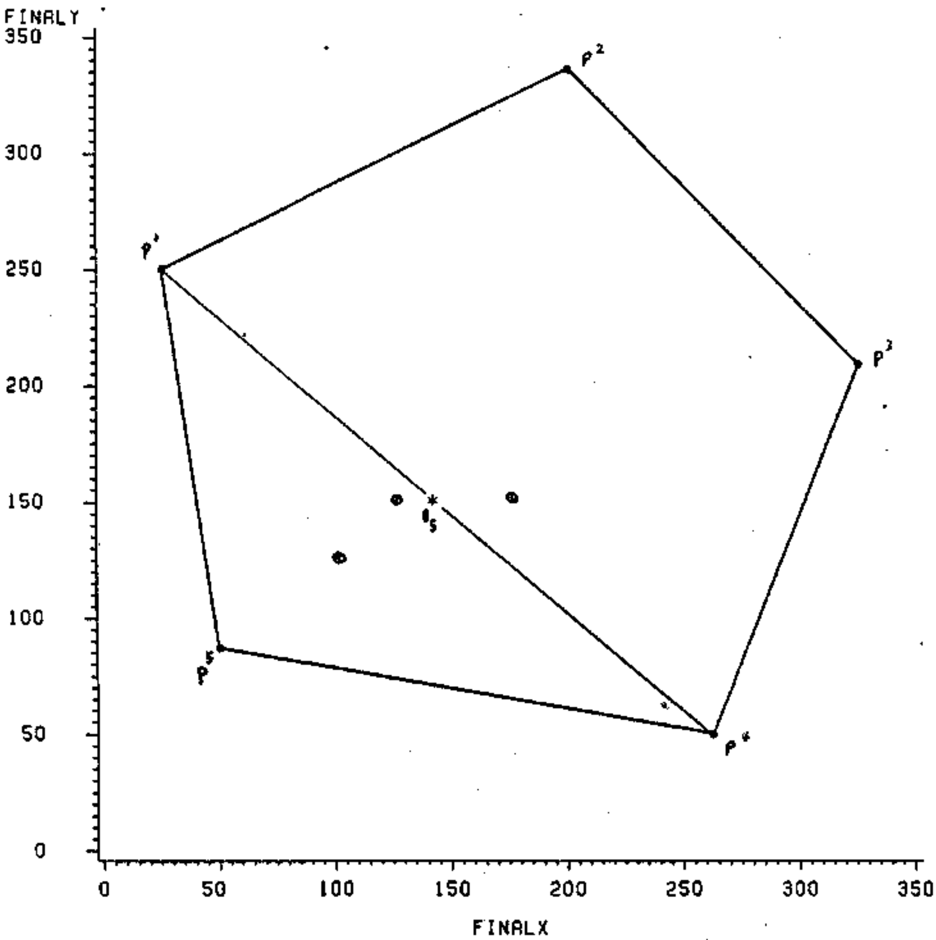
PARTITIONED OUTCOMES: COALITION (345)



⊙ = OUTCOME SELECTED BY A COALITION
◊ = OUTCOME IMPOSED AS TIME RAN OUT
* = PREDICTED COMPETITIVE SOLUTION

FIGURE 6–3E

PARTITIONED OUTCOMES: COALITION (145)



⊕ = OUTCOME SELECTED BY A COALITION
◊ = OUTCOME IMPOSED AS TIME RAN OUT
✱ = PREDICTED COMPETITIVE SOLUTION

experiment — time and message constraints. However, a single experiment was conducted testing the Competitive solution with, no constraints on time or messages. Although participants had two practice rounds of experience prior to making a decision for money, a coalition outside the Competitive set formed. The outcome seemed due in part to one participant's confusion. There are indications that the outcome selected would have been agreed to by the proper coalition had the experiment continued.[7] Neither time nor messages constrained this particular experiment. However, since it was played only once (and all other experiments were played a number of times), and the stakes were high (ranging from $0.01 to $34.00), it is possible that this too had some effect on the outcome.[8]

The Competitive solution does fare better than these initial observations might indicate. It predicts two related elements — an outcome and a coalition. First, I deal with the coalition predictions of the solution. Only ten different minimal winning coalitions can form in this 5-person experiment. A reasonable a priori expectation is that each of the possible minimal winning coalitions is equiprobable. However, of these ten possible coalitions, the Competitive solution predicts that only half are likely to form — these being the coalitions represented in Figures 6-3A through 6-3E. A reasonable test of the solution uses the a priori set of expectations. Simply put, coalitions predicted by the Competitive solution should form as often as those not predicted by the solution. If such is the case, it casts doubt on the Competitive solution. During the baseline committee experiments, only 3 of 18 outcomes were selected by coalitions different from those predicted by the

Competitive solution. The cumulative binomial probability of having three or fewer coalitions forming outside those predicted by the Competitive solution is .0176.[9] Such a low probability indicates the result is unlikely to be accidental and leads support to the value of the Competitive solution's predictions.

In a similar manner, it is possible to test the Competitive solution's prediction that only minimal winning coalitions form. Greater than minimum winning coalitions can possibly form six times, compared with the five coalitions predicted by the solution. Using this as an a priori basis to assign probabilities, greater than minimum winning coalitions should form 54.6 percent of the time. During the baseline committee experiments, only 3 of 12 coalitions that formed were greater than minimum winning. The cumulative binomial probability that three or fewer should occur is .044.[10] Again, this indicates the success of the Competitive solution in predicting the types of coalitions that form.

In a different vein, there are no discernable differences between experimental groups with respect to outcomes chosen under baseline committees. The first section of this chapter found no major individual attributes that predicted variations in experimental outcomes. Now attention is focused on outcomes at the committee level. If results of baseline committees are to be pooled and compared with other committee outcomes, then it must be shown that there are no differences between groups. For this test, the 15 outcomes satisfying the Competitive solution are arbitrarily split in half.[11] Comparisons between specific participant groups is difficult due to the small number of cases for each group. Therefore, pooling participant groups and dividing them into two samples is a reasonable procedure. Comparisons are then made on the mean distance of an outcome from the expected solution, as well as means on the number of proposals sent, vote totals, and time elapsed. Each of these measures gauge important facts about the experiment. Obviously, the distance measure is crucial as a performance measure of outcomes and their distance from a predicted solution. The number of votes taken and the number of proposals sent provides some insight as to the extent of negotiation taking place during the experiment. Likewise, the amount of time elapsed (in seconds) indicates how quickly a committee reached agreement. Since the upper limit on time is 1,200 seconds, cases where time expires should indicate the degree of difficulty that a committee has in reaching agreement.

Beginning with a hypothesis that subsample means are equivalent across distance, vote totals, proposal totals, and time elapsed, a simple T-test indicates that none of the means are significantly different (using a significance level measure of .05). The results in Table 6-3 lend credence to the hypothesis that there are no significant differences between groups in this experimental series.

That the Competitive solution did not fare too badly, consider Table 6-4, which indicates all outcomes from the baseline committee experiments. It lists the outcome, coalition, and distance of the outcome from the solution. For those instances where time ran out, distance was calculated on the basis of the closest Competitive solution point. This is a reasonable approach since it implies that such a coalition is satisfied with that status quo in contrast to other proposals offered toward the conclusion of the round.

Table 6-3

Baseline Committee T-Tests: Between Group Means

Variable:	Number of Cases*	Mean	δ^2	T Value	D.F.	Two-Tailed Probability	Mann-Whitney
Distance	7	34.07	25.77	-1.18	13	0.253	.607
	8	51.72	31.39				
Vote Total	7	11.43	4.58	0.33	13	0.743	.776
	8	10.63	4.72				
Proposal Total	7	34.00	11.92	1.11	13	0.294	.456
	8	27.75	9.79				
Time Elapsed	7	936.14	306.56	0.46	13	0.652	.388
	8	861.00	323.88				

* Only those coalitions predicted by the Competitive solution are included for analysis.

Table 6-4

Baseline Model Outcomes

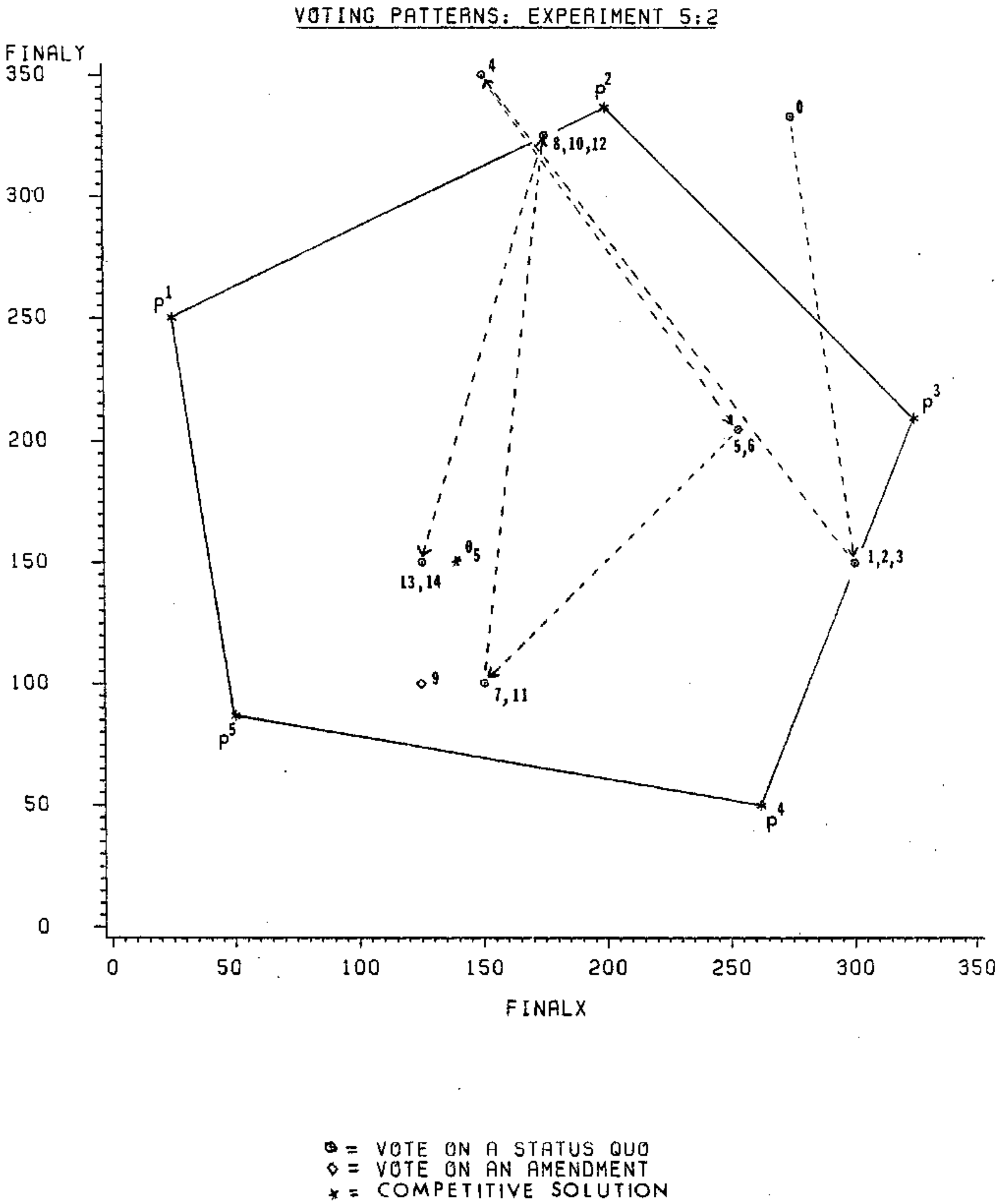
Experiment/Round	Coalition	Outcome	Distance
5:2	(145)	(125,150)	17.03
9:4	(125)	(140,240)	39.29
10:2	(1234)	(200,225)	22.56
11:2	(145)	(100,125)	49.40
12:3	(123)	(200,200)	29.07
13:2	(1345)	(275,125)	89.69
15:5	*	(220,205)	9.49
16.5	(1234)	(200,150)	59.54
17:2	(234)	(250,170)	44.55
17:4	(234)	(230,150)	52.01
17:5	(125)	(160,230)	18.00
18:2	*	(150,200)	27.66
20:3	(145)	(175,150)	33.02
21:2	(123)	(215,235)	37.34
21:5	*	(150,250)	34.41

* Indicates time ran out during the round.

Overall, when participating in a baseline committee structure, individuals generally tended to cycle in toward the Competitive solutions. It should be kept in mind that choosing a point in the Competitive set would be nothing short of a Herculean task. Participants face a screen with 122,500 discrete points. Generally, they do not propose small changes to the current status quo, since such changes represent a change of only pennies in payoff. Instead, points are proposed in increments of 10 or 25 units. In general, this appears to be a device enabling good use of a finite set of messages and meets the time constraints imposed by the experiment. Figure 6-4 depicts one such experimental round.

Figure 6-4 illustrates the votes taken on proposals during an experimental round. Although a total of 42 proposals were sent, only 8 different proposals were voted on (although some proposals were called to a vote more than one time). The dotted lines on the figure indicate a change in the status quo and trace an agenda path to the final outcome. With the exception of the 4th and 8th votes, the status quo moved in toward various points of the Competitive solution. With the 4th vote, it is possible player 5 was strategically voting to push the status quo from where it settled and stayed following the first vote.[12] Meanwhile, players 1, 2, and 3 acted reasonably during the 8th vote, pushing the status quo back to an area where the status quo previously had rested. As can be noted from the figure, the changes in the status quo involve large jumps across the policy space. Also, these proposals typically fall on labeled units of the coordinate axes. Yet, there remains a pattern to the movement. In other rounds with a baseline committee structure, cycling and movements toward the Competitive set are equally apparent.

FIGURE 6–4


VOTING PATTERNS: EXPERIMENT 5:2
FINALY
350
300
250
200
150
100
50
0
0
50
100
150
200
250
300
350
FINALX
P^1
P^2
P^3
P^4
P^5
4
0
8,10,12
5,6
1,2,3
13,14
θ_5
9
7,11
= VOTE ON A STATUS QUO
= VOTE ON AN AMENDMENT
= COMPETITIVE SOLUTION

Although the Competitive solution is not as successful in predicting outcomes in this experimental series as in other experiments, it still serves a useful purpose. It is a baseline model with which to compare other committee structures. If institutional rules constrain the strategies available to individuals, then the patterns of those committee outcomes ought to differ from the baseline model. That is the thrust of the analysis below.

Change in Aggregation Rules

When the committee structure has its aggregation rule changed from the baseline model with a 3-person simple majority rule to a 4-person extraordinary majority rule, the pattern of outcomes change. In Chapter 4 it was argued that as the aggregation rule requires a greater proportion of individuals to pass a proposal, the decision costs facing participants increase. Consequently, the basis over which participants can find agreement shrinks. This has a number of expected empirical manifestations. First, for the 5-person, two-dimensional game, outcomes should be constrained to the interior pentagon of the pareto space. Second, the increase in decision costs should increase the number of votes cast and proposals made by the committee, as well as increase the amount of time taken to reach a decision. To test these conjectures, extraordinary majority rule committee outcomes are compared with those of the baseline committee. The only difference in treatments across these two committee structures concerns the aggregation rule, so differences in patterns of outcomes should be attributable to structural differences.

Before beginning analysis the possibility that there are between group differences for extraordinary majority committees must be examined. To do so, the set of outcomes are split into two samples. T-tests are then performed comparing sample group means for distance, vote totals, proposal totals, and time elapsed. The distance variable is calculated as the distance of the outcome from the associated Competitive solution. Since greater than minimal winning coalitions are always necessary with an extraordinary majority voting rule, the nearest Competitive solution to an admissible coalition subset of the winning coalition is used. This measure provides a congruent measure with the baseline committee distance measure. Table 6-5 provides the set of results from these tests. There are no significant differences between group means along any of these variables. This tends to support the contention that these experimental groups were similar over the experimental series.

