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Manipulation

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Systematic opportunities for manipulation emerge as a by-product of the structure of all group decision processes. Theory suggests that no process is immune. The study of manipulation provides principles and insights about how parts of complex decision systems work together and how changes in one part can have broad impact. Thus, manipulation strategies are derived from many features of voting processes. Often they are the product of changes in the decision environment, including rules, procedures and influence on others, in order to achieve a specific purpose. The issues and variables go beyond individual's own voting strategy within a specific setting and whether or not preferences are truthfully revealed – an issue often studied. Hopefully, the insights can lead to avenues for improvements to decision processes and thus, produce a better understanding of process vulnerabilities.

Our primary perspective will be the mechanical features of rules and processes; and how they interact with behaviors found in theories of public choice and voting. Given that the purpose of group choice is, in part, the revelation/discovery of patterns of preferences, the examples proceed with the assumption that public information about preferences is limited. Indeed, the power of manipulation seems to be rooted in the lack of information. Thus, we leave behind many interesting variables such as the acquisition and selective use of information, confusing language, threats, emotions, misrepresentations, coordinating devices, or even optical illusions. See Riker (1986) for examples of the skill taken from historical cases.

The paper is organized as two sections. The first is devoted to the overall structure of the decision process, the rules, and process decomposition from the point of view of manipulation. The second is focused on behavior and how behavior interacts with rules. The logic is closely associated with the classical public and social choice model that outcomes are determined by the set of options that compete as candidates for the group choice; the preferences or potential preferences; the actions available to individuals; the rules that transform individual actions into public choices; and, the overall structure of the decision process including the possibility of

*The comments of Ali Ozkes are greatly appreciated.

subgroups meeting separately and organizing some form of coalition. Manipulation takes place through control over one or more of these interacting parts.

THE STRUCTURE OF THE DECISION PROCESS AND VOTING RULES

The structure of a decision process can be viewed as separate from the voting rules. Structure encompasses many of the elements of a game in extensive form such as who makes what decisions and under what conditions. By contrast, a voting rule is the procedure by which a group passes from the information contained in individual ballots to the group choice.

The section is divided into four parts. Section A is focused on voting rules. In part, it is the most basic. In the end, all variable work their influence through the voting rule and the implications depend on the details found there. Section B is focused on changes in the set of options. Decision processes do not exhibit the same principles of rationality as individuals. Principles of revealed preference do not apply in the sense that choice over expanded sets may have no consistency with choice over smaller sets. When choosing over the set {a,b,c} the choice of {a} does not suggest the outcome of the contest from {a,b} or {a,c}. The classical impossibility theorems suggest that for every process there is a circumstance in which that consistency property will be violated. Often, paradoxes and thus opportunities for manipulation turn on such features. Section C explores changes of the voting rule given preferences. From a manipulation point of view, can one influence the outcome given preferences that are known and fixed? Different voting rules have different properties. For a given conflict, the choice of the rule can systematically change the group choice even if individual expressions of preferences, their votes, are unchanged. Section D is about organization and the special rules that might apply to the process through which opinions become aggregated.

A. Manipulation within and between voting rules: majority and Borda

When studying these examples keep in mind that changes in people and procedures are the tools of manipulation depends. First, we explore how decisions made with majority rule differ from those made by the Borda Count. Then, we demonstrate the sensitivity of the Borda Count to the set of options under consideration. The discussion expands to include other voting systems in which information about the position of an option in individual rankings is included as part of the aggregation process. We will then illustrate the difference between processes based on the number of people who rank an alternative at the top of the available options.

[INSERT FIGURE 1]

Figure 1 is the classical example of the cycling majority voting of three individuals, indexed as 1, 2 and 3 and three alternatives indexed as X, Y, and Z. Each individual has a preference ranking as shown. For example, individual 1 prefers X to Y and prefers Y to Z. The preference of individuals 2 and 3 are the rankings shown in the figure. A single option is to be chosen by voting. Assume votes mirror preferences, called sincere or non-strategic voting. When put to a pairwise vote between X and Y, option X gets votes from 1 and 3 while 2 votes for Y over X, so X wins with two votes as opposed to the one. When Z is put against the winner X, we find Z gets two votes and X gets one vote. Thus, as illustrated in the example, X beats Y, Z beats X, and Y beats Z. The winning position cycles and the ultimate choice would depend on the order of voting. An alternative voting procedure is the Borda Count in which an individual's top option would get 3 points and the others get 2 and 1, respectively. Summing across individuals the total is the same, 6, for each of the three options, a three-way tie.

The existence of the cycle creates an opportunity for manipulation. In the case of majority rule, the manipulation would focus on the order of voting and the fact that the last items considered are advantaged. In Borda Count case, the process for resolving ties would contain opportunities for manipulation. Of course, the opportunity for manipulation is presented by the fact that the two different rules produce different outcomes. The manipulator would push for a rule that produces the manipulator's most preferred option.

[INSERT FIGURE 2]

Figures 2 and 3 provide more refined examples of how different voting rules induce different outcomes even if individual preferences remain the same. From a manipulator's perspective, the choice of outcome reduces to a choice from among rules. In the Figure 2 example, seven individuals choose from a set of three alternatives. The preference of each of the individuals for three alternatives is shown in the table. If the voting rule is binary majority rule then alternative W beats X by a vote of 4 to 3. Alternative W also beats Y by a vote of 4 to 3. So, as illustrated in Figure 2 if binary choice majority rule is used, the choice is W. In this case, W is called the Condorcet winner, "core" or equilibrium.

