Rewards and Punishments as Selective Incentives for Collective Action: Theoretical Investigations[1]

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Positive and negative selective incentives are shown analytically to have different structural implications when used to induce collective action. Positive selective incentives are effective for motivating small numbers of cooperators and generate pressures toward smaller, more "elite" actions, unless the incentives have jointness of supply. Negative selective incentives are effective for motivating unanimous cooperation, but their use is often uneven and cyclical and may generate hostilities which disrupt the cooperation they enforce. Examples of these dynamics are found in many arenas of collective action and social movements.

One important feature of collective action is the use of *selective incentives* to reward those who cooperate in the action or punish those who do not. An arts fund may reward contributors by giving a lavish party or by printing their names in a program. Workers ensure cooperation with a strike by threatening to ostracize or beat up strikebreakers. In the 1960s, famous folksingers rewarded antiwar demonstrators by singing at protest rallies. In the 1970s, Louisville antibusing protesters threatened violence against other whites to induce them to keep their children out of school.

This paper considers relations among potential cooperators, not their relations with any "enemy." It discusses the processes that arise when actors reward and punish each other to motivate or sustain cooperation in some form of collective action. The first half of the paper provides a formal analysis which reviews the work of Mancur Olson and his critics, formalizes the decision to participate in collective action, and then formalizes and examines the decision to use a resource as a selective incentive to induce others to act collectively. The second half of the paper draws out the implications of this analysis.

The most important implication is the difference between rewards and punishments when they are used as selective incentives. This implication

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has not previously been recognized because prior work has examined only the decision to participate in collective action, not the decision to use a selective incentive to induce others to act collectively. Rewards and punishments are similar in their effects on the recipient's decision but fundamentally different for the person supplying them. For the user, rewards and punishments have different patterns of cost, different contexts in which they are most efficient, and different effects on group process and structure.

THE IMPORTANCE OF SELECTIVE INCENTIVES: OLSON AND HIS CRITICS

The starting point for this work is Mancur Olson's *The Logic of Collective Action* (1965). The most powerful and influential statement of his thesis appears in the first few pages of the introduction: ". . . *rational, self-interested individuals will not act to achieve their common or group interests*" (p. 2, emphasis in original). The logic of Olson's argument is founded in economic theories of public goods, where a good is a public good if its provision to some member of a group means that it cannot feasibly be withheld from others in that group (p. 14). Economists have shown that, under their usual assumptions concerning the costs and values of goods, consumers will not act to "buy" public goods, a problem often referred to as the "theory of market failure."[2]

Olson's contribution was to see that ". . . *the achievement of any common goal or the satisfaction of any common interest means that a public or collective good has been provided for that group.* The very fact that a goal or purpose is common to a group means that no one in the group is excluded from the benefit or satisfaction brought about by its achievement" (1965, p. 15, emphasis in original). He goes on to argue that apparent instances of collective action have actually been due to the presence of *selective incentives:* "Only a *separate and selective incentive* will stimulate a rational individual in a latent group to act in a group-oriented way. In such circumstances group action can be obtained only through an incentive that operates, not indiscriminately, like the collective good, upon the group as a whole, but rather *selectively* toward the individuals in the group. The incentive must be 'selective' so that those who do not join the organization working for the group's interest, or in other ways contribute to the attainment of the group's interest, can be treated differently from those who do" (1965, p. 51, emphasis in original).

[2] The original work is Samuelson (1954). For reviews of public-goods theory, see Head (1974) and Rowley and Peacock (1975). For a mathematical presentation of the arguments, see Henderson and Quandt (1971, pp. 254–90). The "usual assumptions" are substantively important; many common situations fall outside their range. For reviews of the implications of these assumptions, see Bator (1958) and the sources cited in the text below as critics of Olson.

Olson writes persuasively and constructs compelling verbal arguments, but his formal argument depends upon the following rather restrictive assumptions: (1) the good comes in continuously divisible amounts; (2) the value to an individual (or to the group) of a specific amount of the good is a linear function of the amount of the good; (3) the marginal cost of providing the good is a U-shaped function of the amount of the good provided; (4) the individual makes his decision without considering others' actions, and others' actions are independent of his choice; and (5) the decision is independent of how many others are in the group, that is, the decision is *independent of the group's size* (1965, pp. 22–25).[3]

A number of critiques and reformulations of *The Logic of Collective Action* have appeared (Frohlich and Oppenheimer 1970; Frohlich et al. 1975; Chamberlin 1974; Schofield 1975; Bonacich et al. 1976; Smith 1976). These articles identify restrictive assumptions in Olson's work, recast the problem using various mathematical models, and reach conclusions different from Olson's. To summarize this critical literature, Olson overstates the generality of his conclusions. Sometimes rational individuals will participate in collective action, and sometimes they will not. The probability of collective action may increase, decrease, or remain constant as group size increases.

