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**Edited by Jean-Marie Baland, Pranab Bardhan & Samuel Bowles:
Inequality, Cooperation, and Environmental Sustainability**

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Chapter 1

INTRODUCTION

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Does inequality exacerbate environmental problems? Would an equalization of wealth, social status, and political power contribute to environmental sustainability? Or is environmental degradation a likely byproduct of efforts to advance the economic, social, and political interests of the less well-off? In this book, we investigate the impact of inequality on environmental sustainability. We focus on local commons as they are essential to the livelihoods of many of the world's poorest people, and because recent research illuminates how private incentives, group governance, and government policies might combine to better protect these essential resources. At a local level users interact in a structure called social dilemmas, in which the pursuit of individual material gain in exploiting the commons enters into conflict with the general interest. Local environmental degradation often results from a failure by members of the community to cooperate in its protection. For this reason we give special attention to the effect that inequality may have on cooperation.

The problem is often termed the “tragedy of the commons.” However, many communities have managed common resources with great success over hundreds of years. Maine lobstermen limit their catch by means of local restrictions on who can set traps where. Turkish fishermen allocate fishing spots by lot and then rotate them (Ostrom 1990, Acheson 1988). Successful cooperation to protect forestry and water resources has also been documented (Bromley and Feeny 1992). But failures are also too common. Moreover, many studies of “collective action” potentially suffer from a selection bias, as failures are often harder to observe. “Success stories” of local cooperation may thus be overrepresented.

1.1. COLLECTIVE ACTION AND THE TRAGEDY OF THE COMMONS

To blame inequality when the tragedy of the commons unfolds, one needs to know how inequality affects the ability and the incentives of

group members to cooperate. Olson (1965) suggested that inequality promotes cooperation by increasing the likelihood that a few wealthy individuals will be able to capture enough of the benefits to induce them to provide the public good independently of the actions of the others. The first two chapters in this volume provide an approach based on individual incentives to assess the relevance of this argument.

In chapter 2, Baland and Platteau present a survey of simple models of voluntary contributions to a common good, or voluntary participation to a regulatory structure, as a guide to studying the mechanisms linking inequality to collective action. The effects of various dimensions of inequality (income, assets, stakes, . . .) are analyzed and some related empirical evidence is presented. In chapter 3, Bardhan, Ghatak, and Karaivanov propose a general model in which producers voluntarily contribute to a collective input, such as irrigation, which is complementary in production with privately owned inputs, for example, private land. Private inputs are unequally distributed among the producers, giving them differing incentives to contribute to the public good. The challenge is to identify the distribution of private inputs leading to the least inefficient outcome.

The lessons one can draw from these two chapters are close. In equilibrium, cooperators voluntarily contribute to the common good while free-riders choose not to contribute. If incentives to contribute are increasing with wealth, free-riders are less well-off and cooperators are wealthier, so that disequalizing transfers from the former to the latter increase total contributions and Olson's argument about a larger "internalization" effect is right. Both chapters however stress the ambiguity of this result along a number of dimensions. Thus, results can differ widely when benefits are measured in terms of output, surplus, or utility. Results also depend on the technological assumptions made and on the particular type of public good under concern.

These two chapters also illustrate how inequality generates contradictory effects on cooperation, such as:

1. A higher income level increases an agent's demand for the environmental good (an income effect), but also increases the opportunity cost of the time spent collecting the good (a substitution effect).
2. Lower assets may reduce the stakes members have in the resource, but also their ability to extract large amounts. Thus a smaller fisherman is less interested in protecting future catches, but also cannot really overfish.
3. Alternative income opportunities may prompt the user to exhaust the resource before changing occupation, but also make it more costly to spend time exploiting the resource.
4. For collective regulation of the commons, inequality may provide leaders with enough incentives but may also discourage poorer individuals to participate at all.

