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PRIVATE AND COMMON PROPERTY RIGHTS

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Abstract

The relative advantages of private property and common property for the efficiency, equity, and sustainability of natural resource use patterns have been debated in legal and economic literatures for several centuries. The debate has been clouded by a troika of confusions that relate to the difference between (1) common property and open-access regimes, (2) common-pool resources and common property regimes, and (3) a resource system and the flow of resource units. A property right is an enforceable authority to undertake particular actions in specific domains. The rights of access, withdrawal, management, exclusion and alienation can be separately assigned to different individuals as well as being viewed as a cumulative scale moving from the minimal right of access through possessing full ownership rights. All of these rights may be held by single individuals or by collectivities. Some attributes of common-pool resources are conducive to the use of communal proprietorship or ownership and others are conducive to individual rights to withdrawal, management, exclusion and alienation. Many of the lessons learned from the operation of communal property regimes related to natural resource systems are theoretically relevant to the understanding of a wide diversity of property regimes that are extensively used in modern societies.
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1. Introduction

The issue of the relationship between private property and common property has engaged both legal and economic scholars in a long series of controversies over the meaning, the sequence of development, and the superiority of private vs. common property. The issues debated relate to the

efficiency, equity and sustainability of private property as contrasted to common property. The scholarship in both professions has been characterized by formulations that are adopted by each generation of scholars without much effort to examine their foundations or to test them by empirical research. Both have their doctrinal aspects. And, the dominant view in both disciplines has been that private property is clearly superior to common property. Many scholars think of contemporary examples of common property as remnants of the past, likely to disappear as we enter the twenty-first century (see Atran, 1986, 1993). Recent research, however, has challenged the presumption that private property is necessarily superior to common property.

2. The Legal Debate over Private vs. Common Property

Prior to the publication in 1861 of *Ancient Law* by the distinguished English jurist, Henry Sumner Maine, the accepted view among Western jurists was that the origin of the concept of property in ancient times was the occupation of land by a single proprietor and his family (Grossi, 1981). Further, the superiority of individual property holdings was so well accepted in the legal literature of the early nineteenth century that the possibility of other forms of property existing on the European continent threatened juridical views about the origins of social order. Maine drew not only on his own extensive research in India but also on the work of Georg Ludwig von Maurer (1854, 1856) on the primitive Germanic village communities, the Mark, and of the pioneering work of William Blackstone (1766). Maine concluded that: 'it is more than likely that joint-ownership, and not separate ownership, is the really archaic institution, and that the forms of property that will afford us instruction will be those that are associated with the rights of families and of groups of kindred' (Maine, [1861] 1963, p. 252). This set off a flurry of publications challenging and supporting his conclusion (see extensive bibliographic citations in Grossi, 1981). The great debate had much more than academic importance, as major political struggles continued throughout the nineteenth century over the status of the many remaining forms of common property on the European continent. A legal and political belief system that saw the origin of property itself in the efforts of individual proprietors to occupy land gave the landed proprietor a special role in society. These beliefs helped to justify the passage of legislation to eliminate collective landholding rights and to authorize enclosures and the takeover of communal properties by individual proprietors.

The meaning of private property in comparison to common property remains a contested issue in modern legal scholarship. Ellickson, Rose and

Ackerman (1995), for example, start their recent textbook on property law with a first chapter devoted to 'The Debate over Private Property'. The second chapter addresses 'The Problem of the Commons'. In the latter chapter, they include parts of the famous article by Hardin (1968) on 'The Tragedy of the Commons', but then ask students the following questions: 'Private property is often said to avert the tragedy of the commons. But does it? Who enforces property limitations? Does another kind of "commons" problem lurk in the organization and maintenance of a property regime?'(Ellickson, Rose and Ackerman, 1995, p. 141). In an earlier volume, Rose (1994, p. 37) points to the 'kicker' in a sharp distinction between private and common property when she stresses that a private-property *regime* as a system 'has the same structure as a common property' (see also Epstein, 1979, 1985, and Dukeminier and Krier, 1993).

3. The Economic Debate over Private vs. Common Property

Economists tend to view common property institutions as having a longer history than private-property institutions and to explain the growth of modern, Western societies in part as the result of changing from common property to private property (North and Thomas, 1976; North, Anderson, and Hill, 1983). Private property is considered by most economists to be an essential ingredient in economic development due to the incentives associated with diverse kinds of property relationships (see, for example, Welch, 1983). A farmer who owns his own labor, land and other factor inputs, for example, is likely to see a direct relationship between investments and the level of benefit achieved over the long term. A farmer who belongs to an agricultural production cooperative, on the other hand, may see only a loose connection between personal contributions and benefits. The more individuals in a society whose work is only loosely connected to their benefits, the more pervasive an attitude of free riding can become. If everyone tends to free ride on the work of others, overall economic productivity will be low.

Private-property rights, however, cannot simply emerge spontaneously from a common property system. Private-property rights depend upon the existence and enforcement of a set of rules that define who has a right to undertake which activities on their own initiative and how the returns from that activity will be allocated (V. Ostrom, 1989). In other words, rules and rulers are required to establish, monitor and enforce a property system. While some rules generate incentives that greatly increase the welfare of most participants in an economy, there are always individuals who resist changes because of benefits they receive from a prior system or propose

changes that particularly benefit themselves. Rulers may also receive substantial returns from making rules that benefit some to the detriment of others. Thus, rent-seeking behavior is expected on the part of both entrepreneurs and rulers.

