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Institutional Sustainability and the Management of Common Resources

by

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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 non-cooperative game theory (Schotter 1981, Sugden 1984, 1989, Fudenberg and Maskin 1986), but more directly as a result of the explosion of work on common property arrangements and common-pool resources (NRC 1986, McCay and Acheson 1987, Berkes 1989, Ostrom 1990). Anthropologists, economists, environmentalists, political scientists, and rural sociologists among others have contributed to this burgeoning literature. This body of empirical work, using detailed historical and contemporary studies, 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 (McKean 1992, Ostrom 1992, Agrawal 1999). Much of this research has typically focused on locally situated small user groups and communities.[1]

[1]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. In any case, the influence of research on common property is also visible in larger arenas, such as international relations (Keohane and Ostrom, 1995).

Although considerable variation marks the experiences of users in different parts of the world, the effect of documenting successful regimes of local resource management has been that when confronted with the question of how to address externalities related to resource management, careful assessments of the performance of different institutional regimes do not necessarily 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.[2] 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 following new initiatives that would devolve some control over resources to local users.

This paper seeks to synthesize the extensive empirical work that has occurred over the past two decades. Not only do we now possess rich descriptions of particular cases, in many instances scholars of commons also draw from collective action theory and develop plausible causal mechanisms to link particular aspects of their case studies, observed outcomes, and theoretical propositions. Especially valuable for this synthetic enterprise are studies whose conclusions are based on explicit comparisons, or on relatively large samples of cases (Baland and Platteau 1996, Ostrom, Gardner, and Walker 1994, Pinkerton 1989, Sengupta 1991, Tang 1992).

The next 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.[3] These studies are Wade (1988),

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[2]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.

[3]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 and where joint private costs may exceed the costs of organization.

Ostrom (1990), and Baland and Platteau (1996). I examine the conclusions of these studies by drawing upon a larger set of studies of the commons. Many of the findings from scholars of the commons, it can be argued, match closely the theoretical findings from the literature on collective action.[4] Section 3 focuses on some of the common problems of method that plague studies of self-organized resource management institutions. Because many studies of the commons focus upon single cases or are case-based comparisons, they need to be especially attentive to areas in which case analysis is deficient, and highlight the advantages of a case study approach. Section 4 proposes possible complementary methods and areas of emphasis for new 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 institutions is understandable in light of the objective of showing that common property arrangements can result in efficient use, equitable allocation, and sustainable conservation. But the focus on institutions has come 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 management at the local level (but see Ostrom 1999, Tang 1992, Lam 1998, and Ostrom, Gardner, and Walker 1994).

The second problem relates to methods and is more significant. Given the large number of factors, perhaps as many as 35 of them, that appear to be critical to common-pool resource management, it is fair to suggest that existing work has not yet specified 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 rare (Lam 1998). Problems of incomplete model specification and omitted variables in hypothesis testing are widespread in the literature on common property. Therefore, it is possible that many claims in case studies of common-pool resource management and even in some of the comparative studies of 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 persuasive theory of common pool resource management, something that is even more important today because of the increasing number of policy experiments that are under way, scholarship on the commons will inevitably need to move beyond these constraints.

2. Analyses of sustainable management of common-pool resources

[4]Hardin (1982), Hechter (1987) Sandler (1992) and Lichbach (1996) provide useful reviews of the collection action literature.

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 common-pool resources. They are attentive to theoretical developments at the time of writing and draw extensively from such developments 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 most 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 relies on primary 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 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 are more relaxed in the methodological constraints they impose upon themselves. To motivate their empirical analysis, 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, and Verba 1994).

Wade's ([1988] 1994) 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.[5] 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 be organized by users when there are many of them, when the boundaries of the common-pool resource are unclear, when users live in groups scattered over a large area, when undiscovered rule-breaking is easy, and so on (Wade 1988: 215).[6] Wade specifies his conclusions in greater detail by grouping them by resources, technology, user group,

[5]For some comparisons, Wade also uses data on 10 villages that have no irrigation.

[6]These empirical observations of Wade are also corroborated in theoretical terms by Ostrom et al (1994: 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 non-cooperative behavior among fully rational individuals playing finitely repeated complete information CPR games.

noticeability, relationship between resources and user group, and relationship between users and the state (1988: 215-16).[7]

In all, Wade finds 14 conditions to be important in facilitating successful management of the commons he investigates.[8] 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 the local context.

Studies appearing since Wade's work on irrigation institutions have added to his list of factors that facilitate institutional success, but some factors have received mention regularly. 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 management of resources. She crafts these principles on the basis of lessons from a sample of fourteen cases where users attempted, with varying degrees of success, to create or change 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: 90). Seven of the principles are present in a significant manner in all the robust commons institutions she analyzes, and the eighth covers cases that are more complex, such as federated systems.