1.2. THE DIMENSIONS OF INEQUALITY

Various dimensions of inequality are relevant. Income inequality may affect the households' demand for goods provided by the commons, their opportunity cost of time, or their demand for regulation. But asset inequality also matters: land ownership determines one's gains from the collective irrigation scheme; the number of fishing boats owned affects one's long-term gains from voluntary reductions in fishing efforts.

Ethnic and social heterogeneity are also relevant, particularly where collective rules and organizations have to be set up (Alesina and La Ferrara, 2000). Baland et al. in chapter 10 find that caste conflicts reduce the effectiveness of the forest management committees in the Himalayan forests. Gender inequality also affects the performance of cooperation in the Indian forest along various mechanisms described by Agarwal in chapter 11. Technique and skill differences do matter. Thus, following Bardhan and Dayton-Johnson (chapter 5), the position of a farmer at the top-end or the tail-end of the irrigation network crucially affects his incentives to participate in the scheme. In chapter 7, Gaspard and Platteau show how differences in fishing techniques led to conflicts in the management of a shared fishery in Senegal.

1.3. ENVIRONMENTAL OUTCOMES WITHOUT COLLECTIVE ACTION

Inequality has an impact on the environment even in the absence of collective action. The most obvious mechanism is the "consumption" of environmental goods. Thus, redistribution of income from the rich to the poor could worsen the environment if the consumption foregone by the rich had little environmental impact, while the increased consumption of the poor imposed substantial environmental cost. This requires that the marginal impact on the environment decreases with income.

Chapter 10 by Baland et al. is an attempt to separate out this "direct" impact of inequality from its indirect impact via collective action. They find in Nepal evidence of a concavity effect in firewood consumption, which implies that, *ceteris paribus*, were the poor to become a bit richer and the rich a bit poorer, more firewood in aggregate would be extracted. Having identified this effect, they subsequently analyze the remaining unexplained component of firewood collection, as reflecting the nature of collective action at the village level, and find a negative impact of caste heterogeneity on forest conservation.

More generally, however, the evidence for concavity effects is mixed. Data from a study by the U.S. Congressional Budget Office indicate that the relationship between income and "carbon-intensive consumption" shows no strong concave effects and may even be somewhat convex,

depending on the method of estimation (Dinan and Lim 2000). Moreover, the effects of inequality may operate by shifting the relationship between income and environmental exploitation, such as under the “pecuniary emulation” discussed by Thorsten Veblen (1899/1934). If the standard of a decent lifestyle is influenced by the consumption of the rich, then increasing inequality between the rich and the rest of the society may stimulate efforts to catch up through working more and consuming more, thereby accelerating environmental degradation (for related evidence for ten OECD countries, see Bowles and Park 2005). Another possible mechanism follows from the undersupply of leisure-enhancing goods. Highly unequal societies may fail to provide adequate public goods complementary to the use of free time (libraries or public recreational facilities). As free time is thus less valuable relative to the consumption of commodities, consumer choices are biased toward less environment-friendly consumption goods. A third mechanism discussed by James Boyce in chapter 12 is based on two hypotheses. First, social decisions on environmental protection issues favor some groups over others. Second, a less equal distribution of power results in more environmental degradation as wealthier people can better insulate themselves from its consequences by purchasing private environmental quality. This process is illustrated with the example of the hazardous waste disposal policy in the United States, which is biased against low-income areas with a high percentage of African Americans and other minorities.

1.4. COOPERATION

Much of the literature describes as “cooperative” a behavior through which one agent internalizes some of the externalities he imposes on other users, and refrains his own use below what would maximize his individual profits. Cooperation in this setting therefore does not imply any voluntary creation of a collective “institution,” but simply results from an uncoordinated spontaneous reduction in the use of a resource. Even in this simplified setting, the issue is potentially complex as the discussion of games of appropriation in chapter 2 reveals.