Common property regimes are, therefore, presumed by many economists to be inefficient. There are three sources of inefficiency. One is rent dissipation, because no one owns the products of a resource until they are captured, and everyone engages in an unproductive race to capture these products before others do (Knight, 1924; Gordon, 1954; Scott, 1955; Schaefer, 1957; Cheung, 1970; C. Clark, 1976, 1980; Dasgupta and Heal, 1979). The second is the high transaction and enforcement costs expected if communal owners were to try to devise rules to reduce the externalities of their mutual overuse (Demsetz, 1967; Coase, 1960). The third is low productivity, because no one has an incentive to work hard in order to increase their private returns (North, 1990; Yang, 1987). Common property regimes are presumably retained by rulers who do not understand the enhancement in overall economic welfare that will result from a change to private property or who are supported by those who benefit from these 'archaic' regimes. A common policy prescription is articulated by R. Smith (1981, p. 467) when he states that 'the only way to avoid the tragedy of the commons in natural resources and wildlife is to end the common property system by creating a system of private property rights'.

4. Confusions that Generate Misunderstanding

The debate about the relative merits of private and common property has been clouded by a troika of confusions that hinder scholarly communication. Different meanings are assigned to terms without clarifying how multiple aspects relate to one another. The source of confusion relates to the differences between (1) common property and open-access regimes, (2) common-pool resources and common property regimes, and (3) a resource system and the flow of resource units. All three sources of confusion reduce clarity in assigning meaning to terms and retard theoretical and empirical progress.

The Confusion between Common Property and Open-Access Regimes

In a now classic article, Ciriacy-Wantrup and Bishop (1975) clearly demarked the difference between property regimes that are *open access*, where no one has the legal right to exclude anyone from using a resource, from *common property*, where the members of a clearly demarked group have a legal right to exclude nonmembers of that group from using a

resource (see also Bromley, 1991a, 1992b). Open-access regimes (*res nullius*) - including the classic cases of the open seas and the atmosphere - have long been considered in legal doctrine as involving no limits on who is authorized to use a resource. If anyone can use a resource, no one has an incentive to conserve their use or to invest in improvements. If such a resource generates highly valued products, then one can expect that the lack of rules regarding authorized use will lead to misuse and overconsumption. Some local grazing areas, inshore fisheries and forests are effectively open-access resources, but many fewer than presumed in the literature.

Some open-access regimes lack effective rules defining property rights by default (Dales, 1968). Either the resources affected by these open-access regimes are not contained within a nation-state or no entity has successfully laid claim to legitimate ownership. Other open-access regimes are the consequence of conscious public policies to guarantee the access of all citizens to the use of a resource within a political jurisdiction. The concept of *jus publicum* applies to their formal status, but effectively these resources are open access. The state governments of Oregon and Washington intervened in the early twentieth century to prevent local salmon fishermen from devising rules that would have limited entry and established harvesting limits (Higgs, 1982, 1996). Fishing unions along the US coastal areas tried to organize inshore fisheries so as to limit entry and establish harvesting limits during the 1950s. Even though their efforts could not have had a serious impact on prices due to the presence of an active international market for fish, the fishing unions were prosecuted by the US Department of Justice and found in violation of the Sherman Antitrust Act (Johnson and Libecap, 1982). Thus, US inshore fisheries have effectively been open-access resources during much of the twentieth century as a result of governmental action to prevent local fishing groups from establishing forms of common property regimes within those political jurisdictions. In more recent times, however, both the national and state governments have reversed their prior stands and have actively sought ways of creating forms of co-management in inshore fisheries (see Pinkerton 1992, 1994; J. Wilson, 1995).

A third type of open-access regime results from the ineffective exclusion of nonowners by the entity assigned formal rights of ownership. In many developing countries, the earlier confusion between open-access and common property regimes paradoxically led to an increase in the number and extent of local resources that are effectively open access. Common property regimes controlling access and harvesting from local streams, forests, grazing areas, and inshore fisheries had evolved over long periods of time in all parts of the world, but were rarely given formal status in the legal codes of newly independent countries.

As concern for the protection of natural resources mounted during the 1960s, many developing countries nationalized all land and water resources that had not yet been recorded as private property. The institutional arrangements that local users had devised to limit entry and use lost their legal standing, but the national governments lacked monetary resources and personnel to monitor the use of these resources effectively. Thus, resources that had been under a *de facto* common property regime enforced by local users were converted to a *de jure* government-property regime, but reverted to a *de facto* open-access regime. When resources that were previously controlled by local participants have been nationalized, state control has usually proved to be less effective and efficient than control by those directly affected, if not disastrous in its consequences (Curtis, 1991; Hilton, 1992; Panayotou and Ashton, 1992; Ascher, 1995). The harmful effects of nationalizing forests that had earlier been governed by local user-groups have been well documented for Thailand (Feeny, 1988), Niger (Thomson, 1977; Thomson, Feeny and Oakerson, 1992), Nepal (Arnold and Campbell, 1986; Messerschmidt, 1986), and India (Gadgil and Iyer, 1989; Jodha, 1990, 1996). Similar results have occurred in regard to inshore fisheries taken over by state or national agencies from local control by the inshore fishermen themselves (Cordell and McKean, 1992; Cruz, 1986; Dasgupta, 1982; Higgs, 1996; Panayotou, 1982; Pinkerton, 1989).