Suppose, however the Borda Count is advanced as an alternative method with all individual preferences remaining the same. If the Borda Count is used in this three-option case, each person gives three points to their own top choice, two points to the second from top, and one point to the lowest. As is demonstrated in Figure 2, the group choice is X, which gets 16 points as shown on the right, as opposed to 15 for W and 11 for Y. Thus, the Borda Count will produce a different outcome than majority rule. Individuals 4, 5, and 6 would prefer the use of the Borda Count and presumably would push for its use given the opportunity.

Basically, a choice between Borda Count and majority rule amounts to a choice between X and W. Those who prefer W would push for majority rule and those who prefer X would implement the Borda count if given an opportunity to influence the rules.

[INSERT FIGURE 3]

B. Changing the set of options and voting Rule given individual preferences

Changes in the set of options can also be a source of manipulation. Indeed, the sensitivity of the social choice to the set of options reveals a deep property of social choices that leads to many "paradoxes". Social choices do not exhibit the "revealed preference" properties of "rationality" that tend to characterize individual choices. If X is "revealed" better than Y by some choice, then the availability of X will prevent the choice of Y in other sets. If X "is better" than Y, then if X is an option Y should not be chosen. Indeed, it is exactly this property of rationality that the impossibility theorems from the Public Choice and Social Choice literature demonstrate will be lost in the move from a single, individual choosing agent, to a choosing agent that is a group with conflicting individual preferences.[1]

Figure 3 can be used to illustrate the impact of changes to the set of options. The example can also be used to illustrate the impact of other commonly considered voting rules. The example is based on seven individuals as before and four alternatives {W,X,Y,Z}. Preferences for the four alternatives are the orderings shown in Figure 3. Suppose the voting rule is the Borda Count and only three alternatives, alternatives {W,X,Y}, are proposed for consideration. Application of the Borda Count has top ranked alternatives receiving a score of three, the second receiving a score of two, etc. As shown in the Figure 3, the voting produces the ordering with W the winner followed by X and Y with scores, respectively, 15, 14, and 13.

Suppose prior to voting, alternative Z is added to the set to be considered for voting. So, the set is expanded from the three alternatives {W,X,Y} to the four alternative {W,X,Y,Z} while

[1] This property of revealed preference is often confused with the Arrow axiom of "Independence of Irrelevant Alternatives" Indeed the confusion began with Arrow and, unfortunately, touches much of the popular accounts. As it turns out, the IIA axiom is very innocent if the problem is reformulated as a problem of social choice as opposed to the definition of social preference. In fact, it is a property of almost all social decision processes. On the other hand, the revealed preference features that are mistaken for IIA have normative overtones that can involve philosophical issues.

no preferences are changed. The Borda Count now places a score of four on a top rank and three on the second, etc. This change from three alternatives to four causes the Borda Count relative vote scores to completely reverse. With three options the ranking was W over X over Y. Now, as shown in Figure 3 the winner is Y over X over W over Z. The respective totals for Y, X, W and Z are, respectively, 20, 19, 18, and 13. Notice that the manipulation works in reverse should alternative Z, which gets the least points among the four, be dropped from consideration before voting. Dropping Z would invert the order of the others. The possibility that the social order could be reversed was first discovered by Fishburn (1974) and extended by Plott (1976).

The example in Figure 3 illustrates the structural impact of changing the set of options while preferences and rules are unchanged but can be conveniently extended to illustrate the impact of changing voting rule. Specifically, Figure 3 demonstrates the implications of the rules (a) vote for your best, (b) vote for your top two, and (c) vote for your top three. That is, an individual gives a point to an option if it is among the top N options in his ranking. So, an individual with ranking W,X,Y,Z would give a point to W if the rule is vote for your best. The individual would give a point to W and a point to X if the rule is vote for top two, etc. The boxes on the right side of the Figure contain the total point tabulation resulting from an application of the three rules {vote for the best, vote for top two, vote for top three} to the preferences listed on the left. As can be seen the group will be W or X or Y according to the decision rule. Modifications of these processes can involve the elimination of options as they fail to meet the criteria when applied in sequence. Such processes induce still different opportunities for manipulation, Grofman and Feld (2004).

C. Organization and Manipulation

The organization as opposed to the voting rule can be structured to systematically influence the outcomes. Often processes are complicated with many options and conflicts among decision makers. How the set of options become reduced to “manageable” sizes and who participate in such processes become important and can be sources of manipulation. In this section, we introduce a type of divide and conquer process of manipulating group choice, Plott and Merlob (2017).

The opportunity to influence organization and thus manipulate decisions could require working through a rules committee or some other means of putting organization in place. The example in Figure 4 is for six alternatives {A, B, C, X, Y, Z} consisting of the first three and last three elements of the alphabet from which only one alternative will be chosen. The individual preferences are in the Figure and the majority rule ordering is {Y, B, X, C, Z, A} so Y is the Condorcet winner, which would win a majority if compared to any other alternative. As a Condorcet winner Y is the "natural" outcome of a direct voting majority rule voting process so if Y is to be avoided the manipulator must avoid a process of direct vote with open proposals, which would result in a choice of Y.