[7]Wade in part relies on Ostrom's (1985) list of variables that facilitate collective action on the common.

[8]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.

Although Ostrom lists eight principles, on closer examination the number of conditions seems larger.[9] 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 ten, 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 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 better manage commons 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 are summary statements that pertain either to the local context, or to relationships within this context. Only one of them, about nested institutions, can be seen to express the relationship of a given group with other groups or authorities.

[9]In table 1, variables followed by "EO" are those that Ostrom (1990) considers "design principles"

Baland and Platteau (1996), in their comprehensive and synthetic 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: 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 transactions costs), then "*regulated common property and private property are equivalent from the standpoint of the efficiency of resource use*" (ibid: 175, emphasis in original).[10] 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.[11]

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 (ibid: 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 factors[12] 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-

[10]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.

[11]See also Maggs and Hoddinott (1999) for a study of how intra-household allocation of resources is affected by changes in common property regimes.

[12]See the important work of Greif (1994a) on how cultural beliefs are an integral part of institutions and affect the evolution and persistence of different societal organizations. In another paper, Greif (1994b) examines the relationship of political institutions to economic growth. 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).

level institutions, Baland and Platteau arrive at conclusions that significantly overlap 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 and Platteau 1996: 343-45). In addition, they also highlight the importance of external aid and strong leadership.[13]

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 8 conditions, Baland and Platteau should be seen to identify 12 conditions.

The conclusions that Baland and Platteau reach are typically general statements about users, resources, and institutions rather than about relationships between characteristics of these constituent analytical units. Only one of their conclusions is relational: contiguous residential location of group members and of the resource system. Finally, 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.

[13]The full list of factors they cite is summarized in table 1. Their factors are the ones that are followed by "B&P."

The brief review of these three landmark works makes evident some of the patterns in the their conclusions. They all conclude that members of small local groups can design institutional arrangements to help manage resources sustainably. Laying to rest the doubt about the ability of community user groups to manage resources, they go further, and identify a set of conditions that are most likely to promote local self management of resources. Not only that, 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.[14]

Characteristics of resources can include, for example, such features as definition of the 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 and 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 the state. Table 1 summarizes the different conditions that the three authors under consideration have identified as important.

[table 1 here]

The analysis of the information in table 1 reveals several significant obstacles to the identification 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

[14]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, Gardner and Walker 1994) developed by Ostrom and her colleague at Indiana. See also Oakerson (1992), and Edwards and Steins (1998).

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 may need to be questioned at an 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 that bear a causal relationship with sustainability. The identification of such configurations also require sharp analytical insights, but such insights would need to draw from careful case study based research.

3. Supplementing the set of substantive factors

The set of factors identified by Wade, 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 devise effective institutions.[15] For example, it is easy to see that the wide range of many forms of wildlife can make them less well suited to local management alone (Agrawal and Gibson 1999, Moseley 1999, Naughton-Treves and Sanderson 1995).[16] This aspect of common-pool resources is different from Wade's argument about small size in that 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.

[15]An excellent example of a study that relates characteristics of resource systems to development of institutions to manage resources is Netting (1981) who focuses on scarcity and value of resources and the relationship of these two factors to the emergence of private property. See also Thompson and Wisen (1994) for a similar case study from Mexico. Another study that examines the emergence of common property arrangements, but focuses instead on environmental risks is Nugent and Sanchez (1998).

[16]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.

In a carefully argued paper on resource characteristics, Blomquist et al. (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" (309). Stationarity and storage, if considered as dichotomous variables, lead to a four-fold 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 difficulties of storage 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.[17] 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 abilities 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.[18] Thus none of them explicitly remark on demographic issues in their conclusions, and they pay equally small emphasis to 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

[17]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 decisionmaking.

[18]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 and Langholz).

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.[19]

Writings on the role of population in resource management have a long history and an impressive theoretical pedigree (Ehrlich 1968: 15-6, Malthus 1798, 1803; rpt. 1960). Much recent scholarship links environmental degradation in a relatively straightforward fashion with population growth (Abernathy 1993, Durning 1989, Fischer 1993, Hardin 1993, Low and Heinen 1993, and Pimental et.al., 1994). On the whole it is clear that the debate is highly polarized. Some scholars assert that population pressures have an enormous effect (Ehrlich and Ehrlich, 1991; Myers, 1987; Wilson, 1992), and a smaller but vocal group suggests the impact to be far more limited (Fox xxxx, Lappé and Shurman, 1989; Leach xxxx, Simon, 1990, Varughese 1998).

