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978-1-107-56978-2 - Governing the Commons: The Evolution of Institutions for Collective Action

Elinor Ostrom

Excerpt

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Reflections on the commons

Hardly a week goes by without a major news story about the threatened destruction of a valuable natural resource. In June of 1989, for example, a *New York Times* article focused on the problem of overfishing in the Georges Bank about 150 miles off the New England coast. Catches of cod, flounder, and haddock are now only a quarter of what they were during the 1960s. Everyone knows that the basic problem is overfishing; however, those concerned cannot agree how to solve the problem. Congressional representatives recommend new national legislation, even though the legislation already on the books has been enforced only erratically. Representatives of the fishers argue that the fishing grounds would not be in such bad shape if the federal government had refrained from its sporadic attempts to regulate the fishery in the past. The issue in this case – and many others – is how best to limit the use of natural resources so as to ensure their long-term economic viability. Advocates of central regulation, of privatization, and of regulation by those involved have pressed their policy prescriptions in a variety of different arenas.

Similar situations occur on diverse scales ranging from small neighborhoods to the entire planet. The issues of how best to govern natural resources used by many individuals in common are no more settled in academia than in the world of politics. Some scholarly articles about the “tragedy of the commons” recommend that “the state” control most natural resources to prevent their destruction; others recommend that privatizing those resources will resolve the problem. What one can observe in the world, however, is that neither the state nor the market is uniformly successful in enabling individuals to sustain long-term, productive use of natural resource systems. Further, communities of individuals have relied on institutions resembling neither the state nor the market to govern some resource systems with reasonable degrees of success over long periods of time.

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We do not yet have the necessary intellectual tools or models to understand the array of problems that are associated with governing and managing natural resource systems and the reasons why some institutions seem to work in some settings and not others. This book is an effort to (1) critique the foundations of policy analysis as applied to many natural resources, (2) present empirical examples of successful and unsuccessful efforts to govern and manage such resources, and (3) begin the effort to develop better intellectual tools to understand the capabilities and limitations of self-governing institutions for regulating many types of resources. To do this, I first describe the three models most frequently used to provide a foundation for recommending state or market solutions. I then pose theoretical and empirical alternatives to these models to begin to illustrate the diversity of solutions that go beyond states and markets. Using an institutional mode of analysis, I then attempt to explain how communities of individuals fashion different ways of governing the commons.

THREE INFLUENTIAL MODELS

The tragedy of the commons

Since Garrett Hardin's challenging article in *Science* (1968), the expression "the tragedy of the commons" has come to symbolize the degradation of the environment to be expected whenever many individuals use a scarce resource in common. To illustrate the logical structure of his model, Hardin asks the reader to envision a pasture "open to all." He then examines the structure of this situation from the perspective of a rational herder. Each herder receives a direct benefit from his own animals and suffers delayed costs from the deterioration of the commons when his and others' cattle overgraze. Each herder is motivated to add more and more animals because he receives the direct benefit of his own animals and bears only a share of the costs resulting from overgrazing. Hardin concludes:

Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit – in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. (Hardin 1968, p. 1,244)

Hardin was not the first to notice the tragedy of the commons. Aristotle long ago observed that "what is common to the greatest number has the least care bestowed upon it. Everyone thinks chiefly of his own, hardly at all of the common interest" (*Politics*, Book II, ch. 3). Hobbes's parable of man in a state of nature is a prototype of the tragedy of the commons: Men

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seek their own good and end up fighting one another. In 1833, William Forster Lloyd (1977) sketched a theory of the commons that predicted improvident use for property owned in common. More than a decade before Hardin's article, H. Scott Gordon (1954) clearly expounded similar logic in another classic: "The Economic Theory of a Common-Property Research: The Fishery." Gordon described the same dynamic as Hardin:

There appears then, to be some truth in the conservative dictum that everybody's property is nobody's property. Wealth that is free for all is valued by no one because he who is foolhardy enough to wait for its proper time of use will only find that it has been taken by another. . . . The fish in the sea are valueless to the fisherman, because there is no assurance that they will be there for him tomorrow if they are left behind today. (Gordon 1954, p. 124)

John H. Dales (1968, p. 62) noted at the same time the perplexing problems related to resources "owned in common because there is no alternative!" Standard analyses in modern resource economics conclude that where a number of users have access to a common-pool resource, the total of resource units withdrawn from the resource will be greater than the optimal economic level of withdrawal (Clark 1976, 1980; Dasgupta and Heal 1979).