The exercise in Figure 4 reflects an attempt to get X voted as the outcome even though both Y and B are preferred to X by a majority. To accomplish that objective the manipulator partitions the set of objectives into two subsets {A, B, C} and {X, Y, Z} and the voters are partitioned into two groups. Using majority rule each group chooses and alternative that will be elevated to consideration by the group as a whole. One group, the {A, B, C} group is given the responsibility for choosing a single alternative from {A,B,C}. The other group, the {X,Y,Z} group, is to choose a single option from {X,Y,Z} to be considered by the whole group. The two alternatives chosen by the subgroups are then placed on a ballot and the choice between the two alternatives is by the majority vote of all six people.

Figure 4 contains the preferences of people assigned to the two groups. Notice that alternative C is the Condorcet winner in the {A,B,C} group and alternative X is the Condorcet winner in the {X,Y,Z} group. So, the two alternatives C and X are elevated to the group as a whole. When the pair {C,X} is put to the group as a whole, X will be chosen by a majority and is thus the winner. Of course, organizational manipulation requires skill, information about processes and the opportunity to implement process detail. The opportunities to use the organizational form of manipulation might be rare but the basic principles are clear.

[INSERT FIGURE 4]

SYSTEMS BEHAVIOR AND VOTING RULES

The examples in the previous section reflected how the technical relationships among rules and preferences create opportunities for manipulation. The technical models rest on a type of "sincere" voting behavior in which preferences are translated directly into a voting model without modification for strategic purposes or compromise. This section opens the discussion to broader issues of behavior and related potentials for manipulation that behavioral regularities bring. The outcomes from voting groups are systematically related to general principles of Public Choice theories and closely related to the technical models discussed in the previous section. The models are neither perfect nor complete. Neither the limitations nor the capacities are fully explored. Consequently, the practitioner should proceed with some precautions. That said, laboratory experiments do reveal important features of the underlying principles at work. For summaries of the more recent literature, the reader should consult Bottom, King, Handlin and Miller (2008), Wilson (2008a, 2008b), Rietz (2008).

A. Majority Rule with Unrestricted Proposals

Groups that operate under simple majority rule with an open proposal process (a partial implementation of Roberts Rules of Order) have a tendency to choose alternatives near the (generalized) median, equilibrium or core of alternatives should such an equilibrium exist. The simplest way to illustrate the basic principles is by an experiment that has been conducted many times and in settings much more complex than the illustration used here. The discussion in Section (i) assumes a fixed set of individuals and options used to illustrate an important principle. Section (ii) addresses situations in which the preferences represented in the meeting can be altered. The illustration is intended as a demonstration of how the theory works and that it is fully within the capacity of human decision makers.

(i) Fixed Setting

Figure 5A is a setting with five individuals indexed by {1, 2, 3, 4, 5}, who are required to use majority rule to choose a single point in the X-Y plane shown in the figure. Each of the five individuals has circular preferences[2] with a most preferred point located at the appropriate number as shown in the figure. The majority rule equilibrium/core exists for that particular configuration of preferences and it is the point of maximum for individual 2, located in the interior at the intersection of the classical "contract curves" as shown. Figure 5B illustrates the decisions of several different groups. The pattern here is typical of experimental committees (see, for example, Fiorina and Plott, 1978) each of which is operating as a majority rule committee in a controlled experiment. The outcome of a committee deliberation and vote are the dots seen disbursed around the equilibrium point as can be seen. When the equilibrium core exists, it is an excellent model for predicting the choice of groups that follow loose versions of Robert's Rules of Order.

[2] The preferences are induced with money incentives following classical methods. The data are from Fiorina and Plott (1978). The fact that the underlying options reside in a two dimensional (Euclidian) space is important, giving the issues concepts of distance and closeness often not available in political discussions. If the issues are given nonsensical names (e.g. arbitrary letters of the alphabet), the results reflect more scatter.

[INSERT FIGURES 5A AND 5B]

The behavioral models hold implications for manipulation and important aspects of such applications. Four types of manipulation are of interest: attendance influence, preference influence, procedural changes and pre-meeting meetings.

(ii) Committee Member Preference Changes

Obviously, meeting attendance or other forms of preference changes can alter voting dynamics and outcome. The issue is how the outcome will change in response. Which committee members might be considered as a candidate for preference influence and what would be the consequences of preference changes? Meeting attendance is an option that can be influenced in a variety of ways. Examples would include a change of meeting rooms or meeting time without proper notification. The individual(s) might be faced with a need to attend a more important meeting due to a (strategically arranged) conflict, etc. The consequence of preference influence is sensitive to the original patterns of preference so must be studied carefully as a manipulation strategy.

[INSERT FIGURE 6]

Not all preference manipulations result in changes of the committee decision even though the dynamics of the meeting or how people feel about the decision might change. In Figure 5A, for example, given the configuration the removal of any one member, leaving an even number of committee members, would not change the outcome. The core, equilibrium would remain in the same spot – the intersection of the two contract curves. In Figure 6, successful preference changes of, say, individual 1 in the direction of the arrow, would not change the outcome because such changes do not change the equilibrium/core. Amplification of feelings, leaving the committee member preference among pairs of options the same but increasing the “strength” of preference, will not change the outcome. The idea is illustrated by the preference of individual 5 as a larger circle representing a “stronger” preference. The theory says that the configuration of the conflicts matters but changes that leave the configuration, the equilibrium/core, the same, will not change the outcome.