Now it is possible to compare outcomes between the baseline committee and the extraordinary majority rule committee. Comparing Figure 6-5 with Figure 6-2 indicates that outcomes were more likely to cluster in the interior pentagon of the pareto space **(the space γ)** for the 4-person aggregation rule committee.. Only 20 percent of the baseline's outcomes fall in the space γ, compared with 61.1 percent of the outcomes for the extraordinary majority rule committees (see also Table *6-6),*. Further, these outcomes appear to be more densely packed than those of the baseline committees. The average distance of baseline outcomes from the Competitive solution is 37.3 units, while the average distance of committee outcomes with a changed aggregation rule is 27.2 units. As shown in Table 6-7, the difference in these

Table 6-5

Extraordinary Majority Rule T-Tests: Between Group Means

Variable:	Number of Cases*	Mean	δ^2	T Value	D.F.	Two-Tailed Probability	Mann-Whitney
Distance	9	26.47	15.50	-0.27	8.68*	0.794	.436
	9	27.89	3.19				
Vote Total	9	14.67	5.61	-0.04	16	0.967	.796
	9	14.78	5.63				
Proposal Total	9	42.33	14.40	1.36	16	0.193	.094
	9	34.44	9.77				
Time Elapsed	9	1,102.11	199.87	0.71	16	0.487	1.000
	9	1,009.44	335.78				

* Since the variances are significantly different, a separate variance estimate of T is used.

FIGURE 6-5

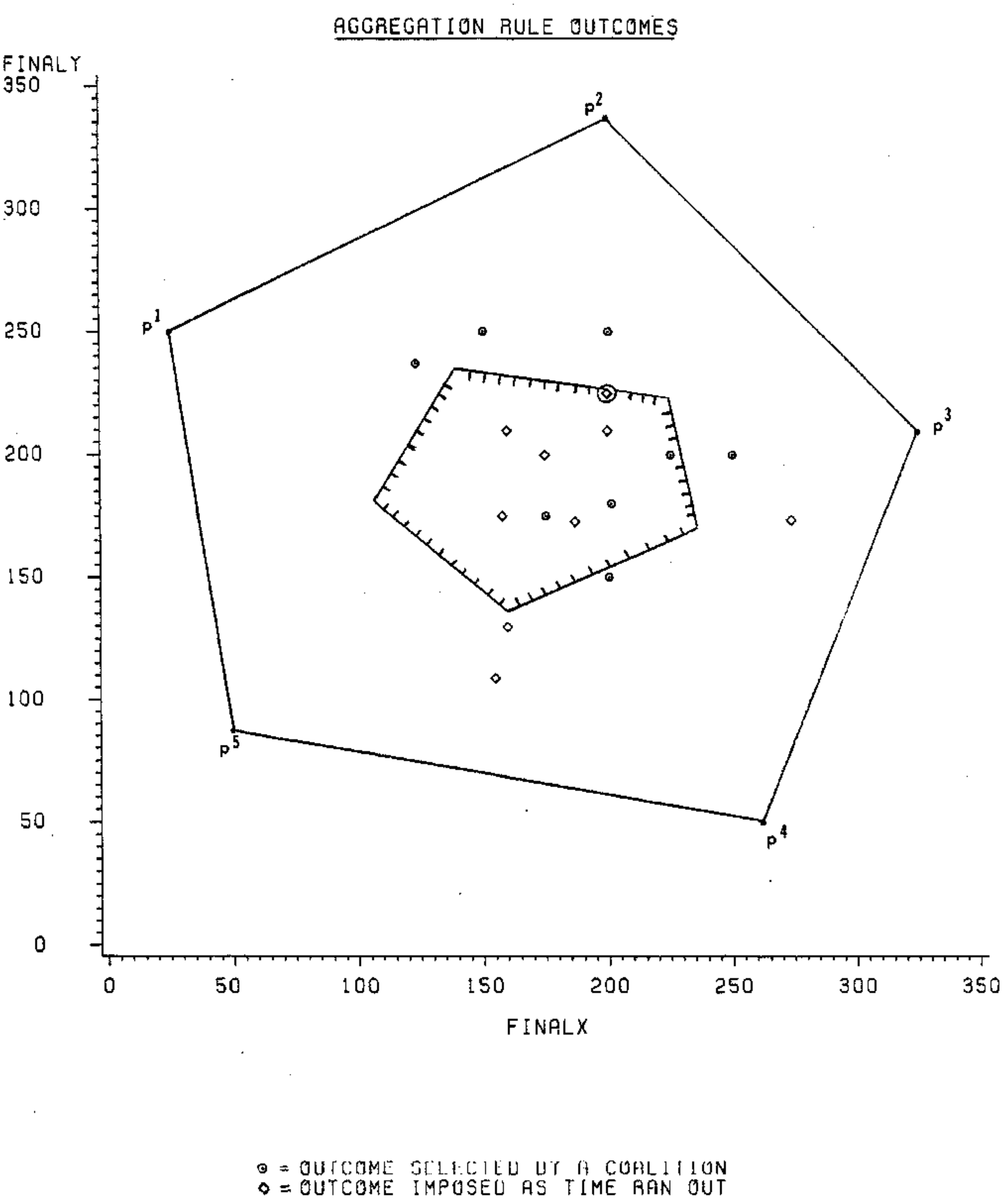

AGGREGATION RULE OUTCOMES
FINALY
350
300
250
200
150
100
50
0
0
50
100
150
200
250
300
350
FINALX
P1
P2
P3
P4
P5
⊙ = OUTCOME SELECTED BY A COALITION
◇ = OUTCOME IMPOSED AS TIME RAN OUT

Table 6-6

Extraordinary Majority Rule Outcomes

Experiment/Round	Coalition	Outcome	Distance
2:2	*	(200,225)	22.56
3:2	*	(155,109)	43.97
3:3	*	(123,237)	19.93
4:2	(2345)	(250,200)	21.10
4:3	(1235)	(225,200)	4.47
5:3	(1235)	(150,250)	34.41
6:4	*	(158,175)	28.84
6:5	(2345)	(200,150)	10.00
9:5	*	(274,174)	53.00
12:4	*	(175,200)	30.15
13:3	(1345)	(200,225)	22.56
13:4	(1234)	(200,250)	29.73
14:4	*	(200,210)	29.73
16:2	(2345)	(201,180)	31.95
16:3	*	(160,210)	26.91
16:4	*	(160,130)	27.66
18:5	*	(187,173)	23.19
19:4	(2345)	(175,175)	29.15

* Indicates time ran out during the round.

means is significant at the .05 level. A one-tailed test is used since the expectation is that committee outcomes with changed aggregation rules vary less than baseline committee outcomes in distance from the Competitive solution. This conjecture is based on the prediction that extraordinary majority rule committees will focus within the subspace γ. This conjecture is reinforced by noting that the. variances of the two committees are significantly different ($F_{(14,17)} = 7.27$). It appears that the extraordinary majority rule shrinks the variation in distance among outcomes more so than the simple majority rule.

When turning to other variables in Table 6-7, other significant differences also emerge between the two committees. In each case it is expected that the mean vote totals, proposals sent, and time elapsed in an extraordinary majority voting rule are greater than that for the baseline committee. This expectation is based on the increased decision-making costs imposed by an extraordinary majority voting rule. This is clearly the case for the number of votes cast. Even more intriguing is the few number of times that the status quo changed in extraordinary majority committees when compared to baseline committees (a mean of 1.28 times for the former and 4.00 for the latter). The number of proposals sent is greater in committees with changed aggregation rules (38.4) than in baseline committees (30.7), although the differences do not meet the test of significance used here. Finally, the differences between the amount of time elapsed are barely significant at the .05 level. However, buttressing the point that these are different is the observation that baseline committees only used the full allotment of time 20 percent of the time while extraordinary majority committees ran out of time in 55.6 percent of the cases.

Table 6-7

Comparison of Baseline and Extraordinary Majority Rule Committees

Variable:	Treatment	Number of Cases	Mean	δ^2	T Value	D.F.	One-Tailed Test	Mann-Whitney
Distance	Baseline	15	37.34	20.35	-1.75	17.21*	.048	.244
	Extraordinary	18	27.18	10.88				
Vote Total	Baseline	15	11.00	4.50	2.11	31	.013	.046
	Extraordinary	18	14.72	5.45				
Proposal Total	Baseline	15	30.67	10.95	1.86	31	.035	.055
	Extraordinary	18	38.39	12.61				
Time Elapsed	Baseline	15	896.07	306.97	1.58	31	.065	.089
	Extraordinary	18	1,055.78	272.27				

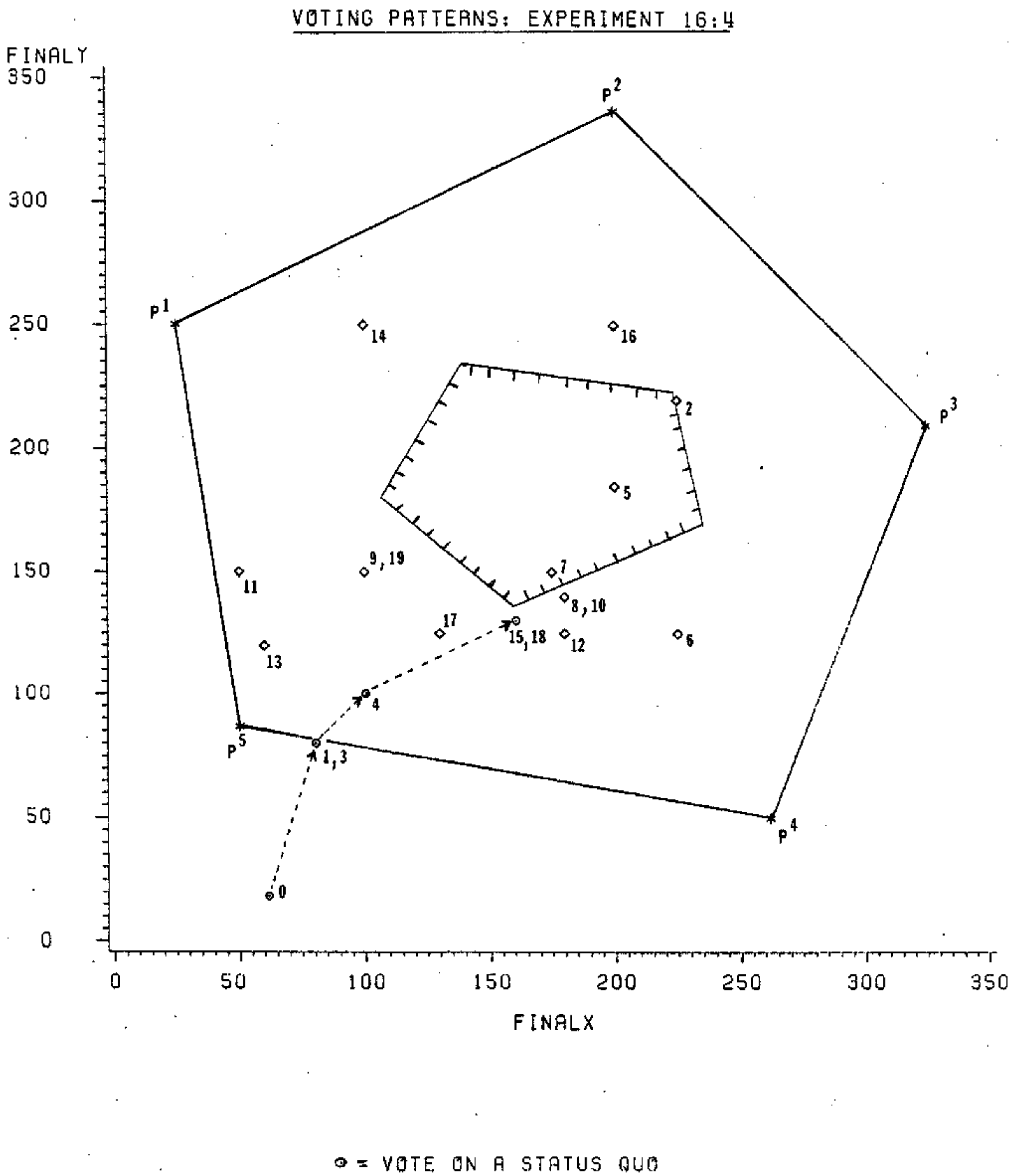
* Since the variances are significantly different, a separate variance estimate of T is used.

In all, these general observations indicate that outcomes under an extraordinary majority rule committee vary less than baseline committee outcomes. These outcomes tend to fall in the predicted solution space, as well as being packed around that space. Further, an extraordinary majority rule committee seems to face significantly greater decision costs as measured by the total number of votes taken and the amount of time elapsed for the committee to reach a decision. Some of these notions are captured by the experiment represented in Figure 6-6. This extraordinary majority rule committee round used the entire 20 minutes allotted for a decision. A total of 42 proposals were sent during the course of the round, with a total of 19 votes taken.

During the course of the experiment, the status quo steadily converged toward the space γ until halting quite close to it. Further movement from the final status quo was possible, but meant constructing an agenda with extremely small steps from the final status quo to the surface of γ. However, uncovering this agenda was unlikely since most participants did not discriminate among proposals in such a fashion. The number of votes, the number of proposals sent, and the time spent in this round is some indication of the constraints an extraordinary majority aggregation rule places on outcomes.

Since the two committees vary <u>only</u> as to the number of votes required to pass a proposal, it seems reasonable to attribute differences in outcomes to this change. Since the pattern of outcomes are different, it seems that the change in aggregation rules constrains the strategies that individuals can successfully employ. Further, the change from a 3-person to a 4-person aggregation rule

FIGURE 6-6


VOTING PATTERNS: EXPERIMENT 16:4
FINALY
FINALX
350
300
250
200
150
100
50
0
0
50
100
150
200
250
300
350
P1
P2
P3
P4
P5
14
16
2
5
9, 19
7
8, 10
11
17
15, 18
12
6
13
4
1, 3
0
⊖ = VOTE ON A STATUS QUO
◇ = VOTE ON AN AMENDMENT

results in greater committee discussion as measured by the number of votes and amount of time taken by such committees to reach agreement. Finally, a large proportion of the outcomes from committees with a changed aggregation rule appears in the sub space G. This is congruent with the prediction tendered in Chapter 4.

Change in Communication Rules

Communication rules affect the type of information individuals have available when making decisions. If a committee operates under rules in which communications are curtailed, the presumption is that outcomes will tend to scatter throughout the pareto space. More precisely, as the number of polls are reduced in the space, so too is the likelihood of uncovering a quasistable point. The resulting prediction (taken from Chapter 4) is that committee members will select points in coalition specific subsets of the pareto space **(points in τ_j for some $Cj \subset W$).** In effect, the outcomes of committees with changed communication rules should be more dispersed than outcomes of baseline committees.

Before beginning analysis, it can be shown that results from different experimental groups can be pooled. Table 6-8 presents the results from sample groups with limited communications. As can be noted by scanning these results, the sample means are not significantly different from one another. As with other committees, this indicates that between groups effects are unlikely to need attention in the following analysis.

Table 6-8

Communication Rule T-Tests: Between Group Means

Variable:	Number of Cases	Mean	δ^2	T Value	D.F.	Two-Tailed Probability	Mann-Whitney
Distance*	7	46.36	29.39	0.15	15	0.882	.601
	10	44.43	23.66				
Vote Total	8	13.63	6.28	1.26	17	0.223	.193
	11	10.36	4.99				
Proposal Total	8	14.25	1.04	1.03	17	0.316	.740
	11	13.36	2.25				
Time Elapsed	8	944.75	353.13	0.70	17	0.491	.417
	11	824.64	376.21				

* Two outcomes with coalitions outside the Competitive set are excluded from this measure, since their distance from that solution cannot be computed.

