

## **Tangian, Andranik: Mathematical theory of democracy. Studies in social choice and welfare**

**XIII, 615pp. Springer, Berlin-Heidelberg, 2014. € 142.79**

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A doctorate in one—albeit particularly prestigious—of the institutes of the USSR Academy of Sciences is an unlikely background for a democratic theorist. Yet, it is with this background that Andranik Tangian, now a resident of Germany, has taken up the task of writing a comprehensive treatise on the development of democratic thinking from its early beginnings ca. 500 BC to the modern days. Tangian's is not the first attempt to cover the entire time span of democracy, but his is arguably one of the first works to delve into the mathematical principles underlying democratic theory in a systematic and comprehensive manner. While many previous works have dealt with the mathematics of democratic choice making institutions, a particularly valuable contribution of Tangian is the focus on principles of representation in general and of random sampling of decision makers, in particular.

The book consists of three parts: history, theory and applications. The first deals in some detail with the main episodes in the development of democracy: the Greek city states, the republican period of Rome, the late medieval city states of northern Italy, the French thinkers of the Enlightenment and the emerging US and French constitutional principles.

The thinkers Tangian mostly relies on in discussing the democratic developments in the antiquity are Polybius, Aristotle, Plato and Cicero. The theory of mixed forms of government is one of the upshots of the discussion. Another is the importance of choices by lotteries in the ancient Greek city states. Of Roman writers Pliny the Younger gets a rather extensive treatment because of his well-known role as the pioneer of strategic thinking in voting institutions.

The discussion on medieval developments also singles out familiar names: Ramon Lull, Nicolaus Cusanus, Marsilius of Padova, William of Ockham, Francesco

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Guicciardini and Niccolò Machiavelli. The analysis of the foundations of citizen sovereignty is illuminating, if somewhat brief. Arguably, a more detailed analysis of the Scholastic thinking would have given us more insight not only into how Catholic theology was able to accommodate many features of the Aristotelian logic and epistemology, but also into how the doctrine of popular sovereignty emerged out of the disputes within the Catholic Church and out of the re-entry of Aristotle's theory of state into the European political thought.

One of the main points of this book is that with the advent of Enlightenment the idea of democracy took a new turn; in a sense the methodological arsenal of democracy became more restricted than before. While the Greek and Roman theorists had considered both election and selection by sampling as legitimate ways of teasing out the will of the people, the theorists of Enlightenment largely bypassed sortition as a way of making political choices. The authors discussed include the well-known social choice classics: Borda, Condorcet, Laplace, Montesquieu and Rousseau. In Tangian's view, Rousseau was the last major political theorist to associate selection by lot with democratic rule. After him the election by vote—i.e. the aristocratic way of choosing leaders—replaced the lot. Not surprisingly, the main focus is on Borda and Condorcet. Despite the fact that the works of these authors have been analyzed in several earlier texts, Tangian is able to uncover new details in their argumentation. In this chapter the author puts on his mathematician's hat. Of the theorems proven here the most interesting one deals with the convergence of the Borda and Condorcet winners.

The final chapter of the historical part of the book deals with the repercussions of Enlightenment thinking through its manifestations in two political systems: the newly established United States of America and the post-revolutionary France. The author maintains that neither of these originally strove for democracy in the classic sense. Rather, in their emphasis on representation and voting they were based on the aristocratic view of decision making. This confusion of democracy and representation, the author argues, continues to the present day and is reflected in UN resolutions as well as in the Lisbon Treaty of the EU. Many readers will undoubtedly find this chapter the most puzzling and provocative in the book. It certainly alerts us to be careful in making conceptual distinctions between representation and government. The author points out that many intuitively desirable things are even today associated with democracy, although conceptually they have nothing to do with it. One such thing is representative government.

The first part of the book is a cogent, consistent and illuminating account of the intellectual trends associated with democracy over two and a half millennia. The trends and persons associated with them are mostly well-known and thoroughly studied, but Tangian offers a fresh perspective to them.

The main focus of the second part is on representative institutions and how well these reflect popular views on various issues. Three indices are defined and applied: representativeness, popularity and universality. For a fixed issue (or question) and representative, the representativeness is defined as the size of the group represented by the representative. The popularity of the representative, in turn, is the average (over several issues) size of the groups that he/she represents, possibly weighted by the importance of issues. Universality, finally, is the frequency of issues in which the representative's view coincides with that of a majority.

One of Tangian's main arguments pertains to the notion of dictatorship, understood in the sense of Arrow's impossibility theorem. He maintains that there are good and bad dictatorships. In the former the opinion of the dictator represents the view of the majority, while in the latter the dictator just imposes his will upon a large majority of people. So, the question is not whether a choice rule is dictatorial, but rather how well the outcomes of public decision making reflect the views of the electorate. In Chapter 8 Tangian shows how the indices of representation can be empirically applied. His examples are taken from the German Bundestag. Parties' and voters' stands on a variety of issues are compared using the popularity and universality indices. Tangian's conclusions are that people tend to vote inconsistently in elections (when evaluated in terms of their own opinion profiles), they pay little attention to party manifestos and they seem to be influenced by traditions and candidate charisma. The author also develops a statistical testing methodology for the representative capacity of single parties and party coalitions to determine the degree of matching between a party's or coalition's positions and that of the prevailing electoral majority.

The third part of the book is devoted to further applications. These range from planning public opinion polls, multi-criterion decision making in groups and stock exchange predictions to traffic control problems. The range of applications demonstrates the versatility of Tangian's methodology.

Andranik Tangian has written an impressive volume, not only in size, but particularly in terms of the fields covered. The author's erudition is remarkable. Many new and thought-provoking ideas are introduced and defended. Some of these will no doubt become subject of vigorous scholarly debate in the coming years. The historical part of the book is suitable for independent study and, combined with McLean and Urken's *Classics of Social Choice*, would work well as a text for a course on history of democratic thought. Parts two and three make for a rough ride for non-mathematicians, but with appropriate instruction, are suitable for advanced doctoral courses in welfare economics, political science and applied mathematics.