However, that is not to say that attendance and preference manipulations will have no impact. They can have substantial impact but it depends on the specific preference changes and how they are implemented. The preference of individual 2 in Figure 5A is at the equilibrium of the preferences but if the preference of individual 2 is shifted lower and to the right as in Figure

7A, or if individual 2 cannot make the meeting and is replaced by an alternative person with the preferences as shifted, the equilibrium is destroyed. Pure theory has not resolved the consequences but several models suggest the outcomes will become scattered (McKelvey (1976), McKelvey and Ordershook (1984), Shepsley and Weingast (1984), Schofield (1978)). Experimental evidence reveals the predicted "explosion" as illustrated in Figure 7B. As can be seen, the data tends to be confined to a central area but the reliability and exact characterization do not exist. Thus, manipulations that destroy the equilibrium do so at the risk of having the final outcome becoming even worse for the manipulator. A similar analysis demonstrates that the strategic addition of committee members can be important. Suppose the number of committee members is odd and configured as in Figure 7A where no equilibrium exits. If the number of committee members becomes even by the addition of a committee member whose preferences are in the Pareto Optimal set of the other five, such as member 6 in Figure 7C then an equilibrium will exist. If the optimums of multiple members are located in the Pareto set the Pareto Optimal of the interior members contains an equilibria. A point on the line connecting members 2 and 6 in Figure 7C is an example.

B. Procedures and Rules

Often committees develop and implement rules as part of the decision making process. Motivations include congestion, simple deference to vocal members of the committee, deference to expertise or the decisions of a predesignated rules committee. Here we consider two types of rules. The first involves various forms of unanimity in which one or more members are given an effective veto. Those with veto power ability to block options in the sense that the option cannot be an outcome without the approval of the group, which could be as few as one. The second involves the packaging and sequencing of options for vote.

[INSERT FIGURES 7A, 7B, 7C]

(i) Veto Players and Unanimity

The veto power could be direct in the sense that the blocking coalitions can be exercised at the time of a vote. It takes a majority to pass a motion but the blocking coalition must be part of that majority and if the blocking coalition does not vote unanimously in favor then the motion does not pass. The power can also work indirectly. Chairpersons or others with the power to recognize proposals (or individuals for making proposals) effectively have veto power. Such powers are not dictatorial since majority rule still operates. No proposal can pass without the positive vote of a majority but the options proposed for the vote would be controlled by the recognition process. The “closed rule” governing amendments and motions is such a process. Basic theoretical results are found in Austin-Smith and Banks (1999, 2004) and relevant experiments are found in Issac, et.al (1978), Bottom, et.al. (2008), Wilson (2008b), and Kagel, et.al, (2010).

[INSERT FIGURES 8A AND 8B]

Figure 8A illustrates the impact of a single veto player operating under majority rule. In this case, individual 5 has veto power but a majority is required for a motion to pass. The equilibrium/core given these preference configurations and with no veto player is the maximum of person 2 but when person 5 has the veto the equilibria/core become the line segment connecting individual's 2 and 5, Koremndi and Plott (1982). As can be seen, the outcomes from the groups each of which is represented by an open circle are approximated by equilibria/core.

If the configuration of individual preferences was such that no equilibrium/core exists, as in Figure 7A, and a committee member is given veto power, then the equilibrium/core becomes that person's most preferred option. For example, if person 2 in Figure 7A was given veto power then the core would be the single option consisting of the maximum for person 2.

If a group operates under unanimity, each committee person has veto power, the equilibria/core are the Pareto Optimal options for that group. Figure 8B is an illustration in which the equilibria/core the options are on the interior of the lines that connect the individual options - the kite shaped object. The dots within the figure illustrate typical committee decision within such processes. As can be seen the outcome shift from the majority rule equilibrium to a pattern that is more closely related to the "center" of opinions. Basically, unanimity tends to produce outcomes close to what might be considered the "fair" or "equal split" options. How "strongly" or "passionate individuals might be seems to have little effect on the outcome unless many of the committee members do not care. From the point of view of the manipulator, the advantage of unanimity over majority boils down to a preference between the equilibrium/core or options near the middle or "average".

(ii) The (Agenda) Grouping and Sequencing of Options

Majority rule by its very nature operates in a binary fashion. When many options are available, they are frequently grouped into sets, which are retained for further consideration or rejected. The grouping of options into such sets forms the heart of agenda theory.

Two types of agenda setting seem to work. The first operates through a choice of dimension for voting in cases in which the language allows options to be represented in a multidimensional space such as those in Figure 5A and 5B. For example if the voting process is posed as a choice of the distance along the horizontal axis followed by a choice along the vertical axis then the outcome can be substantially influenced by the choice of dimension and the sequence in which the voting takes place. Without strategic behavior in which subsequent votes are anticipated, the model predicts the Condorcet winner, the equilibrium, along each dimension. The outcomes can be found by application of the classical single peaked preference procedure together with a specification of the order in which the dimension takes place. Such forms of agenda control are extremely powerful Shepsley (1979), Shepsley and Weingast (1984), Wilson (2008a, 2008b).

A second form of agenda manipulation works by strategically presenting individuals with choices among sets of options, as opposed to pitting one option against another. As such, predictions of the effects can utilize theories about how people chose among sets and by subtly change the order in which sets are presented the effects of the agenda can emerge from member ignorance about the consequences of committee decisions that come later.

