



Common Property Institutions and Sustainable Governance of Resources

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Summary. — The literature on common property-based resource management comprises many important studies that seek to specify the conditions under which groups of users will self-organize and sustainably govern resources upon which they depend. Using three of the more comprehensive such studies, and with an extensive review of writings on the commons, this paper demonstrates that the enterprise of generating lists of conditions under which commons are governed sustainably is a flawed and impossibly costly research task. For a way out, the paper examines the relative merits of statistical, comparative, and case study approaches to studying the commons. It ends with a plea for careful research design and sample selection, construction of causal mechanisms, and a shift toward comparative and statistical rather than single-case analyses. Such steps are necessary for a coherent, empirically-relevant theory of the commons. Published by Elsevier Science Ltd.

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1. INTRODUCTION

Since the mid-1980s, discussions over what kind of institutional arrangements account for sustainable resource use have undergone a remarkable change. The shift has occurred in part as a response to developments in the field of noncooperative game theory (Falk, Fehr, & Fischbacher, forthcoming; Fudenberg & Maskin, 1986; Schotter, 1981; Sugden, 1984, 1989), but more directly as a result of the explosion of work on common property arrangements and common-pool resources (Berkes, 1989; McCay & Acheson, 1987; NRC, 1986; Ostrom, 1990). Anthropologists, economists, environmentalists, political scientists, and rural sociologists among others have contributed to this burgeoning literature. The writings of scholars of commons are often informed by more general research on property rights and institutions.¹ With detailed historical and contemporary evidence, scholarship on the commons has shown that resource users often create institutional arrangements and management regimes that help them allocate benefits equitably, over long time periods, and with only limited efficiency losses (Agrawal, 1999; McKean, 1992; Ostrom, 1992). Much of this research has typically focused on locally situated small user groups and communities.²

Considerable variation marks the experiences of users in different parts of the world. At a general level, all common resource users are confronted with the problem of how to reduce or eliminate externalities related to resource management. Documentation of the variable

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performance of regimes of local resource management has meant that we now know of many cases of successful local management of common-pool resources. In light of this knowledge, scholars and policy makers have become less likely to propose central state intervention, markets, or privatization of property rights over resources as a matter of course. Rather, many scholars examine the conditions under which communal arrangements compare favorably with private or state ownership, even on efficiency criteria, but especially where equity and sustainability are concerned. Other scholars of commons and some institutional theorists question the familiar trichotomy of private, communal, and state ownership and instead focus more directly on underlying rights and powers of access, use, management, exclusion, and transferability that are conferred through rules governing resources.³ The work initiated and carried out by scholars of common property has important connections to the world of policy making and resource management. Governments in more than 50 countries, according to a recent survey on forestry policies (FAO, 1999), claim to be pursuing initiatives that would devolve some control over resources to local users. Although it would be hard to sustain a claim that research on common property by itself is responsible for policy shifts, it has surely informed how many policy makers think about resource management. These new efforts at decentralization of control over common-pool resources testify to the necessity for increasingly careful and thoughtful research on the commons (Agrawal & Ostrom, forthcoming; Agrawal & Ribot, 1999; Ribot, 1999; Wolverkamp, 1999).

This paper seeks to synthesize the extensive empirical work that has occurred over the past two decades, identify lacunae in current work, and suggest some directions in which research is still needed. Several reasons motivate the paper. Many rich descriptions of particular cases are now available. Of the available studies, many draw from collective action theory⁴ and social theory, and develop plausible arguments to explain observed outcomes. An enormous experimental literature has also begun to inform our understanding of how humans act under different incentive structures (see Kopelman & Messick, forthcoming). Especially valuable for my synthesis are studies whose conclusions are based on explicit comparisons or on relatively large samples of cases (Baland & Platteau, 1996;

Ostrom, Gardner, & Walker, 1994; Pinkerton, 1989; Pinkerton & Weinstein, 1995; Sengupta, 1991; Tang, 1992).

The exact definitions of terms such as efficiency, equity, or sustainability that characterize outcomes related to common-pool resource management are beyond the scope of this paper. But in trying to synthesize lessons from empirical studies of sustainability on the commons, I primarily have in mind the durability of institutions. Such a general conceptualization of outcomes permits comparisons of existing studies on the commons, since few of them provide careful and generalizable measures of their dependent variables. Most have an implicit sense of successful institutions as those that last over time, constrain users to safeguard the resource, and produce fair outcomes.⁵

The following section begins by focusing on three comprehensive attempts to produce theoretically informed generalizations about the conditions under which groups of self-organized users are successful in managing their commons dilemmas.⁶ These studies are Baland and Platteau (1996), Ostrom (1990), and Wade (1988).⁷ I examine the conclusions of these studies by comparing them with findings from many other studies of the commons. Many of the conclusions of scholars of the commons, it can be argued, match closely the theoretical findings from the literature on collective action.⁸ Section 3 focuses on several problems of method that plague studies of self-organized resource management institutions. Because studies of the commons typically focus upon single cases or are case-based comparisons, it is especially important to be attentive to areas in which case analysis is deficient. Section 4 proposes possible complementary methods and areas of emphasis for further research on common property.

The main argument of the paper is that existing studies of sustainable institutions around common-pool resources suffer from two types of problems. The first is substantive. Scholars of commons have focused primarily on institutions around common-pool resources. Their focus on local institutions and resources is understandable in light of their objective: to show that common property arrangements can result in efficient use, equitable allocation, and sustainable conservation.⁹ But the focus on institutions comes at a cost. Studies of commons are relatively negligent in examining how aspects of the resource system, some aspects of user group membership, and the

external social, physical, and institutional environment affect institutional durability and long-term management at the local level (but see Lam, 1998; Ostrom, 1999; Ostrom *et al.*, 1994; Tang, 1992).

The second problem relates to methods and is more fundamental. Given the large number of factors, perhaps as many as 35 of them as I explain below, that have been highlighted as being critical to the organization, adaptability, and sustainability of common property, it is fair to suggest that existing work has yet to develop fully a theory of what makes for sustainable common-pool resource management. Systematic tests of the relative importance of factors important to sustainability, equity, or efficiency of commons are relatively uncommon (cf. Lam, 1998).¹⁰ Also uncommon are studies that connect the different variables they identify in causal chains or propose plausible causal mechanisms. Problems of incomplete model specification and omitted variables in hypothesis testing are widespread in the literature on common property. These problems of method often characterize even those writings that claim to address problems of substance.¹¹ Therefore, it is likely that many conclusions from case studies of common-pool resource management and even from comparative studies of the commons are relevant primarily for the sample under consideration, rather than applying more generally.

Of course, there are good reasons for the existence of these problems in studies of sustainability on the commons. Some of these reasons have to do with difficulties of data availability and collection, regional and area expertise of those who study the commons, and disciplinary allegiances. But for a viable and compelling theory of common-pool resource management, something that is even more important today because of the increasing number of policy experiments under way (FAO, 1999), scholarship on the commons will inevitably need to move beyond its existing constraints.

2. ANALYSES OF SUSTAINABLE GOVERNANCE OF COMMON-POOL RESOURCES

The works by Robert Wade, Elinor Ostrom, and Jean-Marie Baland and Jean-Philippe Platteau represent three of the most significant book-length analyses of local, community-

based efforts to manage and govern common-pool resources. They are among the earliest careful comparative studies that are attentive to theoretical developments at the time of writing, and use theory to inform their analysis. In addition, they use a relatively large sample of cases to analyze the validity of theoretical insights. For this paper, one of the more appealing aspects of their argument is that after wide-ranging discussion and consideration of many factors, each arrives at a summary set of conditions and conclusions that they believe to be critical to sustainability of commons institutions. Together, their conclusions form a viable starting point for the analysis of the ensemble of factors that account for sustainable institutional arrangements to manage the commons.