This critical literature highlights the overriding importance of the assumptions made in constructing a model of collective action. The rationality of collective action varies from situation to situation and depends upon the *specific functions* describing the cost of the good, its value to the individual, the probability that the good will be provided without his contribution, and the effect (if any) of group size on the other three functions.[4]

The fact that the "rationality" of collective action depends upon the specific parameters of a situation is precisely why selective incentives are so important for collective action. Olson discussed the impact of a selective incentive on an individual's decision to cooperate with collective action. But he neglected to consider why or when someone who controls a private good would *want* to use it as a selective incentive. If Olson's generalization that collective action is always irrational were correct, the use of selective incentives would also be irrational. Frohlich and Oppenheimer (1970) develop this point well, using it as grounds for dismissing the importance of selective incentives.

But in this dismissal Frohlich and Oppenheimer miss the key insight:

[3] See Appendix for more detail concerning these assumptions, especially the second and fifth.

[4] In a recent article, Marwell and Ames (1979) discuss the many specifications necessary to provide payoff functions which would make their experiment represent adequately Olson's public-goods problem.

selective incentives can turn a collective-action situation in which cooperation is *irrational* into one in which collective action is *rational*. The value functions and cost curves for the decision to use the selective incentive may be different from those for the original collective-action decision. It may be rational for individuals to use their private goods as selective incentives even when it would not be rational for them to cooperate with the original collective action. If they use their goods as selective incentives, they change the original situation, possibly making it one in which collective action is rational.

It is this possibility of altering the parameters that determine others' (and even one's own) behavior which makes selective incentives such an important part of the dynamic processes of collective action. People need not merely react to their situation. They can act to alter the very situation which constrains their choices.

INDIVIDUAL DECISIONS TO PARTICIPATE IN COLLECTIVE ACTION: EFFECTS OF POSITIVE AND NEGATIVE SELECTIVE INCENTIVES

To facilitate discussion of the effect of selective incentives on the rationality of a decision to participate in collective action, it is useful to set up a mathematical expression for the collective-action decision. As was argued briefly above, there is no one "right" way to model collective action: different models imply different assumptions about the situation and lead to substantively different conclusions. One approach which is flexible, fairly general, and similar to approaches commonly used in the literature makes two basic assumptions: (1) each actor has exactly two choices, to "cooperate" or to "defect," and (2) the payoff from each course of action is a function of the number of other actors who choose to cooperate.[5]

Let $G(m)$ represent the gain to each individual (including the one under consideration) if a total of m actors cooperate; it is reasonable to assume that $G(m)$ is monotonic nondecreasing. Let $C(m)$ represent the cost of cooperating when m actors cooperate. Let R be the value to each individual of any positive incentives or rewards which are offered to him contingent on cooperation with the collective action, and let N be the value to each individual of any negative incentives or punishments contingent on his failure to cooperate.[6]

[5] My approach is based on that of Schelling (1973), but I have made substantial (although algebraically equivalent) modifications in setting up the expressions to suit my own purposes.

[6] Several comments about these terms may be made. (i) All terms (G, C, R, and N) could be made probabilistic rather than determinate, e.g., a person does not know exactly what the benefits and costs of participation will be before he must commit himself to action but can estimate their probability distributions. Adding this possibility makes the expressions more complex but does not alter the substance of the

Letting k represent the number of *others* who cooperate, and assuming that k varies probabilistically, with p_k representing the probability that k equals some particular value of k, and letting n represent the total number of individuals in the group, the expected value of cooperating in the collective action is given by

$$E(c) = \sum_{k=0}^{n-1} G(k+1)p_k - \sum_{k=0}^{n-1} C(k+1)p_k + R\,, \tag{1}$$

and the expected value of not cooperating ("defecting") is given by

$$E(d) = \sum_{k=0}^{n-1} G(k)p_k - N\,. \tag{2}$$

Cooperation with collective action is rational if $E(c) > E(d)$, that is, if $E(c) - E(d) > 0$. Thus cooperation is rational if

$$\begin{aligned} E(c) - E(d) = {} & \sum_{k=0}^{n-1} G(k+1)p_k - \sum_{k=0}^{n-1} G(k)p_k \\ & - \sum_{k=0}^{n-1} C(k+1)p_k + R + N > 0\,, \end{aligned} \tag{3}$$

which reduces to the following condition for collective action to be rational:

$$R + N > \sum_{k=0}^{n-1} \{C(k+1) - [G(k+1) - G(k)]\}p_k\,. \tag{4}$$

If the expected gain from cooperating,

$$\sum_{k=0}^{n-1} [G(k+1) - G(k)]p_k\,,$$

is greater than the expected cost of cooperating, the right-hand term in (4) will be negative and the inequality will always be satisfied for any nonnegative values of R and N, even zero. If the expected gain from co-

analysis. (ii) The cost term, $C(m)$, is explicitly made a function of m to highlight the fact that costs of participation generally do shift with the number of other participants. The cost term is viewed as the value of what is expended to cooperate and is subtracted from the expression. If, in fact, participation is intrinsically pleasurable or valuable to the person, as Barry (1970, p. 35) suggests in passing, its "cost" is negative, and subtracting it increases the total value of cooperation. (iii) The terms R and N are treated as constants to make the results easier to interpret, but they may also depend upon m, e.g., incentives which depend upon the "success" of collective action, such as patronage offices or the spoils of war. Since such incentives would be multiplied by $\Sigma_{k=a}^{n} p_k$, where a is the minimum necessary for success, their absolute magnitude would have to be larger to fulfill the condition in expression (4).

operating is less than the expected cost of cooperating, there must be nonzero incentives for the condition to be satisfied.