The Confusion between a Resource System and a Property Regime

The problems resulting from confusing open-access regimes with common property regimes are particularly difficult to overcome due to a second terminological problem. The term ‘common property resource’ is frequently used to describe a type of economic good that is better referred to as a ‘common-pool resource’. All common-pool resources share two attributes of importance for economic activities: (1) it is costly to exclude individuals from using the good either through physical barriers or legal instruments and (2) the benefits consumed by one individual subtract from the benefits available to others (Ostrom and Ostrom, 1977b; E. Ostrom, Gardner, and Walker, 1994). Recognizing a class of goods that shares these two attributes enables scholars to identify the core theoretical problems facing individuals whenever more than one individual or group utilizes such resources for an extended period of time. Using ‘property’ in the term used to refer to a type of good, reinforces the impression that goods sharing these attributes tend everywhere to share the same property regime.

Common-pool resources share with public goods the difficulty of developing physical or institutional means of excluding beneficiaries. Unless means are devised to keep nonauthorized users from benefiting, the strong temptation to free ride on the efforts of others will lead to a suboptimal

investment in improving the resource, monitoring use, and sanctioning rule-breaking behavior. Second, the products or resource units from common-pool resources share with private goods the attribute that one person's consumption subtracts from the quantity available to others. Thus, common-pool resources are subject to problems of congestion, overuse and potential destruction unless harvesting or use limits are devised and enforced. In addition to sharing these two attributes, particular common-pool resources differ on many other attributes that affect their economic usefulness including their size, shape and productivity and the value, timing and regularity of the resource units produced.

Common-pool resources may be owned by national, regional, or local governments; by communal groups; by private individuals or corporations; or used as open access resources by whomever can gain access. Each of the broad types of property regimes has different sets of advantages and disadvantages, but at times may rely upon similar operational rules regarding access and use of a resource (Feeny et al., 1990). Examples exist of both successful and unsuccessful efforts to govern and manage common-pool resources by governments, communal groups, cooperatives, voluntary associations, and private individuals or firms (Bromley et al., 1992; K. Singh, 1994; K. Singh and Ballabh, 1996). Thus, as discussed below, there is no automatic association of common-pool resources with common property regimes - *or, with any other particular type of property regime.* Further, common property arrangements are essentially share contracts (Lueck, 1994; Eggertsson, 1990, 1992, 1993a, 1993b) and, as such, face similar problems of potential opportunistic behavior and moral hazard problems.

The Confusion between the Resource and the Flow of Resource Units

Common-pool resources are composed of resource systems and a flow of resource units or benefits from these systems (Blomquist and Ostrom, 1985). The resource system (or alternatively, the stock or the facility) is what generates a flow of resource units or benefits over time (Lueck, 1995). Examples of typical common-pool resource systems include lakes, rivers, irrigation systems, groundwater basins, forests, fishery stocks and grazing areas. Common-pool resources may also be facilities that are constructed for joint use, such as mainframe computers and the Internet. The resource units or benefits from a common-pool resource include water, timber, medicinal plants, fish, fodder, central processing units, and connection time. Devising property regimes that effectively allow sustainable use of a common-pool resource requires rules that limit access to the resource system and other rules that limit the amount, timing, and technology used to withdraw diverse resource units from the resource system.

5. Property as Bundles of Rights

A property right is an enforceable authority to undertake particular actions in a specific domain (Commons, 1968). Property rights define actions that individuals can take in relation to other individuals regarding some 'thing'. If one individual has a right, someone else has a commensurate duty to observe that right. Schlager and Ostrom (1992) identify five property rights that are most relevant for the use of common-pool resources, including access, withdrawal, management, exclusion, and alienation. These are defined as:

Access: The right to enter a defined physical area and enjoy nonsubtractive benefits (for example, hike, canoe, sit in the sun).
Withdrawal: The right to obtain resource units or products of a resource system (for example, catch fish, divert water).
Management: The right to regulate internal use patterns and transform the resource by making improvements.
Exclusion: The right to determine who will have access rights and withdrawal rights, and how those rights may be transferred.
Alienation: The right to sell or lease management and exclusion rights (Schlager and Ostrom, 1992).

In much of the economics literature, private property is defined as equivalent to alienation. Property-rights systems that do not contain the right of alienation are considered to be ill-defined. Further, they are presumed to lead to inefficiency since property-rights holders cannot trade their interest in an improved resource system for other resources, nor can someone who has a more efficient use of a resource system purchase that system in whole or in part (Demsetz, 1967). Consequently, it is assumed that property-rights systems that include the right to alienation will be transferred to their highest valued use. Larson and Bromley (1990) challenge this commonly held view and show that much more information must be known about the specific values of a large number of parameters before judgements can be made concerning the efficiency of a particular type of property right.