Since there is no single widely accepted theory of the sustainability of common property institutions, it is important to point out that differences of method are significant among these three authors. Wade (1988) relies primarily on data he collected from South Indian villages in a single district. His sample is not representative of irrigation institutions in the region, but at least we can presume that the data collection in each case is consistent. To test her theory, Ostrom (1990) uses detailed case studies that other scholars generated. The independent production of the research she samples means that all her cases may not have consistently collected data. But she examines each case using the same set of independent and dependent variables. Baland and Platteau (1996) are more relaxed in the methodological constraints they impose upon themselves. To motivate their empirical discussion, they use a wide-ranging review of the economic literature on property rights, and the inability of this literature to generate unambiguous conclusions about whether private property is superior to regulated common property. But to examine the validity of their conclusions, they use information from different sets of cases. In an important sense, therefore, the "model specification" is incomplete in each test (King, Keohane, & Verba, 1994). Further, even if these authors differ in their methods, they occupy the same discursive space and are familiar with each other's work. As a result, their conclusions are not strictly independent.¹²

Wade's (1988) important work on commonly managed irrigation systems in South India uses data on 31 villages to examine when it is that

corporate institutions arise in these villages and what accounts for their success in resolving commons dilemmas.¹³ His arguments about the origins of commons institutions point, in brief, toward environmental risks being a crucial factor. But he also provides a highly nuanced and thoughtful set of reasons about successful management of commons. According to Wade, effective rules of restraint on access and use are unlikely to last when there are many users, when the boundaries of the common-pool resource are unclear, when users live in groups scattered over a large area, when detection of rule-breakers is difficult, and so on (Wade, 1988, p. 215).¹⁴ Wade specifies his conclusions in greater detail by classifying different variables under the heading of resources, technology, user group, noticeability, relationship between resources and user group, and relationship between users and the state (1994, pp. 215–216).¹⁵

In all, Wade finds 14 conditions to be important in facilitating successful management of the commons he investigates.¹⁶ Most of his conditions are general statements about the local context, user groups, and the resource system, but some of them are about the relationship between users and resources. Only one of his conditions pertains to external relationships of the group or of other local factors.

Studies appearing since Wade's work on irrigation institutions have added to his list of factors that facilitate institutional success, but some factors have regularly received mention. Among these are small group size, well-defined bounds on resources and user group membership, ease in monitoring and enforcement, and closeness between the location of users and the resource. Consider, for example, the eight design principles that Ostrom (1990) lists in her defining work on community-level governance of resources. She crafts these principles on the basis of lessons from a sample of 14 cases where users attempted, with varying degrees of success, to create, adapt, and sustain institutions to manage the commons. A design principle for Ostrom is "an essential element or condition that helps to account for the success of these institutions in sustaining the CPRs and gaining the compliance of generation after generation of appropriators to the rules in use" (1990, p. 90). She emphasizes that these principles do not provide a blueprint to be imposed on resource management regimes. Seven of the principles are present in a significant manner in all the robust commons institutions she ana-

lyzes, and the eighth covers cases that are more complex, such as federated systems.

Although Ostrom lists eight principles, on closer examination the number of conditions seems larger.¹⁷ For example, her first design principle refers to clearly defined boundaries of the common-pool resource and of membership in a group, and is in fact listed as two separate conditions by Wade. Her second principle, similarly, is an amalgam of two elements: a match between level of restrictions and local conditions, and between appropriation and provision rules. Ostrom thus should be seen as considering 10, not eight, general principles as facilitating better performance of commons institutions over time.

A second aspect of the design principles, again something that parallels Wade's facilitating conditions, is that most of them are expressed as general features of long-lived, successful commons management rather than as relationships between characteristics of the constituent analytical units or as factors that depend for their efficacy on the presence (or absence) of other variables. Thus, principle seven suggests that users are more likely to manage their commons sustainably when their rights to devise institutions are not challenged by external government authorities. This is a general principle that is supposed to characterize all commons situations. In contrast, principle two suggests that restrictions on harvests of resource units should be related to local conditions (rather than saying that the lower (or higher) the level of withdrawal, the more (or less) likely would be success in management). Thus, it is possible to imagine certain resource and user group characteristics for which withdrawal levels can be high, and setting them at a low level may lead to difficulties in management. Where supplements to resource stock are regular and high, and user group members depend on resources significantly, setting harvest levels low will likely lead to unnecessary rule infractions.

Finally, most of Ostrom's principles focus on local institutions, or on relationships within the local context. Only two of them, about legal recognition of institutions by higher level authorities and about nested institutions, can be seen to express the relationship of a given group with other groups or authorities.

Baland and Platteau (1996), in their comprehensive and synthesizing review of a large number of studies on the commons follow a similar strategy as does Ostrom (1990).

Beginning with an examination of competing theoretical claims by scholars of different types of property regimes, they suggest that the core argument in favor of privatization “rests on the comparison between an idealized fully efficient private property system and the anarchical situations created by open access” (1996, p. 175). Echoing earlier scholarship on the commons, they emphasize the distinction between open access and common property arrangements and suggest that when private property regimes are compared with regulated common property systems (and when information is perfect and there are no transaction costs), then “*regulated common property and private property are equivalent from the standpoint of the efficiency of resource use*” (1996, p. 175, emphasis in original).¹⁸ Further, they argue, the privatization of common-pool resources or their appropriation and regulation by central authorities tends to eliminate the implicit entitlements and personalized relationships that are characteristic of communal property arrangements. These steps, therefore, are likely to impair efficiency, and even more likely to disadvantage traditional users whose rights of use seldom get recognized under privatization or expropriation by the state.¹⁹

Their review of the existing literature from property rights and economic theory leads them to assert that “none of the property rights regimes appears intrinsically efficient” and that the reasons for which common property arrangements are criticized for their inefficiency are also likely to be haunt privatization measures. Where agents are not fully aware of ecological processes, or are unable to protect their resources against intruders, or are mired in levels of poverty that drive them to overexploit environmental resources, state intervention may be needed to support both private and common property (1996, p. 178). In the absence of unclear theoretical predictions regarding the superiority of one property regime over another, they argue in favor of attention to specific histories of concrete societies, and explicit incorporation of cultural and political factors²⁰ into analysis. Only then might it be possible to know when people cooperate, and when inveterate opportunists dominate and make collective action impossible.

After a wide-ranging review of empirical studies of common-pool resource management, and focusing on several variables that existing research has suggested as crucial to community-level institutions, Baland and Platteau arrive

at conclusions that overlap in some ways with those of Wade, and Ostrom. Small size of a user group, a location close to the resource, homogeneity among group members, effective enforcement mechanisms, and past experiences of cooperation are some of the themes they emphasize as significant to achieve cooperation (Baland & Platteau, 1996, pp. 343–345). In addition, they also highlight the importance of external aid and strong leadership.²¹

As is true for Ostrom, several of the factors they list are in reality a joining together of multiple conditions. For example, their third point incorporates what Wade and Ostrom would count as four different conditions: the relationship between the location of the users and the resources upon which they rely, the ability of users to create their own rules, the ease with which rules are understood by members of the user group and are enforced, and whether rules of allocation are considered fair. Some of their other conditions also signify more than one variable. Therefore, instead of eight conditions, Baland and Platteau should be seen to identify 12 conditions.

The conclusions that Baland and Platteau reach are typically stated as general statements about users, resources, and institutions rather than about relationships between characteristics of these constituent analytical units. In comparison to Wade and Ostrom, Baland and Platteau pay somewhat greater attention to external forces, as for example, in their discussions of external aid, enforcement, and leadership with broad experience.

The brief review of these three landmark works makes evident some of the patterns in their conclusions. They all conclude that members of small local groups can design institutional arrangements to help manage resources sustainably.²² Laying to rest doubts about the ability of community user groups to manage resources, they go further and identify a set of conditions that are positively related to local self-management of resources. In addition, they use theoretical insights to defend and explain the empirical regularities they find. The regularities in successful management that they discover pertain to one of four sets of variables: (a) characteristics of resources, (b) nature of groups that depend on resources, (c) particulars of institutional regimes through which resources are managed, and (d) the nature of the relationship between a group, and external forces and authorities such as markets, states, and technology.²³

Characteristics of resources can include, for example, such features as well-defined boundaries of the resource, riskiness and unpredictability of resource flows, and mobility of the resource. Characteristics of groups, among other aspects, relate to size, levels of wealth and income, different types of heterogeneity, power relations among subgroups, and past experience. Particulars of institutional regimes have an enormous range of possibilities, but some of the critical identified aspects of institutional arrangements concern monitoring, sanctions, adjudication, and accountability. Finally, a number of characteristics pertain to the relationships of the locally situated groups, resource systems, and institutional arrangements with the external environment in the form of demographic changes, technology, markets, and different levels of governance. Table 1 summarizes, and lists under these four basic categories, the conditions that the three

authors under consideration have identified as important.