Notice that positive and negative incentives are interchangeable in this condition. It is the total magnitude of incentive value that counts, not whether it is added to the payoff of cooperators or subtracted from the payoff to defectors. That is, in the analysis so far, rewards and punishments are not fundamentally different from one another.[7]

THE DECISION TO USE A RESOURCE AS A SELECTIVE INCENTIVE: A HIGHER-ORDER COLLECTIVE-ACTION DECISION

Analysis of individual decisions to cooperate or not has revealed no essential difference between positive and negative selective incentives. The magnitude of the incentive necessary to make collective action rational is the same regardless of whether it is a reward for cooperation, a punishment for noncooperation, or some combination of the two. But when we shift perspectives and seek to identify the conditions under which a rational actor who controls some valuable resource will decide to use that resource as a selective incentive, it rapidly becomes clear that positive and negative incentives are radically different in the view of the person who *uses* them, even though they are the same to the persons *receiving* them.

The use of a selective incentive to induce others to act collectively is itself a form of collective action, in that it provides a public good. However, the parameters of the decision to use a private good as a selective incentive are generally different from the parameters of the original collective-action decision. The sources of these differences may be seen by constructing a model for the decision to use a selective incentive.

This decision must be viewed as a compound or chainlike function: the use (or nonuse) of the incentive affects others' behavior, which in turn affects the user's payoffs. As before, there is no one "right" way to express these relations, no single expression that can cover every instance of the use of selective incentives to induce collective action. But some useful insights into the matter may be gained by extending the expressions developed in the previous section, in which the payoff from collective action is a function of the number who cooperate.

[7] Of course, rewards and punishments have different effects on their recipients. Overviews of these differences may be found in Millenson (1967) for behaviorist laboratory experiments, in Krasner (1971) for therapeutic contexts, and in Schmitt and Marwell (1970) for experiments in which one subject tried to induce cooperative behavior in another subject. In general, rewards are found to change people's behavior more effectively than punishments. The point here is that rewards and punishments do not differ and are interchangeable in their effect on individuals' rational decisions of whether to cooperate with collective action or not. Olson, for example, noted this interchangeability in his discussion of selective incentives (1965, p. 51n.).

To keep matters as simple as possible, we will ignore the question of whether the actor himself should participate in the collective action (if he can), and assume that his payoff from it is due entirely to others' actions and is given by $G(k)$; his *expected* payoff is given by $\Sigma\, G(k)p_k$. Selective incentives alter the p_k in such a way that the revised expected value of k is greater than the original value, that is, $\Sigma\, kp_k' > \Sigma\, kp_k$. (They do so, of course, by altering the values of R and N in the individuals' payoff functions.) Since $G(k)$ is monotonic nondecreasing, the revision in the p_k increases (or leaves unchanged) the incentive user's payoff, so that $E'[G(k)] \geq E[G(k)]$. If U is the cost of using the incentive, it is obvious that the use of the selective incentive will be rational if

$$\sum_{k=0}^{n} G(k)p_k' - \sum_{k=0}^{n} G(k)p_k > U\,.^{8}$$

But U, the cost of using the incentive, is not fixed. First, it varies with the number of people it is given to. That is, U is a function of k, the number of actors who cooperate. This functional dependence is very important and will be discussed further below.

Second, consistent with the previous expressions for collective action, U is allowed to be a function of s, the number of other selective incentive users out of m actors who control the incentive. That is, the cost of using the incentive may vary with the number of others who use it. This cost may increase, decrease, or remain constant as s, the number of other incentive users, rises, depending on the nature of the incentive and the relations among the actors who control it.

Besides affecting the cost of using the incentive, the number of incentive users affects the number of cooperators. That is, the distributions of p_k and p_k' are functions of s and are written $p_k(s)$ and $p_k'(s)$. It is reasonable to treat s as a probabilistic variable, with p_s representing the probability that s equals some particular value of s.

Combining these considerations yields the following expression for the condition under which it is rational to use a selective incentive to induce some particular collective action with payoff $G(k)$:

$$\sum_{s=0}^{m}\sum_{k=0}^{n}[p_k'(s) - p_k(s)]\cdot p_s\cdot G(k) > \sum_{s=0}^{m}\sum_{k=0}^{n} U(k, s)\cdot p_k'(s)\cdot p_s\,. \qquad (5)$$

A number of insights can be gleaned from consideration of this admittedly abstract expression. First, using a selective incentive provides a public good and is therefore subject to the free-rider problem. Some other

[8] The shift from $n-1$ to n as the limit of summation is consistent with the omission from consideration of whether the user should also participate, and simplifies the notation without altering the results.

actors might choose to solve this problem by making other selective incentives available to persons who use selective incentives in this situation. This possibility can be represented simply by adding R' and N' to the left-hand expression to indicate the value of such incentives. This notion is not farfetched. For example, fund-raising campaigns that solicit through workplaces often follow this model: business leaders are given positive incentives (kickoff luncheons, thank-you listings in newspaper advertisements, etc.) to use the positive and negative incentives they control (work conditions, promotions, etc.) to induce their employees to contribute to the campaign. Such incentive chains are a common feature of collective action and can be described formally with another level of recursion.

