

The Economic Rationale of Communal Resources

Introduction

We are concerned in this paper with the logic of economic organization when several independent producers jointly draw inputs from a natural resource which they share and to which they hold exclusive rights. We use the term *communal property* to refer to this arrangement and distinguish it from situations where exclusive rights to a resource do not exist and access to the asset is open.¹

The structure of organization is a chief concern of the economics of institutions which attributes forms of organization not only to economies of scale but to problems of information and costly enforcement of contracts. In explaining the emergence of property rights and alternative forms of organization, most economists have followed an approach that has been called the naive model.² The naive model explains the structure of institutions and organizations in terms of the demand for these arrangements by rational individuals, who are constrained by information and

¹ Many scholars prefer to use the term common property rather than communal property for exclusive resources that are shared. Other scholars use the term common property to refer to non-exclusive assets with open access, and the "commons problem" is widely understood as implying the waste associated with open access. Much confusion has been caused by two theoretical concepts sharing the same two words, which in this instance suggests that individual rights rather than sharing may be a more productive arrangement.

² See pp. 249-262 in Eggertsson, Thráinn (1990). *Economic Behavior and Institutions*. Cambridge: Cambridge University Press.

other transaction costs and seek arrangements that maximize the joint value of their assets. The approach is naive because it does not seek to explain the supply of property rights, which is the domain of social and political organizations.³ Our initial discussion is based on versions of the naive model, but we go on to consider the role of social and political organizations in shaping property rights.

It is sometimes argued that communal property regimes must deal with categorically different problems of organization than other regimes of exclusive rights. We maintain that all forms of exclusive property rights involve essentially the same measurement and policing problems and that the appropriate structure of rights depends on technology, physical characteristics of the resources, relative prices, and social and political institutions. In terms of the criterion of wealth maximization, communal property is the optimal arrangement in some situations but unsuitable under other circumstances. Further, the condition of open access is associated with all forms of exclusive rights, including individual property, and arises because the marginal benefit of enforcing full control over all attributes of a valuable asset tends to fall short of the marginal cost.⁴

We begin by discussing why one expects to find communal property regimes in some and not in other situations and proceed to look at the variables that push resource regimes in the direction of communal ownership. These issues are examined in terms of the naive model, as social and political institutions are assumed to be exogenous.⁵ We then introduce the wealth effect and examine how the struggle

³ Milgrom and Roberts (1992) provide an excellent survey of the modern economics of organization. The studies they examine usually assume that the players are located in a laissez-faire environment. Also, many studies ignore the wealth effects of alternative arrangements when individuals seek to maximize the joint value of their assets. See p. 288 in Milgrom, Paul and Roberts, John (1992). *Economics, Organization and Management*. New Jersey: Prentice Hall.

⁴ Barzel, Yoram (1989). *Economic Analysis of Property Rights*. Cambridge: Cambridge University Press.

⁵ Following North (1990) we distinguish between organizations and institutions. Organizations are groups of individuals that play together according to rules that are both internal and external. The external rules, formal and informal, and their enforcement characteristics are referred to as institutions. The definition implies that the set of institutions that a player

over distribution can affect the structure of communal property regimes. The next step is to consider the supply of exclusive property rights. We continue by examining some of the factors that may undermine communal property and finally conclude with a few thoughts about property rights in the Samii rangelands of Norway's Finnmark.

Economic factors and the choice of an exclusive resource regime

Imagine a group of individuals (households or firms) that contemplates the utilization of a contiguous natural resource such as rangeland, a forest, or a fishery. The individuals are capable of collective action (but collective action requires the use of scarce resources); the objective of the group is to maximize the joint value of their resources (the choice is not constrained by individual wealth effects); and the enforcement of property rights is entirely with the group and its members (although exogenous social norms, customs, and conventions affect the cost of enforcement). The users can choose from a large menu of regimes, each characterized by several dimensions.

The number of independent users that share the entire resource or portions of it is a key dimension of a resource regime. At one extreme we have open access, when the community decides not to incur the cost of excluding outsiders. Then there are various regimes of exclusive rights ranging from the sharing of the entire

confronts depends on his location and status in society — a dictator faces another set of institutions than her subjects. The term property rights refers to the power of an agent to control valuable margins of scarce assets. Society presents individuals with various rights and duties and their enforcement, but also individuals themselves privately enforce their rights. Although it is not common practice in the literature, we distinguish between internal (endogenous) and external (exogenous) property rights. External property rights correspond to institutions. Individuals incur transaction costs when they enforce internal property rights to prevent either outright theft or the appropriation of value by partners in exchange. However, from the aggregate or social viewpoint there is no distinction between internal and external property rights, and transaction costs refer to the aggregate cost of operating a regime of property rights. North, Douglass C. (1990). *Institutions, Institutional Change, and Economic Performance*. Cambridge: Cambridge University Press.

resource by the group (communal property) to individual holdings (individual or private property). In between communal and individual property are intermediate communes which are subgroups of two or more individuals who share property.