Instead of focusing on one right, it is more useful to define five classes of property-rights holders as shown in Table 1. In this view, individuals or collectivities may hold well-defined property rights that include or do not include all five of the rights defined above. This approach separates the question of whether a particular right is well-defined from the question of the effect of having a particular set of rights. 'Authorized entrants' include most recreational users of national parks who purchase an operational right to enter and enjoy the natural beauty of the park, but do not have a right to harvest forest products. Those who have both entry and withdrawal use-right

units are 'authorized users'. The presence or absence of constraints upon the timing, technology used, purpose of use and quantity of resource units harvested are determined by operational rules devised by those holding the collective-choice rights (or authority) of management and exclusion. The operational rights of entry and use may be finely divided into quite specific 'tenure niches' (Bruce, 1995) that vary by season, by use, by technology, and by space. Tenure niches may overlap when one set of users owns the right to harvest fruits from trees, another set of users owns the right to the timber in these trees, and the trees may be located on land owned by still others (Bruce, Fortmann and Nhira, 1993). Operational rules may allow authorized users to transfer access and withdrawal rights either temporarily through a rental agreement, or permanently when these rights are assigned or sold to others (see Adasiak, 1979, for a description of the rights of authorized users of the Alaskan salmon and herring fisheries).

Table 1
Bundles of Rights Associated with Positions

	Owner	Proprietor	Claimant	Authorized User	Auth. Entrant
Access	X	X	X	X	X
Withdrawal	X	X	X	X	
Managment	X	X	X	X	
Exclusion	X	X			
Alienation	X				

Source: E. Ostrom and Schlager (1996, p. 133).

'Claimants' possess the operational rights of access and withdrawal plus a collective-choice right of managing a resource that includes decisions concerning the construction and maintenance of facilities and the authority to devise limits on withdrawal rights. The net fishers of Jambudwip, India, for example, annually regulate the positioning of nets so as to avoid interference, but do not have the right to determine who may fish along the coast (Raychaudhuri, 1980). Fishing territories are a frequent form of property for indigenous, inshore fishers (Durrenberger and Palsson, 1987).

Farmers on large-scale government irrigation systems frequently devise rotation schemes for allocating water on a branch canal (Benjamin et al., 1994).

'Proprietors' hold the same rights as claimants with the addition of the right to determine who may access and harvest from a resource. Most of the property systems that are called 'common property' regimes involve participants who are proprietors and have four of the above rights, but do not possess the right to sell their management and exclusion rights even though they most frequently have the right to bequeath it to members of their family and to earn income from the resource (see Berkes, 1989; Bromley et al., 1992; K. Martin, 1979; McCay and Acheson, 1987).

Empirical studies have found that some proprietors have sufficient rights to make decisions that promote long-term investment and harvesting from a resource. Place and Hazell (1993) conducted surveys in Ghana, Kenya, and Rwanda to ascertain if indigenous land-right systems were a constraint on agricultural productivity. They found that having the rights of a proprietor as contrasted to an owner in these settings did not affect investment decisions and productivity. Other studies conducted in Africa (Migot-Adholla et al., 1991; Bruce and Migot-Adholla, 1994) also found little difference in productivity, investment levels, or access to credit. In densely settled regions, however, proprietorship over agricultural land may not be sufficient (Feder et al. 1988; Feder and Feeny, 1991; Anderson and Lueck, 1992). As land is densely settled, the absence of a title reduces the options for farmers to sell their land and reap a return on this asset. Further, without a title, farmers lack collateral to obtain credit to invest more intensively in the productive potential of their land (see Alston, Libecap and Schneider, 1996). Thus, a key finding from an overview of many studies is that no type of property-rights regime works equivalently in all types of settings. For private-property systems in land to make a difference in productivity gains, one probably needs (1) a somewhat dense population so competition for use is present and (2) the existence of effective markets related to credit, inputs, and the sale of commodities (see further discussion in Section 7). In a series of studies of inshore fisheries, self-organized irrigation systems, forest user groups and groundwater institutions, proprietors tended to develop strict boundary rules to exclude noncontributors; established authority rules to allocate withdrawal rights; devised methods for monitoring conformance; and used graduated sanctions against those who do not conform to these rules (Agrawal, 1994; Blomquist, 1992; Schlager, 1994; Tang, 1994; Lam, 1998).

'Owners' possess the right of alienation - the right to transfer a good in any way the owner wishes that does not harm the physical attributes or uses of other owners - in addition to the bundle of rights held by a proprietor. An individual, a private corporation, a government, or a communal group may possess full ownership rights to any kind of good including a common-pool

resource (Montias, 1976; Dahl and Lindblom, 1963). The rights of owners, however, are never absolute. Even private owners have responsibilities not to generate particular kinds of harms for others (Demsetz, 1967).

What should be obvious by now is that the world of property rights is far more complex than simply government, private and common property. These terms better reflect the status and organization of the holder of a particular right than the bundle of property rights held. All of the above rights can be held by single individuals or by collectivities. Some communal fishing systems grant their members all five of the above rights, including the right of alienation (Miller, 1989). Members in these communal fishing systems have full ownership rights. Similarly, farmer-managed irrigation systems in Nepal, the Phillippines and Spain have established transferable shares to the systems. Access, withdrawal, voting and maintenance responsibilities are allocated by the amount of shares owned (Maass and Anderson, 1986; E. Martin, 1986; Martin and Yoder, 1983a, 1983b, 1983c; Siy, 1982). On the other hand, some proposals to 'privatize' inshore fisheries through the devise of an Individual Transferable Quota (ITQ), allocate transferable use rights to authorized fishers but do not allocate rights related to the management of the fisheries, the determination of who is a participant, nor the transfer of management and exclusion rights. Thus, proposals to establish ITQ systems, which are frequently referred to as forms of 'privatization', do not involve full ownership.

