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Editorial: Voting, Power and Manipulation

In September 2010, a workshop on *Voting, power and manipulation*, with an emphasis on the mathematics of social choice, was hosted by the Institute of Economic Studies of the Faculty of Social Sciences, Charles University in Prague, in cooperation with the Institute of Socioeconomics of Hamburg University and the Public Choice Research Center of the University of Turku. The workshop was co-sponsored by the Czech Science Foundation (GAČR – Grantová agentura České republiky) within the "Political economy of voting behavior, theory of rational voter and models of strategic voting" project (No. 402/09/1066), and by the Faculty of Social Sciences of Charles University in Prague within its institutional research target MSMT0021620841.

Voting signifies the following pattern of collective choice: There is a set of alternatives and a group of individuals. Individual preferences over the alternatives are exogenously specified and supposed orderings. The group is required to choose an alternative on the basis of stating and aggregating all individual preferences, or to produce a ranking of alternatives from the most preferred to the least preferred. Voting is a very common way of resolving disagreements, determining common opinions, choosing public policies, electing office-holders, finding winners in contests and solving other problems of aggregating a set of (typically individual) opinions in a democratic society. In a representative democracy different committees are elected to make decisions on behalf of the voters. Measures of the decision-making power (influence) of committee members provide the possibility of evaluating the fairness of particular types of representation, electoral systems and voting rules (each vote generates the same share of influence). Each voting procedure can be manipulated by strategic voting (misrepresenting voters' preferences to get a more beneficial outcome of voting) or by strategic nomination (if the set of alternatives is endogenous, i.e. not fixed by nature, then the outcomes can be manipulated by adding alternatives to or removing alternatives from the set of alternatives being voted upon). Two famous social choice theorems are related to the problems of dictatorship and manipulability. While Arrow's "impossibility" theorem is usually associated with the non-existence of a non-dictatorial social preference function, the Gibbard-Satterthwaite theorem shows that any non-dictatorial non-degenerate social choice function is manipulable. In fact, many authors observe that both theorems are closely related. Understanding the mechanisms of strategic voting behavior helps to distinguish between "more manipulability" and "less manipulability" in different social choice procedures.

Social choice analyses have benefited from the use of mathematics. Mathematic modeling has made its way from economics into the other social sciences, often accompanied by the same controversy that raged in economics in the 1950's. The reasons for this expansion are several. First, mathematics makes communication between researchers succinct and precise. Second, it helps make assumptions and models clear; this bypasses arguments in the field that are a result of different implicit assump-

tions. Third, proofs are rigorous, so mathematics helps avoid mistakes in the literature. Fourth, its use often provides more insights into the models. And finally, the models can be applied to different contexts without repeating the analysis, simply by renaming symbols.

This special issue brings together a selection of six papers presented at the workshop contributing to the topics of voting, voting power and manipulation, either on the methodological or on empirical level.

In the first paper "Dimension of Political Contestation: Voting in the Council of European Union before the 2004 Enlargement", Madelaine O. Hosli and Marc C. J. Uriot (both from the Institute of Political Science, Leiden University) explore coalition-formation and voting in the Council of Ministers for the EU-15 (i.e., between 1995 and 2004) by analyzing cleavage patterns based on voting records for this institution. Focusing on the pre-enlargement phase, the paper provides new insights into earlier Member State voting behavior in the Council on the basis of a range of independent variables, including governments' absolute and relative positions on the left-right policy dimension, pro-integration sentiments among domestic publics, governments' positions as either net beneficiaries or net payers into the EU budget and finally, the number of votes in the Council. In methodological terms, vote decisions are treated as panel data and adjusted standard errors for country-based clusters are reported, using an ordered probit regression to explain the propensity of EU Member States to vote 'yes', abstain from voting, or vote 'no' in the Council. The authors provide strong evidence for a North-South cleavage pre-enlargement, a significant role for the Presidency and moderate evidence for the relevance of public opinion and government relative left-right positioning in Council voting behavior.

A similar topic is addressed by Běla Plechanovová (Institute of Political Studies, Faculty of Social Sciences, Charles University in Prague) in her paper "Coalitions in the EU Council: Pitfalls of Multidimensional Analysis". The paper identifies the main problems which are encountered in the statistical analysis of the patterns of the decision-making of the EU Council. Compared to most legislative bodies in democratic political systems, in EU Council decision-making only a scarce occurrence of contested legislation can be observed and in these cases only few dissenting positions of the legislators are recorded. Consequently, when analyzing the dimensionality of the Council policy space, we have to deal with extremely lopsided data, which may pose serious problems to standard multivariate methods. The paper aims to identify these problems and discuss the implications for its inference on coalition formation in the EU Council. The assessment is done based on the distribution of the data on voting in the EU Council and the results of the multivariate methods that are available.