Figure 6-7 plots outcomes derived from committees operating under limited communication rules. In this instance, participants were allotted three proposals. Once those were sent, participants could only vote or bring proposals to a vote. Table 6-9 lists these outcomes and provides data as to the coalition that formed and distance of the outcome from the equivalent Competitive solution. Time ran out in 10 out of 19 rounds with the current status quo imposed as the committee's decision. One plausible explanation for this (and an example is offered below) is that individuals use all possible opportunities to vote on different proposals. In effect, this amounts to a full search across available information. In those instances where, time ran out, distance is calculated for the closest Competitive solution on the presumption that coalition would have enacted the proposal if forced to decide for or against the proposal after time ran out.

On the surface, these outcomes generally appear in the proper partitions of the pareto space. Of the nine outcomes selected by a coalition, two-thirds fall into the correct partition. If rounds in which time elapsed are included, and if the coalition voting for the alternate proposal that subsequently became the imposed outcome are taken into account, then 68.4 percent of the coalitions fell into correct partitions of the pareto space. However, when comparing the distance of baseline and limited communication committee outcomes, there is little evidence that outcomes from the two committees are different. Table 6-10 indicates there is no significant difference between the two committee structures as to distance. This is contrary to the expectation that outcomes would be more dispersed under a

FIGURE 6-7

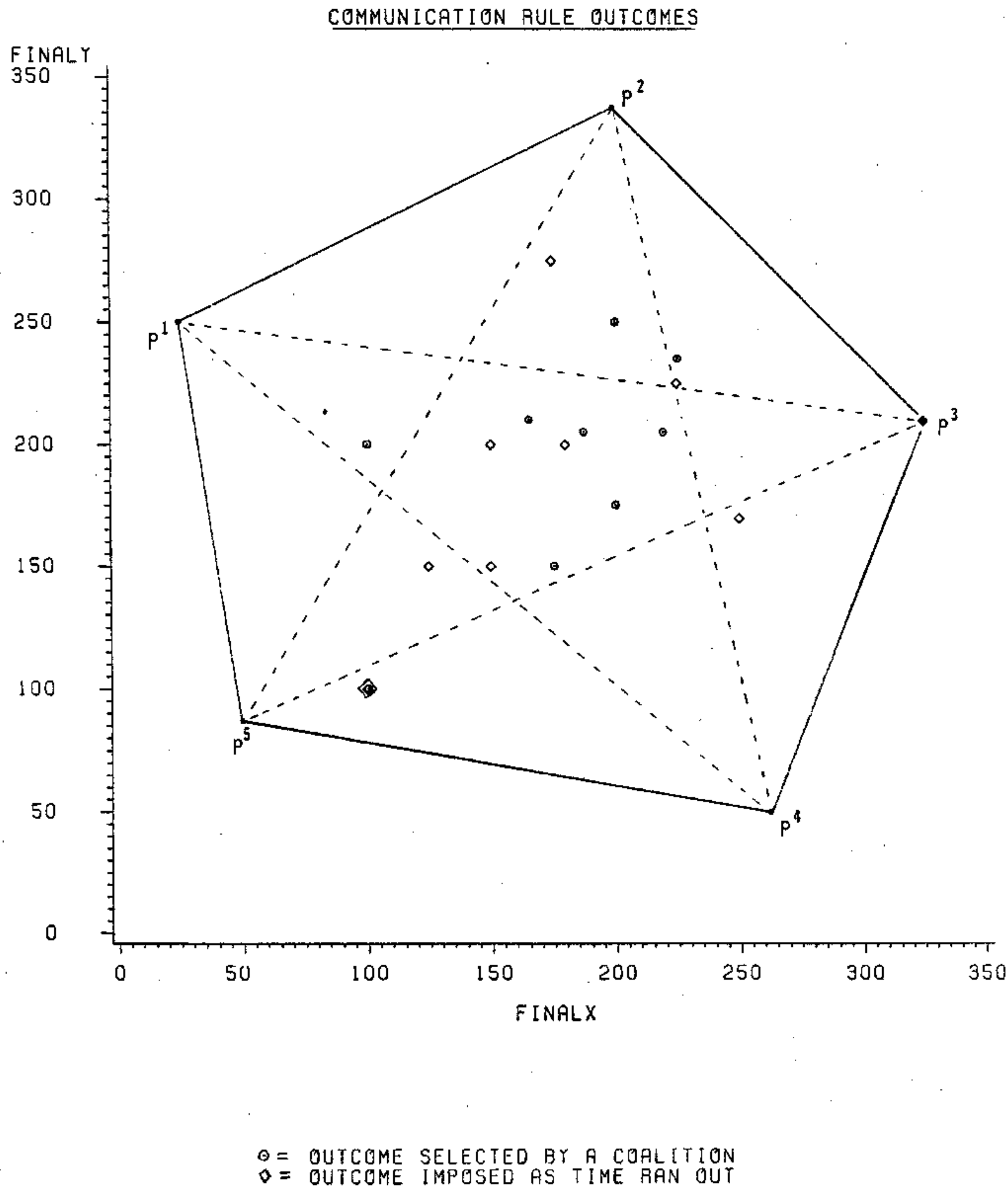

COMMUNICATION RULE OUTCOMES
FINALY
350
300
250
200
150
100
50
0
0
50
100
150
200
250
300
350
FINALX
P1
P2
P3
P4
P5
⊙ = OUTCOME SELECTED BY A COALITION
◇ = OUTCOME IMPOSED AS TIME RAN OUT

Table 6-9

Limited Communication Rule Outcomes

Experiment/Round	Coalition	Outcome	Distance
1:2	(145)	(175,150)	33.02
1:3	(1235)	(165,210)	23.85
2:3	(345)*	(225,225)	82.76
3:4	(1235)	(187,205)	27.57
3:5	(1234)	(219,205)	10.44
5:4	(125)*	(180,200)	30.07
8:4	(125)*	(175,275)	45.10
9:2	(135)	(100,100)	**
10:3	(234)	(200,250)	56.08
10:4	(125)	(100,200)	34.13
10:5	(235)	(225,235)	**
12:5	(234)	(200,175)	39.62
14:2	(145)*	(125,150)	17.03
14:3	(234)*	(250,170)	38.28
15:2	(145)*	(100,100)	66.07
15:3	(125)*	(150,200)	27.66
15:4	(145)*	(100,100)	66.07
19:2	(125)*	(150,150)	8.06
19:3	(234)*	(325,210)	96.33

*Time ran out in the round. These coalitions voted for the alternate proposal that became the imposed outcome.

**Coalition is not in the Competitive set.

Table 6-10

Comparison of Baseline and Limited Communication Rule Committees

Variable:	Treatment	Number of Cases	Mean	δ^2	T Value	D.F.	One-Tailed Test	Mann-Whitney
Distance	Baseline	15	43.48	29.33	0.18	30	.430	.602
	Communication*	17	45.22	25.29				
Vote Total	Baseline	15	11.00	4.50	0.41	32	.338	.876
	Communication	19	11.74	5.65				
Time Elapsed	Baseline	15	896.07	306.97	-0.18	32	.429	.903
	Communication	19	875.21	361.71				

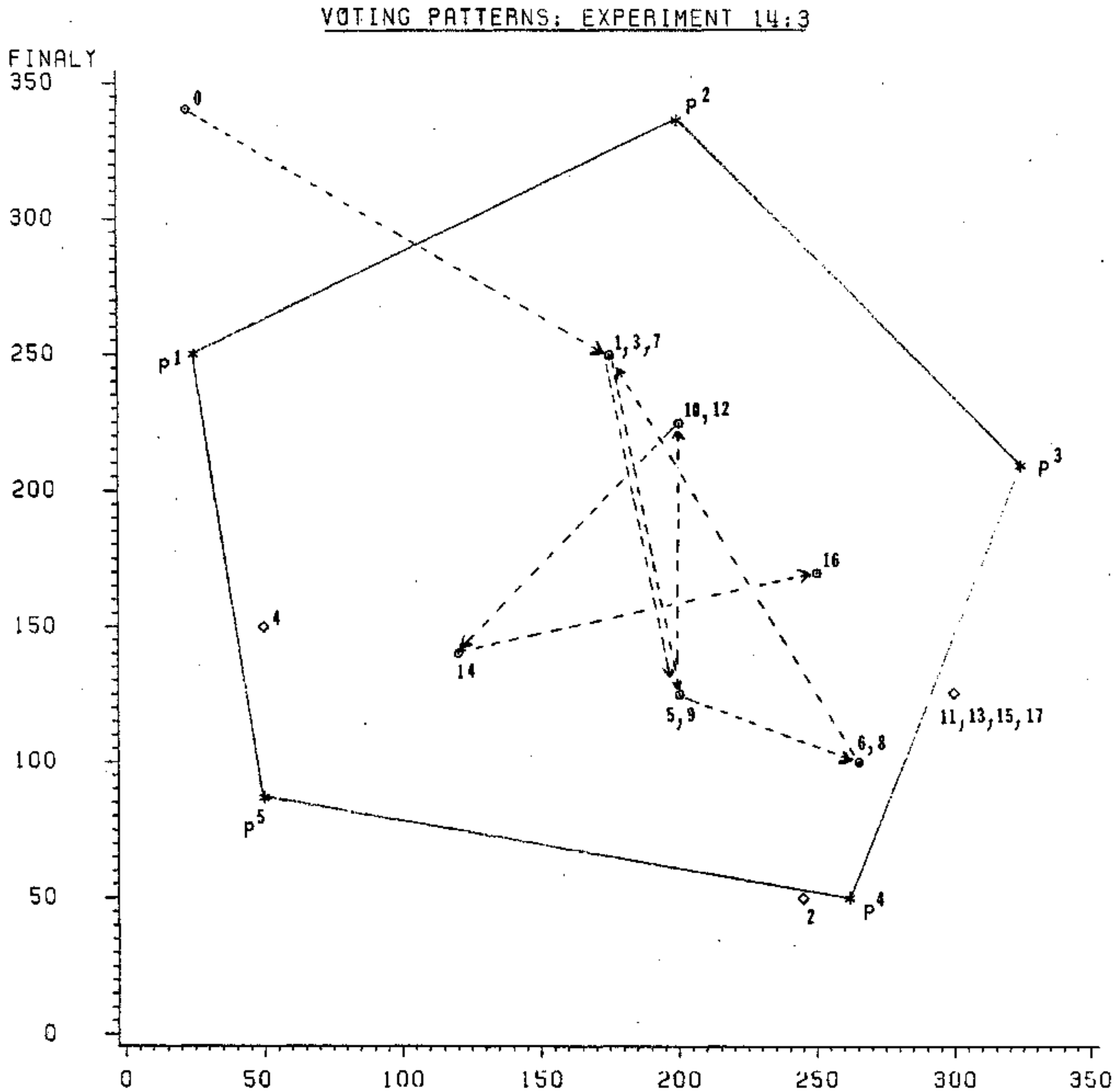
* Two outcomes with coalitions outside the competitive set are excluded from this measure.

limited communication rule. Likewise, there is no significant difference as to the number of votes taken nor as to the amount of time that elapsed. Even though one half of the limited communication rounds ran out of time — compared with only three cases for baseline committees — still the differences are not significant. Except for the large number of outcomes appearing in the central pentagon, it appears that the three communication limit had little effect on outcomes.

However, this is not entirely the case. The three proposal limitation resulted in participants spending a considerable amount of time debating and cycling among proposals. Similar to rounds played under baseline committees, limited communication committees changed the status quo an average of almost four times (3.84). However, this occurred for a much smaller set of proposals (an average of 13.74 compared with 31.94 for baseline committees). Also, limited communication committees voted as often as baseline committees voted, but again over a smaller set of proposals. In effect, the proposals available to individuals were carefully scrutinized by the committees. In turn, this provided an incentive for participants to offer proposals that did not remove them ''from the action.'' This often meant sending proposals far removed from the ideal point to ensure a better than minimal payoff. This could partially explain the comparatively large number of proposals falling in the central pentagon of the pareto set.

Some of this strategic behavior is evident from the limited communication experiment depicted in Figure 6-8. In this case, each player sent the maximum number of proposals allotted. Participants

FIGURE 6-8



⊙ = VOTE ON A STATUS QUO
◇ = VOTE ON AN AMENDMENT

then called 17 votes over nine distinct proposals. Consequently, the bulk of the proposals were subjected to a vote (with the exception of some early proposals that represented proposals near the ideal points of the players). With even these few alternatives to choose from, it is apparent there is considerable effort exerted in searching for an acceptable point. In fact, as illustrated in Figure 6-8, cycling among proposals does occur in interesting ways — as is evident with votes 1, 5, 6, 7, 9. A new cycle was also set up with votes 10, 14, and 16. Had time not run out, the proposal at vote 10 could have defeated the final status quo. In general, limited communication committees appeared to fall into voting cycles more often than baseline committees. This is plausibly due to the limited number of proposals available for scrutiny and the time remaining in the experiment once all allotted proposals are made.

In all, the expected constraints imposed by limited communications are not clearly manifested by the experimental outcomes. While the expectation is that outcomes would be widely divergent throughout the pareto space — they were no more so than with baseline committee outcomes. Glimpses of the effects of a limited communication rule appear — the large number of votes, cycling among proposals, and generally falling into the correct partition of the pareto space. However, these additional information gathering techniques appear to undermine a communication rule aimed at constraining information. In short, participants quickly developed skills that enabled them to seek additional information in a structure that sought to deprive them of information.

Changes in Position Rules

The institutional changes analyzed so far have been imposed on all committee members without assigning any special powers to a subset of participants. The structural constraint discussed now assigns agenda control to two committee members whose ideal points lie in a particular area of the policy space. In Chapter 4, it is argued that participants with these agenda powers can successfully drive the outcome to a specific point — δ_{ij} — in the policy space. This point is a minimax solution for the individuals having special agenda powers. In general, the expectation is that such agenda power enables those assigned to a special position considerable control over outcomes.

As with other committees there appears to be few between group effects among the principle variables of concern. Splitting the limited position rule committees into two subgroups and conducting T-tests comparing means for the standard measure of distance, vote totals, proposals sent, and time elapsed, little difference is found between the subgroups (see Table 6-11). The only discrepancy is the difference among means as to the number of proposals sent. This difference approaches the .05 significance level used in this study. However, given the lack of significant differences among the other variables, it does not represent a serious threat to pooling the grouped data.