Study Figure 9. A group of individuals is considering four options labeled as {a, b, d, e}. The agenda is first to choose between vowels and consonants and then choose between letters. The resulting "agenda tree" is represented in Figure 9. Suppose the committee member's preference was in the order a>e>b>d. Such a voter would almost certainly vote vowels on the first agenda item. The model holds that people tend to use three rules {vote for best, vote against the worst, and vote for average} and in this case the vowels contain the best and the consonants hold the worst. The decision is easy. Suppose, however the first item on the agenda placed the pair {a, d} against the pair {b, e} as the first agenda item. Being afraid the group would choose {d} you could vote for the {b, e} pair and if you did then the agenda manipulator who did not want option {a} succeeded in getting a vote against it.

The theory works on the principle that individuals randomly use a small number of decision rules, Plott and Levine (1978), Levine and Plott (1977), Riker (1986). By having some information about preferences and using grouping and sequencing, the undesirable from the point of view of the manipulator can be voted down at some stage and thus removed from further consideration. At each stage of the agenda, a different group can be used to remove options until only favorable options remain. The language is amazingly flexible for the purposes of grouping together otherwise dissimilar options.

[INSERT FIGURE 9]

The example may seem strained because the vowels' and consonants' distinction may have seemed excessively convenient. In fact, the language is rich with techniques for grouping and sequencing in what appears on the surface to be natural ways. Figure 10 indicates some of the subtle aspects of the language. Each expression induces a different tree and each tree leads potentially to a different outcome. Convenient groupings like vowels and constants will not be available but almost any "tree" can be induced by a sequence of "natural" sounding motions. Agenda theory works by keeping voters in the dark, about how others might vote on the items along the tree. Slight agenda changes and straw votes should be avoided.

[INSERT FIGURE 10]

C. The Caucus

The limited number of studies suggests that the caucus of subgroups prior to the meeting of the committee as a whole is important and can systematically influence a group choice. The nature of the influence depends on the rules in force when full committee deliberations begin. Since the caucus does not necessarily operate to the advantage of everyone in the caucus, it pays to reflect on its influences before forming one.

Figure 11 compares committee choices with unrestricted caucuses representing outcomes similar to those reported by Hoffman (1983) and can be compared to processes in which subgroup meetings interact with the group as a whole while following well-defined rules. Figure 11A is the pattern of committee preferences used for orientation of results. All subgroups had an opportunity to meet and discuss the upcoming meeting prior to the meeting or the whole committee. Two rules governing the procedures used by the committee of the whole are reported. The committee of the whole operates under majority rule but the rules governing the committee as a whole differed according to whether or not the floor must allow deliberation on all proposals. The feature-required deliberation is an element of widely used Roberts Rules. Majority rule was always operative.

Figure 11B represents the committee of the whole decisions when the required deliberation feature of Roberts Rules was not in place and Figure 11C represents the decisions when the rule was in place. As can be seen, the variance in outcome is greater under the caucus when the most deliberate feature of Robert's Rules is not part of the rules. The process begins with a coalition with forms during the caucus. Coalitions of a simple majority always formed. The coalition approaches the committee meeting with an agreed upon option. The option was proposed and a vote was taken without further discussion. The coalition simply informed the others that it was a majority and it had made a decision. That is, if the coalition was a majority, it implemented an option close to the one that resulted from private deliberations. The caucus proposals were typically influenced in the direction of the center of the opinions of the caucus members. The caucus tends to operate under unanimity so it supports an option at the center of the preference of its members. The variance of outcomes shown in the figure 11B reflects the variance of groups that had a successful caucus.

The dynamics differed if committees operated with required recognition and discussion of motions. Deviations of the final committee choice from this initial coalition position reflect concessions made on the floor during the committee meeting. In particular, the concessions are usually necessary to appease the individual at the core/equilibrium who is actually worse off for having joined the coalition. Had that agent refused to join, the group would have automatically chosen his/her maximum. New proposals and discussion bring that fact into the open.

[INSERT FIGURES 11A, 11B, AND 11C]

As can be seen in Figure 11C the decisions move to near the equilibrium/core of the committee of the whole. The fact that the caucus was successful when the required discussion feature of Robert's Rules were not used is important. Rules that prolong considerations, force recognition of motions or amendments, and require discussion of options endanger the effectiveness of the caucus. Competing motions make policing member votes difficult. The individuals who are bound to lose from the caucus will likely discover their folly during protracted discussions. When they recognize the advantage of competing motions, they tend to defect from the coalition.

The implication is that the caucus is an effective but unstable tool to use for influencing group choice. Its advantage as a tool for influencing groups depends upon the location of the manipulator's preferences relative to others. A manipulator near the core/equilibrium should not want caucuses. A manipulator far removed from the others might be helped by caucus opportunities. A committee member who faces undesirable proposals from a caucus and wants to counter should prolong the meeting and discussion with alternative proposals aimed at luring some member away from the caucus proposal.

CONCLUDING REMARKS

Bill Riker coined the term "heresthetics" to describe the political manipulation (1986). He described a wide-ranging class of strategies taken from historical examples. His examples included the skilled use of the language that can confuse or mislead. He appropriately designates that topic as an "art" but he clearly outlines an underlying science. By contrast, the examples outlined here flow from a narrow, analytical structure within which basic principles tend to emerge. Perhaps the study of the art when integrated with the analytical structure will be useful to those who seek to improve the methods through which collective decisions are made.