A second feature to consider is that the expected payoff from using the incentive (the left-hand term) rises if positive values of $p_k' - p_k$ are associated with the larger values of $G(k)$.[9] That is, the potential incentive user must consider the difference his use of the incentive will make in others' behavior and the difference their behavior will make in his payoffs.

Otherwise, the features of expression (5) for using the incentive are similar to those of expression (4) for acting collectively. In both cases, the "rationality" of a decision depends upon the specific parameters of the situation. The combination of the two expressions implies a dynamic relation between the rationality of incentive use and the rationality of collective action. It should be obvious that (5) may yield a positive decision to use the incentive, even when (4) yields a decision against collective action. But a positive decision to use selective incentives changes expression (4) by increasing R or N, an increase which changes collective action from irrational to rational.

This dynamic element may be especially startling when the same pool of people both are potential collective actors and control potential selective incentives. Even though the same people are involved, the two cost terms, $C(k)$ and $U(k, s)$, would almost certainly have different forms and thus could yield opposite decisions. But if it is rational to use selective incentives in the situation, their use changes the collective action from irrational to rational. Thus any analysis of the dynamics of collective action must consider the possibility that the potential cooperators control goods which they could use as selective incentives.

Understanding the dynamics of the effects of selective incentives on collective action requires examination of the different structural and dynamic effects of rewards and punishments when they are used as selective incentives. The source of the difference between rewards and punishments may be traced to the dependence of the cost term U on k, the number of cooperators. Selective incentives are private goods whose costs usually rise

[9] By definition $\Sigma_k(p_k'-p_k) = 0$.

with the number who share in them, that is, with the amount of the good provided. Collective action requires the cooperation of a number of actors, not just one. Selective incentives must affect the decisions of all actors in the situation. But positive and negative selective incentives are given to different people. Positive incentives are given to the k who cooperate, while negative incentives are given to the $n - k$ who do not cooperate. Thus, the cost of providing a standard private good is an *increasing* function of k for a *reward,* while it is a *decreasing* function of k for a *punishment*. This divergence between rewards and punishments as selective incentives has profound and far-reaching consequences for the internal processes of collective action and social movements. Some of these consequences are explored in the remainder of this paper.

REWARDS, PUNISHMENTS, AND THE PROPORTION WHO COOPERATE

Positive and negative selective incentives are given in different contexts to different people. Positive selective incentives are distributed to those who have cooperated, while negative ones are distributed to those who have not. If collective action is completely successful and everyone cooperates, a positive incentive is distributed to everyone, while a negative incentive remains unused. Conversely, if collective action is a complete failure and no one cooperates, a negative incentive is given to everyone, while a positive incentive remains unused.

The importance of this difference may be demonstrated by imagining there are two incentives, one positive and one negative, equally valued by the potential cooperators. That is, imagine $R = N = M$, where M is large enough to make cooperation rational in condition (4). If n is the total number of potential cooperators (the group size) and k is the number who actually cooperate, the total amount of incentive given out is Mk for the positive incentive (a reward to those who cooperate), while it is $M(n - k)$ for the negative incentive (a punishment to those who do not cooperate). The quantity $Mk = M(n - k)$ only in the special case in which $k = \frac{1}{2}n$, when exactly half the group cooperates. If the reward and punishment are commensurate, the reward is cheaper when a small proportion of the total group cooperates (i.e., when $k < \frac{1}{2}n$), and the punishment is cheaper when a large proportion of the total group cooperates (i.e., when $k > \frac{1}{2}n$).

Even though positive and negative incentives are seldom commensurate in practice, this result is highly suggestive, especially in the extreme cases. In the first extreme, cooperation by a few people yields a high payoff to everyone, and additional cooperators add little. In the second extreme, nearly everyone must cooperate for group members to achieve high payoffs, and any one person's cooperation adds little to the payoff unless enough others cooperate.

Notable examples of the first extreme are contributions to charitable organizations, building a fire in a cold lodge room, lobbying, and publishing a newsletter. In these cases, action by a few can yield high payoffs for everybody, so positive incentives are highly efficient. Lobbyists may be paid for their time or given prestigious titles. Everyone who contributes $100 or more to the cancer fund may have his name printed in a newspaper advertisement. It would not be possible to pay thousands of people to lobby or to give prestigious titles to thousands (and still have them be prestigious) or to print thousands of names in an advertisement. These incentives are possible and meaningful precisely because relatively few individuals earn them by cooperating.