If the only "commons" of importance were a few grazing areas or fisheries, the tragedy of the commons would be of little general interest. That is not the case. Hardin himself used the grazing commons as a metaphor for the general problem of overpopulation. The "tragedy of the commons" has been used to describe such diverse problems as the Sahelian famine of the 1970s (Picardi and Seifert 1977), firewood crises throughout the Third World (Norman 1984; Thomson 1977), the problem of acid rain (R. Wilson 1985), the organization of the Mormon Church (Bullock and Baden 1977), the inability of the U.S. Congress to limit its capacity to overspend (Shepsle and Weingast 1984), urban crime (Neher 1978), public-sector/private-sector relationships in modern economies (Scharpf 1985, 1987, 1988), the problems of international cooperation (Snidal 1985), and communal conflict in Cyprus (Lumsden 1973). Much of the world is dependent on resources that are subject to the possibility of a tragedy of the commons.

The prisoner's dilemma game

Hardin's model has often been formalized as a prisoner's dilemma (PD) game (Dawes 1973, 1975).¹ Suppose we think of the players in a game as being herders using a common grazing meadow. For this meadow, there is an upper limit to the number of animals that can graze on the meadow for

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a season and be well fed at the end of the season. We call that number L . For a two-person game, the “cooperate” strategy can be thought of as grazing $L/2$ animals for each herder. The “defect” strategy is for each herder to graze as many animals as he thinks he can sell at a profit (given his private costs), assuming that this number is greater than $L/2$. If both herders limit their grazing to $L/2$, they will obtain 10 units of profit, whereas if they both choose the defect strategy they will obtain zero profit. If one of them limits his number of animals to $L/2$, while the other grazes as many as he wants, the “defector” obtains 11 units of profit, and the “sucker” obtains -1 . If each chooses independently without the capacity to engage in a binding contract, each chooses his dominant strategy, which is to defect. When they both defect, they obtain zero profit. Call this the Hardin herder game, or Game 1. It has the structure of a prisoner’s dilemma game.²

The prisoner’s dilemma game is conceptualized as a noncooperative game in which all players possess complete information. In noncooperative games, communication among the players is forbidden or impossible or simply irrelevant as long as it is not explicitly modeled as part of the game. If communication is possible, verbal agreements among players are presumed to be nonbinding unless the possibility of binding agreements is explicitly incorporated in the game structure (Harsanyi and Selten 1988, p. 3). “Complete information” implies that all players know the full structure of the game tree and the payoffs attached to outcomes. Players either know or do not know the current moves of other players depending on whether or not they are observable.

In a prisoner’s dilemma game, each player has a dominant strategy in the sense that the player is always better off choosing this strategy – to defect

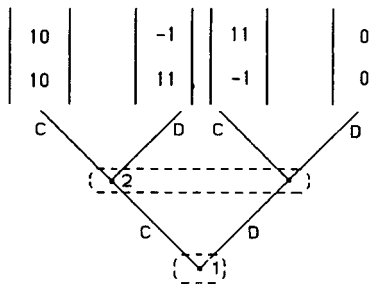


Figure 1.1. Game 1: The Hardin herder game.

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– no matter what the other player chooses. When both players choose their dominant strategy, given these assumptions, they produce an equilibrium that is the third-best result for both. Neither has an incentive to change that is independent of the strategy choice of the other. The equilibrium resulting from each player selecting his or her “best” individual strategy is, however, not a Pareto-optimal outcome. A Pareto-optimal outcome occurs when there is no other outcome strictly preferred by at least one player that is at least as good for the others. In the two-person prisoner’s dilemma game, both players prefer the (cooperate, cooperate) outcome to the (defect, defect) outcome. Thus, the equilibrium outcome is Pareto-inferior.