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Figure 1

1	2	3		outcome
X	Y	Z	Majority order X>Y>Z>X	Order dependent
Y	Z	X	Borda weights: X,6: Y,6: Z,6	Three way tie
Z	X	Y		

Figure 2

							Majority order	Borda order
1	2	3	4	5	6	7		
W	W	W	X	X	X	Y	**W**	**X = 16**
X	X	X	Y	Y	W	W	X	W = 15
Y	Y	Y	W	W	Y	X	Y	Y = 11

Figure 3

									TOP	TOP2	TOP3
1	2	3	4	5	6	7	BORDA {WXY)	BORDA (WXYZ)			
W	X	Y	W	X	Y	W	**W =15**	W=18	**W=3**	W=3	W=5
X	Y	Z	X	Y	Z	X	X= 14	X=19	X=2	**X=5**	X=5
Y	Z	W	Y	Z	W	Y	Y=13	**Y = 20**	Y= 2	Y=4	**Y=7**
Z	W	X	Z	W	X	Z		Z =13	Z=0	Z=2	Z=5

FIGURE 4

	(ABC} Committee preferences			{ABC} Majority rule order and **S**election	{XYZ} Committee preferences			{XYZ} Majority rule order and **S**election	Majority rule order	winner
names	1	2	3		4	5	6			
	C	C	A		B	X	Y		Y	
	Y	Z	Y	**C**AB	X	B	B	**X** YZ	B	
	X	A	B		Y	Z	Z		**X**	wins
	B	Y	X		C	Y	X		**C**	second
	Z	B	C		Z	C	A		Z	
	A	X	Z		A	A	C		A	

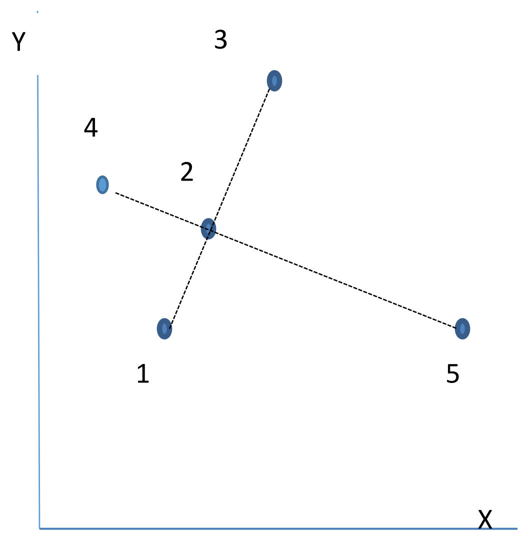


Figure 5A

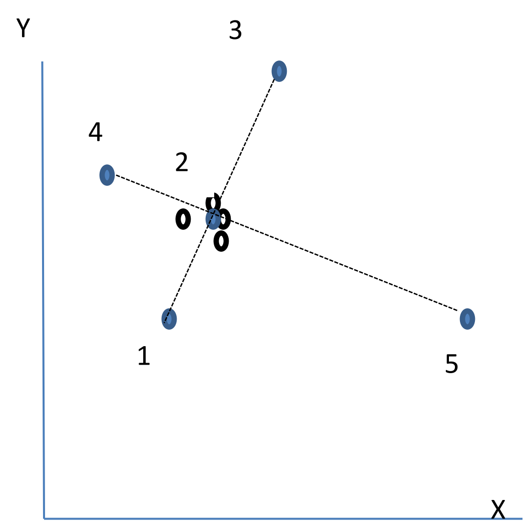
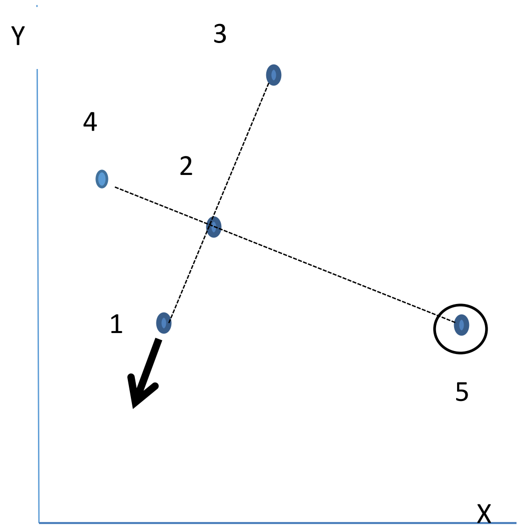


Figure 5B



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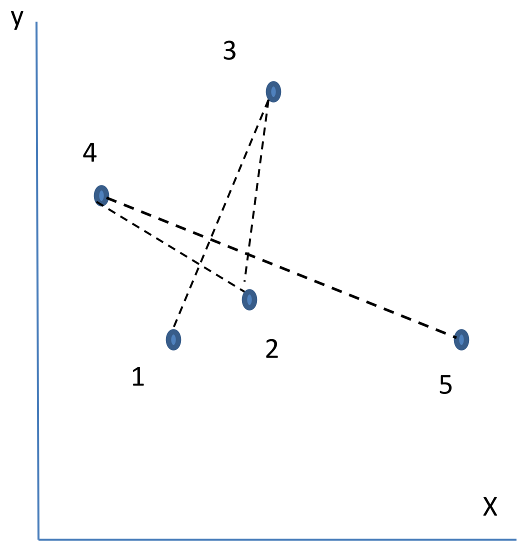