Another dimension of regimes is the size of each individual unit and the potential for mergers. For instance, it is conceivable that the individual producers could minimize costs by merging into one firm that would become the sole user of the resource. This dimension was explored by Coase (1937) in his study of the nature of the firm.⁶ Yet another margin concerns the degree of precision and detail that the community decides to give the rules for operating the resource. The costs of explicit rules are balanced against the benefits of limiting potential disputes over uncertain rights. Libecap (1978) uses nineteenth century data from Nevada's richest mining area to test and find support for the thesis that property rights will be made more precise as resources become more valuable.⁷ Finally, we note that the community must determine the extent of the rights to use, earn income from, and transfer or dispose of the resource.

Let us consider more closely the factors that are supposed to push a resource regime in the direction of exclusive rights, which is an issue that has been given considerable attention in the literature. In a pioneering article, Demsetz (1967) explains the introduction of exclusive rights in land among Indian hunters in the eastern part of Canada in terms of the cost and benefits of internalizing externalities from non-exclusive use of the resource. In this case, the driving force of internalization was the opening of a commercial market and a sharp increase in output demand which induced the Indians to divide open hunting regions into smaller hunting territories.⁸ Demsetz's approach is employed by Anderson and Hill

⁶ Coase, Ronald H. (1937). "The Nature of the Firm." *Economica* 4 (November): 386-405.

⁷ Libecap, Gary (1978). "Economic Variables and the Development of the Law: The Case of Western Mineral Rights." *Journal of Economic History* 38 (No. 2, June): 399-458.

⁸ Demsetz, Harold (1967). "Toward a Theory of Property Rights." *American Economic Review* 57 (May, No. 2): 347-359.

(1975), who explicitly include the *cost of exclusion* to explain the evolution of exclusive rights to the utilization of land, water, and cattle on the Great Plains of the American West during the second half of the nineteenth century.⁹ Field (1986, 1989) has refined the Demsetz approach on two margins¹⁰: first, by explicitly considering both the cost of excluding outsiders, *exclusion cost*, and the cost of controlling the propensity to excessive use when a resource is shared, *governance cost*, and second, by considering a continuum of communality, ranging from individual ownership through a series of intermediate communes of increasing size to a commune of the whole.

A brief description of the Field model may help us to highlight critical variables that affect the relative efficiency of communal property. In the model, it is assumed that the community will select the arrangement that maximizes the aggregate net returns from a natural resource, such as rangeland. There are two corner solutions, individual property and communal property, and the internal solutions involve sets of intermediate communes of different sizes. The resource consists of units of homogeneous quality; the individual producers are also homogeneous; and their production functions are identical. All inputs other than the natural resource are privately owned. The creation of value is based on three activities:

A) The transformation of inputs into outputs that is described by a *transformation function* corresponding to the conventional production function.

B) The exclusion of intruders by monitoring, fencing, and other means.

Successful exclusion is rewarded by greater output at each level of input

⁹ Anderson, Terry L., and Hill, P.J. (1975). "The Evolution of Property Rights: A Study in the American West." *Journal of Law and Economics* 18 (No.1): 163-179.

¹⁰ Field, Barry C. (1986). "Induced Changes in Property Rights Institutions." Research Paper. Amherst: University of Massachusetts, Department of Agriculture. Field, Barry C. (1989). "The Evolution of Property Rights." *Kyklos* 42 (No. 3): 319-345.

use, which implies that the transformation function shifts up.¹¹ The *exclusion function* can be seen as a production function which depends both on the technology of exclusion and social institutions and organizations.

C) The policing of insiders to limit excessive utilization when two or more individuals share (a portion of) the resource. We refer to this activity as *governance*. The group decides on the level of utilization that maximizes the value of the resource and assigns user rights to each individual. The relationship between inputs and level of control achieved is described by the *governance function*, and the cost of governance is balanced against the resulting increase in net income.

Various assumptions can be made about the nature of the exclusion and governance functions. In the Field model exclusion costs depend directly on the length of the borders, which are at a maximum when the resource is divided into individual properties and at a minimum when the resource is one property shared by the whole group. Internal governance problems arise when two or more individuals share a property, and governance costs rise directly with the number of joint users on each plot and peak when the resource is one property. If there were no governance costs and exclusion costs, the division of the resource would be determined by the economies of scale in the transformation function.¹² Below we

¹¹ Inputs or outputs appropriated by intruders are given zero value in the model.

¹² A formal version of the Field model is found in the 1986 working paper. Firm size is not a choice variable in the formal model, which implicitly excludes the possibility that individual producers merge into large firms. See footnote 10.

Merger is explicitly considered by Lueck (1992), and Caputo and Lueck (1992) in an important extension of the naive model. Lueck (1992) explores the optimal use of a fixed (natural) resource. The choice variables include group size, and three contractual arrangements: a) a fixed payment contract (a firm) where a single party owns the fixed resource and hires effort from the other individuals; b) a communal property contract where the group members supply their own inputs and equally share the fixed output; c) a communal property contract where the members only share access to the fixed resource. Caputo and Lueck (1992) extend the model in Lueck (1992) in various ways and compare private ownership with sharing over three possible margins: a) output derived from the resource; b) access to the resource; c) investment in the

assume that there are constant returns to scale and focus attention on the role of governance and exclusion in determining the degree of exclusivity.