The next two sections are devoted to a discussion of the attributes of common-pool resources that are conducive to communal proprietorship or communal ownership as contrasted to individual ownership. Groups of individuals are considered to share communal property rights when they have formed an organization that exercises at least the collective-choice rights of management and exclusion in relationship to some defined resource system and the resource units produced by that system. In other words, all communal groups have established some means of governing themselves in relationship to a resource (E. Ostrom, 1990). Where communal groups are full owners, members of the group have the further right to sell their access, use, exclusion and management rights to others, subject in many systems to the approval of the other members of the group. Some communal proprietorships are formally organized and recognized by legal authorities as having a corporate existence that entails the right to sue and be sued, the right to hold financial assets in a common bank account, and to make decisions that are binding on members. Other communal proprietorships are less formally organized and may exercise *de facto* property rights that may or may not be supported by legal authorities if challenged by nonmembers. Obviously, such groups hold less well-defined bundles of property rights than those who are secure in their *de jure* rights even though the latter may

not hold the complete set of property rights defined as full ownership. In other words, well-defined and secure property rights may not involve the right to alienation.

6. Attributes of Common-Pool Resources Conducive to the Use of Communal Proprietorship or Ownership

Even though all common-pool resources share the difficulty of devising methods to achieve exclusion and the subtractability of resource units, the variability of common-pool resources is immense in regard to other attributes that affect the incentives of resource users and the likelihood of achieving outcomes that approach optimality. Further, whether it is difficult or costly to develop physical or institutional means to exclude nonbeneficiaries depends both on the availability and cost of technical and institutional solutions to the problem of exclusion and the relationship of the cost of these solutions to the expected benefits of achieving exclusion from a particular resource.

Let us start initially with a discussion of land as a resource system. Where population density is extremely low, land is abundant, and land generates a rich diversity of plant and animal products without much husbandry, the expected costs of establishing and defending boundaries to a parcel of land of any size may be greater than the expected benefits of enclosure (Demsetz, 1967; Feeny, 1993). Settlers moving into a new terrain characterized by high risk due to danger from others, from a harsh environment, or from lack of appropriate knowledge, may decide to develop one large, common parcel prior to any divisions into smaller parcels (Ellickson, 1993). Once land becomes scarce, conflict over who has the rights to invest in improvements and reap the results of their efforts can lead individuals to want to enclose land through fencing or institutional means to protect their investments. There are tradeoffs in costs to be considered, however. The more land included within one enclosure, the lower the costs of defending all the boundaries, but the higher the costs of regulating the use of the enclosed parcel.

The decision to enclose need not be taken in one step from an open-access terrain to a series of private plots owned exclusively by single families (Field, 1984, 1985, 1989; Ellickson, 1993). The benefits of enclosing land depend on the scale of productive activity involved. For some agricultural activities, as discussed below, there may be considerable benefits associated with smaller parcels fully owned by a family enterprise. For other activities, the benefits may not be substantial. Moving all the way to private plots is an efficient move when the expected marginal returns from enclosing numerous plots exceed the expected marginal costs of defending a

much more extended system of boundaries and the reduced transaction costs of making decisions about use patterns (Nugent and Sanchez, 1995).

In a classic study of the diversity of property-rights systems used for many centuries by Swiss peasants, Netting (1976, 1981) observed that the same individuals fully divided their agricultural land into separate family-owned parcels, but that grazing lands located on the Alpine hillsides were organized into communal property systems. In these mountain valleys, the *same* individuals used different property-rights systems side-by-side for multiple centuries. Each local community had considerable autonomy to change local rules, so there was no problem of someone else imposing an inefficient set of rules on them. Netting argued that attributes of the resource affected which property-rights systems were most likely for diverse purposes. Netting identified five attributes that he considered to be most conducive to the development of communal property rights:

1. low value of production per unit of area;
2. high variance in the availability of resource units on any one parcel;
3. low returns from intensification of investment;
4. substantial economies of scale by utilizing a large area; and
5. substantial economies of scale in building infrastructures to utilize the large area.

Steep land where rainfall is scattered may not be suitable for most agricultural purposes, but can be excellent land for pasture and forests if aggregated into sufficiently large parcels. By developing communal property rights to large parcels of such land, those who are members of the community are able to share environmental risks due to the unpredictability of rain-induced growth of grasses within any smaller region. Further, herding and processing of milk products is subject to substantial economies of scale. If individual families develop means to share these reduced costs, all can save substantially. Building the appropriate roads, retaining walls and processing facilities may also be done more economically if these efforts are shared.

While the Swiss peasants were able to devote these harsh lands to productive activities, they had to invest time and effort in the development of rules that would reduce the incentives to overgraze and would ensure that investments in shared infrastructure were maintained over time. In many Swiss villages, rights to common pasturage were distributed according to the number of cows that could be carried over the winter using hay supplies produced on the owners' private parcels. In all cases, the village determined who would be allowed to use, the specific access and withdrawal rights to be used, how investment and maintenance costs were to be shared, and how the annual returns from common processing activities were to be shared. All of

these systems included at least village proprietorship rights, but some Swiss villages developed full ownership rights by incorporating and authorizing the buying and selling of shares (usually with the approval of the village). Netting's findings are strongly supported by studies of mountain villages in Japan, where thousands of rural villages have held communal property rights to extensive forests and grazing areas located in the steep mountainous regions located above their private agricultural plots (McKean, 1982, 1992a, 1992b). Similar systems have existed in Norway for centuries (Örebech, 1993; Sandberg 1993).