At the opposite extreme, there are cases in which unanimity or near-unanimity is required for the good to be provided at all. Strikes require near-unanimity. Other examples are prevention of epidemics through widespread immunizations, maintenance of orderly traffic flow through widespread obedience to traffic laws; and the mandatory carrying of automobile liability insurance to protect others against the risk of being hit by a driver who cannot pay for the damage. In these situations, negative incentives are the most efficient. People who disobey traffic laws, or are caught without liability insurance, or fail to have their children immunized are fined or jailed. Workers who do not cooperate with a strike are subject to violence or threats of violence. These negative incentives are effective because the number of holdouts is small. It would be impossible to enforce these sanctions if most people refused to cooperate.

There are different implications for intermediate cases in which cooperation by a moderate proportion of the group is optimal. Again assuming equal costs per recipient, positive incentives are more efficient if the optimal proportion is less than half and negative incentives are more efficient if it is more than half. But the closer the desired proportion is to one-half, the less efficient is either type of incentive. Thus, on structural grounds, we would expect it to be difficult to motivate collective action by a moderate fraction of a group.

THE DYNAMICS OF POSITIVE SELECTIVE INCENTIVES

A good can serve as a positive selective incentive only if it can be given to cooperators and withheld from noncooperators. However, positive incentives differ according to whether or not they may be given to some cooperators but not others: physical constraints, contractual guarantees, or strong social customs may require that a positive incentive be given to all cooperators or none at all. These two cases generate different dynamics and are discussed separately.

Examples of positive incentives which must be given to all cooperators

are entertainment at a protest rally, decals offered to anyone who sends money to the Olympic fund, and movie passes which have been publicly offered to all children who help pick up trash. If an incentive must be given to all who cooperate, the incentive supplier must be prepared to give the incentive to the entire n group members, or to everyone who might conceivably cooperate. Thus the decision to offer such an incentive hinges on comparing the benefit $G(n')$ with the cost $U(n', s)$ where n' is the maximum number who might cooperate.

In many situations, incentive users can only approximate how many people might cooperate. If the cost of the incentive rises with the number who receive it, and if it must be given to all cooperators, the incentive user is in the difficult position of not being able to accurately estimate the costs of using the incentive. In some contexts this is not a problem—each contribution to the Olympic fund more than compensates for the cost of mailing back a decal. But if cooperation by a small fraction of the group is enough to provide the public good and the incentive has a high marginal cost, offering the incentive can be risky: paying out too much in incentives may offset the gain from the collective action.

For this reason, incentives with jointness of supply (in which the cost of providing the good does not depend on how many enjoy it) are often preferable.[10] Such incentives are often employed to draw crowds to marches and rallies; the cost of entertainment or a "name" speaker does not increase with the number present. Concerts and parties with high components of fixed costs and small marginal costs are often used as positive incentives for contributions to fund drives. Such incentives allow the organizers to promote the maximum possible levels of cooperation without worrying about whether the total cost of the incentive will be too high.

Different dynamics arise if positive incentives may be given to only some cooperators, perhaps by offering the incentive only to certain individuals or by offering to reward the first k' cooperators or the highest k' contributions. In such cases, the incentive supplier should determine the optimum level of k' to "buy," given the payoff and cost functions.

If the incentives have jointness of supply, the incentive supplier has no need to limit the number of people he rewards; but if the cost of using the incentive rises with the number who receive it, he does want to limit the number of recipients. If the size of contributions varies, it is more efficient to induce a few "large" contributors to cooperate than to induce many "small" contributors to do so, provided the ratio of the large to the

[10] Incentives whose use brings intrinsic gain to the user as the number of recipients rises are even better. One such incentive is speaking or providing entertainment at a rally: the exposure may benefit one's career, and the benefits increase with the number present.

small contributions is greater than the ratio of the costs of rewarding the large and the small contributors. This provision is generally met. The rewards necessary to motivate a large contribution are often the same as, and rarely proportionately greater than, the rewards necessary to motivate a small contribution.

Social approval is an important positive incentive for many types of voluntary collective action. When a person responds affirmatively to a request for a contribution of time or money toward a public good, it is reasonable to assume that he receives social approval from the person making the request. Thus it is analytically useful to view the cost of making requests for contributions as the cost of manipulating social approval as a selective incentive. The costs of contacting individuals and requesting contributions are proportional to the number contacted. Thus the person soliciting such contributions minimizes his costs by concentrating his efforts on persons who are likely to make large contributions or on persons who are especially likely to agree to the request.

The manipulation of social approval through the request may be accompanied by other positive incentives. Sometimes these incentives have some intrinsic material value, but more often their primary worth is as tokens of social approval. Incentives whose worth is principally as a token of approval include a ticket to an exclusive party, a prestigious title, a letter from an orphan, or a listing in a newspaper advertisement. Of course, for some people an increase in prestige or notoriety may have indirect material benefits, so the distinction is not absolute. Even if the token itself has jointness of supply, the principal cost in offering it as a selective incentive arises in contacting potential cooperators, and is proportional to the number contacted. In addition, selective incentives which are tokens of approval or prestige often have values which decline with the number of others who share in them, thus increasing the tendency to limit their use to a few large contributors.