Consider again the complex optimization problem confronting the community of users. Net income depends not only on the allocation of inputs in conventional production (transformation) but also on the use of inputs in exclusion and governance; furthermore, both governance cost and exclusion cost are influenced by the division of the resource into properties.¹³ Many small intermediate communes imply relatively low governance costs but high exclusion costs, and few large intermediate commons have relatively large governance costs and low exclusion costs. In sum, the degree of exclusivity depends on a trade-off between governance and exclusion costs, other things equal.

Economic forces supporting communal property regimes

The higher the exclusion costs relative to governance costs, the more likely will a community that strives to maximize wealth select large communal arrangements. Therefore, in order to understand the economic logic of communal property, we must examine the factors influencing the levels of the cost functions for governance and exclusion.

Exclusion depends on technology, the physical characteristics of the resource, relative prices (including the prices of inputs in the exclusion function and the output price), and on the social institutions that constrain the players. In extreme cases, and given the state of technology, the physical characteristics of a resource

resource. Again optimization involves choosing the group size. Lueck, Dean (1992). "Common Property as an Egalitarian Share Contract." Working Paper. Baton Rouge: Department of Economics, Louisiana State University. Caputo, Michael R., and Lueck, Dean (1992). "Common Property: Dynamic Incentives and Contract Choice." Working Paper. Davis: Department of Agricultural Economics, University of California.

¹³ The allocation of inputs between the three activities is not optimal unless there is equality among the marginal (net) rates of return on inputs used in transformation, exclusion, and governance.

can make it prohibitively costly to divide it into exclusive sub-units, which leads to the corner solution of a single communal property. Exclusion costs are also influenced by the size of the area required for individual operations. For instance, in arid or infertile regions the typical individual may demand a large geographic area for grazing her flocks or need to vary the pastures with the seasons or climatic changes. When the cost of monitoring or fencing individual properties is high, communal regimes become an attractive alternative, as does the reliance on natural boundaries, when possible.¹⁴

The relative prices of inputs in the exclusion function are an important factor influencing the choice of communal property regimes, for instance in communities where the price of timber and other material for fences is high. Also, an increase in output price creates new incentives for outsiders to intrude and makes it more costly to maintain any level of exclusion. The technology of exclusion is an important determinant of exclusion costs, and primitive exclusion technology increases the relative effectiveness of communal arrangements. When there are important economies of scale in exclusion (particularly in operating a system of individual properties), a small community of users may favor communal property for (some of) its natural resources. Although it is not self-evident, the political integration of a country may bring scale economies in exclusion and increase the attractiveness of individual property. The interaction between transformation technology and exclusion technology should also be noted. The cost of exclusion depends on what is produced and how it is produced, and the choice of output and production methods is

¹⁴ For instance, in the mountain pastures of Iceland the typical farmer required a large area for his or her flock of sheep, and the relative price of fences was high. The pastures were managed as communal property. See Eggertsson, Thráinn (1992). "Analyzing Institutional Successes and Failures: A Millennium of Common Mountain Pastures in Iceland." *International Review of Law and Economics* 32: 423-437.

Note that instead of using large communal areas to meet variable weather conditions, relatively small individual plots could be instituted along with an active trade in grazing rights between individual owners and users. However, high transaction costs could make the introduction and operation of a market in grazing rights inefficient.

nor independent of exclusion (and governance) cost. Furthermore, a change in transformation technology (or a change in relative prices) can affect the choice of regime. For instance, a new transformation technology in agriculture can make the production of fodder on individual plots the optimal alternative and eliminate the dependence on pastures; or new fishing technology may introduce foreign and domestic vessels (and open access) in a fishery that used to be the communal property of coastal fishermen.

It is important to realize that a continued upward shift in exclusion costs, with a constant governance function, first pushes a system toward communal ownership but eventually, as the upward drift continues, places the resource in the public domain. In many instances, communal property is the only practical alternative to open access, and because of their proximity the two arrangements are often confused.

Governance costs depend on social institutions, technology, relative prices, and the physical characteristics of the resource and its environment, just as exclusion costs do. Low governance costs for large groups of users encourage communal property.

It has been argued, for instance by Runge (1992) and Bromley (1992), that poverty is the cause of communal property because the arrangement is frequently found in poor communities. Runge states that "low levels of income imply that formalized private-property institutions are outside the village-level budget for resource management." And Bromley adds: "In fact, as Runge reminds us, low-valued resources are more likely to be managed under common [communal] property for the simple reason that there is insufficient economic surplus to support the more expensive private-property regime. I make the same point elsewhere."¹⁵ We prefer

