LOUIS PUTTERMAN

A NOTE ON THE RELATIONSHIP OF INTERDEPENDENT ACTION TO THE OPTIMALITY OF CERTAIN VOTING DECISIONS

ABSTRACT. While the theory of public goods points to socially suboptimal contributions by agents acting under Cournot assumptions, this externality can be rectified by the introduction of positive interdependence of actions to the individual’s choice calculus. This paper draws attention to the fact that the institution of democratic voting is itself a means of transforming the individual calculus in such a way that parameter changes are evaluated as simultaneous adjustments by the group, on the side of benefits, but by the individual only, on the side of costs, thus generating optimal parameter preference in the case of identical agents.

By now, it is well known that individuals have inadequate incentives to contribute to the provision of a public good when acting in isolation. Even when assured that other individuals will so contribute, the self-interested individual has an incentive to contribute less than adequately — i.e., to “free ride”. This problem can be overcome when individuals can enter into an enforceable contract to share in the provision of the good, although difficulties relating to the revelation of individual prospective benefits have yielded only relatively recently to some artful solutions. When contracting is ruled out by the large numbers of individuals involved, group choice via voting mechanisms may help to achieve a collective outcome that is, at least for most individuals, superior to the purely individualistic result. The fact that democratic voting over the provision of a single public good by a group of identical individuals will produce an optimal outcome is well enough known, but this fact has been greatly overshadowed by a mass of pessimistic results pertaining to non-identical agents, multi-issue voting, etc. It is with the simpler result on single-good, identical preference voting, that I shall primarily be concerned. My purpose is to point out the way in which such a voting solution makes use of the interdependence of individual actions to achieve an optimal outcome. When the more realistic complications are reintroduced, the action of this

factor is no less relevant, although it is now no longer sufficient to bring about an optimal result.

The interdependence of agents with which we are presently concerned is not a welfare interdependence, as such: our agents are neither 'sympathetic' nor 'envious', but purely self-interested. Rather, we are concerned with the interdependence of actions, both actual (my decision affects your choice) and perceived (I believe that my decision affects your choice, or that it does not). For the purpose of agent decision-making, it is the perceived interdependence that is crucial; but this may in one way or another be related to the actuality.

Consider first the large numbers case. A very large number, $N$, of individuals, are deciding upon their optimal outlays, $x_i$, $i = 1, \ldots, N$, for the provision of a public good. Since there are so many of them, they may, without being entirely unreasonable, assume that their individual contributions will have no affect upon the contributions ($x_j$, $x_k$, etc.) made by others. Each individual will therefore want to contribute units of $x$ to the point at which his or her personal marginal utility from the consumption of $x$ is equal to the cost of providing a unit of $x$:

$$\frac{dU_i}{dx} = px.$$  

(1)

Now, suppose that individuals believe that their contributions will somehow affect the contributions of others, however slightly. If the expected effects are taken into account, the relevant marginal condition becomes

$$(\frac{dU_i}{dx}) \cdot (\frac{dx}{dx_i}) = px,$$  

(2)

where $x$ is the total amount provided by all individuals, including $i$ ($x = \sum_{i=1}^{N} x_i$). Consider an individual who believes that his contribution will be matched, one for one, by all other individuals. Then $(dx/dx_i) = N$, and (2) becomes

$$N(\frac{dU_i}{dx}) = px$$  

(3)

which, for the case of identical utility functions, exactly satisfies the Samuelson condition that the sum of the marginal utilities equals the marginal cost.

This assumption of universal matching, or "complete emulation", appears to be an extreme one if we are dealing with self-interested individuals acting