The analysis of the information in Table 1 reveals several significant obstacles to the specification of a universal set of factors that are critical to successful governance of common-pool resources. Of these, three relate to substantive issues, and two stem from conundrums of method. The substantive obstacles can be overcome at least in part by examining other important research on common property. But unfortunately, attempts to redress substantive issues tend to exacerbate the problems of method. In consequence we have to contend with the possibility that the enterprise of attempts to create a list of critical enabling conditions that apply universally can founder at a very basic epistemological level. Instead of focusing on lists of factors that apply to all commons institutions, it may be more fruitful to focus on configurations of conditions

Table 1. *Synthesis of facilitating conditions identified by Wade, Ostrom, and Baland and Platteau*

1. *Resource system characteristics*

- (i) Small size (RW)
- (i) Well-defined boundaries (RW, EO)

2. *Group characteristics*

- (i) Small size (RW, B&P)
- (ii) Clearly defined boundaries (RW, EO)
- (iii) Shared norms (B&P)
- (iv) Past successful experiences—social capital (RW, B&P)
- (v) Appropriate leadership—young, familiar with changing external environments, connected to local traditional elite (B&P)
- (vi) Interdependence among group members (RW, B&P)
- (vii) Heterogeneity of endowments, homogeneity of identities and interests (B&P)

1. and 2. *Relationship between resource system characteristics and group characteristics*

- (i) Overlap between user group residential location and resource location (RW, B&P)
- (ii) High levels of dependence by group members on resource system (RW)
- (iii) Fairness in allocation of benefits from common resources (B&P)

3. *Institutional arrangements*

- (i) Rules are simple and easy to understand (B&P)
- (ii) Locally devised access and management rules (RW, EO, B&P)
- (iii) Ease in enforcement of rules (RW, EO, B&P)
- (iv) Graduated sanctions (RW, EO)
- (v) Availability of low cost adjudication (EO)
- (vi) Accountability of monitors and other officials to users (EO, B&P)

1. and 3. *Relationship between resource system and institutional arrangements*

- (i) Match restrictions on harvests to regeneration of resources (RW, EO)

4. *External environment*

- (i) Technology: Low cost exclusion technology (RW)
 - (ii) State:
 - (a) Central governments should not undermine local authority (RW, EO)
 - (b) Supportive external sanctioning institutions (B&P)
 - (c) Appropriate levels of external aid to compensate local users for conservation activities (B&P)
 - (d) Nested levels of appropriation, provision, enforcement, governance (EO)
-

that bear a causal relationship with sustainability. The identification of such configurations also requires sharp analytical insights, and such insights can follow both from comparative research that is either based on carefully selected cases, or on datasets that can be analyzed through statistical techniques. The critical step is the specification of a theoretical argument to motivate the case selection and data collection.

3. SUPPLEMENTING THE SET OF SUBSTANTIVE FACTORS

The set of factors identified by Wade and Ostrom, and Baland and Platteau is relatively deficient in considering resource characteristics. Only two aspects of resource systems find explicit mention by the three authors. Baland and Platteau do not include aspects of resources in their final conclusions at all.

The limited attention to resource characteristics is unfortunate. Even if we leave aside the climatic and edaphic variables that may have an impact on levels of regeneration and possibility of use, there are grounds to believe that other aspects of a resource may be relevant to how and whether users are able to sustain effective institutions.²⁴ For example, it is easy to see that extensive movements of many forms of wildlife can make them less well suited to local management alone (Naughton-Treves & Sanderson, 1995).²⁵ This aspect of common-pool resources is different from Wade's argument about size. The issue is one of mobility of the resource, and volatility and unpredictability in the flow of benefits from a resource; it is not just about size.

In a carefully argued paper on resource characteristics, Blomquist, Schlager, Tang, and Ostrom (1994) focus on two physical features of resource systems: stationarity and storage. Stationarity refers to whether a resource is mobile and storage concerns the extent to which it is possible to "collect and hold resources" (p. 309). Stationarity and storage, if considered as dichotomous variables, lead to a fourfold typology of common-pool resources. Resources such as wildlife are mobile and cannot be stored, and groundwater basins and lakes have stationary water resources characterized that can be stored. Shellfish and grazing lands are stationary but their degree of storage is limited, and conversely, irrigation canals with reservoirs have water resources that can be stored, but are

mobile. Sheep flocks and cattle herds, owned and/or managed as common property, would also fall in this last category. After examining the impact of these two physical characteristics of resources on externalities, they conclude that these two factors have an impact on management because of their relationship to information. Greater mobility of resources and storage problems make it more difficult for users to adhere to institutional solutions to common-pool resource dilemmas because of their impact on the reliability and costs of information needed for such solutions.²⁶ This point can be seen also as a question about the extent to which resource availability is predictable, something noted by Naughton-Treves and Sanderson (1995) as well, and how unpredictability affects the ability of users to allocate available resources or undertake activities that would augment supply.

A second broad area to which the analyses by Wade, Ostrom, and Baland and Platteau pay only limited attention is the external social, institutional, and physical environment.²⁷ Thus none of them explicitly remark on demographic issues in their conclusions, and they place equally small emphasis on market-related demands that may make local demand pressures relatively trivial. But variations in levels of population and changes in demographic pressures, whether as a result of local changes or through migration, are surely significant in influencing the ability of users to create rules to manage resources. Indeed, there is an enormous literature that focuses on questions of population and market pressures on resource use and asserts the importance of these two complex factors.²⁸

Writings on the role of population in resource management have a long history and an impressive theoretical pedigree (Ehrlich, 1968, pp. 15–16; Malthus, 1960). Much recent scholarship links environmental degradation in a relatively straightforward fashion with population growth (Durning, 1989; Fischer, 1993; Hardin, 1993; Low & Heinen, 1993; Pimental, Harman, Pacenza, Pecarsky, & Pimental, 1994). On the whole it is clear that the debate is highly polarized. Some scholars assert that population pressures have an enormous effect (Ehrlich & Ehrlich, 1991; Myers, 1991; Wilson, 1992), and a smaller but vocal group suggests the impact to be far more limited (Lappé & Shurman, 1989; Leach & Mearns, 1996; Simon, 1990; Tiffen, Mortimore, & Gichuki, 1994; Varughese & Ostrom, 2001).

The story is somewhat similar where markets are concerned, except that the terms of the debate are less polarized and there is wider agreement that increasing integration with markets usually has an adverse impact on the management of common-pool resources, especially when roads begin to integrate distant resource systems and their users with other users and markets (Chomitz, 1995; Young, 1994). As local economies become better connected to larger markets, and common property systems confront cash exchanges, subsistence users are likely to increase harvesting levels because they can now exploit resources for cash income as well (Carrier, 1987; Colchester, 1994, pp. 86–87; Stocks, 1987, pp. 119–120). Analogous to market articulation is the question of technological means available to exploit the commons. Sudden emergence of new technological innovations that transform the cost-benefit ratios of harvesting products from commons are likely to undermine the sustainability of institutions. Sufficient time may be necessary before users are able to adapt to the new technologies.

The arrival of markets and new technologies, and the changes they might prompt in existing resource management regimes, is not a bloodless or innocent process (Oates, 1999). Typically, new demand pressures originating from markets and technological changes are likely to create different incentives about the products to be harvested, technologies of harvest, and rates of harvest. They are also likely to change local power relations as different subgroups dependent on common-pool resources gain variable levels of access, and maneuver to consolidate their gains (Agrawal, 1999; Fernandes, Menon, & Viegas, 1988; Young, forthcoming). In many cases, as new market actors gain access to a particular common-pool resource, they may seek alliances with state actors in efforts to privatize commons or defend the primacy of their claims (Azhar, 1993; Ascher & Healy, 1990). Indeed, state officials can themselves become involved in the privatization of commons and the selling of products from resources that were earlier under common property arrangements (Agarwal, 1986; Rangarajan, 1996; Sivaramakrishnan, 1999; Skaria, 1999).

The specific arguments above about changes in resource use and management institutions under the influence of markets are in line with more general perceptions about the transformative role and potential of new capital,

market forces, and institutions. But clearly, differences in market and population pressures need greater attention in any examination of the factors that affect sustainability of commons institutions. It is important not only to attend to different levels of these pressures, but also to the effect of changes and rates of changes in them.