¹⁵ See p. 33 in Runge, C. Ford (1992), "Common Property and Collective Action in Economic Development." In Daniel W. Bromley (ed.), *Making the Commons Work. Theory, Practice and Policy*. San Francisco: Institute for Contemporary Studies Press. Note also p. 5 in Bromley's

different reasoning. The statement that poor communities cannot afford exclusive rights may apply to the purchase of expensive consumer goods, but not to the choice of property regimes. In fact, poor communities can afford only regimes that maximize the net output from their natural resources, the difference between gross output and costs. The observation that communal property regimes are found relatively frequently in developing countries is to be explained in terms of the available technology in transformation, exclusion and governance, relative prices, and social institutions. Many low-income communities rely on a mixture of individual and communal rights: for instance, the livestock, farmland, tools, and housing are often the property of individual economic units (households) while grazing land remains communal property.¹⁶ That communal property regimes are found in wealthy communities as well, such as Switzerland with its celebrated Alpine pastures, also undermines the poverty argument.¹⁷

The wealth effect and communal property regimes

In our discussion so far, we have ignored the individual wealth effects of introducing alternative property rights regimes. Even though it has been assumed that new property rights regimes are only chosen if they increase aggregate wealth (or minimize unavoidable losses), it must be recognized that all changes in property

introduction to the volume.

16 The poverty argument for communal rights could be rescued if the introduction of individual rights required large-scale lump investments that bear fruit only in future periods. An isolated community that cannot borrow and is too close to subsistence to save is not able to make such investments. It is an empirical question whether a financial constraint is an important explanation of communal property regimes. Note that implicit in the poverty argument is the notion that communities would do better under individual property rather than communal property, if only the financial constraint were lifted.

17 See Stevenson's (1991) extensive study of the Swiss case. In his econometric investigations, Stevenson compared communal property with individual property in Alpine *grazing* and found that outcomes of communal regimes were inferior to those in individual regimes. Stevenson gives several theoretical and empirical reasons why his statistical results may not be correct. However, if the results are correct, the Swiss may indeed have ideological attachment to their communal arrangements and enjoy them like consumer goods. Stevenson, Glenn G. (1991). *Common Property Economics. A General Theory of Land Use Applications*. Cambridge: Cambridge University Press.

rights involve winners and losers. Therefore, the losers have an incentive to prevent changes that are expected to worsen their (relative) wealth position, unless they are guaranteed compensation, which is often impractical. When side-payments are impractical, the outcome depends on the power of the losers relative to the winners, which is partly determined by the community's political structure.

Consider again the previous case of a community of users choosing a resource regime. The community now confronts a new constraint: each individual has the power to veto all proposals that change the status quo, and no rational (and selfish) individual will agree to a new regime that makes him or her worse off than before. Let us assume that the current situation is one of open access with excess utilization of the resource. The group does not maximize the net economic yield from the resource, but the current yield is sustainable and the resource not in immediate danger of destruction.¹⁸

The group is faced with a dilemma. Their calculations show that a change from open access to communal property (rather than to individual property or intermediate communes) would increase the total wealth of the community, but some individual members could easily lose from the change in regimes. As side payments are ruled out by high transaction costs, the introduction of exclusive rights hinges on the community's ability to constrain the communal regime in such a way as to make sure that no individual will lose from the change.

Roberts (1990), using a straightforward graphic analysis of supply and demand, has analyzed the situation above.¹⁹ First, it is easy to show that the introduction of a (Pigouvian) tax, for limiting the use of the resource to the efficient

¹⁸ Imagine that the users are restrained by costs and thus prevented from devastating the resource. The cost constraints could be due to the inelastic supply of a cooperating input, such as water on grazing land or Fishing vessels in a fishery.

¹⁹ Roberts, Russell D. (1990). "The Tragicomedy of the Commons: Why Communities Rationally Choose 'Inefficient' Allocations of Shared Resources." Political Economy Working Paper. St. Louis: Center in Political Economy, Washington University.

level, makes all previous users worse off, unless the revenue from the tax is returned to them.²⁰ However, the tax revenue does more than cover the consumers' surplus lost by the users, when the price of entry is raised.

As the use of a tax for aligning social marginal costs and benefits is information intensive, a system of marketable coupons is more practical in a world of costly information. With marketable coupons the community would establish the efficient total level of use for the resource and apply some formula to issue coupons to previous users, giving each a share in the total. Again, if the coupons are sold to the users at market price, they are worse off than before, unless the proceeds are returned to them. However, even if the coupons are given for free, the task of assigning shares to previous users in such a way that no one is made worse off becomes a complex task. Consider two individuals with equal levels of usage in the free-entry equilibrium, but individual A has a greater price elasticity of demand for the resource than individual B. If both receive the same share of coupons when communal property rights are introduced, Roberts (1990) shows that B, because of his low elasticity of demand, is made relatively better off than A. Equal treatment of the two requires that A receive a larger share of the coupons than B.

When the price elasticity of demand is similar for all individuals in the group, the allocation of coupons relative to the level of prior usage or relative to some proxy for demand, such as land ownership in the case of private farmers using communal pastures, is likely to guarantee that no one is made worse off and that the relative wealth position of the individuals does not change substantially.

