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Power, Freedom and Voting
Essays in honour of Manfred J. Holler
Edited by Matthew Braham and Frank Steffen
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This book is a collection of 22 articles dedicated to understanding the concepts of power, freedom and voting. The majority of the articles are based on game theoretic models, but there is a strong focus on philosophy and applications to the social sciences, which is underlined by the opening and closing chapters. Hence, this book is aimed at both game theorists and social scientists. Although those in the second group should have a basic grounding in game theory to follow the mathematical arguments, the chapters are generally written in a style accessible to such researchers and many practical examples are considered. As a game theorist, it seems to me that the primary goals of the book are to illustrate the scope of applications of game theory in political science and develop a mathematician's understanding of the philosophical issues involved.

M. Braham opens the book with a chapter on the nature of power and causation. He critically analyses philosophical definitions of power and causation and differentiates between the power "to do something" and the power "over somebody". He notes using various examples that power and causation are fundamentally different. His exposition is clear and entertaining. At the end of the chapter, he attempts to define power and causality in terms of cooperative game theory. Although his definition is in line with classical concepts of power indices, it does not fully satisfy my purely intuitive concepts of power. He considers a set of agents N and possible outcomes X . A coalition $T \subseteq N$ is what he calls α -effective for $A \subseteq N$, if the agents in T can take a profile of actions such that the outcome is guaranteed to be in A . Coalition T is said to be a minimum winning coalition for A if it is α -effective for A , but no subset of T is. He says that individual i has power to bring about A , if and only if there is a minimal winning coalition for A that contains i . However, what does that mean that individual i has the power to bring about A , a set of outcomes, when the particular outcome may depend on the actions made by the other members of the coalition? In

particular, the individuals in $T - i$ may not want to bring about an outcome in A . So there seem to be unanswered questions.

M. Holler closes the book with an interesting philosophical discourse on Machiavelli's the Prince. He notes that many of his ideas can easily be reconciled with Arrow's theoretical work on establishing social preferences using voting systems.

The rest of the book can be roughly split into two sections of approximately equal length. The first half is mainly concerned with the concept of power indices in voting games. The chapters in the second half are generally concerned with particular issues in the realm of power, freedom and voting.

F. Turnovec et al. carry out a review of power indices. They differentiate between I -power, the power of a group over the result of a vote and P -power, the expected relative share in a fixed prize obtained by a winning coalition. They note that classical measures of power do not take into account the preferences of the groups and by modelling these preferences in a simple manner, these different approaches can be reconciled.

D. Felsenthal and M. Machover consider the formation of alliances within voting systems. They assume that parties may decide on how to vote in the principal voting game by means of a vote within the alliance. This should be devised in order to increase the power in the principal voting game of each member of the alliance. In particular, they note that in the first voting system set up within the European Union, Luxemburg could not swing the result of any straight vote. However, by forming such an alliance with Belgium and the Netherlands, Luxemburg could increase its power without decreasing the power of the remaining two countries (measured according to the Penrose index).

R. van den Brink and F. Steffen consider power in hierarchies. They consider an organisation in which proposals enter at the bottom of the hierarchy. If an agent wishes to implement a proposal, it is sent to his immediate supervisor and so on up to the top of the hierarchy. A strong swing is defined to be a change in an individual's action, which changes the outcome of the voting procedure whatever the actions of the remaining agents. A weak swing is defined to be such a change, which changes the outcome given that the remaining agents do not change their decisions. The power of an individual is defined according to the number of strong and weak swings available to a player.

C. Bertini et al. define and axiomatise a public help index. The relative power of an agent is the proportion of winning coalitions that include that agent. According to such an index, a dummy player will have a positive power index. They note that although some agents may not have any voting power in the legislation process, their support will help the implementation of legislation and this should be reflected in measures of power. These ideas could be developed by considering models in which agents not only have different voting strengths, but have differing abilities to affect the implementation of legislation.

In their lively chapter, S. Napel and M. Widgren reconcile classical power indices with concepts based on the preferences of agents using the UN Security Council as an example.

G. Owen et al. analyse the electoral college system used in the USA. They assume that in each state there is a core level of support for each party with the remaining voters changing their votes from election to election. They assume that when party X wins, then the states are ordered from the one in which party X obtained the largest proportion of the vote to the state in which they obtained the least proportion. The pivotal state is the one for which the cumulative sum of the electoral votes first becomes a majority of the total number of electoral votes. The voting power of a state is defined according to the probability of a state being pivotal. Under such a model the measure of power of a state in which the parties have equal levels of core support will be higher than obtained using a traditional measure. It is possible that medium-sized states have a low level of power compared to other states. Their low number of electoral votes and the relative difficulty of changing the result of the state election by campaigning mean that candidates may well concentrate on small and large sized states, as observed in practice.

J. Godfrey and B. Grofman analyse lobbying Senate and Congress using Shapley–Owen scores based on measures of the preferences of senators and congressmen and observes that individuals with centrally positioned preferences were most often the subjects of lobbying. Their analysis highlights mistakes made by the Clinton administration in attempting to pass the 1993 Health Care Reform.