As the ultimate guarantor of property rights arrangements, the role of the state and overarching governance structures is perhaps central in the functioning of common-pool resources. It is true that many communities and local user groups have the right to craft and implement new institutional arrangements. But unspecified rights and the settlement of major disputes often cannot be addressed without the intervention of the state (Rangan, 1997). Although the three authors are more attentive to the potential role of central governments in local commons than they are to issues of population and market pressures, the nature of local-state relations requires more careful exploration.²⁹ As an increasing number of governments decentralizes control over diverse natural resources to local user groups, questions about the reasons behind such loosening of control and the effects of differences in organization of authority across levels of governance become extremely important. A large number of studies have attempted to explore these issues, either by focusing on decentralization of resource management in general (Ascher, 1995; Poffenberger, 1990), or by examining the role of resource management-related laws and national policies (Ascher & Healy, 1990; Lynch & Talbott, 1995; Repetto & Gillis, 1988). But as yet we do not have a systematic examination or clear understanding of variations in these relationships and how these variations affect common-pool resource management.

One reason scholars of commons have focused so little on external factors such as markets, technology, states, and population pressures lies simply in the nature of their intellectual enterprise. Because their efforts have aimed at showing the importance of local groups, institutions and resource system-related factors, they have focused relatively less on those factors that other scholars earlier examined, often to the exclusion of local social and political dynamics. But it seems that in focusing upon the locality and the importance of local factors, the current scholarship on the commons has tended to ignore how what is

local is often created in conjunction with the external and the nonlocal environment. The almost exclusive focus upon the local has made the work on common property vulnerable to the same criticisms that apply to the work of those anthropologists who see their field sites as miniature worlds in themselves, changing only in response to political or economic influences from outside. The attention to the locality in preference to the context within which localities are shaped and produced has thus prevented the emergence of a better understanding of how factors such as population, market demand, and state policies interact with local institutional arrangements and resource systems.

My argument in favor of attention to markets, demography, and the state addresses the nature and importance of contextual factors only to a partial degree. Clearly, the context of any study comprises far more than just markets, demographic changes, and encompassing governance arrangements.³⁰ In research, the context can be defined as the encompassing variables that remain constant for a given study, but not across studies. Precisely because the historical, spatial, social, or political context of a given study likely remains constant for all analytical purposes, it becomes possible to ignore it. But surely, in any real world situation, the state of contextual variables may affect the impact of variables that are being studied explicitly.

It is likely impossible to define *a priori* the ensemble of factors that constitute the context because contextual factors for a given study depend on the questions it seeks to answer. But, studies of commons that examine institutional sustainability can afford to ignore the nature of markets and market-related changes, population and demographic changes, and the state and its policies only when these remain constant. For many single-time period, single-location case studies, inattention to these critical contextual variables may be justifiable. But where studies seek to develop more general arguments, attention to context and how contextual factors relate to specified causal arguments become extremely important.

Even where the locality itself is concerned, and even where some important features of groups that manage commons are concerned, there are important gaps in our understanding. Take three aspects of groups as an illustration: size, heterogeneity, and poverty.

According to an enormous literature on the commons and collective action, sparked in part

by Olson's seminal work (1965), smaller groups are more likely to engage in successful collective action. This conclusion is supported by Baland and Platteau (1999, p. 773) who reiterate Olson: "The smaller the group the stronger its ability to perform collectively." But other scholars (Hardin, 1982) have remarked on the ambiguities in Olson's argument and suggested that the relationship between group size and collective action is not very straightforward. For example, Marwell and Oliver (1993, p. 38) emphatically claim, "a significant body of empirical research... finds that the size of a group is positively related to its level of collective action." Agrawal and Goyal (2001), use two analytical features of common-pool resources—imperfect exclusion and lumpiness of third party monitoring³¹—to hypothesize a curvilinear relationship between group size and successful collection action. They test their hypothesis using systematically collected data from a sample of 28 cases from the Kumaon Himalaya, and explain why a curvilinear relationship is more likely than a monotonic one. The current state of knowledge is perhaps best summarized by Ostrom (1997), who says that the impact of group size on collective action is usually mediated by many other variables. These variables include the production technology of the collective good, its degree of excludability, jointness of supply, and the level of heterogeneity in the group (Hardin, 1982, pp. 44–49). After more than 30 years of research on group size and collective action, there is still a need to tease out more carefully the relationship between group size and successful collective action as the state of the variables mentioned above changes.

Cumulation of knowledge into a coherent and empirically supported theory has proved even more difficult in relation to group heterogeneity. It can fairly be argued that most resources are managed by groups divided along multiple axes, among them ethnicity, gender, religion, wealth, and caste (Agrawal & Gibson, 1999). Especially significant are gender-related differences within groups because of the often critical role women play in the gathering and harvesting of products from common-pool resources, the simultaneous position of relative marginality to which they are relegated in terms of decision making, ownership of assets, and exercising political power,³² and the seeming invisibility of such relegation to the margins.

Other forms of heterogeneity within groups can be equally pernicious, however, and at any

rate, can have multiple and contradictory effects on the possibilities of collective action.³³ Wade and Baland and Platteau highlight the importance of greater interdependence among group members as a basis for building institutions that would promote sustainable resource management. In addition, Baland and Platteau also provide an initial assessment of the nature of heterogeneities by classifying them into three types and hypothesizing that heterogeneities of endowments have a positive effect on resource management whereas heterogeneities of identity and interests create obstacles to collective action. Their first point, that heterogeneity of endowments may enhance the possibility of collective action, is similar to that made by Olson (1965). But the three categories into which they classify heterogeneities are not mutually exclusive. Further, empirical evidence on how heterogeneities affect collective action is still highly ambiguous (Baland & Platteau, 1999; Kanbur, 1992; Quiggin, 1993; Varughese & Ostrom, forthcoming). Thus even in groups that have high levels of heterogeneities of interest, it may be possible to ensure collective action if some subgroups can coercively enforce conservationist institutions (Agrawal, 1999, 2000; Jodha, 1986; Peluso, 1992; but see also Libecap, 1989, 1990). On the other hand, the role of intragroup heterogeneities on distribution may be more amenable to definition. Significant research on the effects of development projects and also on commons suggests that better-off group members are often likely to gain a larger share of benefits from a resource (Agrawal, 2001).

Another locality related factor that is critical to outcomes, and on which much research has been carried out without the emergence of a consensus is the relationship between the poverty of users and their levels of exploitation of common-pool resources. Whether poverty leads to a greater reliance on the commons (Jodha, 1986) and their degradation, or do increasing levels of wealth, at least initially, lead to greater use of commons by users is a question on whose answer the contours of many commons-related policies would hinge. But to a significant degree, government interventions in this arena are based on limited information and even less reliable analysis.

For each of the three factors—size, heterogeneity, and poverty—the extent to which existing research has settled the question of the nature and direction of their effect on the sustainability of commons institutions is

uncertain at best. Whether the relationship between sustainability and these variables is negative, positive, or curvilinear seems subject to a range of other contextual and mediating factors, not all of which are clearly understood. Table 2 constitutes an effort to supplement the set of variables presented in Table 1. The additional factors presented in the table are the ones that are not followed by the name of a particular author. Although the factors in Table 2 are among those that many scholars of commons would consider most important for achieving institutional sustainability on the commons, they do not form an exhaustive set. Nor is it likely that an undisputed exhaustive set of variables can ever be created.³⁴

Table 2 lists factors that different scholars have identified as being critical to the sustainable functioning of commons institutions. Some of these factors, it can be argued, are also important in the emergence of commons institutions. For example, Ostrom (1999) examines a large literature to cull four attributes of resources and seven attributes of users that she suggests are important to the emergence of self-organization among users of a resource. Some of these—feasible improvement of the resource, and low discount rate—are absent from Table 2, since the table focuses on conditions that promote sustainable governance, not institutional emergence. But other attributes she lists are also present in Table 2, among them, predictability of benefit flow from the resource, dependence of users on the resource, and successful experience in other arenas of self-organization. Indeed, at least one of the factors that she counts as being important for emergence of commons institutions is also one of her design principles (recognition by external authorities of the ability of users to create their own access and harvesting rules). The overlap between conditions that facilitate emergence and those that facilitate continued successful functioning of institutions points to the close and complex relationship between origins and continued existence, without any suggestion that the two can be explained by an identical set of facilitating conditions.