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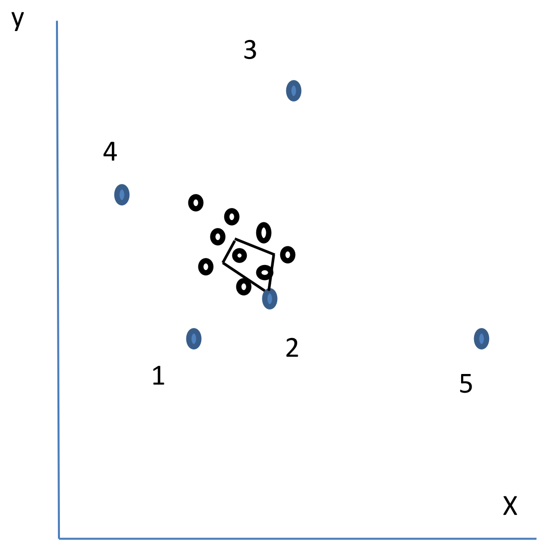

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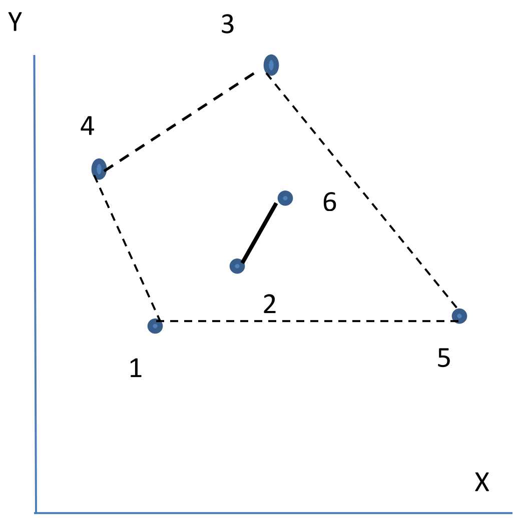

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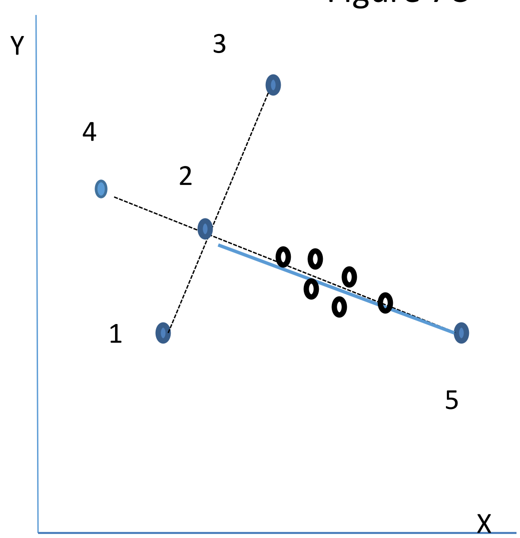