Finally, Roberts shows that unrestricted resale of coupons can make some individuals worse off than they were in the open-access equilibrium, particularly if

²⁰ Roberts (1990), p. 5. Also see Weitzman, Martin L. (1974). "Free Access vs. Private Ownership as Alternative Systems for Managing Private Property." *Journal of Economic Theory* 8 (June): 225-234.

the coupons are sold to outsiders who drive up the price.²¹ The trouble does not arise if the allocation of coupons correctly reflects the consumers' surplus lost by each individual, but when that fails some individuals will veto unrestricted resale of coupons, even though unlimited resale maximizes the total wealth of the group.

Several scholars, such as Ostrom (1990), have emphasized that agreements on efficient communal property regimes are reached more easily in a homogeneous than a heterogeneous group. Johnson and Libecap (1982) and Libecap (1989) discuss how heterogeneity among fishermen limits the fisheries regulations that they can agree on.²²

We have discussed how the wealth effect influences the choice of property rules by a small group of producers, such as the farmers in a rural village. When resource regimes are selected by an external authority, such as a national government, the interplay of inside and outside interests, and complex procedures for making decisions, can make the story much more complex.

The supply of exclusive property rights

We now leave the naive model behind and briefly consider the supply of exclusive rights. For social scientists who employ the rational choice model, the establishment and successful operation of a system of communal property rights by rational, non-altruistic individuals poses several puzzles. The first puzzle concerns the supply of a mechanism for selecting a system of communal property. The services of individuals who provide this apparatus have the characteristics of a public good and, therefore, are likely to be supplied in inadequate quantity. Second,

²¹ Of course, technically these individuals could be compensated for their loss.

²² Ostrom, Elinor (1990). *Governing the Commons. The Evolution of Institutions for Collective Action*. Cambridge: Cambridge University Press. Johnson, Ronald N., and Libecap, Gary D. (1982). "Contracting Problems and Regulations: The Case of the Fishery." *American Economic Review* 72, (No. 5): 1005-1022. And Chapter 5, "Contracting in Fisheries," in Libecap, Gary D. (1989). *Contracting for Property Rights*. Cambridge: Cambridge University Press.

the choice of constitutional and operational rules for managing the resource regime is likely to involve hard bargaining over the distribution of expected gains, possibly with indeterminate results. Third, individual compliance with rules that restrict use of the resource is also a public good, and free riding may undermine the regime when monitoring is costly.²³

Before we go further, it is important to note that these collective action problems are not limited to communal property but shared by all attempts to establish exclusive rights. In terms of the rational choice approach, the creation of any system of exclusive rights for a community always requires some curtailment of the propensity to free ride. All changes in property rights have wealth effects which invite bargaining over distribution, and transaction costs always make exclusive rights incomplete and cause a certain amount of waste.

The decision by a group to restrict access to a resource can be represented as a contract among its members, and all contracts are incomplete because of transaction costs, according to contract economics.²⁴ However, the nature of the open access problems varies from one contractual structure to another.

In the case of individual property, residual rights are exercised by an owner who both has residual control and receives (under ideal conditions) the net residual benefits of her actions, which encourages the owner to make efficient decisions that maximize wealth. However, when the proprietor expands her operations beyond the unitary firm and hires agents, she must deal with incomplete contracts and shirking by the agents, which lowers the joint value of the cooperating assets. In order to limit such losses, the proprietor usually attempts to realign the incentives of

²³ For an excellent survey of the current state of the theory of collective action, see Sandier, Todd (1992). *Collective Action. Theory and Applications*. Ann Arbor: University of Michigan Press.

²⁴ For an introduction to the theory of implicit and explicit contracts and various applications of the theory, see Werin, Lars, and Wijkander, Hans, eds. (1992): *Contract Economics*. Oxford: Basil Blackwell.

her agents by monitoring and with contractual arrangements which, for instance, link their pay to the fortunes of the firm. The internal problems of the firm — opportunism, shirking, free-riding — mount as the structure becomes more complex and changes from individual proprietorship to a partnership or to a public corporation. In the public corporation it is not clear whether any party, such as the stockholders, directors, managers or the workers, both has residual control and receives the residual income.²⁵ However, in all these instances various arrangements have evolved for limiting the incentives problems, including competition in the market place.

Communal property arrangements, just as other forms of economic organization, depend on contracts that are structured to limit transaction costs. Recently, the complexities of communal property regimes have been documented and analyzed by various scholars, of whom Ostrom (1990) is a noted example.²⁶

Why do rational actors supply the institutions of communal property? How do they overcome the collective action problem? In responding to such questions about the supply of property rights (which the naive model does not consider), the theoretical literature has not converged on a single answer, but several approaches to the problem can be discerned. We will briefly consider some of these.

The collective action problem is frequently analyzed in terms of game theory, particularly as a Prisoners' Dilemma where non-cooperation is the dominant strategy. Incentives to cooperate are introduced by considering not a single game but repeated games or supergames. Others claim that the problem of cooperation is best modeled by games, such as the Assurance Game or the Game of Chicken, which are more likely than the Prisoners' Dilemma game to lead to some cooperation, if the game is played only once.²⁷ In the continuous case, hybrids of games have been

²⁵ Milgrom and Roberts (1992), pp. 314-315.