The prisoner’s dilemma game fascinates scholars. The paradox that individually rational strategies lead to collectively irrational outcomes seems to challenge a fundamental faith that rational human beings can achieve rational results. In the introduction to a recently published book, *Paradoxes of Rationality and Cooperation*, Richmond Campbell explains the “deep attraction” of the dilemma:

Quite simply, these paradoxes cast in doubt our understanding of rationality and, in the case of the Prisoner’s Dilemma suggest that it is impossible for rational creatures to cooperate. Thus, they bear directly on fundamental issues in ethics and political philosophy and threaten the foundations of the social sciences. It is the scope of these consequences that explains why these paradoxes have drawn so much attention and why they command a central place in philosophical discussion. (Campbell 1985, p. 3)

The deep attraction of the dilemma is further illustrated by the number of articles written about it. At one count, 15 years ago, more than 2,000 papers had been devoted to the prisoner’s dilemma game (Grofman and Pool 1975).

The logic of collective action

A closely related view of the difficulty of getting individuals to pursue their joint welfare, as contrasted to individual welfare, was developed by Mancur Olson (1965) in *The Logic of Collective Action*. Olson specifically set out to challenge the grand optimism expressed in group theory: that individuals with common interests would voluntarily act so as to try to further those interests (Bentley 1949; Truman 1958). On the first page of his book, Olson summarized that accepted view:

The idea that groups tend to act in support of their group interests is supposed to follow logically from this widely accepted premise of rational, self-interested behavior. In other words, if the members of some group have a common interest or object, and if they would all be better off if that objective were achieved, it has been

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thought to follow logically that the individuals in that group would, if they were rational and self-interested, act to achieve that objective. (Olson 1965, p.1)

Olson challenged the presumption that the possibility of a benefit for a group would be sufficient to generate collective action to achieve that benefit. In the most frequently quoted passage of his book, Olson argued that

unless the number of individuals is quite small, or unless there is coercion or some other special device to make individuals act in their common interest, *rational, self-interested individuals will not act to achieve their common or group interests.* (Olson 1965, p. 2; emphasis in original)

Olson's argument rests largely on the premise that one who cannot be excluded from obtaining the benefits of a collective good once the good is produced has little incentive to contribute voluntarily to the provision of that good. His book is less pessimistic than it is asserted to be by many who cite this famous passage. Olson considers it an open question whether intermediate-size groups will or will not voluntarily provide collective benefits. His definition of an intermediate-size group depends not on the number of actors involved but on how noticeable each person's actions are.

The tragedy of the commons, the prisoner's dilemma, and the logic of collective action are closely related concepts in the models that have defined the accepted way of viewing many problems that individuals face when attempting to achieve collective benefits. At the heart of each of these models is the free-rider problem. Whenever one person cannot be excluded from the benefits that others provide, each person is motivated not to contribute to the joint effort, but to free-ride on the efforts of others. If all participants choose to free-ride, the collective benefit will not be produced. The temptation to free-ride, however, may dominate the decision process, and thus all will end up where no one wanted to be. Alternatively, some may provide while others free-ride, leading to less than the optimal level of provision of the collective benefit. These models are thus extremely useful for explaining how perfectly rational individuals can produce, under some circumstances, outcomes that are not "rational" when viewed from the perspective of all those involved.

What makes these models so interesting and so powerful is that they capture important aspects of many different problems that occur in diverse settings in all parts of the world. What makes these models so dangerous – when they are used metaphorically as the foundation for policy – is that the constraints that are assumed to be fixed for the purpose of analysis are taken on faith as being fixed in empirical settings, unless external author-

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ities change them.³ The prisoners in the famous dilemma cannot change the constraints imposed on them by the district attorney; they are in jail. Not all users of natural resources are similarly incapable of changing their constraints. As long as individuals are viewed as prisoners, policy prescriptions will address this metaphor. I would rather address the question of how to enhance the capabilities of those involved to change the constraining rules of the game to lead to outcomes other than remorseless tragedies.