4. ADDRESSING PROBLEMS OF METHOD

The factors presented in Table 2 above, relating to resource characteristics, group features, institutional arrangements, and the

Table 2. *Critical enabling conditions for sustainability on the commons*

<p>1. <i>Resource system characteristics</i></p> <ul style="list-style-type: none"> (i) Small size (RW) (ii) Well-defined boundaries (RW, EO) (iii) Low levels of mobility (iv) Possibilities of storage of benefits from the resource (v) Predictability <p>2. <i>Group characteristics</i></p> <ul style="list-style-type: none"> (i) Small size (RW, B&P) (ii) Clearly defined boundaries (RW, EO) (iii) Shared norms (B&P) (iv) Past successful experiences—social capital (RW, B&P) (v) Appropriate leadership—young, familiar with changing external environments, connected to local traditional elite (B&P) (vi) Interdependence among group members (RW, B&P) (vii) Heterogeneity of endowments, homogeneity of identities and interests (B&P) (viii) Low levels of poverty <p>1. and 2. <i>Relationship between resource system characteristics and group characteristics</i></p> <ul style="list-style-type: none"> (i) Overlap between user group residential location and resource location (RW, B&P) (ii) High levels of dependence by group members on resource system (RW) (iii) Fairness in allocation of benefits from common resources (B&P) (iv) Low levels of user demand (v) Gradual change in levels of demand <p>3. <i>Institutional arrangements</i></p> <ul style="list-style-type: none"> (i) Rules are simple and easy to understand (B&P) (ii) Locally devised access and management rules (RW, EO, B&P) (iii) Ease in enforcement of rules (RW, EO, B&P) (iv) Graduated sanctions (RW, EO) (v) Availability of low cost adjudication (EO) (vi) Accountability of monitors and other officials to users (EO, B&P) <p>1. and 3. <i>Relationship between resource system and institutional arrangements</i></p> <ul style="list-style-type: none"> (i) Match restrictions on harvests to regeneration of resources (RW, EO) <p>4. <i>External environment</i></p> <ul style="list-style-type: none"> (i) Technology: <ul style="list-style-type: none"> (a) Low cost exclusion technology (RW) (b) Time for adaptation to new technologies related to the commons (ii) Low levels of articulation with external markets (iii) Gradual change in articulation with external markets (iv) State: <ul style="list-style-type: none"> (a) Central governments should not undermine local authority (RW, EO) (b) Supportive external sanctioning institutions (B&P) (c) Appropriate levels of external aid to compensate local users for conservation activities (B&P) (d) Nested levels of appropriation, provision, enforcement, governance (EO)

external environment, relate to the substantive aspects of the careful analyses that scholars of common property have conducted. Continued successful research on the commons will depend on the ability of those interested in the commons to resolve some important methodological obstacles that this list of factors raises.

One important problem that is evident from the factors specified in Table 2 is a consequence of the fact that most of the conditions cited as facilitating successful use of common-pool resources are general: they are expected to pertain to all common-pool resources and

institutions, rather than being related to or dependent on some aspect of the situation.³⁵

As an illustration, consider the first two conditions in Table 2 under the broad class of resource system characteristics: small size, and well-defined boundaries. According to Wade, relatively small sized resource systems are likely to be managed better under common property arrangements, and according to both Ostrom and Wade, resources that have well-defined boundaries are likely better managed as common property. Although these conditions are couched as general statements about all

commons, it is in principle possible, and perhaps more defensible, to think of the effects of resource size or boundary definition as contingent, dependent on the state of one or more other variables.³⁶

It is possible, thus, to suggest that boundaries of resources should be well defined when flow of benefits are predictable and groups relying on them stationary, but when there are large variations in benefit flows, and/or the group relying on a resource system is mobile, then resource boundaries should be fuzzy so as to accommodate variations in group needs and resource flows. This example also brings home the importance of context. If the resources and groups being analyzed are all stationary, and there are few variations over time in the flow of benefits from the resource, then it may be possible to treat characteristics of the resource system as part of the context, and no explicit attention to these characteristics may be necessary. But if a given study comprises cases of common-pool resources that are highly variable in their outputs over time as well as resources that produce steady flows, then resource characteristics, from being part of the context, may very well become highly significant elements in the specification of general lessons from the study.

The effects of resource size, it can be similarly argued, are also contingent on the state of other variables, rather than always flowing in the same direction. Instead of accepting that small resource systems are likely to have a positive relationship with institutional sustainability, it may be more defensible to hypothesize that "size of the resource system should vary with group size, and for larger resources, authority relations within a group should be organized in a nested fashion." Attempts to identify such conjunctural relationships are critically important for the commons literature, and for formulating commons-related policies because many of the causal relationships are likely contingent relationships where the impact of a particular variable depends on the state attained by a different causal factor, or on the relationship of the variable with some contextual factors.

As another example, consider the question of fairness in allocation of benefits from the commons. Typically, intuition as well as much of the scholarship on the commons suggests that fairer allocation of benefits is likely to lead to more sustainable institutional arrangements. But in a social context characterized by highly

hierarchical social and political organization, institutional arrangements specifying asymmetric distribution of benefits may be more sustainable even if they are entirely unfair. The caste system and racial inequalities constitute two familiar examples of such hierarchical social arrangements.

The most significant issues of method stem, however, from the sheer number of conditions that seem relevant to the successful management of common-pool resources.³⁷ Wade, Ostrom, and Baland and Platteau jointly identify 36 important conditions. On the whole there are relatively few areas of common emphasis among them. If one compares across their list of conditions, interprets them carefully, and eliminates the common conditions, 24 different conditions are still to be found (as in Table 1). Because these authors argue from theoretical foundations, the conditions they find empirically critical in their sample can also be defended on broader grounds. Thus it is difficult to eliminate *a priori* any of the conditions they consider important.

The discussion of substantive conclusions of Wade, Ostrom, and Baland and Platteau in the previous section reveals that even the 24 factors they have identified do not exhaust the full set of conditions that may be important in common-pool resource management.³⁸ Once we take into account additional factors identified in the vast literature on the local governance of common-pool resources as being important, it is reasonable to suppose that the total number of factors that affect successful management of commons may be somewhere between 30 and 40. Table 2 lists a total of 33 factors. Not all of these factors are independent of each other. Some of them are empirically correlated, as for example, group size and resource size, or shared norms, interdependence among group members, and fairness in allocation rules, or ease of enforcement and supportive external sanctioning institutions. We do not, currently have any reliable way of assessing the degree of correlation among these and other variables that have emerged as important in the discussion.

Further, because the effects of some variables may depend on the state of other variables and interactional effects among variables may also affect outcomes, any careful analysis of sustainability on the commons needs to incorporate interaction effects among variables. As soon as we concede the possibility that somewhere between 30 and 40 variables affect the

management of common-pool resources, and that some of these variables may have important interactional effects, we confront tremendous analytical problems.

When a large number of causal variables potentially affect outcomes, the absence of careful research design that controls for factors that are not the subject of investigation makes it almost impossible to be sure that the observed differences in outcomes are indeed a result of hypothesized causes. Consider an example. One can select between large group size or high levels of mobility as the relevant causal variables that adversely affect successful management only if the selected cases are matched on other critical variables, and differ (significantly) in relation to group size and mobility. If the researcher does not explicitly take into account the relevant variables that might affect success, then the number of selected cases must be (much) larger than the number of variables. But there are no studies of common-pool resources that develop a research design by explicitly taking into account the different variables considered critical to successful management, as they have been specified in Table 2.³⁹ In an important sense, then, many of the existing works on the management of common-pool resources, especially those conducted as case studies or those that base their conclusions on a very small number of cases, suffer from the problem that they do not specify carefully or explicitly the causal model they are testing. In the absence of such specification, qualitative studies of the commons are potentially subject to significant problems of method. Two of the most important of these problems are those stemming from "omitted variable bias," and the problem of endogeneity (King *et al.*, 1994, pp. 168–182, 185–195). These biases resulting from deficiencies of method have the potential to produce an emphasis on causal factors that may not be relevant, ignoring of other factors that may be relevant, and the generation of spurious correlations.