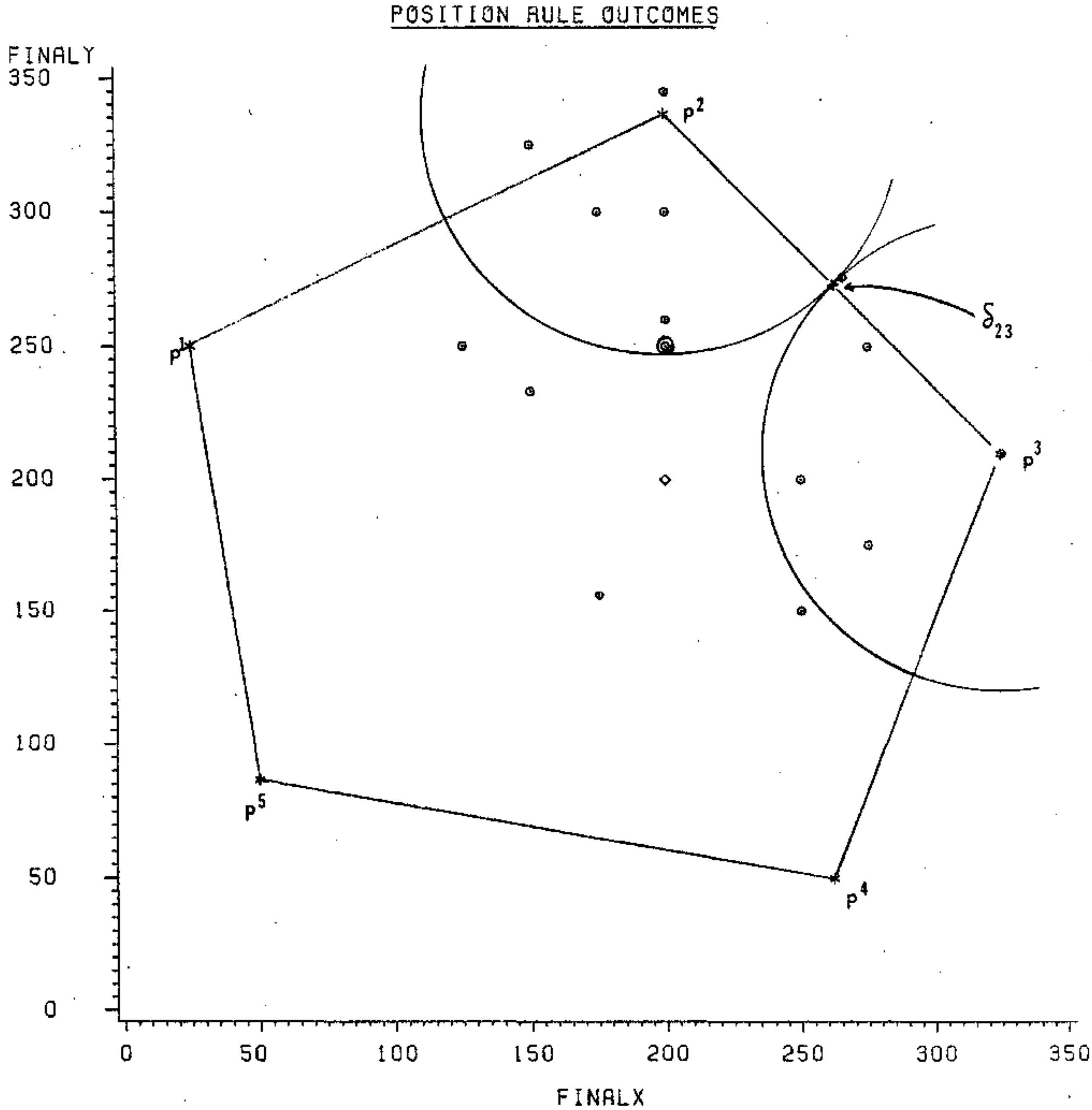
Outcomes for the limited position committees are depicted in Figure 6-9, with a list of those outcomes in Table 6-12. As can be noted from the figure, only two outcomes cluster around the expected

Table 6-11

Position Rule T-Tests: Between Group Means

Variable:	Number of Cases	Mean	δ^2	T Value	D.F.	Two-Tailed Probability	Mann-Whitney
Distance	8	54.31	31.81	-0.09	15	0.931	.9626
	9	55.68	31.97				
Vote Total	8	7.38	3.29	0.42	15	0.681	.277
	9	6.44	5.43				
Proposal Total	8	13.75	6.02	2.00	15	0.063	.059
	9	8.22	5.36				
Time Elapsed	8	647.63	342.53	1.09	15	0.294	.167
	9	467.22	339.76				

FIGURE 6–9



⊙ = OUTCOME SELECTED BY A COALITION
◇ = OUTCOME IMPOSED AS TIME RAN OUT

outcome δ_{23}. Otherwise, proposals scatter through the upper portion of the policy space. In short, these outcomes do not lend any credence to the predicted solution argued in Chapter 4. A reasonable explanation, however, may account for this. Since agenda setters were ignorant of other's ideal points, the initial proposals sent by agenda setters determined the ensuing deliberations. If a proposal is sent that falls within the pareto set, and if it is voted for, it cannot be defeated by a proposal closer to the predicted solution. Only proposals that are also in the pareto space and closer to the unknown silent voters can subsequently defeat such a status quo. Since there is no mechanism by which agenda setters can collude, competing for others' votes seems to characterize much of the decision-making process.

This is not to say that the limited position rule has little effect on outcomes. Compared with the set of baseline committee outcomes, these differences are considerable (see Table 6-13). Comparing the relative distance of committee outcomes from the Competitive set in this instance is not useful. The expected outcome of the limited position rule committees does not consider all coalitions or areas of the policy space to be equally likely. It predicts outcomes will cluster in the upper right quadrant of the policy space, close to the predicted solution δ_{23}. Meanwhile, baseline outcomes should disperse fairly uniformly around the central pentagon of the pareto space. Two T-tests in Table 6-13 test this notion by taking the mean X and Y outcome coordinates and comparing between different committee structures. Interestingly, there is no significant difference along the X axis coordinates. However, along

Table 6-12

Limited Position Rule Committee Outcomes

Experiment/Round	Coalition	Outcome
1:4	(234)	(275,175)
2:4	(1235)	(275,250)
4:4	(123)	(266,276)
4:5	(235)	(200,345)
6:2	(134)	(250,200)
6:3	(345)	(250,150)
7:2	(234)	(200,300)
7:3	(345)	(325,210)
7:4	(124)	(200,250)
8:2	(125)	(200,250)
8:3	*	(200,200)
9:3	(124)	(150,325)
11:3	(1245)	(175,156)
11:4	(125)	(150,233)
11:5	(125)	(125,250)
12:2	(124)	(200,260)
18:4	(1235)	(175,300)

*Time ran out during this round.

Table 6-13

Comparison of Baseline and Position Rule Committees

Variable:	Treatment	Number of Cases	Mean	δ^2	T Value	D.F.	One-Tailed Test	Mann-Whitney
Final X	Baseline	15	186.00	48.67	1.47	30	.075	.163
Coordinate	Position	17	212.71	53.25				
Final Y	Baseline	15	187.00	43.50	3.11	30	.002	.001
Coordinate	Position	17	242.94	56.41				
Vote	Baseline	15	11.00	4.50	-2.60	30	.008	.009
Total	Position	17	6.88	4.44				
Proposal	Baseline	15	30.67	10.95	-6.41	30	.000	.000
Total	Position	17	10.82	6.19				
Time	Baseline	15	896.07	306.97	-2.97	30	.003	.008
Elapsed	Position	17	552.12	343.02				

the Y axis, these differences are considerable and significant. The implication is that the set of limited agenda committee outcomes are manifestly different from baseline committee outcomes. As a whole, constrained agenda control committees yield outcomes that are located in the upper two quadrants, with emphasis on the upper right quadrant.

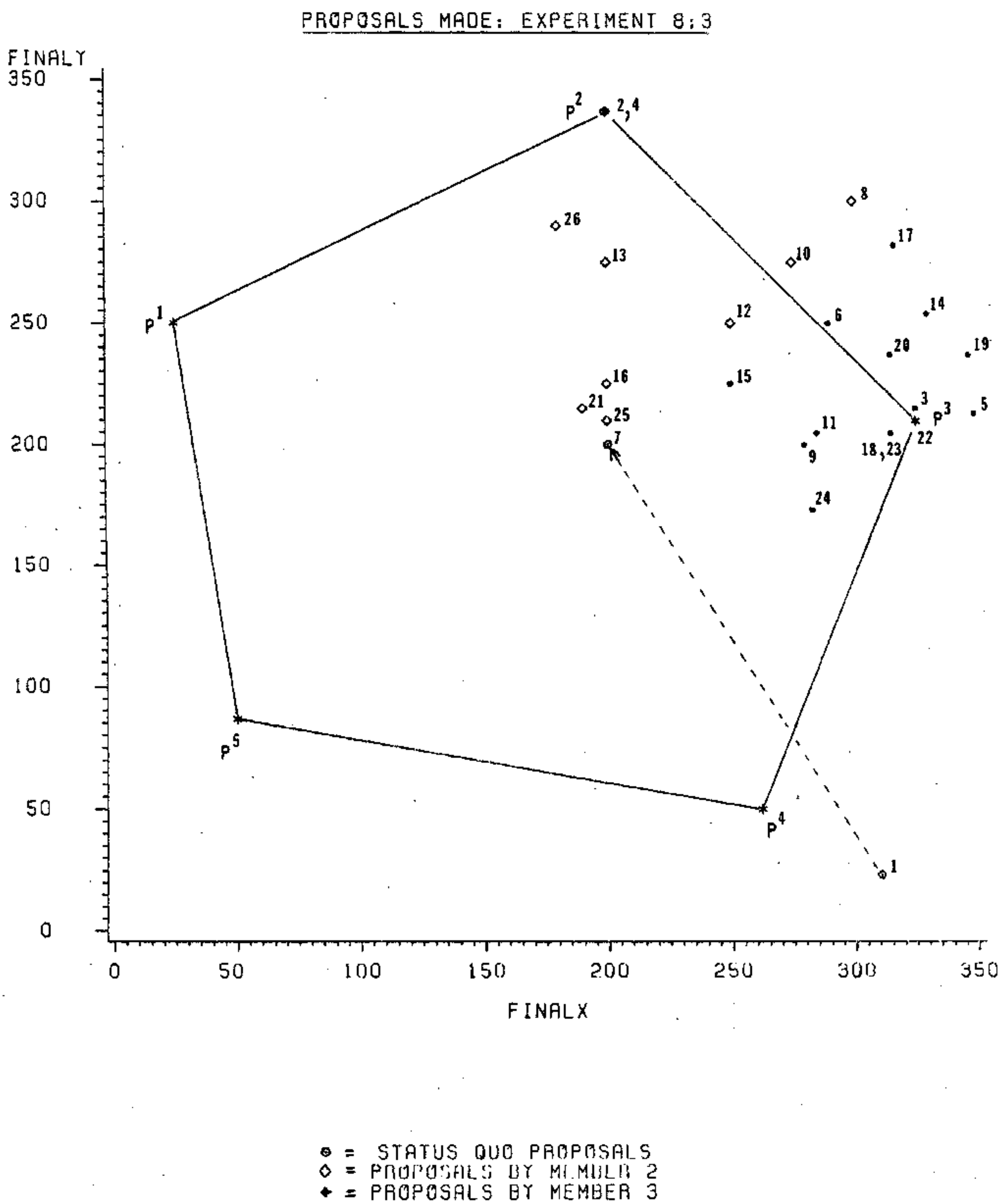
An initially surprising finding is that vote totals, the number of proposals sent, and the time elapsed are consistently lower than the baseline committee's totals, and that these are all significantly different. However, this may be expected if it is taken into account that position rules empower agenda setters with considerable powers. Obviously, the number of proposals sent should be lower. More importantly, although agenda setters cannot force other members to vote for a proposal, they can refuse to send alternate proposals. In a way this forces other members to vote on a much smaller set of proposals (even less than the limited communications committees). With a fewer number of proposals to consider, and with fewer votes, the amount of time taken is also likely to be lower.

As briefly mentioned above, there is a tendency for agenda setters to compete rather than collude during the experiment. As a result, there is an identifiable tendency for outcomes to concentrate around the ideal points of the agenda setters. Returning to Figure 6-9, it can be seen that 70.6 percent of the outcomes lie in an area that is within a radius of $||\delta_{23} - p^i||$ (where i = {2,3}) units of the ith agenda setter's ideal point. This competitive tendency can partially be explained by the lack of any binding structure allowing collusion. As argued in Chapter 4, any point in the policy space is unstable for the agenda setters unless δ_{23} is settled on. Otherwise, agenda setters can quickly undercut one another. The other supporting point relates to the unknown position of other committee members in the space. Their votes, which are crucial to passing any proposal, remain uncertain quantities. As a result, agenda setters generally tend to propose points fairly close to their own ideal points.

This tendency of keeping proposals in a defined area is evident from the experimental round illustrated in Figure 6-10. This experiment was not notable for the agenda skills of player 2 who early on sent a proposal in the central pentagon of the pareto space. Although 11 votes were taken, the status quo quickly moved to the center and remained there. However, player 2 subsequently defined an area that extended northeast of a line defined by proposals 7, 8, 10, and 12. Meanwhile, player 3 kept his proposals narrowly clustered around his ideal point. However, due to proposal 7 being accepted as the status quo early on, movement of the status quo to the northeast was very unlikely. In all, this experiment illustrates a distinct disinclination for collusion between agenda setters. Not knowing the position of others within the policy space, proposals focused in the northeast quadrant. It was not until late in the round that player 2 sent proposals 21 and 25 in an attempt to better off his position, while player 3 sent proposal 24 to attract other voters. However, by this point time was running out and the status quo was well entrenched. In the meantime, there was little bargaining among the agenda setters.

In all, agenda setting powers appear to benefit those with power — as expected. However, neither did that power result in agenda setter's achieving their ideal points.[13] Although the prediction made

FIGURE 6-10


PROPOSALS MADE: EXPERIMENT 8;3
FINALY
FINALX
350
300
250
200
150
100
50
0
0
50
100
150
200
250
300
350
P1
P2
P3
P4
P5
2,4
1
3
5
6
7
8
9
10
11
12
13
14
15
16
17
18,23
19
20
21
22
24
25
26
⊕ = STATUS QUO PROPOSALS
◇ = PROPOSALS BY MEMBER 2
✦ = PROPOSALS BY MEMBER 3

in Chapter 4 was not borne out by this data, still special agenda powers do appear to have some impact on outcomes. This is especially so when comparing these committee outcomes with those of baseline committees.

A General Retrospection

Rarely are predictions from formal models put to empirical test. The experiment outlined in Chapter 5, and outcomes reported in this chapter represent an effort at tackling that task. The thrust of the experimental series was to control a large set of variables and examine the effects of carefully controlled variations in structure. In each instance, committees with institutional configurations deviating from a baseline committee had outcomes that varied from those obtained by baseline committees. Further, these variations were in directions predicted by models established in Chapter 4. Although predicted solutions did not always materialize, the variability of outcomes in different committee structures was predictable.

In sum, the analysis in this chapter points to the role played by institutional structure in changing patterns of outcomes. Presumably the variations noted in outcomes can be attributed to these changes in institutional structure, since all other elements of the experiment were subject to strong controls over exogenous variables. Extraneous effects due to individual characteristics do not explain a great deal, nor do between group differences within particular committee structures. Yet, the poor performance of many of the predicted outcomes do need further investigation. A number of plausible explanations might be offered. Most concern task complexity and motives of participants. Although the experiment was designed to simplify task complexity, still it involved participants employing skills in abstracting new information and putting it to use. The experiences in the experiment were new to most of the participants. Although some learning could be expected during the experiment, it may have involved a process exceeding the five rounds that most committee members participated in. Likewise, unfamiliarity with a new environment could have resulted in relatively poor task completion. Unfamiliarity with the equipment caused two participants to ''freeze'' at the start of the experiment. However, once they were comfortable with the equipment following the practice round, those individuals performed well. However, others could have suffered the same problems without seeking or receiving guidance. Also, given the large policy space confronting participants, it was little wonder that proposals were viewed in terms of large increments rather than as somewhat smaller units that would have enabled movements toward solutions. Finally, constrained verbal communications bothered a few participants. Understanding that sending a proposal was tantamount to communicating was difficult for these individuals to understand. This problem could possibly have been more widespread, contributing to confusion.

On another front, individuals might not have been acting as maximizers. Although the incentive structure was carefully designed so that participants would pursue real-valued gain, on occasion individuals voted against their best interests. Two types of answers were given when these individuals were questioned following the experiment. On the one hand, a few participants appeared extremely shrewd, demonstrating an innate sense of strategic voting in order to cycle a status quo proposal. On the other hand, others remarked that they wanted to effect a decision —- the ''Henry Clay'' syndrome — in which compromise was thought to be an integral part of their role. Finally, it is possible that some participants set expectation levels for what they would earn. In this respect, they acted as satisficers rather than as maximizers. This is an interesting possibility deserving further investigation, but outside the scope of this study.

One general suggestion for future work is that ''experienced'' participants be used in similar experiments. This approach has been used extensively in economics for a number of years without resulting in serious threats to internal validity. With a few early pretests, participants were called back, and they appeared to do better. However, this means developing and maintaining a stable participant pool, which can be difficult in a university setting.

It may be the case that the models developed in Chapter 4 fail to capture much of what is occurring in these abstracted committee experiments. Other models (such as the Ferejohn, Fiorina, and Packel's, 1980, Markov models) may explain some of the underlying nuances at work. However, by and large, this experimental series does provide important evidence for the effects of structure on outcomes. It remains for the next Chapter to tie together these observations with the discussions in the earlier chapters.