V. Chua and D. Felsenthal test Aumann's theory that a party charged with forming a majority will maximize its Shapley-Shubik index in an appropriately defined voting game played between the coalition members. They use data on the government coalitions formed in several countries from 1918 to the 1970s. They conclude that the best predictive model is the one that assumes that the government is formed by the smallest majority coalition which includes all parties within a certain distance of the one charged with forming a government. However, this predicts only about 40% of the coalitions correctly.

F. Bolle and Y. Breitmoser also consider a situation in which a party is invited to form a government. However, they adopt a completely different approach from the adoption of power indices and this marks a transition from the first group of articles to the second. They assume that parties negotiate on the agenda to be used and the coalition that is to be formed. Each party obtains a payoff according to the coalition formed and the agenda accepted. If no government is formed, they obtain a payoff corresponding to the resulting situation (e.g. repeat elections). The outcome should correspond to a subgame perfect equilibrium in the appropriately defined extensive form game. Such an approach seems highly promising, but in order to be tested empirically the payoffs in such games should be based on the observed preferences of the parties.

W. Guth et al. consider the paradox of allowing anti-democratic parties power in democratic governments. Preventing their participation would be non-democratic.

Allowing them to take part in democratic procedures leads to the risk of democracy falling, but may democratise a non-democratic party. They present a model that takes these factors into consideration.

S. Brams and D. Kilgour consider the instability of power sharing. Often after a merger one party will become the dominant figure. They model this using a duel type game in which an agent chooses a moment to try and eliminate the others and obtain the whole of a future stream of payoffs rather than a share. If there are no costs to a power struggle, then the only sensible strategy is to try and eliminate the others, even when the likelihood of success is very low. If such costs are introduced into the model, then there is the possibility of peaceful coexistence. However, as they note, the many devastating conflicts of the 20th century shows that coexistence is not easy.

D. Wittman considers the power of a proposer, legislators and a vetoer according to their position on a one-dimensional scale. The voting game is defined as an extensive form game with the proposer choosing a position, with the legislative body and vetoer in turn deciding whether to accept or reject this proposal. The equilibrium solution is then derived by recursion. This procedure reflects the procedure used in many governments, where a group proposes a bill, which is then sent to parliament and then to the head of state.

N. Schofield presents a model in which parties should not all attempt to take a central position in the policy space. He assumes that each party has some measure of valence, which is understood as voters' assessments of the competency of a party to govern. The higher the valency and the closer a party is to a voter, the more likely a voter is to vote for that party. He states that a high valency enables parties to occupy the centre ground, while small and newly formed parties have to find an electorate by appealing to the extremes. His model is well illustrated using an analysis of the manifestoes of Israeli political parties, the preferences of voters and the election results to the Knesset in 1988, 1992 and 1996.

In one of the more mathematically theoretical articles, T. Meskanen and H. Nurmi review common voting systems, which may lead to different outcomes for a given set of voter preferences. They argue that voting procedures measure the distance from consensus on each possible outcome using some metric and the outcome is chosen to minimise this distance. This is followed by K. Dowding and M. van Hees philosophical discussion on the concepts of freedom, coercion and ability.

M. Ahlert considers a model of governance where the government sets up a framework in which agents play a game. Each agent is guaranteed the appropriate minimax payoff in such a game. The government should act so as to set up a framework which maximises the utility it gains from this set of minimax payoffs. These concepts are illustrated using versions of the dictator game and the ultimatum bargaining game.

S. Bavetta et al. interpret the results of an Italian study on attitudes towards inequality and personal autonomy. For a given level of earnings, those who feel autonomous have on average a higher level of support for income differences.

L. Andreozzi notes that multilateral treaties, such as the Kyoto treaty are subject to the problem of freeriding. Using a game theoretic approach, he argues that it is morally justifiable to coerce agents into ratifying a treaty by threatening to punish by an amount not exceeding an agent's gain from implementation of the treaty. He does, however, point out that there are problems related to estimation of the gain an agent obtains from implementation and the fact that his model does not consider the costs of executing punishment.

F. Guy and P. Skott note that technological advances have greatly increased the possibility of monitoring employees. They describe a model of the effect of such monitoring on worker effort and wages. Using this model, they argue that increased monitoring may well have been a factor in increasing the dispersion of wages, as observed in recent times.

T. Airaksinen gives a philosophical treatise on the role of trust and social capital. He differentiates between reliance on (weak trust of) an object or person fulfilling a role and full trust of a friend and family member. He notes that some forms of social capital are negative (e.g. mafia).

In general, although some chapters could have benefitted from more careful editing, the articles are clear and well presented. The range of these papers enables game theorists to see the range of applications of game theory in democratic procedures and the possibilities for advance in this field. It also gives them the opportunity to develop their understanding of the philosophical concepts involved. Due to the accessibility of many of the primarily game theoretic articles and the many practical examples considered, this book will also be of interest to social scientists. I therefore recommend this collection to all such researchers.