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: 86-7, Stocks 1987: 119-20). 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 benefits 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 groups within a group using a common-pool resource gains different types of access and manoeuver to ensure their gains (Fernandes et al. 1988, Jessup and Peluso 1986, Peluso 1992). And 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 and Healy 1991). Indeed, state officials can themselves become involved in the

[19]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 et al. (1998) examine how market-related and technological changes may affect rates of harvest and resource use.

privatization of commons and the selling of products from resources that were earlier under common property arrangements (Rangarajan 1996, Sivaramakrishnan 1999, Skaria 1999)

These specific arguments 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 capital and market forces. 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 or 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.[20] 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 (Agrawal and Ribot 2000). We do not yet have a systematic examination of variations and changes in these relationships and how they affect common-pool resource management.

One reason scholars of commons have focused so little on external factors like 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 little on those factors that have received attention from many other streams of scholarship. But it seems that in focusing upon the locality and the importance of local factors, they have ignored how what is local is often created in conjunction with the external and the non-local 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 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.

But 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.

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[20]Two studies that examine some of the complexities of state-local relationships are Gibson (1999) and Richards (1997).

This is the third substantive area of neglect in research on common property institutions. Take three aspects of groups as an illustration: size, heterogeniety, 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 (1999:773) who reiterate Olson: "The smaller the group the stronger its ability to perform collectively." But other scholars 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 (1993:38) 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 (Forthcoming, 2001), use two analytical features of common pool resources – imperfect exclusion and lumpiness of third party monitoring – to hypothesize a curvilinear relationship between group size and successful collection action, and test the hypothesis using a sample of 28 cases from the Kumaon Himalaya. 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 1982:44-49). After more than 30 years of research on group size and collective action, the state of knowledge is scarcely comforting.

The situation is even more unclear where group heterogeneity is concerned. 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 and Gibson 1999). The nature of heterogeneities within groups can have multiple and contradictory effects. 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, about heterogeneities of endowments enhancing the possibilities of collective action, is similar to that made by Olson (1965). But the categories into which they classify heterogeneities are not mutually exclusive. Further, empirical evidence on how heterogeneities affect collective action is still highly ambiguous (Baland and Platteau 1999, Kanbur 1992, Quiggin 1993, Varughese and Ostrom 1998). It is possible, thus, even in groups that have high levels of heterogeneities of interest, to ensure collective action if some subgroups can coercively enforce conservationist institutions (Agrawal 1999, Jodha 1986, Peluso 1993, but see also Libecap 1989, 1990). On the other hand, the role of intra-group 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.

Another locality related factor that is critical from a policy perspective, and on which much research has been carried out without the emergence of a consensus is the relation of poverty of users to 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 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 (Agrawal and Varughese 2000).

For each of the three factors – size, heterogeneity, and poverty – the extent to which existing research has settled the question of the direction of their effect on the sustainability of commons institutions is ambiguous 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 listed in the table are the ones that are not followed by the name of a particular author. Although the factors listed 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 be created.

(Table 2 here)

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. 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 external environment, refers 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 that are 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. 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 question of resource size or boundary definition as a contingent one, where the effects of one variable depend on the state of another variable.[21]

It may be 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 flow of benefits, 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. 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, for example, 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 because many of the causal relationships in commons situations may be contingent relationships where the impact of a particular variable is likely to depend 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,

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[21]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.

institutional arrangements specifying asymmetric distribution of benefits may be more sustainable.

But the most significant issues of method stem from the sheer number of conditions that seem relevant to the successful management of common-pool resources. 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.[22] Once we take into account additional factors that merit discussion and incorporation in the efforts to think about what makes management of common pool resources sustainable, it is reasonable to suppose that total number of factors that affect successful management of commons may be somewhere between 30 and 40. Table 3 lists a total of 33 factors. Not all of these factors are independent of each other. Some of them are surely 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, however, have any way of assessing the degree of correlation among these and possibly other variables that have emerged as significant 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 the variables under consideration. As soon as we concede the possibility that somewhere between 30 to 40 variables affect the management of common pool resources, and that some of these variables may have important interactional effects, we confront additional analytical problems.

When there are a large number of variables, 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. One can pick 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. In an important sense, then,

[22]Indeed, it should be clear that my discussion of potentially missing variables was aimed not at highlighting deficiencies of substance in these careful analyses, but to focus on a more general problem of method that characterizes most studies of common property, and that these studies avoid to the extent possible.