The third paper "Power and Responsibility in Environmental Policy Making" by Manfred J. Holler and Wenke Wegner (Institute of SocioEconomics, University of Hamburg, and Public Choice Research Centre, University of Turku) applies the theory of power indices in simple voting games with a priori unions on the relationship between power and responsibility. Given the challenges facing the world in the field of environmental policy, research on the complex interdependencies in world politics and transnational policy-making has intensified. Several institutions came into existence in

response to the increasing concerns about global climate change. The paper analyzes the structure of the parties involved in regulating climate conventions and treaties, and designs instruments for allocating responsibility to them. In order to point out the possibilities of allocating responsibility, the relationship between power and responsibility is examined. By applying power measures, the impact of the various agents in these contractual or instrumental arrangements is estimated taking a priori unions into consideration. The United Nations Convention on Climate Change and the United Nations Convention to Combat Desertification is examined. Depending on the decision topics, developing countries can hold more power and responsibility than developed countries. Both conventions refer to responsibilities of the parties as common but differentiated responsibilities. The primary responsibilities, and thus power, should fall to the industrial countries that are not reflected in our calculations.

A new family of power indices is discussed in the paper "Embedding Classical Indices in the FP Family" by Michela Chessa (Department of Mathematics, University of Milan) and Vito Fragnelli (Department of Sciences and Advanced Technologies, University of Eastern Piedmont). The FP family of power indices, introduced by Fragnelli, Ottone and Sattanino, requires that the parties of a majority are ideologically contiguous along a left-right axis. The different choices of some parameters allow representing various situations, resulting in different indices in this family. The paper analyzes how to select parameters with the aim of transferring some properties of classical power indices (relaxation of the hypothesis of contiguity, reduction of the relevance of non-contiguous coalitions, definition of a sequence of indices that converges into a modified version of the classical indices). The method is applied to the lower chamber of Italian parliament. Finally, the approach is extended to situations in which the parties are not necessarily ordered according to the left-right axis, expressing their relations by a graph.

The efficiency of voting systems is analyzed in the paper "Optimizing the Efficiency of Weighted Voting Games" by Pavel Doležel (Institute of Economics Studies, Faculty of Social Sciences, Charles University in Prague). Having a group of voters endowed with weights, the simple weighted voting game (or system) represents a system of approving propositions in which the approved is only a proposition that is accepted by voters weighted to a number that is at least equal to a prescribed number called a quota. The system is called simple if there is only one set of weights and one quota, as opposed to the multi-rule systems that have more weights assigned to each voter and come with more quotas. The paper presents an analysis of the efficiency of simple weighted voting systems. It assumes the Impartial Anonymous Culture (the probability of a single voter voting for a proposition is 1/2 and voters act independently). This culture is used for the general evaluation of voting systems when no specific information about propositions and voters' preference are known, or when the voters' preferences and proposition characteristics are not willing to be reflected in the voting system itself, keeping in mind its non-pragmatics, fairness and generality. The efficiency of a simple weighted voting system is defined as the probability of a proposition being approved. This paper focuses on efficiency maximization and minimization with respect to weights. A theorem is proved which enables the computing of the efficiency maxi-

mum and efficiency minimum with respect to weights, given the number of voters and the quota in linear time.

The last paper "Voting Experiments: Measuring Vulnerability of Voting Procedures to Manipulation" by Ján Palguta (Centre of Economic Research and Graduate Education – Economics Institute, Charles University in Prague) studies the manipulability of different voting procedures by strategic voting. A minimal reduction in strategic voter's knowledge about other voters' voting patterns severely limits his/her ability to strategically manipulate the voting outcome. In this paper the implicit assumption made in the Gibbard-Satterthwaite's impossibility theorem about strategic voter's complete information about all other voters' preference profiles is relaxed. Via a series of computation-based simulations it was found that vulnerability to strategic voting decreases in the number of voters and increases in the number of alternatives. The least vulnerable voting procedures are the Condorcet-consistent procedures, followed by elimination procedures, while the procedures most prone to manipulation are the simplest rules. Simulations indicate that strategic voting is vulnerable both to an absolute and relative reduction in the amount of information.

The workshop benefited from the active participation of other colleagues, economists, political scientists and mathematicians, who presented their research findings and took part in intensive discussions. The following topics, not represented in this special issue, were presented—and, for the most part, published elsewhere—and also discussed during the workshop: An evaluation of the veto players' power applied on the division of influence between president and parliament (J. W. Mercik, Wroclaw University of Technology); an analysis of the 2010 Polish presidential elections employing ecological regression (M. Mazurkiewicz, Wroclaw University of Technology); strategic voting behavior and the dictatorship versus manipulability dilemma (F. Turnovec, Charles University in Prague); transferable utility games and their balanced solutions (René Levínský, Max Planck Institute of Economics, Germany); signaling and its application to a specific conflict of a civic initiative and a conservative mayor (M. Gregor, Charles University in Prague); the generalization of coalitional bargaining taking into account the Markov chains property (A. Nohn, Hamburg University and University of Turku); advanced methods of efficiency computation to compare the efficiency of local governments in the Czech Republic (L. Šťastná, Charles University in Prague); the computational aspects of power indices (A. Pajala, University of Turku); the impact of the left-right political position of key actors on the length of a co-decision procedure in the EU legislative process (V. Knutelská, R. Hokovský, Charles University in Prague); theoretical insights into possible 'inertia' in the Council of EU's decision-making process (M. Parízek, Charles University in Prague).

František Turnovec, editor of the special issue