The importance of sharing risk is stressed in other theoretical and empirical studies of communal proprietorships (Antilla and Torp, 1996; Gupta, 1986, Nugent and Sanchez, 1993). Unpredictability and risk are increased in systems where resource units are mobile and where storage facilities, such as dams, do not exist (Schlager, Blomquist and Tang, 1994). Institutional facilities for sharing risk, such as formal insurance systems or institutionalized mechanisms for reciprocal obligations in times of plenty, also affect the kinds of property-rights systems that individuals can devise. When no physical or institutional mechanisms exist for sharing risk, communal property arrangements may enable individuals to adopt productive activities not feasible under individual property rights. A recent study has demonstrated that the variance in the productivity of land over space - due largely to the variance in rainfall from year to year - is strongly associated with the size of communally held parcels allocated to grazing in the Sudan (Nugent and Sanchez, 1995). Ellickson (1993) compares the types of environmental and personal security risks faced by new settlers in New England, in Bermuda, and in Utah to explain the variance in the speed of converting jointly held land to individually held land in each of these settlements.

A consistent finding across many studies of communal property-rights systems is that these systems do not exist in isolation and are usually used in conjunction with individual ownership. In most irrigation systems that are built and managed by the farmers themselves, for example, each farmer owns his or her own plot(s) while participating as a joint proprietor or owner in a communally organized irrigation system (Coward, 1980; Sengupta, 1991, 1993; Tang, 1992; Vincent, 1995; Wade, 1992). Water is allocated to individual participants using a variety of individually tailored rules, but those irrigation systems that have survived for long periods of time tend to allocate water and responsibilities for joint costs using a similar metric - frequently the amount of land owned by a farmer (E. Ostrom, 1990, 1992). In other words, benefits are roughly proportional to the costs of investing and maintaining the system itself.

Further, formally recognized communal systems are usually nested into a series of governance units that complement the organizational skills and

knowledge of those involved in making collective-choice decisions in smaller units (O. Johnson, 1972). Since the Middle Ages, most of the Alpine systems in both Switzerland and Italy have been nested in a series of self-governing communities that respectively governed villages, valleys, and federations of valleys (Merlo, 1989). In modern times, cantonal authorities in Switzerland have assumed an added responsibility to make periodic, careful monitoring visits to each alp on a rotating basis and to provide professional assessments and recommendations to local villages, thereby greatly enhancing the quality of knowledge and information about the sustainability of these resources (Glaser, 1987).

Contrary to the expectation that communal property systems lacking the right to alienate ownership shares are markedly less efficient than property-rights systems involving full ownership, substantial evidence exists that many communal proprietorships effectively solve a wide diversity of local problems with relatively low transaction costs (Gaffney, 1992; Hanna and Munasinghe, 1995a, 1995c; Kaul, 1996; Sandberg, 1993, 1996a, 1996b; Wilson, 1995). Obtaining valid and reliable measures of outputs and costs for a large number of property-rights systems covering similar activities in matched environmental settings is extremely difficult. In regard to irrigation, a series of careful studies of the performance of communal proprietorship systems as contrasted to government-owned and managed systems, clearly demonstrates the higher productivity of the communal systems controlling for relevant variables (Tang, 1992; Benjamin et al., 1994; E. Ostrom, 1996; Lam, 1998). Schlager's (1990) studies of inshore fisheries demonstrate that fishers who have clearly defined proprietorship are able to solve difficult assignment problems and assign the use of space and technology so as to increase both the efficiency and equity of their systems. James Wilson's (1995) studies also demonstrate that communal proprietorship systems are more efficient than frequently thought.

Performance of communal property-rights systems varies substantially, however, as do the performance of all property-rights systems. Some communal systems fail or limp along at the margin of effectiveness just as private firms fail or barely hang on to profitability over long periods of time. In addition to the environmental variables discussed above that are conducive in the first place to the use of communal proprietorship or ownership, the following variables related to the attributes of participants are conducive to their selection of norms, rules, and property rights that enhance the performance of communal property-rights systems (E. Ostrom, 1993):

1. Accurate information about the condition of the resource and expected flow of benefits and costs is available at low cost to the participants (Blomquist, 1992; Gilles and Jamtgaard, 1981).

2. Participants share a common understanding about the potential benefits and risks associated with the continuance of the status quo as contrasted with changes in norms and rules that they could feasibly adopt (E. Ostrom, 1990; Sethi and Somanathan, 1996).
3. Participants share generalized norms of reciprocity and trust that can be used as initial social capital (Cordell and McKean, 1992).
4. The group using the resource is relatively stable (Seabright, 1993).
5. Participants plan to live and work in the same area for a long time (and in some cases, expect their offspring to live there as well) and, thus, do not heavily discount the future (Grima and Berkes, 1989).
6. Participants use collective-choice rules that fall between the extremes of unanimity or control by a few (or even bare majority) and, thus, avoid high transaction or high deprivation costs (E. Ostrom, 1990).
7. Participants can develop relatively accurate and low-cost monitoring and sanctioning arrangements (Berkes, 1992).