An incorrect emphasis on some causal variables may also result from the underlying problem of multiple causation, where different causal factors or combinations of causal factors may have similar impacts on outcomes (Ragin, 1987). Thus unpredictable benefit flows and unfair allocation may both have adverse effects on durability of institutions. But in a particular case, it is possible that although benefit flows are unpredictable, they have a much smaller

effect on outcomes compared to "unfair allocation of benefits," and that the researcher has ignored the nature of allocation. In such a situation, the conclusions from the study would be flawed in that they would under- or over-emphasize variables inappropriately. This issue is especially acute for commons researchers because conclusions from much case study analysis are couched in terms of directional effects of independent variables: positive or negative. "Unpredictable benefit flow," it can be argued, undermines the sustainability of commons institutions. In a case study it may be difficult to discover how exactly particular independent variables are related to each other, or the strength of their relationship to observed outcomes. Single case analyses, especially when they cover a single time period, limit conclusions about cause-effect relationships to bivariate statements when actual relationships are likely to be more contingent, or continuous. This is especially true when the case itself is also the unit of analysis rather than comprising multiple observations on a different unit of analysis, for example, the household.

The large number of variables potentially affecting the sustainability of institutions that govern common resources, thus, have important theoretical implications for future research. The most important implication perhaps concerns research design. Because the requirements of a random or representative selection of cases are typically very hard to satisfy where common-pool resources are involved (even when the universe of cases is narrowed geographically), purposive sampling easily becomes the theoretically defensible strategy for selecting cases whether the objective is statistical analysis or structured comparative case analysis. In purposive sampling, the selected cases are chosen for the variation they represent on theoretically significant variables. This strategy can be defended both because it is easier to implement than an effort to select a representative sample, and because it requires explicit consideration of theoretically relevant variables (Bennett & George, forthcoming; Stern & Druckman, forthcoming).⁴⁰

The large number of variables that are potentially relevant to sustainability of commons institutions also has implications for data analysis. One of the strategies that scholars on the commons may need to follow is to reduce the number of closely related variables by constructing indices that combine them. Thus for example, several of the factors listed

under "Institutional Arrangements" in Table 2 may be sufficiently correlated to permit the creation of an index of "enforcement strength." Especially suitable for such an index may be "graduated sanctions," "ease in enforcement of rules," and "availability of low cost adjudication." Such indices may also be formed out of variables that are listed under different headings in that table. Thus, an indicator of stress on existing institutions might be revealed by bringing together such factors as "gradual change in levels of demand," "low levels of articulation with external markets," and "gradual change in articulation with external markets."

There is no general theory of purposive sampling apart from the commonsensical consideration that selected cases should represent variation on theoretically significant causal factors. Therefore two factors are likely to be critical in research design: awareness of the variables that are theoretically relevant, and particular knowledge of the case(s) to be researched so that the theoretically relevant variables can be operationalized. For example, when constructing a research design where the variables of interest have to do with mechanisms of monitoring and sanctioning, it would be important for the researcher to be aware of the different forms of monitoring that groups can use. The presence or absence of a guard may only be indicative of the presence or absence of third-party monitoring, and may reveal nothing about whether the group being studied has monitoring. Other forms of monitoring would include mutual monitoring and rotational monitoring, where households in a group jointly share the tasks related to monitoring and enforcement.

The information presented in Table 2, organized under four major categories, can therefore be useful in the creation of a research design, and case selection for comparative studies or data collection for statistical studies.⁴¹ Given a particular context, the information in Table 2 can help in the selection of the variables that need closest attention in the selection of cases. For example, if the cases to be selected lie in the same ecological zone and represent the same resource type, then variables related to resource characteristics may not be very important for case selection. The obvious tradeoff for this reduction in the number of variables is that the research is likely to provide only limited insights into how differing levels of predictability affect institutional sustainability.

If the objective of the research was to understand the effects of unpredictability, then it would be imperative to select cases where resource output varied from highly predictable to unpredictable. Structured comparisons, where researchers select their cases to maximize the variation on independent causal variables, and theoretically account for why the omitted variables are not as likely to be important in the proposed comparative work, will then be more reliable in generating compelling conclusions.

At the same time, a large-N study of commons institutions that incorporated more than 30 independent variables and their interactions would require impossibly large samples and entail astronomically high costs. Researchers conducting such studies are likely to face complex problems in interpreting the data and stating their results, even were it possible to collect information on thousands of cases. Even were it possible to create purposive samples of cases that accommodated variation on more than 30 causal factors and their interactions, the problems related to contingent and multiple causation will not fade away. The problems of contingent and multiple causation make it necessary that even those researchers of the commons who use statistical data to postulate causal relationships among the critical theoretical variables they have identified, explain why the variables they do not examine are likely not important for their work, and only then test the causal links they have postulated among their variables.

A two-pronged approach to advance the research program related to institutional solutions to commons dilemmas, then seems advisable. On the one hand, scholars of commons need to deploy theoretically motivated comparative case analyses to identify the most important causal mechanisms and narrow the range of relevant theoretical variables and their interactions. On the other hand commons scholars also need to conduct large-N studies to identify the strength of causal relations.⁴² Only then would it be possible to advance our understanding of how institutional sustainability can be achieved on the commons.

Once again, the list of factors in Table 2 can serve as a starting point for postulating such causal links. For example, a significant body of research on the commons suggests that the nature of monitoring and enforcement is a crucial variable in determining whether existing institutional arrangements to manage the commons will endure. This is to be expected

since common property institutions typically are aimed to constrain resource use, and therefore are likely to require enforcement. A complex causal chain to test this finding carefully might be constructed out of the following three hypotheses that connect some of the factors listed in Table 2 in causal chains (see Figure 1):

- (a) small size of the group, low levels of mobility of the resource, and low levels of articulation with markets promote high levels of interdependence among group members; Effects of resource size are unclear;
- (b) interdependence, social capital, and low levels of poverty promote well-defined boundaries for the group and the resource; and
- (c) well-defined boundaries, ease of enforcement, and recognition of group rights by external governments leads to sustainable institutional performance.

Other variables may be causally related to social capital, ease of enforcement, or recogni-

tion of group rights, and such relationships among different variables can be elaborated in turn. The effect of institutional arrangements related to monitoring and enforcement may be dwarfed by variations in population density or unpredictability of benefit flows. But it may still be possible to investigate some of the above causal links with a relatively small number of case studies because each comparative study may be used to throw light upon only one or two causal chains. The investigation of such causal chains, especially with attention to contextual variables upon which particular causal effects may be dependent, therefore, continues to be necessary in commons research.

Consider another example. Common property theorists have argued that high levels of dependence on resources in a subsistence-oriented economy is likely to be associated with better governance of common resources. Once again, a chain of causal relationships might be stated as follows (see Figure 2):

$$\begin{aligned} \text{Durable Institutions } (\uparrow) &= f(\text{Boundary Definition } (\uparrow), \text{ Strong} \\ &\quad \text{Enforcement } (\uparrow), \text{ Government Recognition } (\uparrow)) \\ &\quad + \text{ error} \\ \text{Boundary Definition } (\uparrow) &= f(\text{Group Interdependence } (\uparrow), \text{ Poverty } (\downarrow), \text{ Social} \\ &\quad \text{Capital } (\uparrow)) + \text{ error} \\ \text{Group Interdependence } (\uparrow) &= f(\text{Group Size } (\downarrow), \text{ Resource Size } (\downarrow), \\ &\quad \text{Mobility } (\downarrow), \text{ Market Pressures } (\downarrow)) + \text{ error} \end{aligned}$$

The above equations would lead to:

$$\begin{aligned} \text{Durable Institutions } (\uparrow) &= f(\text{Group Size } (\downarrow), \text{ Resource Size } (\downarrow), \\ &\quad \text{Mobility } (\downarrow), \text{ Market Pressures } (\downarrow), \text{ Poverty } (\downarrow), \\ &\quad \text{Social Capital } (\uparrow), \text{ Enforcement } (\uparrow), \\ &\quad \text{Government Recognition } (\uparrow)) + \text{ error} \end{aligned}$$

where (\uparrow) signifies an increase; (\downarrow) signifies a decrease; and (\downarrow) signifies an undetermined effect.