In chapter 8 Cardenas brings behavioral experiments typically performed in university laboratories into the field, by letting Colombian farmers whose livelihood involves exploiting a common forest play common resource experiments. In this setting, individuals freely set their levels of extraction, and are fully informed of the impact of their use on the other users in the group. Cardenas shows that wealth distance increased overexploitation of the experimental commons. This is surprising, as the game was designed so that individual incentives were independent of the

characteristics of the members of the group. Cardenas was able however to pinpoint why wealth inequality may matter. In experiments in which no communication was allowed, the more homogeneous groups did no better than the groups with unequal wealth, but when communication was allowed, they were much more successful. By contrast, Cardenas did not find that poverty as such was a major obstacle: poor but homogeneous groups displayed significantly higher levels of spontaneous cooperation than wealthier homogeneous groups

Cooperation however often requires collective action, a coordinated effort to regulate the use of the resource. Users then have to create collective institutions to this end. Chapter 2 analyzes the individual incentives to contribute to this coordinated effort, as well as to abide by these rules. In chapter 4, Janssen and Ostrom present an alternative theoretical approach to the creation and the adoption of collective rules, based on agent-based computational modeling. In the evolutionary dynamic their model captures, some rules are copied more than others and proliferate, while others do not diffuse and are eliminated. By simulating repeated interactions between agents, they show that high levels of heterogeneity undermine the building up of trust, a necessary condition for the emergence of conservation rules. Heterogeneity leads to the development of different identities, and to mentalities of “us” versus “them,” which reduce the levels of cooperation and the overall performance of the society.

Many of the empirical studies in the present book investigate various aspects of collective action. For instance, in chapter 5 Bardhan and Dayton-Johnson present the main results of two large-scale empirical studies of irrigators’ communities, one located in South India and the other in Mexico. They investigate how inequality affects the design of local rules for managing irrigation resources, and in turn how the rules in place themselves affect the level of cooperation. They find that inequality in landholdings is associated with lower maintenance and greater incidence of water-related conflicts, and also find that social heterogeneity—caste differences in India—reduces cooperation. They also show how rule compliance in these communities depends on the farmers’ perception of the process by which these rules were created. Thus, in South India, maintenance rules are often broken because farmers believe that they were crafted by the local elite. Rules made by governmental officials who are not villagers are particularly prone to noncompliance.

In chapter 7 Gaspart and Platteau analyze attempts by Senegalese fishermen to regulate catches in the 1990s. They find that even though skill and technical heterogeneity are important obstacles to collective organization, they can often be overcome through the design of differentiated and adaptable rules. Wealthy local elites sometimes plays a leading role in the organization of collective action. By contrast, as noted above, a long

history of conflicts characterizes villages where migrants and local fishermen compete and make use of different equipment and fishing methods. In addition, where poor fishers were indebted to fish sellers, efforts by the fishers to restrict the catch generally failed.

In chapter 9 Somanathan, Prabhakar, and Mehta use data on the Himalayan forests in North India based on satellite imagery. They investigate the impact of caste heterogeneity and land inequality on forest conservation. As these forests are managed by local village councils, they also examine the effect of female participation in such councils. There is no evidence of an impact of caste heterogeneity and female participation on collective action, nor on the state of the forest. There is some partial evidence that land inequality plays a negative role, but the evidence is not systematic.

1.5. COOPERATION AND ENVIRONMENTAL SUSTAINABILITY

The causal relationship going from “cooperation” to the state of the resource is not simple either. First, even when a well-identified group has an exclusive use of the resource (i.e. collective property rights are well-defined), and the user group is potentially well organized, it is not clear that users have a correct perception of the optimal use of the resource. For example, the idea that hunting pressure could reduce populations in the long run was absent in many traditional societies (see Baland and Platteau 1996).

Second, even where users realize that their current actions have a direct impact on the state of the resource, it may not be optimal to preserve the resource. Thus, conversion of forests to agricultural land may often correspond to an “optimal use path” in densely populated rural areas. In some instances, collective action may even be initiated to degrade the resource, as a reaction to a feeling of dispossession of local communities by state authorities. In northern India, Ho tribesmen who lost rights to forest lands developed a “forest cutting movement . . . as a means of asserting their rights to use the lands which forestry laws denied them” (Colchester 1994:83).