Many of these variables are, in turn, affected by the type of larger regime in which users are embedded. If the larger regime recognizes the legitimacy of communal systems, and is facilitative of local self-organization by providing accurate information about natural resource systems, providing arenas in which participants can engage in discovery and conflict-resolution processes, and providing mechanisms to back up local monitoring and sanctioning efforts, the probability of participants adapting more effective rules over time is higher than in regimes that ignore resource problems or presume that all decisions about governance and management need to be made by central authorities.

Two additional variables - the size of a group and its homogeneity - have been noted as conducive to the initial organization of communal resources and to their successful performance over time (Kanbur, 1991; Libecap, 1989a, 1989b; E. Ostrom, 1992). As more research has been conducted, however, it is obvious that much more theoretical and empirical work is needed since both variables appear to have complex effects. Changing the size of a group, for example, always involves changing some of the other variables likely to affect the performance of a system. Increasing the size of a group is likely to be associated with at least the following changes: (1) an increase in the transaction costs of reaching agreements; (2) a reduction of the burden borne by each participant for meeting joint costs such as guarding a system, and maintenance; and (3) an increase in the amount of assets held by the group that could be used in times of emergency. Libecap (1995) found that it was particularly hard to get agreements to oil unitization with groups greater than four. Blomquist (1992), on the other hand, documents processes conducted in the shadow of an equity court that involved up to 750 participants in agreeing to common rules to allocate

rights to withdraw water from groundwater basins in southern California. The processes took a relatively long period of time, but they have now also survived with little administrative costs for half a century. Agrawal (1996) has shown that communal forestry institutions in India that are moderate in size are more likely to reduce overharvesting than are smaller groups because they tend to utilize a higher level of guarding than smaller groups.

Group heterogeneity is also multifaceted in its basic causal processes and effects. Groups can differ along many dimensions including their assets, their information, their valuation of final products, their production technologies, their time horizons, their exposure to risk (for example, headenders versus tailenders on irrigation systems), as well as their cultural belief systems. Libecap's (1989b) research on inshore fisheries has shown that when fishers have distinctively different production technologies and skills, all potential rules for sharing withdrawal rights have substantial distributional consequences and are the source of conflict that may not easily be overcome. Libecap and Wiggins' (1984) studies of the prorationing of crude oil production reveal an interesting relationship between the levels and type of information available to participants and the likelihood of agreement at various stages in a bargaining process. In the early stages of negotiation, all oil producers share a relatively equal level of ignorance about the relative claims that each might be able to make under private-property arrangements. This is the most likely time for oil unitization agreements to be reached successfully. If agreement is not reached early, each participant gains asymmetric information about their own claims as more and more investment is made in private information. Agreements are unlikely at this stage. If producers then aggressively pump from a common oil pool, all tend to be harmed by the overproduction and are willing late in the process to recognize their joint interests. Libecap's (1995) study of marketing agreements among orange growers also shows a strong negative impact of heterogeneity. The theoretical work of Mancur Olson (1965) on privileged groups, on the other hand, predicts that when some participants have substantial assets and whose interests are aligned with achieving an agreement, such groups are more likely to be organized. The empirical support for this proposition comes more from studies of global commons (Mitchell, 1995; Oye and Maxwell, 1995).

Heterogeneity in the knowledge and acceptance of local common property regimes is likely to lead to their undoing. In frontier regions, new migrants increase the number of people sharing the return from a common-pool resource. Further, migrants are unlikely to recognize the legitimacy of extant, *de facto*, property-rights systems (see Alston, Libecap and Schneider, 1996). Thus, the common agreement necessary for the

sustenance of any property-rights system may rapidly disappear if settlement patterns undergo a rapid change. Similarly, common property systems related to inshore fisheries have also proved to be unstable when trawlers from other locations start to visit on a regular basis without recognizing the *de facto* property rights of local fishers.

7. Attributes of Common-Pool Resources Conducive to the Use of Individual Rights to Withdrawal, Management, Exclusion, and Alienation

The advantage of individual ownership of strictly private goods - where the cost of exclusion is relatively low and one person's consumption is subtractive from what is available to others - is so well established that it does not merit attention here. Industrial and agricultural commodities clearly fit the definition of private goods. Individual rights to exclusion and to transferring control over these goods generate incentives that lead to higher levels of productivity than other forms of property arrangements.

It has frequently been assumed that land also is clearly always a private good and therefore best allocated using market mechanisms based on individual ownership rights. Agricultural land in densely settled regions is usually best allocated by a system of individual property rights. Gaining formal title to land, however, may or may not increase efficiency. Feder et al. (1988) conducted an important econometric study that showed that agricultural land in Thailand without a formal title was worth only one-half to two-thirds of land with a formal title. Further, increasing the security of private-property rights also led to an increased value of the crops produced (between one-tenth and one-fourth higher than those without secure title). More secure titling also provided better access to credit and led to greater investments in improved land productivity (see also Feder and Feeny, 1991). Insecure property rights may lead potential users to arm and engage in violent conflict so as to gain control over land through force or by negotiation to avoid force. Several types of economic losses result from conflict over ownership (Skaperdas and Syropoulos, 1995; Umbeck, 1981a, 1981b).