THE METAPHORICAL USE OF MODELS

These three models and their many variants are diverse representations of a broader and still-evolving theory of collective action. Much more work will be needed to develop the theory of collective action into a reliable and useful foundation for policy analysis. Considerable progress has been made during the past three decades by theorists and empirically oriented social scientists. The sweeping conclusions of the first variants of this theory have given way to a more qualified body of knowledge involving many more variables and explicit base conditions.

As an evolving, rather than completed, theory, it provokes disagreement regarding the importance or insignificance of some variables and how best to specify key relationships.⁴ The results from more recent work, particularly work focusing on the dynamic aspects of relevant empirical settings, have begun to generate more optimistic predictions than did earlier models; see, in particular, the work of Axelrod (1981, 1984) and Kreps and Wilson (1982). This is one of the most exciting areas in the social sciences, for although considerable cumulation has already occurred, some deep questions remain unanswered. Some of these puzzles are key to understanding how individuals jointly using a common-pool resource might be able to achieve an effective form of governing and managing their own commons. These puzzles are examined in Chapter 2.

Much that has been written about common-pool resources, however, has uncritically accepted the earlier models and the presumption of a remorseless tragedy (Nebel 1987). Scholars have gone so far as to recommend that “Hardin’s ‘Tragedy of the Commons’ should be required reading for all students . . . and, if I had my way, for all human beings.”⁵ Policy prescriptions have relied to a large extent on one of the three original models, but those attempting to use these models as the basis for policy prescription frequently have achieved little more than a metaphorical use of the models.

When models are used as metaphors, an author usually points to the similarity between one or two variables in a natural setting and one or two

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variables in a model. If calling attention to similarities is all that is intended by the metaphor, it serves the usual purpose of rapidly conveying information in graphic form. These three models have frequently been used metaphorically, however, for another purpose. The similarity between the many individuals jointly using a resource in a natural setting and the many individuals jointly producing a suboptimal result in the model has been used to convey a sense that further similarities are present. By referring to natural settings as “tragedies of the commons,” “collective-action problems,” “prisoner’s dilemmas,” “open-access resources,” or even “common-property resources,” the observer frequently wishes to invoke an image of helpless individuals caught in an inexorable process of destroying their own resources. An article in the December 10, 1988, issue of *The Economist* goes so far as to assert that fisheries can be managed successfully only if it is recognized that “left to their own devices, fisherman will overexploit stocks,” and “to avoid disaster, managers must have effective hegemony over them.”

Public officials sometimes do no more than evoke grim images by briefly alluding to the popularized versions of the models, presuming, as self-evident, that the same processes occur in all natural settings. The Canadian minister of fisheries and oceans, for example, captured the color of the models in a 1980 speech:

If you let loose that kind of economic self-interest in fisheries, with everybody fishing as he wants, taking from a resource that belongs to no individual, you end up destroying your neighbour and yourself. In free fisheries, good times create bad times, attracting more and more boats to chase fewer and fewer fish, producing less and less money to divide among more and more people.

(Romeo LeBlanc, speaking at the 50th anniversary meeting of the United Maritime Fishermen, March 19, 1980; quoted by Matthews and Phyne 1988)

The implication, of course, was that Canadian fisheries universally met that description – an empirically incorrect inference.⁶ But many observers have come to assume that most resources are like those specified in the three models. As such, it has been assumed that the individuals have been caught in a grim trap. The resulting policy recommendations have had an equally grim character.