Because of these cost considerations, reliance on positive selective incentives, especially those with large social approval or prestige components, generates structural pressures toward creating a smaller and more elite group of cooperators. These pressures are one factor contributing to the professionalization of social movements documented by McCarthy and Zald (1973, 1977), in which members of a small professional staff choose tactics entailing large amounts of work by a few people (such as media advertisements, lobbying, and court cases) and raise money from the "conscience constituencies" of prosperous liberals or conservatives, depending upon the movement. Activists in volunteer organizations have frequently noted the tendency for fewer and fewer people to do more and more of the work. This happens, at least in part, because finding and motivating one person to do a large job is easier than finding and motivating several

people each to do a small part of the job. Of course, it is well known that experienced fund raisers concentrate their efforts on large donors.

Exceptions to this rule tend to be campaigns relying on solicitors whose time is treated as a "free" resource, such as housewives or scout troops. However, recruitment of these solicitors generally follows the principles developed above. Hard-working energetic fund raisers who will walk several blocks are preferred to those who will do only one block, since the cost of recruiting the solicitor is the same in either instance. Alternatively, a key individual such as a scoutmaster or supervisor is induced (through selective incentives) to deliver his subordinates as solicitors, in a chain of selective incentives. Whenever organizers value their time and energy, pressures foster the recruitment of small groups of committed individuals.

Thus, the choice of selective incentives intertwines with choices of strategy and tactics. Using positive incentives with costs proportional to the number of recipients, including positive incentives with large social approval components, leads the incentive user to concentrate on motivating high levels of contribution from fewer people. Broad-based participation is more likely to be induced by incentives with jointness of supply.[11] But most such incentives have relatively low values and can induce only fairly low levels of participation. Ongoing social movements may rely on mixtures of small contributions and large ones, each induced by different kinds of positive incentives.

THE DYNAMICS OF NEGATIVE SELECTIVE INCENTIVES

Because the cost of using a negative selective incentive is usually a *decreasing* function of the number who cooperate, negative incentives are cheaper to use the more successful they are at inducing cooperation. At the extreme, if everyone cooperates a negative incentive does not have to be used at all, and its only cost is that of threatening to use it. Additionally, since a negative incentive is often the removal of some good or privilege, the cost of its use per recipient may be much lower than that of a positive incentive of comparable intensity. Thus negative incentives are often less costly than positive ones when unanimous cooperation is sought.

Even when some positive resource is available as a positive selective incentive, its use when cooperation is nearly unanimous is effectively the same as using a negative incentive. It is well known that a person who is denied an expected reward feels punished. "Rewards" for cooperation enjoyed by nearly everyone in a group are frequently taken as a perquisite

[11] A major exception would be collective action which spreads through networks of influence, each new "convert" in turn using social incentives to induce cooperation in several other individuals.

of group membership, and their withdrawal is likely to be viewed as punishment. A policy of allowing access to some valuable resource (insurance, medical care, journals, or companionship) in exchange for cooperation with or contribution to the collective good may be viewed as a reward for cooperation or as a contractual arrangement evoking no sense of punishment. But it is at least as likely that the person who is "not rewarded" will feel punished.

For this reason, it is even more likely that collective action requiring unanimity or near-unanimity will involve what are, effectively, negative selective incentives. If perfect unanimity is not necessary to achieve the collective good (so that an individual may believe that the good will be obtained without his cooperation) or if persons who defect when everyone else cooperates obtain especially high defection payoffs, negative selective incentives of one form or another are essential to ensure costly collective action.

But using negative incentives involves complications. For one thing, the negative incentive imposes a norm of unanimity, since any noncooperator is punished. But in many circumstances unanimity is not necessary for maximal provision of the public good. This lack of necessary unanimity creates conflicts for the actor who bears the cost of administering the negative selective incentive. Recalling condition (5) for rational use of a selective incentive, the actor using the incentive must compare the likely increase in payoff $G(k)$ from using the incentive with the cost $U(k, s)$ of using the incentive. If $G(k)$ is maximum with some high but nonunanimous level of cooperation (say, 90%), and if the expected number who will cooperate even if there is no negative incentive is above that level, it is irrational to incur the cost of using the incentive, which includes the cost of detecting violators. But nonenforcement of sanctions may lead more actors to prefer defection to cooperation. Declining cooperation threatens the collective good, and the enforcement of sanctions becomes cost effective again. This cycling in the use of negative incentives often occurs in law enforcement and in the provision of public goods such as the immunization of schoolchildren. Depending on the cost functions, it may be entirely rational to enforce sanctions only when noncooperation is high enough to threaten the collective good.

Hostility and Tension: The Side Effects of Negative Incentives

Considering their efficiency and low cost, negative selective incentives seem ideal for inducing unanimous collective action. In fact, they are often essential to prevent defection in certain contexts. Any time there is a high reward for defecting when everyone else cooperates, some form of nega-

tive incentive (including withdrawal of a positive incentive) must be present to ensure cooperation. The knowledge that any defector will be punished can allow group members to relax and enjoy the benefits of cooperation.