FOOTNOTES FOR CHAPTER SIX

[1]All participant data are taken from a post-experimental questionnaire.

[2]The regression equation used in this analysis is straightforward, and is represented by,

$$IND = \alpha + \beta_1 SEX + \beta_2 RACE + \beta_3 EDUC + \beta_4 USTAND + \beta_5 USE.$$

[3]The dependent variable was calculated by:

$$IND = [\textstyle\sum_{ij} ((x_j - p_x^{ij})^2 + (y_j - p_y^{ij})^2)^{1/2}]/J$$

where: $i \in G$, $G \subset N$; and
$j \in$ {set of rounds in an experiment}, and
J = the number of rounds to an experiment.

This measure is really a performance measure, since the lower the value of IND, the closer outcomes feel (on the average) to the individual ideal point.

[4]The precise wording of the questionnaire for these last two items was:

USTAND — Did you have problems understanding the instructions to the experiment?

USE — Did you have problems using PLATO during the experiment?

[5]McKelvey, Ordeshook, and Winer (1978) offer an algorithm for computing the Competitive solution. It is:

If $j,k,l,m,n \in N$ with $k = j+1 \pmod 5$, $l = k+1 \pmod 5$ etc.; then,

$$\theta_j = {}^1/_2[s_{km} - s_{mj} + s_{jl} - s_{ln} + s_{nr}]; \text{ and}$$

$$r_n = {}^1/_2[s_{nk} - s_{kn} + s_{mj} - s_{jl} + s_{ln}].$$

However, this is incorrect. The proper algorithm is:

$$\theta_{i(x)} = \frac{x_m r_j + x_j r_m}{r_j + r_m}$$

$$\theta_{i(y)} = \frac{y_m r_j + y_j r_m}{r_j + r_m}$$

where: $r_j = {}^1/_2[s_{jm} - s_{km} + s_{kn} - s_{ln} + s_{jl}]$;

$s_{jm} = ||X_j - X_m||$; and

X_j = jth individual's ideal point.

All solutions are calculated on this basis.

[6]Two experimental rounds are missing from this total. Both involved instances where the committee structure had limited position rules. The first concerns an error in the setting experimental parameters, resulting in participants having ideal points different than those used in other experiments. The second instance involved a lightning storm that forced wrecked havoc with the computer system. Consequently, all data for that round were lost.

[7]In fact, there were technical difficulties with this round. The winning vote on the outcome did not automatically end the game. Before being called to a halt, the outcome again was brought to a vote, and this time the proper coalition voted for it.

[8]Fiorina and Plott (1978) note that differences in stakes make a significant difference in outcomes. During pretests this variable was manipulated at length, but with no obvious changes in strategies on the part of participants.

[9]This is calculated from the standard binomial probability distribution:

$$\sum \binom{n}{k} p^k q^{n-k} \qquad \text{where: } n = 15; \quad k = (0,1,2,3); \text{ and } \quad p = q = .5.$$

The three instances where time ran out before a decision was reached are excluded from analysis.

[10]Both coalitions falling outside the Competitive set and outcomes that exceed the time limit are omitted from this calculation.

[11]Experiments were arbitrarily assigned to one of the two samples. Because some committee members participated in three baseline committees while others participated in only one, randomizing procedures were not used. Taking two baseline committees with the same membership, and placing one in each sample would negate the effect of this test. It is assumed, of course, that members of a committee are fairly consistent in their behavior, and, therefore, their behavior in one round is similar to behavior in another round, when confronting the same decision situation. The samples were chosen with an eye to keeping membership unique to each sample. With this in mind, sample 1 was composed of committees in experiments 10, 11, 12, 13, 15, 16, 17, and sample 2 from experiments 5, 9, 18, 20, and 21. Subsequent group tests follow a similar procedure.

[12]Strategic voting was not an important consideration in most experimental rounds, since participants generally voted to maximize their payoffs. However, a few participants did vote for less money (on occasion substantially less) in order to cycle the status quo back to a point where they were better off. With this group, player 5 was

observed to do precisely this a number of times. There is no evidence this player was confused by the experiment, but on the contrary, appeared rather adept.

[13]In one case a player did have her ideal point selected, and in another the outcome was quite close. However, in both instances these events occurred because of very quick decisions by others in the committee. They were not due to sly manipulations of the agenda by either participant.

CHAPTER SEVEN

BEYOND THE POLICY SPACE: REASSESSMENTS AND DEMOCRACY

> "And hast thou slain the Jabberwock?"
> - Jabberwocky

Analyzing experimental results obtained from a student population based on models of institutional constraints may not shake the foundation of political science. And yet. the narrow questions asked in this study have broad implications for questions raised by political philosophers and commentators. This study cannot pretend to answer questions relating to the survival of a democratic polity, the role of consensus, or the importance of information for decision making, or the effects of inequalities on a polity. However, it can provide a heuristic discussion of these questions. Further, some observations are offered on the linkage between formal work in political science and results obtained by this study.

Caution in Interpretation

While it is tempting to generalize from the empirical results of this study to the world, such an enterprise would quickly collapse. The results reported in this study are obtained under highly antiseptic conditions. First, these experiments are abstractions of particular mechanisms. Here, the object of study concerns committee structures. Specific aspects of structure are deliberately changed so as to provide variation across committees. All other aspects of structure and other extraneous variables are either controlled or held constant. Rarely are such opportunities to compare treatments available in the real world. Further, these stripped-down versions of committees are unlikely to be found in the real world. Much of the institutional richness of committees is missing as well as historical patterns of interaction among participants. The committees here are more akin to clubs in which members make private decisions that have some value to them. In all, the structure of these committees is at variance with their counterparts in the real world. Consequently, generalizing to real-world committees is difficult.

Second, the models developed in Chapter 4 assume strict rationality criteria. Actors are assumed to be self-interested maximizers. Typically, this condition is regarded as too stringent for the real world, and such appears to be the case for some of the experiments in this study. On occasion, individuals acted in ways peculiar to a rational model — even when accounting for strategic voting. This was particularly pronounced in an early pretest where one participant twice voted against her ideal point (worth $8.00) and agreed to a proposal worth $0.06. While odd cases can often be attributed to confusion, they do tend to undermine a strong rationality postulate.

Finally, the pool of participants is rather unique. It is doubtful that college students are representative of the world at large. In this series of experiments, most appeared unfamiliar with many parliamentary conventions. Whether politicians or businessmen accustomed to participating in collective decisions would behave differently is an interesting empirical question. Yet, differences in types of behavior is not a damning criticism of this study. Again, the concern is with the way that participants act when confronted with different institutional arrangements. As such, college students provide a relatively homogeneous population with which to test the principal claims of the study. Problems arise when attempting to generalize findings to the population at large based on results obtained from a narrow group of participants.

In short, this experimental series lacks qualities of representative populations and isomorphism with real-world processes. As such, the results from these experiments are not representative in any real sense, and consequently, they do not translate to real-world processes. However, these results are meant to be illustrative of a set of particular models. Different committee structures are designed to explicitly test changes across institutional configurations. As such, the research is motivated by a specialized set of variables and aims at providing insights into the ways institutional structure affects outcomes. This heuristic intent of the research sets it apart from other types of research seeking to make generalizations about the world. Yet, this does not devalue its usefulness. Instead, the relationships of interest are derived from metatheoretical questions concerning the role of structure for the outcomes individuals select. Analyzing and testing such questions is best accomplished through the careful development and exposition of models and by imposing controls on relationships that might yield competing (and jumbled) explanations.

The empirical results discussed in Chapter 6 indicate institutional constraints do have meaning for effects on outcomes. The results also suggest that further research is necessary on collective decision-making arrangements with a richer institutional context. If such research is conducted in the real world, with real institutions and proper controls, then generalization might be possible. In any case, the research discussed here serves as a guidepost for making predictions and indicates directions that researchers might take when conducting similar research.

Generalizations to real-world phenomenon, then, are possible only when meeting strict external validity criteria. However, making the transition from highly abstract models to the real world is difficult due to problems in controlling for variation among exogenous variables, uncovering comparable decision situations, and developing compatible measures. The value of experimental research lies in the control of large sets of variables, the construction and manipulation of particular contexts, and the fashioning of comparable measures. The price of experimental research is the lack of generalizability. However, the insights gained from this particular form of research may outweigh this cost.

Democratic Theory and 5 Person Committees

Democratic theory serves a motivating role for this project. At the outset it was asserted that "Rule By the People" is not a precisely defined concept. On the one hand, in its least constrained form, formal democratic theory establishes that the decision mechanism may fail its most basic task — arriving at a decision. On the other hand, highly constrained models of "Rule By the People: — such as that offered by Schumpeter — contend that decisions will be made, although debate and formation of those decisions must be limited to a few elected officials. Democratic theory, then, embodies a number of concepts that describe institutions that variously constrain individual involvement in decision making.

These incentives or constraints are a function of the institutional rules imposed on a decision-making arrangement. Further, these incentives or constraints have important consequences for the outcomes of decision-making arrangements. For instance, as the admissible set of participants is limited to a specific set of individuals (e.g., to those living in a geographical area such as a watershed), decisions across issues are likely to be different than if the set of participants is differently defined. Clearly, decision-making arrangements concerned with a restricted set of issues and containing members with relatively homogeneous preferences will arrive at different decisions than will arrangements concerned with a variety of issues and characterized by a membership with heterogeneous preferences. Likewise, if the number of individuals included in a decision-making arrangement is small, then relatively open operational rules as to participation and discussion may be possible. As the set of participants grows larger, these operational rules are likely to change since the size of the decision-making body may result in prohibitive decision-making costs associated with open debate.

Democratic theory can be conceptualized across a number of normative dimensions. Whether the normative focus be on increased participation, greater citizen education, or salutary collective decisions, those ends are only achieved through institutions. The way decision-making arrangements are ordered lies at the heart of democratic governance. In a way, this returns to Aristotle's observations as to the importance of the form of government, since form signifies either vigor or infirmity for the polity. It also returns to arguments offered during the American constitutional period that the proper design of government can retard the ills of politics derived from competing factions or the threat of majority tyranny. The complex arguments in The Federalist Papers attest to the importance of structure in achieving particular ends.

In sum, these observations stress the importance of means for achieving ends. The general implication for democratic societies is that particular attention needs to be focused on the institutions of those societies. If the underlying institutional configuration provides incentives or constrains decision making in particular ways, then these influences should be accounted for. This is especially so if these effects on behavior have important normative implications. That is, if a participatory democratic society is desired, and yet the institutional configuration constrains participation and yields outcomes beneficial primarily to a subset of participants, then the normative ends desired will not be attained. Instead, because of the particular configuration of rules and subsequent outcomes, participation is likely to decrease, and an elite is likely to develop as outcomes benefiting a subset of individuals compound over time. By focusing on the underlying organizational structure of a decision-making arrangement, many incentives and constraints on decision making can be uncovered. Piecing together these varied institutional rules and conceptualizing their effects on outcomes is an important enterprise — especially when offering prescriptive norms for a society.

Consensus and Debate — Extraordinary Majority Rules

Political scientists and commentators long have been fascinated with the effects of voting rules on outcomes. Among the earliest commentaries on the role of voting rules are the observations by the Marquis de Condorcet and discussions in America's Constitutional Convention concerning the protection of minority rights from fundamental constitutional changes.[1] Modern political scientists have subsequently formalized many of the speculations of earlier thinkers. Concepts pertaining to the opportunity costs involved in reaching decisions and the costs of having decisions imposed on individuals are important in modern democratic theory. Buchanan and Tullock (1962), for example, conclude that as the proportion of votes necessary to reach a decision increase, decision-making costs also rise. But, the deprivations that can be imposed on the individuals fall. The net effect is that individuals have a difficult time reaching agreement when making decisions using an extraordinary majority rule, although the decisions that are reached involve benefits for a larger proportion of those involved.

Requiring participants in an experimental committee to make decisions under an extraordinary majority voting rule enables an examination of Buchanan and Tullock's predictions. Compared with committees that employed a simple majority rule, extraordinary majority rule committees settled on outcomes from a smaller subset of the policy space, and this was closer to the preferred position of a larger group of participants. This subspace corresponds to the solution space predicted in Chapter 4. Further, these committees generally voted more often on proposals and typically ran out of the time allotted to reach such a decision. Such experimental evidence attests to the increased costs placed on participants by such a rule.

Two interesting points emerge from this particular institutional configuration. The first relates to consensual decision making while the second pertains to veto power. Committees employing an extraordinary majority voting rule had great difficulty moving the status quo. While many proposals tended to be voted on, most failed to amend the status quo. However, once it became apparent that amending the status quo was difficult, participants quickly lowered their expectations and searched for an outcome agreeable to all. This was especially the case once an amendent to the status quo received support from a 3-person coalition. Following the unsuccessful vote, one member typically would bring up for a vote or propose an amendment moving toward the perceived position of one of those members voting against the previous alternative to the status quo. In most cases this meant that at least one member of the old 3-person coalition ended up losing. Consequently, a new vote might find a different 3-person coalition forming. This in turn launched a new search with the process generally driving the status quo toward the center of the policy space.

In many instances boredom set in after it appeared the status quo could not be changed. The mutterings occasionally voiced by participants indicated that money no longer was an object, but that reaching agreement was what mattered. As many alternate proposals were voted on, individuals found themselves giving up more and more as time pressed on. Even though those finally agreeing to an outcome did not appear entirely satisfied, there were clear expressions of relief at reaching agreement. Rather than pressing for an outcome that was individually preferred, participants operating under an extraordinary majority voting rule seemed to turn their attention to locating a consensual decision.

In a related sense, an extraordinary majority voting rule exhibits the potential veto power available to minority coalitions. In this particular instance, only two members needed to object to an amendment to the status quo. More than anything, this veto power contributed to keeping the status quo from changing too often. Finding an agenda path by which at least four participants were better off was extremely difficult — especially when the status quo moved into the general pareto set. As a result, movements took a considerable amount of time and involved voting across a large number of proposals. Players recognized this pattern. Once a status quo was accepted near them, most players stopped sending proposals. They waited for time to expire.

Veto power consequently emerged in two ways. First, it involved at least two players voting against alternate proposals. Second, once a relatively satisfactory status quo was reached, the player closest to it stopped sending further proposals. On occasion, players adopted a third strategy — a filibuster tactic — by calling for votes on amendments that obviously could not defeat the current status quo, then voting against the amendment. This was done to try to use up time and ensure the adoption of a favorable status quo. Usually, however, such a strategy did not succeed, since an agenda could be constructed leading into the expected solution space. Once the status quo moved into that region, then further movement was impossible (unless at least one member of the winning coalition was willing to give up money for such a movement — which seldom happened). Veto power, then, became important for small subsets of participants to prevent too great a movement of the status quo away from their preferred positions.

The constraints imposed by extraordinary majority voting rules exerted the clearest effects on participants during the experimental series. This constraint suggests at least two implications for democratic theory. First, it supports the view that such a rule enables minority self-protection through implicit veto power. While it may be the case that minorities could consistently be harmed by this rule, as well as most other voting rules, filibustering and veto powers are more effective under greater rather than simple majority rules. Second, if the issue has considerable importance, then such a rule is essential for extending debate. Extended discussion is practically assured through increasing decision-making costs. Extraordinary majority voting rules typically do not yield expeditious decisions.

Communication Rules and Institutional Adjustments

The level of information that participants have with which to make decisions has long dominated formal and game-theoretic models. Typically, early models of decision situations assumed that all participants have full information. Recent models have relaxed this assumption in a variety of ways. However, concern with the level of information is contingent on the institutional mechanisms that transmit or relay information. Information is not freely available to individuals, but rather there are costs to gaining information, or it is constrained in some other manner. Recent technological innovations — such as the high speed computer and nationwide information networks — may provide seemingly limitless, cost-efficient information. However, use of such information systems requires substantial start-up costs. Even with such a system, its use may be limited to particular types of decisions. Also, there is a real danger that the amount of information (even if it is transformed) will exceed the capacity of the individual processing it. Still, for most collective decisions, the institutional structure relaying information will have an effect on the decisions individuals make.