Third, the measurement of the “environmental outcome” is not in itself an easy task. Some studies focus on a measure of current flows or catches (e.g., the number of loads of firewood taken from a forest in a week, such as in Baland et al., chapter 10), while others rely on measures of stocks (e.g., forested areas, and measures of crown cover per species, such as in Somanathan et al., chapter 9). Other authors, such as Gaspart and Platteau (chapter 7) even rely on subjective perception of the state of

the resource. In a stationary equilibrium, the flow and the stock should vary in the same way. However, in most cases the environment studied is far from a “stationary path.” As a result those two measures do not coincide, and the simultaneous use of both should be recommended. Even where the resource is well defined, good measures of the current use and stock are often multidimensional. Thus, in a degrading forest, one should look not only at the amount of firewood taken (a flow measure), or the forested area and the crown cover (a stock measure), but also at the various indicators of forest biomass and growth potential: basal area, girth, height, cutting practices, species composition, density of seedlings, ratio of branches and twigs to the trunk, and so on.

Moreover, collective action need not produce a unique type of outcome. The nature of this outcome may also vary with inequality. For instance, as also stressed by Boyce in chapter 12, the type of public good desired depends on income, so that the type and the amount of public good produced collectively varies systematically with income distribution (see also Alesina, Baqir, and Easterly 1999). In chapter 11 Agarwal provides a striking illustration of the way gender inequalities, through the action of village forest committees in India, translate into widely different forest management practices. Based on her field investigations in five states of India and additional data drawn from other studies, she shows that male dominated committees are tempted to impose seasonal bans on firewood collection in order to increase the stock of timber, the proceeds of which they control; the cost of such restriction is almost exclusively borne by the women, who are in charge of collecting firewood. Moreover, women’s lack of involvement in the decision-making processes also reduces their ability as well as their incentive to cooperate in local forest management.

Finally, collective regulation has a distributive impact, the pattern of which depends on the initial differences across users. The larger those differences, the more likely some users will oppose a particular regulation, producing a status quo bias. Sara Singleton in chapter 6 analyzes the critical role played by distributional conflicts in the history of the Pacific Northwest salmon fishery. By reviewing intertribal negotiations, she describes how the acceptability of an agreement depended on its (perceived) distributional consequences. Thus, despite an urgent need for a coordinated management scheme, no general scheme for solving intertribal allocation rules could be found because each proposed rule disadvantaged at least one of the user group. And some measures that benefited everyone were opposed by some groups because alternative rules would give them higher returns. Gaspart and Platteau in chapter 7 also provide a striking illustration of the importance of the redistributive

impact of a given rule for its acceptability among users. They also show how collective action was more likely where more immediate returns were visible.

1.6. SOME CONCLUDING COMMENTS

Our book is devoted almost entirely to the question of the sustainability of local commons, and the impact that inequality may have on the kinds of cooperation necessary to deter environmental degradation at the local level. Our findings suggest that the effect of inequality on environmental sustainability depends critically on the institutional setting that structures interactions among agents and the technical nature of the environmental asset in question. We find little evidence in any of our studies that poverty per se contributes to environmental degradation.

Our research provides evidence that in many settings inequality does indeed inhibit mutually beneficial approaches to the governance of the commons. Redistributive policies (like land reform or expansion of mass education) may then have important beneficial side effects on common resources that are often ignored in the literature on land reforms or education. Other studies in this book also offer a more skeptical view. In forest management in Asia, the effect of inequality, if any, is minor compared to the impact of population growth, income growth, or modernization. In general, the studies in this volume make us more aware of the complexities in the relation between inequality and collective action, and of the need for more context-specific empirical investigations into the different types of alternative mechanisms through which the relevant processes may operate.

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