Title insurance is another mechanism used to reduce the risk of successful challenges to ownership of land. Registering brands is still another technique used to increase the security of ownership over resource units in the form of cattle that may range freely over a large area until there is a communal effort to undertake a round-up. Gaining formal titles is, however, costly. In societies that do not yet have high population densities and where customary rights are still commonly understood and accepted,

formal titling may be an expensive method of increasing the security of a title that is not associated with a sufficiently higher return to be worth the economic investment (see Migot-Adholla et al., 1991). In addition, it should now be clear that the cost of fencing land by physical and/or institutional means is nontrivial and that there are types of land and land uses that may be more efficiently governed by groups of individuals rather than single individuals.

A commonly recommended solution to problems associated with the governance and management of mobile resource units, such as water and fish, is their 'privatization' (Christy, 1973; Clark, 1980). What private ownership usually means in regard to mobile resource units, however, is individual ownership of withdrawal rights. Water rights are normally associated with the allocation of a particular quantity of water per unit of time or the allocation of a right to take water for a particular period of time or at a particular location. Fishing rights are similarly associated with quantity, time, or location. These rights are typically 'withdrawal' rights that are tied to resource units and not to a resource system. In addition to the individual water rights that farmers hold in an irrigation system, they may also jointly own - and, therefore, govern and manage - the irrigation facilities themselves (Tang, 1992). In addition to the quotas or 'fishing units' that individual fishers may own, no one owns the fishing stock and governmental units may exercise various types of management rights in relationship to these stocks (Schlager, 1990). In groundwater basins that have been successfully litigated, individual pumpers own a defined quantity of water that they can produce, rent, or sell, but the groundwater basins themselves may be managed by a combination of general-purpose and special-purpose governmental units and private associations (Blomquist, 1992).

Implementing operational and efficient individual withdrawal rights to mobile resources is far more difficult in practice than demonstrating the economic efficiency of hypothetical systems. Simply gaining valid and accurate measurements of 'sustainable yield' is a scientifically difficult task. In systems where resource units are stored naturally or by constructing facilities such as a dam, the availability of a defined quantity of the resource units can be ascertained with considerable accuracy, and buying, selling, and leasing rights to known quantities is relatively easy to effectuate in practice. Many mobile resource systems do not have natural or constructed storage facilities and gaining accurate information about the stock and reproduction rates is very costly and involves considerable uncertainty (Allen and McGlade, 1987; Wilson, et al., 1991). Further, as Copes (1986) has clearly articulated, appropriators from such resources can engage in a wide diversity of evasive strategies that can destabilize the efforts of government agencies trying to manage these systems. Further, once such systems have allocated individual withdrawal rights, efforts to further regulate patterns of

withdrawal may be very difficult and involve expensive buy-back schemes (Örebech, 1982). Experience with these individual withdrawal-rights systems has varied greatly in practice (see McCay, 1992; McCay, et al., 1996; Pinkerton, 1992; Wilson and Dickie, 1995).

Exactly which attributes of both physical and social systems are most important to the success of individual withdrawal rights from common-pool resources is not as well established as the attributes of common-pool resource systems conducive to group proprietorship or ownership. On the physical side, gaining accurate measurements of the key variables (quantity, space, technology) that are to be involved in management efforts is essential. Resource systems that are naturally well-bounded facilitate measurement as well as ease of observing appropriation behavior. Storage also facilitates measurement. Where resource units move over vast terrain, the cost of measurement is higher than when they are contained (for example, it is easier to develop effective withdrawal-rights systems for lobsters than for whales).

Considerable recent research has also stressed the importance of involving participants in the design and implementation of such property-rights systems. When participants do not look upon such rules as legitimate, effective, and fair, the capacity to invent evasive strategies is substantial (Seabright, 1993; J. Wilson, 1995). The size of the group involved and the heterogeneity of participants also affect the costs of maintaining withdrawal-rights systems (Edwards, 1994). And, the very process of allocating quantitative and transferable rights to resource units may undo some of the common understandings and norms that allowed communal ownership systems to operate at lower day-to-day administrative costs.

8. Communal Property Regimes in the Twenty-First Century

The focus of this entry has been primarily on natural resources. Many of the lessons learned from the operation of communal property regimes in these sectors, however, are quite relevant for a wide diversity of similar property regimes that are currently in wide use and likely to have a substantial presence in the next century. A very large number of housing developments - both apartment houses and individual family dwellings - involve individual property to the housing unit itself combined with communal property to the grounds, recreational facilities, and other joint facilities. While individuals can buy and sell their individual housing units, at the time of purchase they assume a set of duties in respect to the closely related communal properties. Monthly assessments for the repair and maintenance of these common facilities are not unlike the assessments made by a community of irrigators on themselves for the maintenance of their own system. Further, purchase

and sales frequently require the permission of other members of the group. Similarly, many sports clubs allocate use quotas to members and assess members regular fees for the maintenance of the commonly owned facilities.

The modern corporation is frequently thought of as the epitome of private property. While buying and selling shares of corporate stock is a clear example of the rights of alienation at work, relationships within a firm are far from being 'individual' ownership rights. Since the income that will be shared among stockholders, management, and employees is itself a common pool to be shared, all of the incentives leading to free riding (shirking) and overuse (padding the budget) are found within the structure of a modern corporation (Ghoshal and Moran, 1996; Putterman, 1995; Seabright, 1993). Thus, where many individuals will work, live, and play in the next century will be governed and managed by mixed systems of communal and individual property rights.

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