Alternate communication structures can be discovered in different conceptions of democratic theory. Participatory theorists idealize a communication structure based on face-to-face communication. Although such a structure is cumbersome, the theoretical expectation is that participants will exchange all relevant information. Through the process of information exchange and debate, a set of viable alternatives will emerge, with subsequent discussion focusing on those. The key here is an institutional mechanism by which information can be exchanged. At the other extreme are the elite democratic theorists who desire a relatively constrained communication structure. This involves elected representatives making decisions with tenuous lines of communications between representatives and represented. Debate and discussion by the populace is highly constrained, although the rationale is that the best ideas, like the best leaders, will emerge with this forestalling a good deal of "noisy" information brought by the masses. These differences in communication structures mean different things for the organization, discussion, and debate of issues.

The results from the experimental series comparing committees with highly constrained communication structures and those with much less constrained structures are mixed. While limited communication did seem to have an effect on the ways participants acted, the effects on outcomes are less clear. However, two interrelated points do emerge. The first is that information is necessary for decision making, and the second is that individuals are very good at using existing institutional rules to obtain information.

In committees with limited communication rules, participants were able to send three proposals. Once these proposals were used up, participants could only call other proposals to a vote, and then vote. The three-proposal rule was steadfast, and it was thought such a rule would constrain the amount of information individuals had to work with. This was the case in terms of limiting the actual number of proposals that were made. However, such a rule did not end the search for information. Instead, participants were exceptionally clever in using the voting process to provide information about the policy space. These committees called up the bulk of the alternatives and voted to see which had support of particular coalitions. In this sense they used an existing set of institutional rules to uncover additional information about the preferences of others. In those committees there is evidence that cyclical voting is common.

Stepping back from these results, some interesting implications emerge from these experiments. A striking point concerns the adaptability of individuals when confronting a strange environment. By and large, individuals quickly use elements of a given structure to supplement their decision making. Even though such an institution was designed to constrain information, participants uncovered other means for making decisions. This is in contrast to the expectation that participants would succumb to the lack of information, resigning themselves to accepting practically any proposal.

Adaptability implies a further point -- the steadfastness of institutions. Most institutional arrangements are thought of as unchanging entities umpiring conflicts among participants. However, since institutions are malleable, and if individuals are viewed as adaptable, then institutions should be viewed as evolving structures. Institutional arrangements tend to change as individuals learn new patterns of behavior and restructure the meanings of old rules. Although in many instances this process of institutional change is slow, still it undermines the notion of building everlasting, "perfect" institutions. Adaptation of institutions to meet human needs are as important as the adaptability of individuals when confronting strange situations.

Finally, these results generally point to the difficulty in designing institutions with special characteristics. The intent of this series of experiments was the construction of an institution with a communication rule that severly limited information. Instead, what was achieved was a committee structure with only partially limited information. Here, a gap emerged between intended and resulting design. Like all human enterprises, attempts at design must be regarded as incomplete. However, political scientists have at their disposal tools to understand the connections between particular institutional designs and failures of elements of those structures. Again, it is essential to account for the constraints and incentives produced by structural elements on individual behavior when designing institutions. It seems doubly important to anticipate the adaptability of individuals and their strategies when constructing institutions. It is fundamental to keep in mind that institutions are not machines stamping out invariant decisions. Further, individuals are not automatons unreflective about their actions. But, individuals acting as autonomous artifacers does not decry the logic of a positive theory of politics. Individuals remain constrained by the institutions within which they act.

Positional Advantage — Agenda Control Rules

A primary tenet of democratic theory is that power ultimately resides in the people. Specialized powers have always been an anathema to popular rule. These powers can be viewed as granting a subset of individuals the right to do something others cannot. In politics this generally focuses on rights to make decisions or to otherwise uniquely contribute to decision making. The general concern with specialized powers relates to advantages that accrue to those with power and the divisions this forms between those with and without power. First, specialized powers are seen as providing unearned advantages to a distinct set of individuals. With the decline of "divine right" arguments through the seventeenth and eighteenth centuries, ruling power gradually devolved to the populace. One variation of specialized political power relates to the institution of representation. However, it has generally been defended either on the basis of savings in political decision-making costs, or that representatives owe their positions solely to an electorate.

Specialized powers are feared for their anticipated effects. Tocqueville remarked that Americans are noted for jealously defending their equality. A principle vehicle for widening inequalities involves positional differences derived from an institution. Further, advantages are viewed as compounding themselves, giving rise to larger rifts. It was precisely this problem that disturbed both state and national constitutional founders following independence. Although the need for representatives was clear, there was widespread fear that this would lead to a permanent ruling class. Slowly, representatives would use their positions to fabricate differences between themselves and the ruled. The end result would be a ruling class as pervasive as that previously imposed by Britain. To forestall this, proposals as varied as imposing elections every year, single terms, and delegate instructions, were implemented in some states. The fear, then, of power in the hands of others is deeply ingrained in liberal democratic thought -— and especially in American political practice.

A set of experiments were conducted using a committee with only two participants empowered to create an agenda. This is a highly specialized power, and has attracted considerable attention in formal theory. As mentioned, the implications of such powers are enormous for democratic theory. Although the predicted results were not empirically observed, still it appears that agenda powers are important for differentiating outcomes between committees with and without such powers.

Outcomes concentrated in the upper quadrants of the policy space where the agenda setters' ideal points were located. Most outcomes were contained within a fairly small radial distance from the agenda setters' ideal points. In all, it seems that agenda setters were most advantaged by these special positions. An interesting pattern to note concerns inequalities in gain from differences in position. This is obviously expected since the tendency for agenda setting is to drive outcomes closer to the agenda setters' ideal points. Yet such a result, if carried out over a period of time, would quickly undermine the relative equality initially possessed by those with and without agenda control powers. The effects of this divergence in monetary resources could only contribute to the power of agenda setters rather than detract. A simple-minded explanation with respect to the experiment is that as agenda setters amass more money, they have less incentive to give up more in subsequent decisions. That is, they can stick with points close to their ideal points, hoping to convince others of their determination, while able to absorb short-term losses. In effect, they can propose a set of points that leave little to those without agenda power.

Another interesting pattern was observed during these experiments. Those without agenda powers very quickly lost interest in participating. Having little control over the outcomes (at least in constructing an agenda), these participants seemingly voted for anything, simply to end the round. This in part may explain the significantly lower times these committees took to obtain agreement on an outcome. This has interesting parallels with political apathy. If participants without agenda powers lose interest because they contribute little to constructing an agenda (and as a consequence, contribute little to decision making), then their apathy stems from their perceived powerlessness. If similar events occur in the real world (and there is some evidence they do), then the structure of control in decision-making arrangements is important. A closed structure could undermine popular involvement. This is part of the claim that Pateman (1970) and other participatory theorists make.

In sum, it seems that special agenda control powers undermine fundamental democratic values. Again, this points to the substantial effects that changes in institutional rules can have on how individuals behave.

The importance of normative democratic theory resides in the ideals upheld and prescriptions made by such a theory. The dividing line between democratic theory and democratic practice hinges on the institutions constituting a polity. The bulk of this study aims at developing a means of comprehending the effects of prescriptive reform on behavior and outcomes. Since institutions that regulate human behavior are subject to conscious (and unconscious) design, then prescriptions for change must be carefully examined to determine if they yield anticipated results. Reform of institutions is a central concern for most normative theorists — whether it involves piecemeal reforms or major transformations of society. Prescriptions for reform of democratic institutions are especially important given the complex configurations of various institutions that regulate varying degrees of participation, minority rights, and liberty.

Two principal empirical results are apparent. The first indicates institutional rules do variously affect outcomes. Although the experiments are conducted in a relatively abstract environment, simple changes of institutional constraints across aggregation, communication, and position rules result in detectable differences in individual strategic behavior. Second, variations in outcomes have predictable patterns. Although the results do not correspond exactly with the predicted solution sets, still, those results incline in directions predicted by the models outlined in Chapter 4. If nothing else, these results illustrate the importance of pinpointing essential institutional features to uncover likely sets of outcomes. This has an important implication for normative democratic theory. Reforms or transformations of the machinery of democracy must account for the constraints or incentives that will be imposed on the polity. Through careful analysis it is possible to predict likely sets of outcomes. Once these outcomes are known, the task is to determine whether they are congruent with the normative ends being sought.

Implications for Game Theory and Formal Theory

The results of this series of experiments are more relevant to the burgeoning formal literature in political science. This is so since the study explicitly borrows predictions from other models, or suggests predictions that can be derived from other models. Further, the experiments sought to approximate those committee structures that have been used extensively to study collective behavior.

Variations in outcomes over practically identical committees indicate differences among sets of outcomes can partially be explained by structural variations between committees. Similarly, these variations are congruent, by and large, with the models developed in Chapter 4. A major implication of these results returns to the discussion of game theory in Chapter 2. The assertion was that the search for single game-theoretic solutions is misdirected. Uncovering a single general solution concept is a quixotic enterprise at best. Game-theoretic models, after all, are based on assessing available strategies, ruling out sets of unlikely outcomes, and focusing on sets of outcomes displaying some stability properties. Results from this study indicate that institutional configurations have an important impact on individual's calculations, and as such, should be accounted for in any model predicting or prescribing particular sets of solutions.

While there are infinitely many institutional configurations, this does not mean that developing predictive models is a hopeless task. As a social science concerned with general tendencies, political science has at its disposal the tools with which to dissect a decision situation. Obviously, a fundamental concern for political scientists is with institutional variables that regulate collective action. This study has examined only a few. very select institutional mechanisms — aggregation rules, communication rules, and agenda powers — and examined only two variants of each rule. It is not obvious these are the most important set of variables, nor is it obvious that these variables are conceptualized along their most important dimensions. Nonetheless, the point remains that aspects of institutions affect the outcomes that might be predicted from collective action. Game-theoretic models, then, must account for the possibility that solution concepts will vary as the environment in which individuals make decisions changes.

In a broader sense, these results illustrate the usefulness of formal models — particularly as they contribute to disentangling complicated relationships. Institutions are complex arrays of rules, with the interrelations among rules being equally complex. Only by clearly specifying the component elements of an institution is careful and elaborate analysis possible. Specifying a set of committee rules made it possible to trace differences in rule changes across committees to the strategic calculations of individuals, and finally to different sets of outcomes. Such an approach appears quite valuable in undertaking institutional analysis as well as with examining general patterns of collective action.

Finally, the experimental method is extraordinarily useful for examining the consequences of institutional variations. First, controls over exogenous variables and the ability to manipulate variations are such that they cannot be matched in the real world. In some respects this is fortunate, since a restricted agenda control rule would be distasteful when imposed on individuals without their consent. Second, the number of experiments that can be conducted is limited only by the researcher's time and budget. Further, this budget need not be large (in this series the average payoff ranged around $42.00 per 5-round experiment). This provides excellent opportunities to construct reasonable statistical tests.

A note should be added concerning experimental work. First, it is essential that task complexity does not exceed the capacities of participants. I suspect that with some participants, the experience with the experiment was too much to digest over the period of 2 hours. This could account for much of the variation in outcomes from a particular predicted solution for a committee structure. However, this would not account for the observed variations between committee structures. A means for circumventing task complexity is the development of a pool of participants familiar with the arrangement of the experiment. Other than the problem of task complexity, a computer-controlled experiment provides an excellent tool for research. Aside from benefits derived from control over the environment, it provides an excellent means for replication and provides a simple means for making comparisons across a host of parameters. Further, with the processing faculties of a computer, future research designs can add real costs to decision making. Whether this includes a decreasing valuation of proposals associated with the passage of time, or real costs to making a proposal, many variations with interesting implications are possible. Finally, this mode of research provides an excellent crossroad for the "dangerous intersection" of theory and research. Moreover, as this study has repeatedly argued, it is especially appropriate for examining claims made in the formal literature.

A number of questions, approaches, and methods have been employed in this study. Still, the normative questions are tied closely with the formal models, and the experimental structure falls directly out of those models. Although generalizations to the world at large are impossible, inferences from the models and the experimental empirical results do provide important insights into democratic theory.

Democracy remains a pervasive theme in American politics. However, aside from prescribing a few structural reforms to achieve a particular set of ends, political theorists and commentators are notably lax in explicitly linking the effects of those structural reforms to the strategic calculations of individuals and consequently expected outcomes from a collective decision-making institution. This concern with institutional structure and its effects on individual behavior is the special province of political science. Any suggestions for structural reform of collective institutions must be based on normative prescriptions. Whether these notions be built on efficiency or increased participation, change is likely to have some effect on behavior and outcomes. Therefore, careful analysis of changes across an institution is crucial before recommending or implementing such change. The configuration of structural rules composing an institutional arrangement interact in peculiar ways. This often results in unanticipated effects on outcomes. Reform is a treacherous process, but doubly so when little thought is given to the normative reasons for reform or the effect of structural change on outcomes.

Realizing that normative goals -- especially democratic goals -- are obtained by imposing or removing particular institutional constraints on individual behavior, is a first step toward achieving those desired ends. Analysis of the interplay between institutional configurations and individual behavior is a second step. Clearly, this discussion has ignored other equally important components of a democratic social order. Obviously, history and political culture cast a heavy hand as to what structural reforms are likely to achieve. But, this does not mean that structural changes are insignificant. Reforms at the turn of the twentieth century brought an end to ward-based political machines in cities. Yet, these reforms carried with them the seeds for new problems with respect to representation of minorities and responsiveness.

Democratic goals and institutional mechanisms are tightly interrelated. Dissecting these relations is paramount for introducing reforms or changes designed to achieve particular ends. While suggestions for institutional tinkering should not be based on experimental evidence, such evidence does provide valuable insights as to reasonable expectations from institutional changes. Experimental study, then, has some potential contributions for the understanding of political phenomenon.

FOOTNOTES FOR CHAPTER SEVEN

[1]For good reviews of the extensive literature, see Black (1958) or Riker (1960; 1982).

BIBLIOGRAPHY

Abrams, Robert (1980) Foundations of Political Analysis: An Introduction to the Theory of Collective Choice. New York: Columbia University Press.

Arrow, Kenneth J. (1963) Social Choice and Individual Values. Second Edition. New Haven, Connecticut: Yale University Press.

______________ (1968) "Mathematical Models in the Social Sciences." In May Brodbeck, ed. Readings in the Philosophy of the Social Sciences. New York: Macmillian Publishing Co., Inc., 635-667.

Asscher, Nechemia (1976) "An Ordinal Bargaining Set for Games Without Sidepayments." Mathematics of Operations Research, Vol. 1, No. 4 (November), 381-389.

Aumann, Robert J. (1967) "A Survey of Cooperative Games Without Sidepayments." In Martin Shubik, ed. Essays in Mathematical Economics: In Honor of Oskar Morgenstern. Princeton, New Jersey: Princeton University Press.

______________ and Michael Maschler (1964) "The Bargaining Set for Cooperative Games." In M. Dresher, L. S. Shapley, and A. W. Tucker, eds. Advances in Game Theory: Annals of Mathematical Studies 52. Princeton, New Jersey: Princeton University Press.

Axelrod, Robert (1981) "The Emergence of Cooperation Among Egoists." American Political Science Review, Vol. 75, No. 2 (June), 306-318.

Bachrach, Peter (1967) The Theory of Democratic Elitism: A Critique. Boston: Little, Brown, and Co.

Badger, Wade W. (1972) "Political Individualism, Positional Preferences, and Optimal Decision Rules." In Richard Niemi and Herbert Weisberg, eds. Probability Models of Collective Decision Making. Columbus, Ohio: Charles E. Merrill Publishing Co.

Baudier, Edmond (1973) "Competitive Equilibrium in a Game." Econometrica, Vol. 41, No. 6 (November), 1,049-1,068.

Berl, Janet E., Richard D. McKelvey, Peter C. Ordeshook, and Mark D. Winer (1976) "An Experimental Test of the Core in a Simple N-Person Cooperative Nonsidepayment Game." Journal of Conflict Resolution, Vol. 20, No. 3 (September), 543-579.