Figure 1. Illustrative set of causal links in commons research (1).

$$\text{Durable Institutions } (\uparrow) = f(\text{Strong Enforcement } (\uparrow), \text{Predictable Benefit Flow } (\uparrow)) + \text{error}$$

$$\text{Strong Enforcement } (\uparrow) = f(\text{Dependence on Resource } (\uparrow), \text{Migration Levels } (\downarrow)) + \text{error}$$

$$\text{Resource Dependence } (\uparrow) = f(\text{Market Pressures } (\downarrow), \text{Population Pressures } (\uparrow), \text{Migration Levels } (\downarrow), \text{Technology Levels } (\downarrow)) + \text{error}$$

The above equations would lead to

$$\text{Durable Institutions } (\uparrow) = f(\text{Technology Levels } (\downarrow), \text{Migration Levels } (\downarrow), \text{Population Pressures } (\uparrow), \text{Market Pressures } (\downarrow), \text{Strong Enforcement } (\uparrow), \text{Predictable Benefit Flows } (\uparrow)) + \text{error}$$

where (\uparrow) signifies an increase; (\downarrow) signifies a decrease; and (\downarrow) signifies an undetermined effect.

Figure 2. *Illustrative set of causal links in commons research (II).*

(a) low levels of articulation with the market, high population pressures, and low availability of substitutes promotes high dependence on common resources; Effects of technological change are unclear;

(b) high dependence on common resources and low possibilities of migration lead users to devise strong constraints on resource use including strong enforcement mechanisms; and

(c) strong enforcement mechanisms, and predictability in flow of benefits leads to sustainable institutional arrangements for governing common resources.

Figures 1 and 2 indicate how some of the causal factors, presented in Table 2, can be combined into causal chains. They also signal some of the problems of method this paper has highlighted. They show that different analysts, depending on the context, may choose to highlight very different causal variables to explain the same phenomenon. They also show how multiple causation is a real world phenomenon that most commons scholars need to confront explicitly. Finally, they show that the use of the variables presented in Table 2

must be informed by the knowledge of the analyst about his or her specific cases if the variables are to be translated into specific empirical proxies.

To examine such causal links as presented for illustrative purposes in Figures 1 and 2, it may not be necessary to launch fresh case studies. Given the large number of studies of commons dilemmas that exist already, it is likely possible to draw on their empirical contents, and compare them systematically for understanding the operations of specific causal mechanisms. Postulating causal links among the listed variables can also help reduce the total number of variables on which data needs to be collected, and thereby make large-N studies more practical. But it should also be obvious that to investigate the full ensemble of relationships depicted in Figure 1, it will be necessary to undertake analyses that draw information from a large number of studies that contain data on each of the identified variables. A large number of studies are also important because more than one empirical measure might be needed to assess some of the theoretical variables listed in the figure.

5. CONCLUSION

This paper examines three of the more influential studies in the field of common property, and compares their findings to ascertain whether there is widespread agreement among scholars of commons on the set of causal variables that are most relevant to sustainability of institutions that shape resource use and management. Although the paper finds some agreement, the set of relevant variables turns out to be a large number, potentially creating obstacles to the project of building a systematic, empirically-based theory of common property. These obstacles exist in the shape of noncomparability of results from different studies, the problem of spurious correlation, and the difficulty of avoiding multiple and contingent causation in single case studies. To address these problems, the paper advocates careful attention to research design, index construction to reduce the number of variables in a given analysis, and a shift toward comparative rather than case study analysis. The paper also suggests that scholars of commons need to highlight the strengths of the focused comparison approach by emphasizing the multiple tests of several theories that all carefully conducted, deeply engaged comparative studies undertake. Contextual factors such as state policies, demographic shifts, technology, and markets can then be related more compellingly to the primary object of attention for commons scholars: local communities, institutions, resources, and outcomes.

Although the problems of method and analysis that this paper identifies seem widespread, it is necessary to recognize that there are important reasons for the existence of these problems. In contrast to quantitative studies that often rely on ready-made data sets, or focus on collecting data through multiple observations of specific variables, scholars of commons have a far more engaged relationship with the objects of their analysis. In such a situation, where case studies are often the

preferred mode of investigation, and where it is combinations of variables that may produce an impact on outcomes rather than each variable individually, undertaking multiple studies, each using the same methods and variables to ensure comparability, would be an enormously expensive affair in terms of time, finances, and keeping ones involvement in the case at bay. Few such ambitious projects have been attempted.⁴³

Ultimately, however, the fact that we have not yet had many systematic tests of the different factors considered relevant for studying sustainability on the commons makes it likely that the problems of method and substance upon which this paper focuses have been addressed in existing studies primarily as a result of coincidence. The paper identifies the need for new research that would (a) postulate causal links that can be investigated through structured case comparisons, (b) use a large number of cases that are purposively selected on the basis of causal variables and (c) undertake statistical tests to examine the strength and direction of causal relationships. The current stage of research on common property arrangements makes such systematic studies possible. One possibility for conducting such causal tests would be to use some of the more careful case studies that have already been completed and which contain information on the critical variables related to resource systems, user groups, institutional arrangements, and external environment that I identify and present in Table 2 (Tang, 1992). It is unlikely that the cases for such an enterprise could be randomly selected. But the objective of random selection of cases is unrealistic perhaps in any case. Even an intentional selection of cases that ensures variation on independent variables will allow causal inferences and relatively low levels of bias. What is exciting about studies of commons is that the collective scholarship on local institutions has now made it possible to approach the construction of a coherent, empirically relevant theory of the commons.

NOTES

1. There is a vast literature on institutions and property rights that proves relevant for the study of common property. Some illustrative starting points for pursuing an interest may be Bates (1989), Eggertsson (1990), Hechter *et al.* (1990), Knight and Sened (1995), Libecap (1989), North (1980, 1990) and Rose (1994). Some of the

early foundations of this literature can be traced back to Commons (1924) and two influential articles of Coase (1937, 1960) and contributions by such scholars as Alchian and Demsetz (1972), Cheung (1970) and Demsetz (1964). A review of some of this literature is ably presented in Ensminger's (1992) introduction.

2. To say that groups and resources under consideration are locally situated is not to deny the often intimate connections that exist between external forces and what is considered to be local (Raffles, 1999). In any case, the influence of research on common property is also visible in larger arenas, such as international relations (Keohane & Ostrom, 1995).
3. See Schlager and Ostrom (1992) for a discussion of types of rights, and the nature of incentives related to resource use and management that their different combinations create. For discussions that undermine the familiar and seemingly obvious separation between the state and the community, see Agrawal (2001), Moore (1998), and Mosse (1997).
4. For a careful introduction to collective action theory, articulated in the context of social movements, see Tilly (1978). Although more than two decades old, it is still one of the most comprehensive statements of the relationship between collective action, political structures, and social context.
5. See, for example, Ostrom (1990, p. 89). Baland and Platteau (1996, p. 285) highlight the difficulties inherent in deciding upon parameters of successful management when they say, "It is perhaps too simplistic to view the experiences of common-property management in terms of outright failure or success. It is likely that a good number of these experiences are only partially successful." They do not, however, define precisely what they mean by success.
6. See Blomquist and Ostrom (1985) for a distinction between "commons situations" that are potentially subject to problems of crowding and depletion, and "commons dilemmas" in which private actions of users of commons have costs that cannot be overcome without collective organization.
7. There are other valuable comparative studies of commons management as well that interested readers can examine at greater length than has been possible in this paper. Pinkerton and Weinstein (1995) and Steins (1999) focus on fisheries; Arnold and Stewart (1991) are concerned mainly with land-based resources in India while Raintree (1987) examines tenure-related issues in agroforestry more widely; Lane (1998) and Peters (1994) examine livelihood importance of common grazing resources in Africa; Sengupta (1991) compares 12 cases of community irrigation management in India and the Philippines; and Redford and Padoch (1992) and Sandbukt (1995) analyze different institutional regimes around forest commons. Some general overview studies about designing sustainable institutions are also available in Hanna and Munasinghe (1995).
8. Hardin (1982), Hechter (1998), Lichbach (1996) and Sandler (1992) provide useful reviews of the collective action literature. Runge (1986) provides an early discussion of the importance of common property and collective action in economic development.
9. The research focus of commons scholars, in some sense, has followed Redfield's (1956) argument that studies of the "little community" can enable an understanding of larger patterns through ethnographic study.
10. See also Agrawal and Yadama (1997) who assess the relative importance of institutional, demographic, and market related variables in explaining the perceived condition of commonly managed forests in the Indian Himalaya for a sample of about 280 cases.
11. See, for example, Steins and Edwards (1999) who attempt to examine how context affects the incentives of users of a resource, but derive their conclusions from a single case study related to a single resource type.
12. I am grateful to Bina Agarwal, who pointed out that since Baland and Platteau's work relies on earlier empirical studies, it is possible that their conclusions are not strictly independent of existing inferences in the empirical literature. But, of course, her observation also holds for Ostrom (since *Governing the Commons* also relies mostly on published studies), and for Wade, who acknowledges his familiarity with Ostrom's work before he produced his list of facilitating conditions. In the case of this paper, the likely familiarity of the three authors with prior work on the commons only strengthens the main inference of the paper that the literature on the commons is beset by the problem of a very large number of causal factors. If anything, conversations among scholars aiming to explain why sustainable outcomes occur, should act to produce greater consensus.
13. For some comparisons, Wade also uses data on 10 villages that have no irrigation.
14. These empirical observations of Wade are also corroborated in theoretical terms by Ostrom *et al.* (1994, p. 319) who suggest that when individuals do not trust each other, cannot communicate effectively, and cannot develop agreements, then outcomes are likely to match theoretical predictions of noncooperative behavior among fully rational individuals playing finitely repeated complete information CPR games.