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 of not specifying carefully 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 being "omitted variable bias," and the problem of endogeneity.(King, Keohane, and Verba 1994: 168-82, 185-95). These biases resulting from 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). In a particular case analysis, it may be possible that although benefit flows are unpredictable, they have a much smaller effect on outcomes compared to "unfair allocation of benefits" which also affects outcomes in a similar fashion, but may have been ignored by the researcher. In such a situation of multiple causation, 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. For example, "unpredictable benefit flow," it can be argued, undermines the sustainability of commons institutions. But in a case study it may be difficult to discover how particular independent variables are related to each other, or the strength of their relationship to observed outcomes. In an important sense, single case analyses often limit conclusions about cause-effect relationships to bivariate statements when actual relationships are likely to be more contingent, or continuous.

The large number of variables potentially affecting the sustainability of institutions that govern common resources, thus, has important theoretical implications for future research. The most important implication is perhaps for research design. Because the requirements of a random or representative selection of cases is typically very hard to satisfy where common pool resources are concerned (even when the universe of cases is narrowed geographically), purposive sampling, whether the objective is statistical analysis or structured comparative case analysis, easily becomes the theoretically defensible strategy for selecting cases. 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 and George, Forthcoming, Stern and Druckman xxxx).[23]

There is no general theory of purposive sampling apart from the commonsensical consideration that selected cases should represent variation on theoretically significant factors. Therefore what is likely to be critical in research design is a general sense of the variables that existing scholarship has counted as important, and particular knowledge of the case(s) to be researched. The information presented in table 2, organized under four major categories, can

[23]For discussions of problems of bias that result from sampling on the dependent variable, see King, Keohane and Verba (1994), and Collier and Mahoney (1996).

therefore be useful in the creation of a research design and for case selection. Given a particular context, it 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 ecotone and represent the same resource type, then variables related to resource characteristics do not need to be considered in case selection. The obvious tradeoff for this reduction in the number of variables is that the research will provide little or no insight into the effect of unpredictable resource flows on institutional sustainability. If the objective of the research were to understand the effects of unpredictability, then it would be imperative to select cases where resource output varied from highly predictable to unpredictable.

However, 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 analytical results. 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 researchers of the commons also postulate causal relationships among the critical theoretical variables they have identified, and then conduct structured comparative case studies that examine the postulated causal links among variables. A two-pronged approach that on the one hand uses theoretically motivated comparative case analysis to identify causal mechanisms and narrow the range of relevant theoretical variables, and on the other hand uses large-N studies to identify the strength of causal relations would be necessary to advance our understanding of how 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 complex causal chain might be constructed out of the following three hypotheses that connect the factors listed in table 2 in causal chains: a) small size of the resource and the group, low levels of mobility of the resource, and low levels of articulation with markets promote high levels of interdependence among group members; b) interdependence, social capital, and low levels of poverty promote well-defined boundaries for the group and the resource; 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 recognition of group rights, and such relationships among different variables can be elaborated in turn. It may be possible to investigate such causal links with a far smaller number of case studies because each case study may be used to throw light upon more than one causal connection. The investigation of such causal chains, especially with attention to contextual variables upon which particular causal effects may be dependent, continues to be necessary in commons research. It is not necessary that fresh case studies be launched to investigate causal links. Given the large number of studies of commons dilemmas that exist already, it would be 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.

5. Conclusion

Although the problems of method and analysis that this paper identifies are important, 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 that focus on collecting data through multiple observations of specific variables, scholars of commons have a far more personal 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. 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.

It is also possible that the bite of some of the criticisms is low in terms of their effects on the more widely accepted conclusions of commons scholars. Especially where scholars proceed from theoretical underpinnings, and undertake a process of sample selection that test for specific relationships, the general criticisms of this paper are less applicable. In other cases, scholars may be implicitly or unknowingly controlling for variations in some causal factors by selecting cases from the same geographical region or the same resource type.

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 points to the need for new research that would a) postulate causal links that can be investigated through structured case comparisons, and b) use a large number of cases that are purposively selected on the basis of causal variables. We are at a stage in research on common property arrangements that makes such systematic studies possible. The work being carried out at Indiana University has already been mentioned. But another possibility for conducting such 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, groups, institutional arrangements, and external environment (Tang 1992, Schlager 1993). It is unlikely that the cases for such an enterprise would 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.

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

1) Resource System Characteristics
    i) Small size (RW)
    ii) 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)

Table 2
Critical Enabling Conditions for Sustainability on the Commons

1) Resource System Characteristics
    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
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)
    viii) Low levels of poverty
(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)
    iv) Low levels of user demand
    v) Gradual change in levels of demand
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
        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:
        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)

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