Birnberg, Jacob and Louis Pondy (1971) "An Experimental Study of Three Voting Rules." In Bernhardt Lieberman, ed. Social Choice. New York: Breech and Gordon.

Black, Duncan (1958) The Theory of Committees and Elections. Cambridge, Massachusetts: Cambridge University Press.

Brodbeck, May (1968) "Models, Meaning and Theories." In May Brodbeck, ed. Readings in the Philosophy of the Social Sciences. New York: Macmillian Publishing Co., Inc.

Browne, Eric C. (1973) Coalition Theories: A Logical and Empirical Critique. Beverly Hills: Sage Publications.

__________ and John P. Frendreis (1980) "Allocating Coalition Payoffs by Conventional Norm: An Assessment of the Evidence from Cabinet Coalitions Situations." American Journal of Political Science, Vol. 24, No. 4 (November), 753-768.

Buchanan, James (1965) "Economic Theory of Clubs." Economica, Vol. 32 (February), 1-14.

__________ and Gordon Tullock (1962) The Calculus of Consent: Logical Foundations of Constitutional Democracy. Ann Arbor, Michigan: University of Michigan Press.

Buckley, James J. and T. Edward Westen (1975) "The Majority Rule Game." The International Journal of Game Theory, Vol. 4, No. 2, 105-112.

__________ (1976) "Bargaining Set Theory and Majority Rule." Journal of Conflict Resolution, Vol. 20, No. 3 (September), 481-495.

Campbell, Donald T. and Julian C. Stanley (1966) Experimental and Quasi-Experiment Designs for Research. Chicago: Rand McNally and Co.

Cohen, Linda (1979) "Cyclic Sets in Multidimensional Voting Models." Journal of Economic Theory, Vol. 20, No. 1 (February), 1-12.

__________ and Steven Matthews (1980) "Constrained Plott Equilibrium, Directional Equilibrium and Global Cycling Sets." Review of Economic Studies, Vol. 47, No. 5 (October), 975-986.

Cook, Thomas and Donald Campbell (1976) "The Design and Conduct of Quasi-Experiments and True Experiments in Field Settings." In M. D. Dunnette, ed. Handbook of Industrial and Organizational Psychology. Chicago: Rand McNally College Publishing Co., 224-326.

Coppinger, Vicki M., Vernon Smith, and Jon Titus (1980) "Incentives and Behavior in English, Dutch and Sealed-Bid Auctions." Economic Inquiry, Vol. 18, No. 1 (January), 1-22.

Dagger, Richard (1981) "Metropolis, Memory, and Citizenship." American Journal of Political Science, Vol. 25, No. 4 (November), 715-737.

Dahl, Robert (1956) A Preface to Democratic Theory. Chicago: University of Chicago Press.

Dahl, Robert (1970) After the Revolution? Authority in a Good Society. New Haven, Connecticut: Yale University Press.

__________ (1971) Polyarchy, Participation and Opposition. New Haven, Connecticut: Yale University Press.

Davis, Michael (1970) Game Theory: A Nontechnical Introduction. New York: Basic Books.

Denzau, Arthur, Robert MacKay, and Carolyn Weaver (1982) "Agenda Cost, Institutional Inertia, and the Possibility of Majority Rule Equilibrium." A paper presented at the Annual Meeting of the Public Choice Society, San Antonio, Texas, March 5-7.

Dodd, Larry (1976) Coalitions in Parliamentary Government. Princeton, New Jersey: Princeton University Press.

Downs, Anthony (1957) An Economic Theory of Democracy. New York: Harper and Publishers.

Duncan, Graeme (1973) Marx and Mill. New York: Cambridge University Press.

Eavey, Cheryl and Gary Miller (1982) "Experimental Evidence on the Fallibility of the Core." Paper to have been presented at the Public Choice Meetings, San Antonio, Texas, March 5-7.

Enelow, James and Melvin Hinich (1981) "A New Approach to Voter Uncertainty in the Downsian Spatial Model." American Journal of Political Science, Vol. 25, No. 3 (August), 483-493.

Farquharson, Robin (1969) Theory of Voting. New Haven, Connecticut: Yale University Press.

Ferejohn, John A., Morris P. Fiorina, and Edward Packel (1980) "Nonequilibrium Solutions for Legislative Systems." Behavioral Science, Vol. 25 (March), 140-148.

__________, Robert Forsythe, Roger Noll, and Thomas Palfrey (1980) "An Experimental Examination of Auction Mechanisms for Discrete Public Goods." In Vernon Smith, ed. Research in Experimental Economics V. II. JAI Press.

Fiorina, Morris (1975) "Formal Models in Political Science." American Journal of Political Science, Vol. 19, No. 1 (February), 133-159.

__________ and Charles Plott (1978) "Committee Decisions Under Majority Rule: An Experimental Study." American Political Science Review, Vol. 72, No. 2 (June), 575-598.

__________ and Kenneth Shepsle (1982) "Equilibrium, Disequilibrium and the General Possibility of a Science of Politics." In Peter Ordeshook and Kenneth Shepsle, eds. Political Equilibrium: A Delicate Balance. Boston: Martinus-Nijhoff.

Fishburn, Peter (1973) The Theory of Social Choice. Princeton, New Jersey: Princeton University Press.

______________ (1974) "Paradoxes of Voting." American Political Science Review, Vol. 68, No. 2 (June), 537-546.

Frohlich, Norman, Thomas Hunt, Joe Oppenheimer, and R. Harrison Wagner (1975) "Individual Contributions for Collective Goods: Alternative Models." Journal of Conflict Resolution, Vol. 19, No. 2 (June), 310-329.

Gibbard, Allan (1973) "Manipulation of Voting Schemes: A General Result." Econometrica, Vol. 41, No. 4 (July), 587-601.

Greenberg, Edward (1981) "Industrial Self-Management and Political Attitudes." American Political Science Review, Vol. 75, No. 1 (March), 29-42.

Greene, Vernon (1978) "The Methaphysical Foundations of Constitutional Order." Ph.D. Dissertation. Bloomington, Indiana: Indiana University.

Groves, Theodore and John O. Ledyard (1978) "The Existence of Efficient and Incentive Compatible Equilibria with Public Goods." Social Science Working Paper No. 203 (March). Pasadena, California: California Institute of Technology.

Guiasu, Silviu and Mircea Malitza (1980) Coalitions and Connection in Games: Problems of Modern Game Theory Using Methods Belonging to Systems Theory and Information Theory. New York: Pergamon Press.

Hardin, Garrett (1968) "The Tragedy of the Commons." Science, Vol. 132 (December), 1,243-1,248.

Harsanyi, John C. (1961) "On the Rational Postulates Underlying the Theory of Cooperative Games." Journal of Conflict Resolution, Vol. 5, No. 2, 179-196.

______________ (1976) Rational Behavior and Bargaining Equilibrium in Games and Social Situations. New York: New York University Press.

Hartz, Louis (1955) The Liberal Tradition in America. New York: Harcourt, Brace and World.

Hempel, Carl G. (1965) Aspects of Scientific Explanation. New York: Free Press.

Hirschman, Albert O. (1970) Exit, Voice and Loyalty: Response to Decline in Firms, Organizations, and States. Cambridge, Massachusetts: Harvard University Press.

Hinckley, Barbara (1981) Coalitions and Politics. New York: Harcourt Brace Jovanovich, Inc.

Hinich, Melvin J., John O. Ledyard, and Peter C. Ordeshook (1973) "A Theory of Electoral Equilibrium: A Spatial Analysis Based on the Theory of Games." Journal of Politics, Vol. 35 (February), 154-193.

Hoffman, Elizabeth and Edward Packel (1980) "A Stochastic Model of Committee Voting with Exogenous Costs: Theory and Experiments." Mimeograph.

______________ and Charles Plott (1980) "Pre-Meeting Discussion and the Possibility of Coalition-Breaking Procedures in Majority Rule Committees." Mimeograph.

Holden, Barry (1974) The Nature of Democracy. New York: Barnes and Noble.

Hurwicz, Leonid (1973) "The Design of Mechanisms for Resource Allocation." American Economic Review, Vol. 63, No. 2 (May), 1-30.

Isaac, R. Mark and Charles Plott (1978) "Cooperative Game Models of the Influence of the Closed Rule in Three-Person Majority Rule Committees: Theory and Experiment." In Peter Ordeshook, ed. Game Theory and Political Science. New York: New York University Press.

Ishikawa, Shin and Kenjiro Nakamura (1980) "Representation of Characteristic Function Games by Social Choice Functions." The International Journal of Game Theory, Vol. 9, No. 4, 191-199.

Joseph, Lawrence B. (1981) "Democratic Revisionism Revisited." American Journal of Political Science, Vol. 25, No. 1 (February), 160-187.

Kaplan, Abraham (1964) The Conduct of Inquiry: Methodology for Behavioral Science. San Francisco: Chandler Publishing Co.

Kelly, Jerry S. (1978) Arrow Impossibility Theorems. New York: Academic Press.

Kerlinger, Fred (1969) Foundations of Behavioral Research: Educational and Psychological Inquiry. New York: Holt, Rinehart & Winston.

Kiser, Larry and Elinor Ostrom (1982) "The Three Worlds of Action: A Metatheoretical Synthesis of Institutional Approaches." In Elinor Ostrom, ed. Strategies of Political Inquiry. Beverly Hills: Sage Publications, 179-222.

Kramer, Gerald H. (1973) "On a Class of Equilibrium Conditions for Majority Rule." Econometrica, Vol. 41, No. 2 (March), 285-297.

______________ (1977) "A Dynamical Model of Political Equilibrium." Journal of Economic Theory, Vol. 16 (December), 310-334.

Kramer, Gerald H. (1978) "Existence of Electoral Equilibrium." In Peter C. Ordeshook, ed. Game Theory and Political Science. New York: New York University Press.

Laing, James D. and Richard Morrison (1974) "Sequential Games of Status." Behavioral Science, Vol. 19, No. 3 (May), 177-196.

____________ and S. Olmsted (1978) "An Experimental and Game Theoretic Study of Committees." In Peter C. Ordeshook, ed. Game Theory and Political Science. New York: New York University Press.

Leibenstein, Harvey (1976) Beyond Economic Man: A New Foundation for Microeconomics. Cambridge, Massachusetts: Harvard University Press.

Leiserson, Michael (1968) "Factions and Coalitions in One-Party Japan." American Political Science Review, Vol. 62, No. 3 (September), 770-787.

Lucas, William F. (1965) "Solutions for Four-Person Games in Partition Function Form." SIAM Journal of Applied Mathematics, Vol. 13, No. 1 (March), 118-128.

____________ (1968) "A Game in Partition Function Form with No Solution." SIAM Journal of Applied Mathematics, Vol. 16, No. 3 (May), 582-585.

____________ (1971) "Some Recent Developments in N-Person Game Theory." SIAM Review, Vol. 13, No. 4 (October), 491-523.

Luce, Robert D. and Howard Raiffa (1957) Games and Decisions: Introduction and Critical Survey. New York: John Wiley & Sons.

MacKay, Alfred F. (1980) Arrow's Theorem: The Paradox of Social Choice. New Haven, Connecticut: Yale University Press.

Mansbridge, Jane J. (1980) Beyond Adversary Democracy. New York: Basic Books.

Marwell, Gerald and Ruth Ames (1979) "Experiments on the Provision of Public Goods. I. Resources, Interest, Group Size, and the Free-Rider Problem." American Journal of Sociology, Vol. 84, No. 6, 1,335-1,360.

____________ (1980) "Experiments on the Provision of Public Goods. II. Provision Points, Stakes, Experience, and the Free-Rider Problem." American Journal of Sociology, Vol. 85, No. 4, 926-937.

May, Robert (1971) "Some Mathematical Remarks on the Paradox of Voting." Behavioral Science, Vol. 16, No. 2, 143-151.

McKelvey, Richard (1976) "Intransitivities in Multidimensional Voting Models and Some Implications for Agenda Control." Journal of Economic Theory, Vol. 12, 472-482.

____________ (1980) "Ambiguity in Spatial Models of Policy Formation." Public Choice, Vol. 35, No. 4, 385-402.

____________ and Peter Ordeshook (1976) "Symmetric Spatial Games Without Majority Rule Equilibria." American Political Science Review, Vol. 70, 1,172-1,184.

____________ (1978) "Competitive Coalition Theory." In Peter Ordeshook, ed. Game Theory and Political Science. New York: New York University Press, 1-37.

____________ (1979a) "An Experimental Test of Several Theories of Committee Decision-Making Under Majority Rule." In S. J. Brams, A. Schotter, and G. Schwödiauer, eds. Applied Game Theory. Würzbury. Wien: Physica-Verlag, 152-167.

____________ (1979b) "Some Experimental Ambiguities with Respect to the Core for Majority Rule Voting Games." Social Science Working Paper No. 260 (April). Pasadena, California: California Institute of Technology.

____________ (1980) "Vote Trading: An Experimental Study." Public Choice, Vol. 35, No. 2, 151-184.

____________ and Mark Winer (1978) "The Cooperative Solution for N-Person Games without Transferable Utility with an Application to Committee Games." American Political Science Review, Vol. 72, No. 2 (June), 599-615.

____________ and Richard Wendall (1976) "Voting Equilibria in Multidimensional Choice Spaces." Mathematics of Operations Research, Vol. 1, No. 2 (May), 144-158.

Michner, H. A., K. Yuen, and I. J. Ginsberg (1977) "A Competitive Test of the $M^{(im)}$ Bargaining Set, Kernal, and Equal Share Models." Behavioral Science, Vol. 22, No. 5 (September), 341-355.

Miliband, Ralph (1977) Marxism and Politics. Oxford, England: Oxford University Press.

Mill, John Stuart (1951) Representative Government. New York: E. P. Dutton and Co., Inc.

Miller, Gary (1980) "Experimental Results in Two-Party Agenda Setting: What's It Worth to be a Party?" Paper presented at the Midwest Political Science Association Meeting, April 24.

Miller, Nicholas R. (1977) "Graph-Theoretical Approaches to the Theory of Voting." American Journal of Political Science, Vol. 24, No. 4 (November), 769-803.

Miller, Nicholas R. (1980) "A New Solution Set for Tournaments and Majority Voting: Further Graph-Theoretical Approaches to the Theory of Voting." American Journal of Political Science, Vol. 24, No. 1 (February), 68-96.

Moe, Terry M. (1979) "On the Scientific Status of Rational Models." American Journal of Political Science, Vol. 23, No. 1 (February), 215-243.

__________ (1980) "A Calculus of Group Membership." American Journal of Political Science, Vol. 24, No. 4 (November), 593-632.

Murnighan, J. Keith (1978) "Models of Coalition Behavior: Game Theoretic, Social Psychological. and Political Perspectives." Psychological Bulletin, Vol. 85, No. 5, 1,153-1,170.

Nash, John F. (1950) "The Bargaining Problem." Econometrica, Vol. 18, No. 2 (April), 155-162.

Niemi, Richard (1969) "Majority Decision Making with Partial Unidimensionality." American Political Science Review, Vol. 63, No. 2 (June), 488-497.

Niskanen, William A., Jr. (1971) Bureaucracy and Representative Government. Chicago: Aldine-Atherton.

Olson, Mancur (1965) The Logic of Collective Action. Cambridge. Massachusetts: Harvard University Press.

Orbell, John and L. A. Wilson (1978) "Institutional Solutions to the N-Prisoner's Dilemma." American Political Science Review, Vol. 72, No. 2 (June), 411-421.

Ordeshook, Peter and Mark Winer (1980) "Coalitions and Spatial Policy Outcomes in Parliamentary Systems: Some Experimental Results." American Journal of Political Science, Vol. 24, No. 4 (November), 730-752.

Ostrom, Elinor (1982) "Institutional Analysis." Working Paper W82-30. Bloomington, Indiana: Indiana University. Workshop in Political Theory and Policy Analysis.