²⁶ See footnote 22.

²⁷ For an excellent discussion of these issues, see Taylor, Michael (1987). *The Possibility of*

suggested.²⁸ Many studies distinguish between formal rules that are provided by political organizations and informal rules, such as customs and norms, that are not purposefully created but evolve spontaneously.²⁹

Many scholars have bypassed the fundamental question of how to reconcile rationality on the part of the individual with rationality on the part of the group, and focus on the role of coercion in overcoming the collective action problem. These social scientists "see in collective dilemmas reasons for the existence of institutions: forms of hierarchy in which sanctions are employed to make self-interested choices consistent with the social good."³⁰ Hechter (1990) associates the emergence of coercive organizations in traditional societies with the joint production of private goods in situations where individual behavior is easily visible. These organizations of producers are then used to control free-riding in the supply of public goods.³¹

The scholar can also equip his players with internal norms and values that change the structure of the payoff matrix in their games and introduce cooperation as the dominant strategy. Although not formally stated in terms of game theory, pioneering work along these lines was undertaken in the first half of the century by a number of investigators, such as Evans-Pritchard, who studied traditional societies in Africa.³² These studies report how customary law and ideology in traditional

Cooperation. Cambridge: Cambridge University Press.

²⁸ The pure game-theoretic approach catches the group before it forms a community and before the individuals are constrained by social institutions, such as norms, conventions and customs, which implies that the members have not developed a common language, religion, set of customs, or network of family and kinship ties. It is an amusing thought to try to visualize these isolated speechless individuals gathered to select a system of property rights and play complex games with each other. However, it must be admitted that the introduction of prior rules begs the question of the origins of cooperation.

²⁹ North (1990). See footnote 5.

³⁰ P. 387 in Bates, Robert H. (1988). "Contra Contractarianism: Some Reflections on the New Institutionalism." *Politics and Society* 16 (No. 2-3): 387-401.

³¹ Hechter, Michael (1990). "The Emergence of Cooperative Social Institutions." In Hechter, Michael et al., eds. *Social Institutions. Their Emergence, Maintenance and Effect* Berlin: De Gruyter.

³² Gluckman (1956) has summarized and interpreted some of their findings. Bates (1983) has retold the story in the language of game theory. Bates, Robert H. (1983). "The Preservation of Order in Stateless Societies: A Reinterpretation of Evans-Pritchard's *The Nuer*." Chapter 1 in

societies contribute to the maintenance of order. Vengeance groups, collective responsibility, the institution of compensation, exogamy and relations of kinship, the system of beliefs surrounding the institution of witchcraft, and a host of other arrangements have been interpreted as raising the cost of non-compliance and promoting cooperation.

In the naive model of property rights discussed in previous sections, social and political institutions do not enter directly but affect outcomes by shifting the exclusion and governance functions. One can speculate that certain social structures may be likely to contribute to relatively low governance costs for communal property, while other social institutions may support low exclusion costs for individual property. For instance, it is sometimes argued that the thrust of norms and customary law in many traditional societies is to restrain individualism and lower governance costs, while traditional societies often lack specialized organizations for enforcing individual ownership rights, particularly when ownership rights can be traded.³³

The demise of communal property regimes

Communal property regimes can give way to either open access or more exclusive (individual) property rights. We now consider in what direction economic growth is likely to push a system of communal property. There is little help to be found in formal economic models, such as the Field model: an increase in either of the two critical variables associated with economic growth, the demand for the resource and population, has uncertain effects on the exclusivity of the resource regime. The reason for this indeterminacy is that each variable affects both the cost of exclusion and the costs of governance in many ways. For instance, an increase in

Essays on *The Political Economy of Rural Africa*. Cambridge: Cambridge University Press.
Gluckman, Marx (1956). *Custom and Conflict in Africa*. Oxford: Basil Blackwell.

³³ Here we are faced with the fundamental question of whether social and political institutions lead an independent life or merely reflect technologies and economic forces. The answer is, both.

output demand, that is reflected in a higher output price, shifts up the governance cost curve and creates an incentive for smaller communes or individual property. However, an increase in output price can also affect the cost of exclusion by increasing the incentive for encroachment, which means that additional resources are required to achieve the same level of exclusion as before. The cost curve for exclusion shifts up which directs the system in the opposite direction, toward communal property.

Furthermore, it is beyond the scope of formal models, to consider directly the impact on exclusivity of the numerous developments that usually accompany economic growth, such as technological change in transformation, governance and exclusion, organizational innovation, changes in the location of industry, the nature of products, and new forms of political and social organization. Economic growth with increasing population and falling transportation costs may introduce open access by overwhelming the capacity of small appropriator organizations to provide exclusion.³⁴ Economic growth may also bring integration and restructuring of political units and a greater capacity to manage individual properties. Further, economic growth can contribute to the breakdown of social structures in traditional societies and raise the governance cost of communal property, and with weak social structures the capacity to exclude may also be diminished.³⁵

There are myriad possibilities and special cases. The impact of economic growth on communal property arrangements in particular cases has been analyzed informally by several authors. For instance, Ensminger and Rutten (1990) study how economic growth has dismantled a communal system among the Orma, who were

³⁴ The term "appropriator organization" is due to Ostrom, Elinor (1992). "The Rudiments of a Theory of the Origins, Survival, and Performance of Common-Property Institutions." In Bromley, Daniel W., ed. *Making the Commons Work. Theory, Practice and Policy*. San Francisco: Institute of Contemporary Studies Press.