CURRENT POLICY PRESCRIPTIONS

Leviathan as the “only” way

Ophuls (1973, p. 228) argued, for example, that “because of the tragedy of the commons, environmental problems cannot be solved through co-operation . . . and the rationale for government with major coercive

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powers is overwhelming.” Ophuls concluded that “even if we avoid the tragedy of the commons, it will *only* be by recourse to the tragic necessity of Leviathan” (1973, p. 229; emphasis added).⁷ Garrett Hardin argued a decade after his earlier article that we are enveloped in a “cloud of ignorance” about “the true nature of the fundamental political systems and the effect of each on the preservation of the environment” (1978, p. 310). The “cloud of ignorance” did not, however, prevent him from presuming that the only alternatives to the commons dilemma were what he called “a private enterprise system,” on the one hand, or “socialism,” on the other (1978, p. 314). With the assurance of one convinced that “the alternative of the commons is too horrifying to contemplate” (1968, p. 1,247), Hardin indicated that change would have to be instituted with “whatever force may be required to make the change stick” (1978, p. 314). In other words, “if ruin is to be avoided in a crowded world, people must be responsive to a coercive force outside their individual psyches, a ‘Leviathan,’ to use Hobbes’s term” (Hardin 1978, p. 314).

The presumption that an external Leviathan is necessary to avoid tragedies of the commons leads to recommendations that central governments control most natural resource systems. Heilbroner (1974) opined that “iron governments,” perhaps military governments, would be necessary to achieve control over ecological problems. In a less draconian view, Ehrenfeld (1972, p. 322) suggested that if “private interests cannot be expected to protect the public domain then external regulation by public agencies, governments, or international authorities is needed.” In an analysis of the problems involved in water resource management in developing countries, Carruthers and Stoner (1981, p. 29) argued that without public control, “overgrazing and soil erosion of communal pastures, or less fish at higher average cost,” would result. They concluded that “common property resources *require* public control if economic efficiency is to result from their development” (1981, p. 29; emphasis added).⁸ The policy advice to centralize the control and regulation of natural resources, such as grazing lands, forests, and fisheries, has been followed extensively, particularly in Third World countries.

One way to illustrate these proponents’ image of centralized control is to modify the Hardin herder game using the assumptions that underlie this policy advice. The proponents of centralized control want an external government agency to decide the specific herding strategy that the central authority considers best for the situation: The central authority will decide who can use the meadow, when they can use it, and how many animals can be grazed. Let us assume that the central authority decides to impose a penalty of 2 profit units on anyone who is considered by that authority to

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be using a defect strategy. Assuming that the central agency knows the sustainable yield of the meadow (L) and can unfailingly discover and penalize any herder using the defect strategy, the newly restructured game imposed by the central authority is represented in Game 2. Now, the solution to Game 2 is (cooperate, cooperate). Both players receive 10 profit units each, rather than the zero units they would have received in Game 1. If an external authority accurately determines the capacity of a common-pool resource, unambiguously assigns this capacity, monitors actions, and unfailingly sanctions noncompliance, then a centralized agency can transform the Hardin herder game to generate an optimally efficient equilibrium for the herders. Little consideration is given to the cost of creating and maintaining such an agency. This is seen as exogenous to the problem and is not included as a parameter of Game 2.⁹

The optimal equilibrium achieved by following the advice to centralize control, however, is based on assumptions concerning the accuracy of information, monitoring capabilities, sanctioning reliability, and zero costs of administration. Without valid and reliable information, a central agency could make several errors, including setting the carrying capacity or the fine too high or too low, sanctioning herders who cooperate, or not sanctioning defectors. The implications of all forms of incomplete information are interesting. However, as an example, I shall focus entirely on the implications arising from a central agency's incomplete information about the herders' strategies. The implicit assumption of Game 2 is that the central agency monitors all actions of the herders costlessly and imposes sanctions correctly.

In Game 3, we assume that the central agency has complete information about the carrying capacity of the meadow, but incomplete information about the particular actions of the herders. The central agency conse-

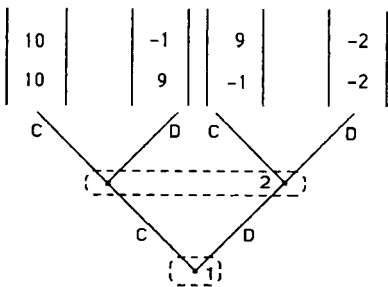


Figure 1.2. Game 2: The central-authority game with complete information.