

# **Voting power as a probability when votes are not independent**

**by Serguei Kaniovski**

## **Voting Power and Procedures (VPP) Colloquium at the University of Warwick**

### **ABSTRACT**

I would like to begin this talk by reflecting on the Weberian notion of power as a probability, and on voting power as the probability of casting a decisive vote. Thus defined, the notion remains useful in the absence of independent voting behaviour required in Straffin's probabilistic characterizations of the classical measures of voting power, provided one does not conflate voting power with power, influence or authority exerted by any means other than casting one's vote.

I discuss a simple generalization of the Banzhaf measure that admits any probability distribution on the set of coalitions. Two questions are raised: First, which distributions occur empirically and, second, which distributions consistently arise from different modes of individual voting behaviour.

Furthermore, I propose a method which solves the second (aggregation) problem of finding a distribution on the set of coalitions that is consistent with empirically estimable probabilities and correlations between individual votes. It is general in admitting varying probabilities and correlation coefficients. Perhaps unsurprisingly, analysis shows *a priori* voting power is likely to be very different to actual power, given by the probability of casting a decisive vote.

Introducing correlation between the votes is a general way of capturing heterogeneity among the members of a voting body that is due to preference, strategies, or informational asymmetries. Correlation introduces an element of realism to the analysis of *a priori* power, while preserving the basic structure of the Banzhaf measure and everything we know of weighting voting games. A critical examination of correlation as a statistical tool for modelling heterogeneous preferences is provided.

The fact that correlations can readily be estimated from ballot data opens up the possibility of calibrating an accurate empirical model of a heterogeneous voting body or estimating such a model from ballot data. Such models will find applications in scenario analysis and forecasting.