³⁵ The breakdown of communal (or any) property regime need not involve the formal removal of the rules that define the regime, but a weakening of their enforcement.

nomadic pastoralists in a district of northeastern Kenya.³⁶ The study shows how economic growth has altered the geographic location of the industry and increased the diversity of interest within the community by introducing a sub-group of sedentary livestock producers who produce for commercial markets and demand different property rights than the nomads.³⁷ The new heterogeneity has increased the conflict over collective decisions. Also, with economic growth the role of the appropriator organizations has diminished while the role of the national government has increased, the government seeming to favor commercial producers. The decentralized enforcement of a stateless society has been replaced by third-party specialists.³⁸

The Orma story is not solely one of increased demand for the output with a resulting increase in overgrazing and encroachment, but also a story of major changes in the structure of political and social institutions. With the national government now sharing exclusion costs, the local exclusion cost curve shifts down, which increases local demand for exclusive rights and promotes a move away from communal property.

Does the nationalization of rule-making, governance, and exclusion contribute to a more or less efficient utilization of natural resources? There is no definite answer to this question. On the negative side, decision makers in government are often less affected personally than an appropriator organization by decisions that waste resources. They may sacrifice local interests to national or special interests, and their remoteness suggests that they may have less information for making

³⁶ Ensminger, Jean and Rutten, Andrew (1990). "The Political Economy of Changing Property Rights: Dismantling a Kenyan Commons." Working Paper. St. Louis: Center in Political Economy, Washington University.

³⁷ Rainfall is localized in the region and the sedentary households "solve this problem by keeping only small milking herds in the village and hiring herders to take the majority of their stock to remote and highly mobile cattle camps." Ensminger and Rutten (1990), p. 23.

³⁸ In the case of the Orma, at one point decentralized control was successfully maintained with family ownership of wells, and the control of access to water was used to regulate access to grazing. *Ibid.*, p. 3.

decisions and receive weaker feed-backs about the consequences of their actions than appropriator organizations. Also, as national decision makers often face softer economic constraints than appropriator organizations, they are more likely to indulge in personal preferences that are out of tune with economic reality; for instance, they may have ideological preferences for individual property or communal property. On the other hand, local users may not be able to resolve satisfactorily their bargaining over the increase in wealth that is expected to flow from changes in property rights, and a powerful outsider could possibly break the deadlock and introduce a new structure that sharply increases the value of the resource.³⁹

Conclusions

We have used the criterion of wealth maximization to study the choice of regimes of exclusive rights. On the wealth criterion, optimization requires that costs be minimized. It was argued that communal property is a form of exclusive rights that, in specific circumstances, has absolute advantage in minimizing the aggregate costs of production, governance, and exclusion. We attempted to show how the relative efficiency of communal property depends not only on economic factors but on the nature of social and political institutions.

The choice of regimes of property rights is complicated by the so-called wealth

³⁹ Consider the vast dissipation of oil reserves in many parts of the American Southwest that results when several independent producers share the same underground oil reservoir. According to Libecap and Wiggins (1985), asymmetric information about the value of each lease prevents independent users from agreeing on jointly operating their reservoir. An outside government could force an agreement and set general rules that require joint operations in all cases. However, positive political theory tells us that decisions by governments are plagued by information and transaction problems, and individually rational behavior by public decision makers can bring irrational outcomes. Libecap and Wiggins (1985) report that the state governments of Texas and Oklahoma failed to design rules that encouraged unitization of oil fields, whereas in Wyoming, where oil fields were mostly on federal land, the federal government designed a structure of property rights that encouraged unitization. Libecap, Gary D., and Wiggins, Steven N. (1985). "The Influence of Private Contractual Failure on Regulation: The Cost of Oil Field Unitization." *Journal of Political Economy* 93 (No. 4): 690-714.

effect and by the problem of collective action. We used the example of a transition from open access to communal property to illustrate why rational agents might place inefficient constraints upon communal property, such as restrictions on the resale of user rights.

We were mostly concerned with the choice of resource regimes by small appropriator organizations, but recognized that national and local governments often have a large role in specifying and enforcing resource regimes. It was also recognized that economic growth is associated with various changes in social institutions and technology, in addition to increases in demand and in population, which makes it impossible to generalize about the impact of economic growth on the viability of communal property. Finally, it must be recognized that the objective function of those who choose the structure of resource regimes may contain other elements than wealth, narrowly defined.