But the reaction to punishment often does not follow this scenario. Objective interests or not, many people do not react calmly to punishment or to the threat of punishment. Often the response is ambivalent: a person acknowledges the reason for the sanction, and even supports its goal, but is angry and hostile at being its recipient. Many union members calmly accept the implied coercion of a picket line out of class solidarity. Many citizens calmly accept the sanction of a speeding ticket. Many parents cheerfully take their children, who have been barred from school, off to the clinic for an immunization. But at least as often the reaction includes irritation, frustration, anger, or hostility. If, as is often the case, perfect unanimity is not required for the collective good, the recipient of the sanction feels doubly outraged, since he can rightly claim that his defection did not hurt anyone else while it benefited him.

These hostile reactions may create no problem if the collective action is an isolated incident. But they may create complications when ongoing cooperation is required. The individual who is punished may come to attach negative value to benefiting his punishers. That is, his cost function $C(k)$ may shift to reflect higher subjective costs of participating in future collective action. This shift makes it harder to induce his cooperation. In addition, he may retaliate by punishing the punisher. Such retaliation increases the cost of using negative incentives. Thus, hostile responses to negative incentives tend to disrupt ongoing collective action.

These dilemmas of negative incentives are particularly acute for collective action by conflict groups. Many of these are groups of weak individuals facing a powerful adversary who can be dealt with only by coalescence and unified action. Examples are workers confronting their employer, tenants confronting a slumlord, and consumers buying from a monopolist. Only unified action gives them the strength to bargain with their adversary. This necessity for unity leads to a reliance on negative incentives.

But these negative selective incentives, these threats of violence or sanctions, are directed against members of one's own group, with whom one needs to cooperate, not against an outsider. There is a profound dilemma in their use. The threat of punishment must be available to deter defection. But the use of punishment, or the threat of its use, disrupts the spirit of cooperation and coordination necessary for the collective action to succeed in its confrontation with the opposition. Defectors who receive sanctions are likely to respond with hostility, anger, or intransigence. They are not likely to respond to the punishment with feelings of solidarity for the group which punished them.

Once a negative sanction has been employed, it is unlikely that its target will become a trustworthy group member. He may cooperate because he sees no alternative, but he will be ready to defect again if he thinks he can get away with it. Even if he is truly penitent and plans no further deviance, group members are likely to doubt his conversion. Their doubt leads them to act distant or to distrust the former defector, which in turn weakens his ties to the group in a self-fulfilling prophecy. Consequently, defectors are most likely to be permanently ostracized and expelled from the group as persons who can never be trusted. This means that negative incentives tend to diminish the ranks of a movement in those very confrontations in which the movement's strength lies in numbers.

Groups which must rely on negative incentives seek to minimize their harmful side effects. One important mechanism for this is an appropriate ideology, such as "law and order," "morality," or "class solidarity." Because these ideologies give people positive reasons to conform or cooperate, they can minimize the need for using the sanctions. In addition, they justify and legitimize punishment of those who do not cooperate. Thus, groups which successfully employ negative incentives are likely to have fairly well developed ideological systems.

In summary, a deep ambivalence and tension may surround any movement requiring costly cooperation by a large proportion of the group. The tension may erupt if the conflict with the adversary goes badly (thus weakening the potential value of the collective good), the cost of participation rises over time, or personal antagonisms and divisions exist within the group. The tension may be muted if the collective good is provided (or is likely to be provided) and costs are relatively low, or high levels of positive incentives make group membership beneficial, or the group is infused with a positive ideology stressing a sense of purpose and solidarity. But even when muted, the tensions are there if, at the base of the system, cooperation is supported by the threat of punishment.

It is not new to highlight the role of coercion and violence in collective action and social movements. But most treatments of these topics tend to focus on the interaction between a group and its opposition, not the processes within the group.[12] Analysis of selective incentives sheds new light on the internal processes of social movements. Intragroup violence and coercion are not unfortunate accidents in the history of a movement due to uncontrolled personalities or cultural clashes; they are the likely products of the structural imperatives of unanimous collective action.

[12] For excellent examples of these sorts of discussions of coercion and violence between conflicting groups, see Wilson (1973), Oberschall (1973, 1977), and Gamson (1975). Of course, Olson's (1965) discussion of labor movements highlights the use of coercion and violence as selective incentives within unions.

RATIONALITY AND IDEOLOGY

Assuming that people do attempt to maximize their expected payoffs and exploring the implications of this assumption have illuminated some highly suggestive patterns that seem to reflect actual processes and experiences in many collective-action contexts. But this assumption obviously does not explain the whole picture in collective action. People consider not only their own payoffs, but others' as well. As Fireman and Gamson (1977) argue, solidarity among group members leads them to attach value to others' outcomes as well as their own.

Analytically, ideologies or norms of solidarity and equity may be viewed as having the effect of increasing the intrinsic benefit (or "negative costs") of cooperation. Such a view does not capture the depth, complexity, and importance of social movement ideologies, but it does suggest an interface between rationalist and ideological models. It suggests that selective incentives and movement ideologies might in some ways be substitutable for each other: a movement with a strong ideology would require fewer selective incentives to motivate collective action than would a movement with a weak ideology.