15. Wade in part relies on Ostrom's (1985) list of variables that facilitate collective action on the common.
16. Wade states that he has a set of 13 conditions, but the first condition identified by Wade is in effect two different conditions: small size, and clearly defined boundaries of the common-pool resource. The full set of Wade's conditions can be seen in Table 1. Factors followed by "RW" are mentioned by Wade as facilitating conditions.
17. In Table 1, variables followed by "EO" are those that Ostrom (1990) considers "design principles."
18. Note that this particular result is a formal expression of Coase's insight about the irrelevance of property rights arrangements in the absence of transactions costs (1960). See also Lueck (1994) who examines conditions under which common property can generate greater wealth than private property.
19. See also Maggs and Hoddinott (1999) for a study of how intrahousehold allocation of resources is affected by changes in common property regimes.
20. See the important work of Greif (1994) on how cultural beliefs are an integral part of institutions and affect the evolution and persistence of different societal organizations. A more discursive discussion of political and social relations in the context of common-pool resources is presented by Cleaver (2000) and McCay and Jentoft (1998). A carefully contextualized and fine-grained historical analysis of the commons is present in Mosse (1997).
21. The full list of factors they cite is summarized in Table 1. Their factors are the ones that are followed by "B&P."
22. For a review of experimental and game theoretic evidence on this, see Falk *et al.* (forthcoming) and Kopelman *et al.* (forthcoming).
23. To a significant extent, my choice of these four broad categories into which to classify the conditions identified by Wade, Ostrom, and Baland and Platteau is motivated by the work carried out by Elinor Ostrom and her colleagues at the Workshop in Political Theory and Policy Analysis at Indiana University since the mid-1980s on fisheries, forests, irrigation, and pastoral resources. For attempts to establish relationships among these different sets of variables, see discussions of the IAD framework (Ostrom *et al.*, 1994) developed by Ostrom and her colleagues at Indiana. See also Oaker-son (1992), and Edwards and Steins (1998).
24. An excellent example of a study that relates characteristics of resource systems to the viability of institutions to manage resources is Netting (1981) who focuses on scarcity and value of resources and the relationship of these two factors to whether common property institutions will endure. See also Thompson and Wisen (1994) for a similar case study from Mexico.
25. The same argument would also hold for some forms of humanly created products—for example, greenhouse gases or industrial pollutants—that create externalities across many groups and jurisdictions.
26. Indeed, as Ostrom points out, the impact of all the independent variables on sustainability of commons institutions can be depicted in terms of a cost-benefit calculus related to individual decision making.
27. Although this paper does not focus on cultural contextual factors that may affect how local conservation and resource use processes unfold, such factors may also, in some instances have important effects (Uphoff & Langholz, 1998).
28. For a review of some of the writings on this subject, and for a test of the relative importance of population pressures, market pressures, and enforcement institutions on resource condition see Agrawal and Yadama (1997). Regev, Gutierrez, Schreiber, and Zilberman (1998) examine how market-related forces and technological changes may affect rates of harvest and resource use.
29. Two studies that examine some of the complexities of state-local relationships are Gibson (1999) and Richards (1997). See Robbins (2000) for an examination of potentially complementary relationships between states and localities.
30. For a careful study of the many contextual factors that might affect what users gain from a common-pool resource, see Ribot (1998). See also Agrawal (1999) and Blaikie (1985) for empirical investigations of the context of resource access. Granovetter (1985) provides for a sharp analytical cut at the question of context.
31. Lumpiness of monitoring refers to the situation in which a specialist guard is hired to enforce common property arrangements. In this situation, the guard needs to be paid a salary for fixed periods such as a few months or a year, rather than just for an hour or a day in the year.

32. The literature on gender and environment is sufficiently large to preclude any easy summary. For accessible introductions to some of the salient issues see Agarwal (1994, 2000), Beneria and Feldman (1992), and Rocheleau, Thomas-Slayer, and Wangari (1996). Soper (1995) and Sturgeon (1997) provide acute introductions to feminist theories and the environment.
33. In the introduction to their recent discussion of inequality, Bowles and Herbert (1998, p. 4) state, "economic theory has proven, one hears, that any but cosmetic modifications of capitalism in the direction of equality and democratic control will exact a heavy toll of reduced economic performance. Yet economic theory suggests no such thing. On the contrary, there are compelling economic arguments and ample empirical support for the proposition that there exist changes in the rules of the economic game that can foster both greater economic equality and improved economic performance... inequality is often an impediment to productivity."
34. Elster (1992, p. 14) suggests about the study of local justice, that "it is a very messy business, and that it may be impossible to identify a set of necessary and sufficient conditions that constitute a theory of local justice." His diagnosis for local justice may be equally applicable to the study of commons, as also his prescription: instead of making a choice between theory and description, focusing on identifying mechanisms, "identifiable causal patterns" (p. 16).
35. Commenting on a similar tendency in political analysis, Ostrom recognizes that, "political systems are complexly organized, and that we will rarely be able to state that one variable is always positively or negatively related to a dependent variable" (1998, p. 16).
36. This issue of the effects of a given variable being very different depending on the state of another variable is not addressed by the *ceteris paribus* clause that is implicit in all the conditions stated by these authors. Depending on the state of a related variable, the effects of another variable may even run counter to the suggested direction. Thus, Turner (1999) shows how clear definition of boundaries and strengthening of exclusionary powers in the context of high levels of variability and mobility can lead to increased conflict. Agrawal (1999) uses the example of the raika shepherds in western Rajasthan to make a related argument about the marginalization of mobile shepherds through firmer delineation of boundaries to resources and exclusionary powers of communities.
37. A somewhat different but also very critical question of method is whether conclusions derived from one level of analysis or at a particular spatial/temporal level apply to other levels. Do inferences that are valid at the local level also apply to more macro-level phenomena? Although I do not address this question, Young (forthcoming) examines it carefully.
38. Indeed, it should be clear that my discussion of potentially missing variables was aimed not just at highlighting deficiencies of substance in these careful analyses, but to focus on a general problem of method that characterizes most studies of common property, and that these studies avoid to the extent possible.
39. The point is not that a systematic study of sustainable common-pool resource management must collect data on, and examine all the factors presented in Table 2. Rather, I am proposing that the factors mentioned in Table 2 are potentially significant causes in any study of the commons, and if a particular study ignores some or most of the listed factors, it needs to attend to why such omission does not affect its inferences.
40. For discussions of problems of bias that result from sampling on the dependent variable, see King *et al.* (1994); Collier and Mahoney (1996).
41. General descriptions of these three different comparative research strategies—case analysis, focused case comparisons, and statistical analysis—can be found in King *et al.* (1994) and Ragin (1987). See also Skocpol and Somers (1980) for a rigorous defense of the historical comparative approach in social-scientific inquiry.
42. White and Runge (1994, 1995) use large-N research techniques by collecting data on individuals in commons situations to examine the relative importance of factors that prompt such individuals to participate in collective action. They present some counterintuitive findings about the limited role of scale and heterogeneity.
43. The International Forestry Resources and Institutions Program at the Workshop in Political Theory and Policy Analysis, Indiana University is in the middle of such an ambitious project, and members are just initiating analysis that may address some of the substantive and methodological criticisms voiced in this paper (see the collection of studies in Gibson *et al.*, 2000). Even in this project, however, case selection can sometimes depend on availability of funding, an individual researcher's interests, and the ease of establishing collaborative partnerships with research institutions in different countries.

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