Figure 8A

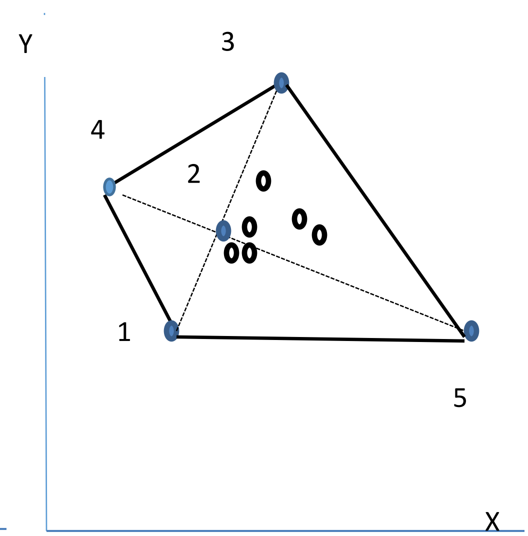


Figure 8B

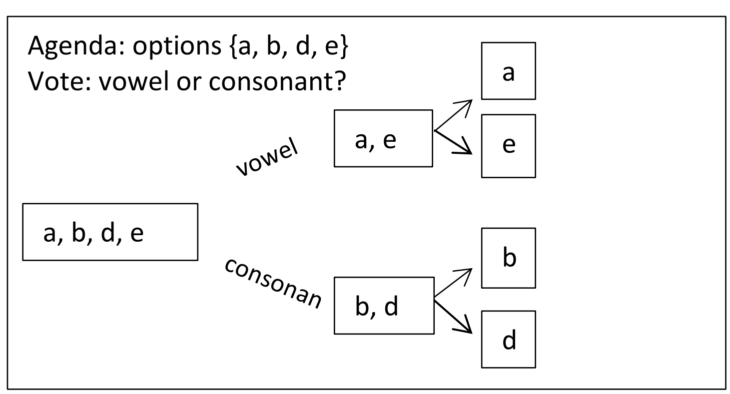


Figure 9

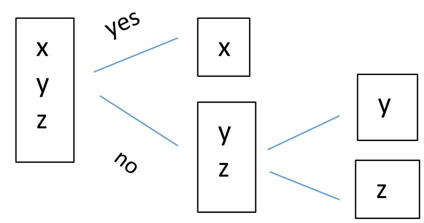
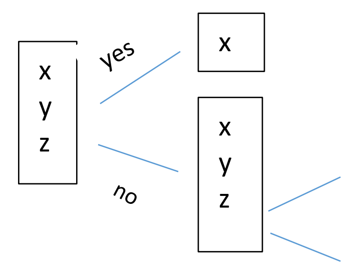
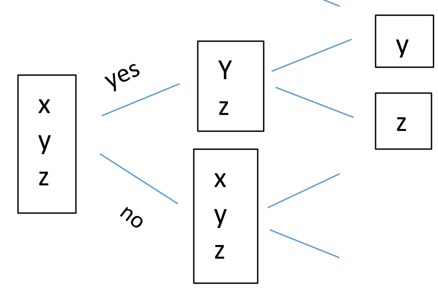
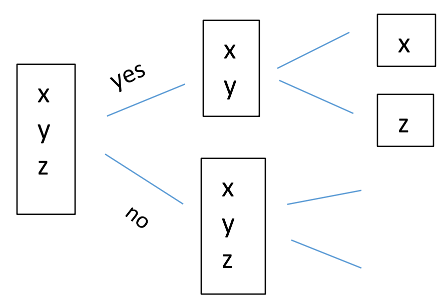
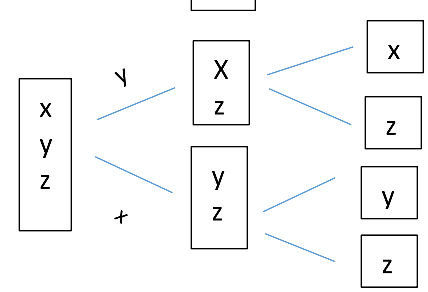
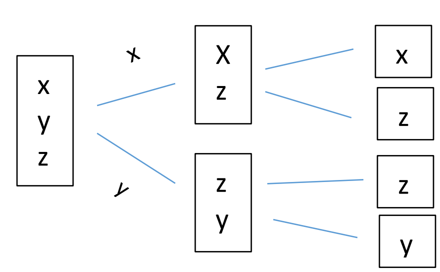
Question	Example option in the “blank	Tree Diagram
Do we want _____ or do we not?	x	
Do we want _____ ?	x	
Can we eliminate __________?	x	
	y	
Of the two, which shall we eliminate?	{x, y}	
Of the two, which do we prefer?	{x,y}	

Figure 10

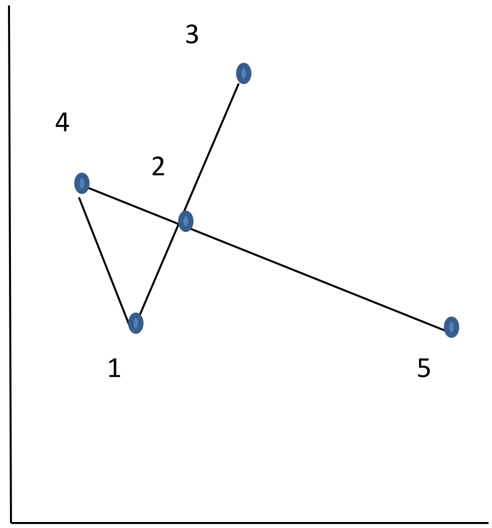


Figure 11 A

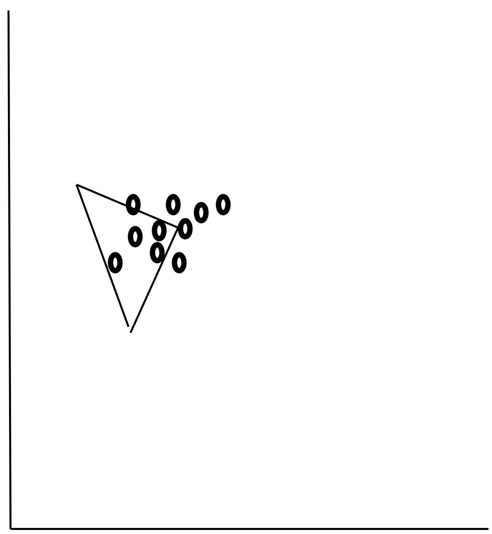


Figure 11 B

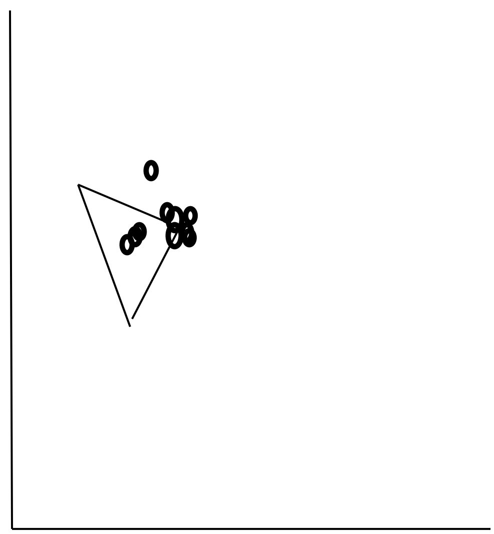


Figure 11 C