There is substantial evidence that some people value cooperation and equity even when they are not members of ideological social movements. In an ingenious experiment, Marwell and Ames (1979) found that high school students who were allowed no personal contact or relevant ideological context generally believed it was "fair" to contribute a majority of their available resources to a "public good" in which all would share equally, and that most subjects behaved (at least in part) in accord with this principle of fairness, rather than simply maximizing their individual payoffs.

Marwell and Ames's subjects usually earned more money behaving as they did than they would have had everyone behaved according to the principle of individual rationality. This is the paradox of mixed-motive (or "prisoner's dilemma") situations: "irrational" cooperators may end up making more money than "rational" noncooperators. But this paradox exists only when individuals make their choices independently. If actors know their choices will affect others' choices in a kind of iterative process, mutual cooperation may be rationally chosen over mutual defection.[13] Such

[13] The basic expressions in this paper can be modified to take into account the effect of the individual's decision on the number of others who are likely to cooperate by replacing k in expressions (1)–(4) with k_d, the number of others who will cooperate if this individual does not, and replacing $k + 1$ in these expressions with k_c, the total number (including the individual) who will cooperate if he does. Then the relevant comparison of payoffs is $G(k_c) - G(k_d)$, which is often likely to yield a substantial payoff increment from cooperating. Such an increment would often exceed the cost of cooperation.

situations are common. Workers staging a walkout can see what the others are doing and can turn around and go back if others defect.

In this context, it is interesting that Marwell and Ames's subjects, acting independently, behaved in part as they would have behaved had their decisions not been independent. It is reasonable to postulate that widely held norms of equity or class solidarity bridge the communication gap, leading individuals to behave in isolation as they would if they were in communication with others, thus protecting everyone's payoffs against the erosion of a competitive spiral.

SUMMARY AND SCOPE

When used as selective incentives, rewards and punishments generate different dynamics in collective action. Much of this difference is due to the different ways costs are related to the number who cooperate in collective action. Positive incentives are especially efficient for motivating cooperation by a relatively small proportion of a group and, in many instances, generate pressures toward collective action by a small group of large contributors. Negative incentives are essential for ensuring unanimous cooperation in costly collective action but have the potential side effects of disharmony and discord.

The goal of this paper has been to illuminate processes of collective action by persons with shared interests. However, the basic model applies to any situation in which individuals' payoffs are affected by others' actions. Selective incentives can be used to induce others to engage in actions which are not in their interests (except for the incentives). The principles are the same but the incentive would have to be larger. Thus the formal model is more general than the substantive concerns which led to its formulation.

APPENDIX

It is important to emphasize the assumptions underlying Olson's formal argument because they are far more restrictive than Olson suggests in his verbal arguments and choice of examples. Furthermore, he would *deny* the fifth assumption, since he claims the opposite—that he has shown that the rationality of contributions for public goods declines with group size. Three of the assumptions (1, 3, and 4) are made explicitly (1965, pp. 22–23) and are not controversial. The linear relation between the value of the good to the actor, V_i, and the level at which it is provided, T, is a consequence of the definition $V_i = F_i S_g T$ (p. 23), where S_g is the "size" of the group (in value units) and F_i is the fraction an individual's value is

and S_g are constants, and thus V_i is a linear function of T.

Olson's results are *independent* of group size, despite his claims to the contrary. This is because the two "size" terms, F_i and S_g, cancel each other out. For example, consider the results for the level T which the individual should purchase, that is, the point at which the marginal cost equals the marginal value. Olson gives two versions of this result, $dC/dT = F_iS_g$ (p. 23) and $dC/dT = F_i(dV_g/dT)$ (p. 24); the latter he interprets by of the total group value, that is, $F_i = V_i/V_g$. For any particular group, F_i saying: ". . . the rate of gain to the group (dV_g/dT) must exceed the rate of increase in cost (dC/dT) by the same multiple that the group gain exceeds the gain to the individual concerned $(1/F_i = V_g/V_i)$" (p. 24). His implication in this passage, and in the subsequent references he makes to his results, clearly is that the likelihood of the marginal gain to the group exceeding the marginal cost by the appropriate multiple declines as the group size increases, since F_i gets small as the group size gets large.

But this is not true, essentially because of that earlier assumption that value is a linear function of T, which makes the marginal value constant. We may see the independence of group size by comparing a group of size S_g with a larger augmented group of size $S_g' = S_g + d$. The linearity assumption, $V_i = F_iS_gT$, implies $F_i = (V_i/S_gT)$. So the individual's fraction of the augmented group is $F_i' = [V_i/(S_g + d)T]$. Now the level of T which should rationally be purchased in the augmented group occurs when $(dC/dT)' = F_i'S_g' = [V_i/(S_g + d)T](S_g + d)$. But the $(S_g + d)$s cancel out, leaving $(dC/dT)' = F_i'S_g' = V_i/T = F_iS_g = dC/dT$, the same as it was for the smaller group size.

Similarly, the statement $dV_g/dT = 1/F_i(dC/dT)$ (p. 25), which is simply an algebraic rearrangement of the above, is actually independent of group size.

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