Ostrom, Vincent (1973) The Intellectual Crisis in American Public Administration. University, Alabama: University of Alabama Press.

__________ (1979) "Constitutional Level of Analysis: Problems and Prospects." Paper presented at the Western Political Science Association Meeting, Portland, Oregon, March 22-24.

__________ (1980) "Artisanship and Artifact." Public Administration Review, Vol. 40, No. 4 (July/August), 309-317.

Ostrom, Vincent and Timothy Hennessey (1975) "Conjectures on Institutional Analysis and Design: An Inquiry into Principles of Human Governance." Working Paper W75-11. Bloomington, Indiana: Indiana University, Workshop in Political Theory and Policy Analysis.

__________ and Elinor Ostrom (1978) "Public Goods and Public Choices." In E. S. Savas, ed. Alternatives for Delivering Public Services. Toward Improved Performance. Boulder, Colorado: Westview Press, 7-14.

Packel, Edward (1981) "A Stochastic Solution Concept for n-Person Games." Mathematics of Operations Research, Vol. 3, No. 6 (August), 349-362.

Pateman, Carole (1970) Participation and Democratic Theory. Cambridge, Massachusetts: Cambridge University Press.

Peleg, B. (1979) "Representations of Simple Games by Social Choice Functions." International Journal of Game Theory, Vol. 7, No. 2, 81-94.

Pennock, J. Roland (1979) Democratic Political Theory. Princeton, New Jersey: Princeton University Press.

Plott, Charles (1967) "A Notion of Equilibrium and Its Possibility Under Majority Rule." American Economic Review, Vol. 57, No. 4 (September), 787-806.

__________ (1979) "The Application of Laboratory Experimental Methods to Public Choice." In Clifford Russell, ed. Collective Decision Making: Applications from Public Choice Theory. Washington, D.C.: Resources for the Future.

__________ (1981) "Industrial Organization Theory and Experimental Economics." Social Science Working Paper 405. Pasadena, California: California Institute of Technology.

__________ and Michael Levine (1978) "A Model of Agenda Influence on Committee Decisions." American Economic Review, Vol. 68, No. 1 (March), 141-160.

__________ and William P. Rogerson (1979) "Committee Decisions Under Majority Rule: Dynamic Theories and Experimental Results." Social Science Working Paper 280. Pasadena, California: California Institute of Technology.

Radner, Roy (1975) "A Behavioral Model of Cost Reduction." The Bell Journal of Economics, Vol. 6, 196-215.

Rae, Douglas (1969) "Decision Rules and Individual Values in Collective Choice." American Political Science Review, Vol. 63, No. 1 (March), 40-56.

Rapoport, Amon and Albert Chammah (1965) Prisoner's Dilemma. Ann Arbor, Michigan: University of Michigan Press.

______________, J. P. Kahan, S. G. Funk, and A. D. Horowitz (1979) Coalition Formation by Sophisticated Players. Berlin, West Germany: Springer-Verlag.

Rapoport, Anatol (1970) N-Person Game Theory: Concepts and Applications. Ann Arbor, Michigan: University of Michigan Press.

Rawls, John (1971) A Theory of Justice. Cambridge, Massachusetts: Harvard University Press.

Redman, Eric (1973) The Dance of Legislation. New York: Simon and Schuster.

Riker, William (1963) The Theory of Political Coalitions. New Haven, Connecticut: Yale University Press.

______________ (1967a) "Bargaining in a Three-Person Game." American Political Science Review, Vol. 61, No. 3 (September), 642-656.

______________ (1967b) "Experimental Verification of Two Theories About N-Person Games." In Joseph L. Bernd, ed. Mathematical Applications in Political Science III. Charlottesville, Virginia: University Press of Virginia.

______________ (1971) "An Experimental Examination of Formal and Informal Rules of a Three-Person Game." In Bernhardt Lieberman, ed. Social Choice. New York: Breech and Gordon.

______________ (1978) "A Confrontation Between the Theory of Social Choice and the Theory of Democracy." Paper presented at the Annual Meeting of the American Political Science Association, New York, August 31-September 3.

______________ (1980) "Implications from the Disequilibrium of Majority Rule for the Study of Institutions." American Political Science Review, Vol. 74, No. 2 (June), 432-446.

______________ (1982) Liberalism Against Populism: A Confrontation Between the Theory of Democracy and the Theory of Social Choice. San Francisco: W. H. Freeman.

______________ and Peter Ordeshook (1973) An Introduction to Positive Political Theory. Englewood Cliffs, New Jersey: Prentice-Hall.

______________ and William Zavoina (1970) "Rational Behavior in Politics: Evidence from a Three-Person Game." American Political Science Review, Vol. 64, No. 1 (March), 48-60.

Roelofs, H. Mark (1976) Ideology and Myth in American Politics. Boston: Little, Brown and Company.

Ryan, Alan (1972) "Two Concepts of Politics and Democracy: James and John Stuart Mill." In Martin Fleisher, ed. Machiavelli and the Nature of Political Thought. New York: Atheneum Press.

Schofield, Norman (1975) "A Game Theoretic Analysis of Olson's Game of Collective Action." Journal of Conflict Resolution, Vol. 19, No. 3 (September), 441-461.

_______________ (1978) "Instability of Simple Dynamic Games." Review of Economic Studies, Vol. 45, No. 3 (October), 575-594.

Schumpeter, Joseph (1950) Capitalism, Socialism, and Democracy. Third Edition. New York: Harper and Row Publishers.

Sen, Amartya (1970) Collective Choice and Social Welfare. San Francisco: Holden-Day.

Shenoy, P. P. (1978) "On Coalition Formation in Simple Games: A Mathematical Analysis of Caplow's and Gamson's Theories." Journal of Mathematical Psychology, Vol. 18, 177-194.

Shepsle, Kenneth (1978) "Institutional Structure and Policy Choice: Some Comparative Statics of Amendment Control Procedures." Paper presented at the Annual Meeting of the American Political Science Association, New York, August 31-September 3.

_______________ (1979) "Institutional Arrangements and Equilibrium in Multidimensional Voting Models." American Journal of Political Science, Vol. 23, No. 1 (February), 27-59.

_______________ and Barry Weingast (1981a) "Political Preferences for the Pork Barrel: A Generalization." American Journal of Political Science, Vol. 25, No. 1 (February), 96-111.

_______________ (1981b) "Structure and Strategy: The Two Faces of Agenda Power." Paper prepared for the Annual Meeting of the American Political Science Association, New York, September 3-6.

_______________ (1981c) "Structure-Induced Equilibrium and Legislative Choice." Public Choice, Vol. 37, No. 3, 503-519.

Simon, Herbert (1957) Models of Man: Social and Rational. New York: John Wiley & Sons.

_______________ (1978) "Rationality as Process and as a Product of Thought." American Economic Review, Vol. 68, No. 2 (May), 1-16.

_______________ (1979) Models of Thought. New Haven, Connecticut: Yale University Press.

Simpson, Paul B. (1969) "On Defining Areas of Voter Choice: Professor Tullock on Stable Voting." Quarterly Journal of Economics, Vol. 83, No. 3 (August), 478-490.

Skinner, Quentin (1973) "The Empirical Theorists of Democracy and Their Critics: A Plague on Both Their Houses." Political Theory, Vol. 1, No. 3 (August), 287-306.

Sloss, Judith (1973) "Stable Outcomes in Majority Rule Voting Games." Public Choice, Vol. 15 (Summer), 19-48.

Smith, Vernon (1976) "Experimental Economics: Induced Value Theory." American Economic Review, Vol. 66, No. 2 (May), 274-279.

__________ (1978) "Experimental Mechanisms for Public Choice." In Peter Ordeshook, ed. Game Theory and Political Science. New York: New York University Press.

Stokes, Donald and Warren E. Miller (1962) "Party Government and the Saliency of Congress." Public Opinion Quarterly, Vol. 26 (Winter), 531-546.

Synder, Richard (1962) "Experimental Techniques and Political Analysis: Some Reflections in the Context of Concern Over Behavioral Approaches." In James C. Charlesworth, ed. The Limits of Behavioralism in Political Science. Philadelphia: The American Academy of Political and Social Science.

Taylor, Michael (1969) "Proof of a Theorem on Majority Rule." Behavioral Science, Vol. 14 (May), 228-231.

__________ (1976) Anarchy and Cooperation. New York: John Wiley and Sons.

Thompson, Dennis F. (1970) The Democratic Citizen: Social Science and Democratic Theory in the Twentieth Century. Princeton, New Jersey: Princeton University Press.

__________ (1976) John Stuart Mill and Representative Government. Princeton, New Jersey: Princeton University Press.

Tiebout, Charles M. (1956) "A Pure Theory of Local Expenditures." Journal of Political Economy, Vol. 64 (October), 416-424.

Tocqueville, Alexis de (1969) Democracy in America. Garden City, New York: Anchor Books, Doubleday and Co., Inc.

Tullock, Gordon (1967) "The General Irrelevance of the General Impossibility Theorem." Quarterly Journal of Economics, Vol. 81, No. 2 (May), 256-270.

__________ (1981) "Why So Much Stability?" Public Choice, Vol. 37, No. 2, 189-205.

Verba, Sidney and Norman Nie (1972) Participation in America: Political Democracy and Social Equality. New York: Harper and Row Publishers.

von Neumann, John and Oskar Morgenstern (1944) Theory of Games and Economic Behavior. Princeton, New Jersey: Princeton University Press.

Wahlke. John C. (1971) "Policy Demands and System Support: The Role of the Represented." British Journal of Political Science, Vol. 1 (July), 271-290.

Westen, T. Edward and James Buckley (1974) "Toward an Explanation of Experimentally Obtained Outcomes to a Simple, Majority Rule Game." Journal of Conflict Resolution, Vol. 18, No. 2 (June), 198-236.

Wilde. Oscar (1981) "A Model of 'Satisfactory' Choice: Optimal and Nonoptimal Satisficing." Social Science Working Paper 363 (April). Pasadena, California: California Institute of Technology.

Williams, Arlington W. (1980) "Computerized Double-Auction Markets: Some Initial Experimental Results." The Journal of Business, Vol. 53 (July), 235-258.

Williamson, Oliver E. (1967) "Hierarchial Control and Optimum Firm Size." The Journal of Political Economy, Vol. 75, No. 2 (April), 123-138.

Wills, Garry (1970) Nixon Agonistes: The Crisis of the Self-Made Man. New York: New American Library.

Wilson, Rick K. (1981) "Coproduction, Constraints, and Cockroaches: Institutional Effects on Service Production." Working Paper W81-29. Bloomington, Indiana: Indiana University, Workshop in Political Theory and Policy Analysis.

Wilson, Robert (1971) "Stable Coalition Proposals in Majority-Rule Voting." Journal of Economic Theory, Vol. 3 (September), 254-271.

Winch. Peter (1958) The Idea of a Social Science and its Relation to Philosophy. New York: Humanities Press.

12/8/82

VITA

Rick K. Wilson
Department of Political Science
Washington University
Campus Box 1063
St. Louis, Missouri 63130
Office: (314) 889-5810 Home: (314) 781-5852

Born: September 19, 1953, New Underwood, South Dakota
Marital Status: Married, no children
Education: University of South Dakota, Vermillion, South Dakota, (1971-1972)
B.A., Creighton University, Omaha, Nebraska, (May 1975)
M.A., Creighton University, Department of History (August (1977)
Ph.D., Indiana University, Department of Political Science (Degree December 1982)

Areas of Specialization:

Policy Analysis:
(Urban Service Delivery; Research Methods and Quantitative Analysis)

American Politics:
(Urban Politics; Political Behavior — participation and representation)

Political Theory:
(Game Theory; Formal and Empirical Democratic Theory; Normative Democratic Theory)

Teaching Experience:

Visiting Lecturer, Department of Political Science, Washington University, St. Louis. 1982-1983.

Associate Instructor, Department of Political Science, Indiana University, Taught Y103, Introduction to American Politics, Summer 1980; Taught Y315, Psychology of Politics, Summer 1979.

Associate Instructor, Department of Economics, Indiana University, Team Taught E306, Research Seminar in Political Economy, 1979-1980.

Associate Instructor, Department of Political Science, Indiana University, Discussion Section Leader, Y103, Introduction to American Politics, 1977-1978.

Teaching Associate, Department of History, Creighton University, Discussion Leader, H131, H132, History of the Americas, 1975-1977.

Awards:

Post-Doctoral Research Award, Washington University, St. Louis. Visiting Research Associate in the Center for the Study of American Business. September 1982-May 1983.

National Science Foundation Grant (SES 81-04772) — Doctoral Dissertation Research in Political Science. Research award for work on "Institutional Effects on Committee Behavior: A Game Theory Experiment," August 1, 1981-January 31, 1983.

National Research Service Award (1T32MH15222); Research Training in Institutional Analysis and Design, Workshop in Political Theory and Policy Analysis, Indiana University, January 1979-May 1982.

Research Experience:

Principle Investigator, "Institutional Effects on Committee Behavior: A Game Theory Experiment." August 1, 1981- January 31, 1983. National Science Foundation Grant (SES 81-04372).

Research Assistant, Arthur D. Little, Inc. "The Juvenile Justice System in Indiana." April 1982.

Research Associate, Workshop in Political Theory and Policy Analysis, Indiana University, September 1979-June 1980. Co-director (with Larry Kiser) of Apartment Services Study evaluating effects of institutional structural variations on patterns of service delivery. Supported by a grant from NIMH (1T32MH15222).

Research Skills:

Languages: French — Reading, Speaking.

Survey Research: Questionnaire Design and Testing; Sampling; Interviewing and Interview Training.

Experimental Research: Experimental Design; Computer-Controlled Research.

Data Analysis: Probability Theory; Multivariate Analysis; Log-Linear and Categorical Data Analysis.

Publications and Professional Papers:

"Citizen Coproduction as a Mode of Participation: Conjectures and Models," Journal of Urban Affairs, Vol. 3, No. 3, Fall 1981.

"Consumers as Coproducers of Public Services: Some Economic and Institutional Considerations," with Roger B. Parks, et al., Policy Studies Journal, Vol. 9, No. 7, Summer 1981, 1,001-1,011.

"Institutional Arrangements and the Delivery of Urban Services — An Annotated Bibliography," Bloomington, Indiana: Indiana University: Workshop in Political Theory and Policy Analysis, 1978.

"Institutional Effects on Committee Behavior: Or, You Can't Stop to Smell the Roses When Playing a 5-person Game." Paper presented at the Southern Political Science Association Meeting, Memphis, Tennessee, November 5-7, 1981.

"Citizen Coproduction As a Mode of Participation:. Conjectures, Models, and Cockroaches." Paper presented at the Annual Conference of the Council of University Institutes of Urban Affairs, Omaha, Nebraska, March 25-28, 1981.

Panel Discussant, "Political Participation in the Verba and Nie Modes," Midwest Political Science Association Meeting, Chicago, Illinois, April 18-20, 1980.

"Roy Medvedev's Concept of Socialist Democracy: A Critical Analysis." Paper presented at the Western Social Science Association Meeting, Lake Tahoe, Nevada, April 1979.

Teaching Interests:

My teaching interests include the following courses:

Introduction to American Government.
Introduction to Public Policy Analysis.
Urban Politics.
Research Methods and Design (including quantitative analysis).
Introduction to Formal Modeling and Game Theory.
Formal and Empirical Democratic Theory.

Research Interests:

My current research interests stem from work on my dissertation. This includes formally modeling the way institutional structure constrains behavior in a committee setting. Laboratory experimental methods are used to investigate those models. This involves human participants making committee decisions over an interactive computer system. Future work will involve investigating dynamic and multiple committee decisions. Also, I anticipate beginning work on representational processes in local jurisdictions.

Referees

Elinor Ostrom (Chairperson)
Department of Political Science
Indiana University
Bloomington, IN 47405
(812) 335-6473

James Kuklinski
Department of Political Science
Stanford University
Stanford, CA 94305

Gerald Wright
Department of Political Science
Indiana University
Bloomington, IN 47405