The case of communal grazing pastures of the nomadic Samii reindeer herders of Finnmark in northern Norway is a clear illustration of the difficulties of designing a positive theory of communal property. Prior to the large-scale involvement by the Norwegian state, a simple economic model incorporating transaction costs might have gone far to explain the structure of property rights in the reindeer industry.⁴⁰ The Samii took their herds through a sophisticated annual cycle of spring, summer, fall, and winter pastures with the sizes of communes, herds, and appropriator organizations, the Siida organizations, varying systematically over the cycle, much in the spirit of the Field model.⁴¹ Also, Samii society instituted procedures for resolving disputes on the basis of customary law, although the details

⁴¹ The discussion of the Samii case is based on several of the essays contained in Stenseth, Nils Chr., Trandem, Nina, and Kristiansen, Gorill, eds.(1991). *Forvaltning av vare fellesressurser. Finnmarksvidda og Barentshavet i et lokalt og global perspektiv*. Oslo: Ad Notam forlag.

⁴² Saram Aslak Nils and Kristiansen, Gorill (1991). "Reindriften i Finnmark — arssyklus, driftsstrategier og forskningsutfordringer." In Stenseth et al., eds. See footnote 40.

of the system are apparently not known today.⁴² The property regime appears to have been reasonably efficient. Not a single historical example of overgrazing in the Samii reindeer regions is known, although the Samii have been nomadic herders of domestic reindeer in Finnmark at least since the 1600s.⁴³

In the modern system, the Siida organizations are no longer autonomous. Their former authority has been transferred to the national government and its agencies which regulate the industry in detail, determining, for instance, grazing districts, grazing periods, and the maximum number of reindeer that can graze in a district. The authorities can even determine the size of individual flocks.⁴⁴ The administrative structure of the industry is rather complex with three levels — industry, district, and subdistrict levels — not counting the Ministry of Agriculture which tops the pyramid.⁴⁵ To the extent that the objectives of the top decision makers can be deduced from formal declarations, they are complex and even contradictory. The agreement of 1976 between the Ministry of Agriculture and the National Association of Samii Reindeerherders lists the following objectives:

- a) to maximize the production of food from the pastures, without weakening the resource base,
- b) to guarantee personal incomes in the industry that are comparable with incomes in the other sectors of the economy,
- c) to guarantee secure employment and traditional residence,
- d) to guarantee that the reindeer industry develop in such a way that its central role in Samii culture is preserved.⁴⁶

⁴² Ibid., p. 168.

⁴³ p. 183 in Bjorklund, Ivar (1991). "Samisk reindrift som pastoral tilpassningsform. Noen betraktninger om Okonomisk modernisering and kulturell endring pa Finnmarksvidda." In Stenseth et al. See footnote 40.

⁴⁴ See p. 185 in Bjorklund, Ivar (1991) See footnote 43.

⁴⁵ Kristiansen, Gerill (1991). "Organisasjon og forvaltning i reindriften." P. 184 in Stenseth et al. See footnote 40.

⁴⁶ See Bye, Karstein (1991). "Målsettinger og virkemidler i reindriftspolitikken." P. 175 in Stenseth et al. See footnote 40.

Over time, the Samii have become increasingly sedentary, and motor vehicles, including snow-scooters, have lowered the cost of monitoring large herds over long distances. Also, the incentives in the reindeer industry have been affected by the instruments of government policy. These instruments include various forms of subsidies, and some scholars argue that an increase of about 100% in the size of the reindeer herds in the period since 1976 can be explained in large part as a response to government programs.⁴⁷ Crowding in the communal pastures is reflected in the falling weights of the animals and signs of overgrazing.⁴⁸ The evidence suggests that the national government has in part replaced the former system of communal property with open access.⁴⁹

Why do national governments introduce open access and place resources in the public domain? We can think of three possible explanations:

a) It suits the interest of the decision makers, for some reason, which implies that they are satisfied with the outcome.

⁴⁷ P. 186 in Bjorklund (1991). See footnote 43.

⁴⁸ Lenvik, Dag and Trandem, Nina (1991). "Forvaltning av tamrein i Nord-Norge: status og Muligheter." And Johansen, Bernt et al. (1991). "Det biologiske ressursgrunlaget for Finnmarksreinen. Both in Stenseth et al. See footnote 40.

⁴⁹ Open access is both an indirect and direct result of the new law for the industry. As an example of a direct effect, the law has given free access to pastures that by tradition were exclusively owned by specific individuals or groups. There are some similarities between the Norwegian government creating open access in the pastures in Finnmark and the chronic overgrazing on the Navajo Reservation as the result of the policies of the U.S. interior Department and the Navajo Tribal Council. The policies were intended to preserve the pastoral culture of the Navajo, but in effect they legislated a common property condition for the range and forced many Navajo to leave their traditional employment of sheep raising and accept wage work or welfare. Libecap, Gary D., and Johnson, Ronald N. (1980). "Legislating Commons: The Navajo Tribal Council and the Navajo Range." *Economic Inquiry* 18 (January): 69-86.

b) It is **an** instance of the collective action problem where decisions by **rational individuals bring** outcomes that no one likes.

c) **The decision makers either lack data to make better decisions and/or they are using the wrong model of reality to make their decisions.**

All three explanations are possible, and the answer to the puzzle is essentially an empirical question that we leave to the reader.

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Footnotes

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