

## CHAPTER ONE

### *Covenants, Collective Action, and Common-Pool Resources*

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UNTIL RECENTLY, students of constitutional choice focused almost entirely on formal documents written for national governments during an overt constitutional process. During the past three decades, however, considerable analytical and empirical work has centered on how individuals covenant together to create local enterprises in order to provide public goods or common-pool resources. Buchanan and Tullock's foundational *Calculus of Consent* (1962) concentrated on the logic used by a group of farmers who were creating a public enterprise to provide a local road. Mancur Olson's *The Logic of Collective Action* (1965) started with a problem facing a group that wanted to lower local tax rates. Todd Sandler's recent *Collective Action: Theory and Applications* (1992) ranges in its focus from problems of global warming and destruction of the ozone layer to how individuals can create and sustain local neighborhood clubs.

Besides examining phenomena that are both smaller and larger than national governments, scholars have also begun to recognize the importance of covenants made among individuals to create nongovernmental organizations for solving collective-action problems. The presence of written, legal documents and external enforcers is no longer seen as the necessary foundation for a successful effort at constitutional change. All too many formal constitutional documents have been little more than words on paper, without any impact on the political and social order that follows their pronouncement. In response to many collective-action problems, actors covenanting together to follow a set of rules and to monitor and enforce rule conformance themselves has been a more effective remedy than policy prescriptions formally made in a nation's capital.

The establishment of the Panel on Common Property Resources



at the National Academy of Sciences (NAS) during the mid-1980s has stimulated even further the theoretical and empirical research on collective-action problems specifically related to common-pool resources. Common-pool resources (CPRs) are natural or man-made resources where exclusion is nontrivial (but not necessarily impossible) and where the yield is subtractable (E. Ostrom, Gardner, and Walker 1994). CPRs include inshore and ocean fisheries, irrigation systems, grazing areas, and forests as well as bridges and other man-made resources. When the NAS panel was first created, many social scientists interested in natural resource policy problems presumed that the "appropriators" (a general term used to describe all persons who harvest or withdraw benefits, and who thus "appropriate," from a CPR) were unlikely to develop their own norms and institutions to reduce the costs of externalities associated with the use of CPRs.

On the assumption that no evolution of local norms, rules, or rights would occur, recommendations were made that external agents should impose solutions to CPR problems. The imposed solutions were frequently presented as "the *only* way" to reduce these externalities and increase efficiency. One proposed solution was control of natural resources by a central government agency; another was the imposition of private property. Something had to be wrong with the theories, their interpretation, or the policy prescriptions based on the theories, however, if solutions as different as state control and market control were both proposed as the *only* way to manage natural resources efficiently.

Research in this area has come a long way over the past decade.<sup>1</sup> The initial publication of the summary volume of the NAS panel (National Research Council 1986), the many important books recently published (McCay and Acheson 1987; Fortmann and Bruce 1988; Wade 1988; Berkes 1989; Pinkerton 1989; Sengupta 1991; Dasgupta and Mäler 1992; V. Ostrom, Feeny, and Picht 1993; Netting 1993), the revision of the NAS volume (Bromley et al 1992), the influential article by Feeny et al. (1990), and recent important work on property rights (Libecap 1989; Eggertsson 1990; Bromley 1991) have all contributed to this progress. Books by those associated with the Workshop in Political Theory and Policy Analysis at Indiana University (E. Ostrom 1990 and 1992; E. Ostrom, Gardner, and Walker 1994; Blomquist 1992;

1. Of course, that progress drew on an immense body of scholarly work that already existed in scattered sources. The theoretical breakthroughs probably would not have occurred if many scholars in different disciplines had not already undertaken in-depth and detailed studies of particular natural resource systems. See F. Martin (1989 and 1992) for a bibliographic overview of this literature.

Tang 1992; F. Martin 1989 and 1992; Sproule-Jones 1993; Thomson 1992) have contributed as well.

### Emergence and Consequences of Self-Organized CPR Institutions

While many of those affected by the threat of overuse and potential destruction of CPRs find ways of constituting their own institutions, others do not. Empirical research both in the field and the laboratory has now yielded a series of important findings regarding the emergence and consequences of institutions. These findings can be summarized as follows:

1. Overuse, conflict, and potential destruction of CPRs producing highly valued products is likely to occur where those involved act independently owing to a lack of communication or an incapacity to make credible commitments.
2. If those who directly benefit can communicate, agree on norms, monitor each other, and sanction noncompliance to their own covenants, then overuse, conflict, and the destruction of CPRs can be reduced substantially.
3. Locally developed systems of norms, rules, and property rights that are not recognized by external authorities may collapse if the legitimacy of these covenants is challenged or if large, exogenous economic or physical shocks occur.
4. Control of local or regional CPRs by state authorities is effective in some settings but is frequently less effective and efficient than control by those directly affected, especially in settings related to smaller-scale natural resource systems.
5. Efforts to establish marketable property rights to natural resource systems have substantially increased efficiency in some cases and encountered difficulties of implementation in others.

At a general level, these findings can be summarized with three statements. Open-access resources—those characterized by *no* property rights—will be overused, generate conflict, and may even be destroyed. All types of institutions—including private property, common property, and state property—may be used to reduce the costs of open-access regimes. Performance of diverse institutions depends on how well the attributes of the resource, the social and economic attributes of those using the resource, and the specific rules used work together. Thus, evolved or self-consciously designed institutions are needed to regulate the use of natural resource systems, but all such



regimes have limits. If those who know the most about local time-and-place information and incentives are given sufficient autonomy to reach and enforce local covenants, they frequently are able to devise rules well tailored to the problems they face.

The dominant theories of a decade ago have not been proved wrong. Rather, their claim to universal applicability has been challenged both theoretically (Sandler 1992) and empirically (E. Ostrom, Gardner, and Walker 1994). Empirical research readily confirms that when those using open-access regimes are limited by physical and institutional constraints to act independently and not to take each other's interests into account, then the predictions derived from the "tragedy of the commons" (G. Hardin 1968), the finitely repeated prisoner's dilemma game (R. Hardin 1982), and the logic of collective inaction (Olson 1965) are empirically supported. In the simpler environment of an experimental laboratory, findings from repeated experiments that do not allow subjects to communicate about their contributions to public goods (Isaac, Walker, and Williams 1994) or their investments in common-pool resources (Walker, Gardner, and Ostrom 1990) are quite consistent with predictions of low levels of "cooperative" behavior. On the other hand, when symmetric subjects are given opportunities in a laboratory to communicate and devise their own agreements and sanctioning arrangements, then the outcomes approximate optimality (E. Ostrom, Walker, and Gardner 1992; see also E. Ostrom and Walker 1991 and Isaac and Walker 1991). These findings are surprising for many theorists, because the capacity to communicate without an external enforcer for monitoring and sanctioning behavior inconsistent with covenantal agreements is considered to be mere "cheap talk" having no impact on the strategic structure of the game (but see Banks and Calvert 1992a, 1992b). Hackett, Schlager, and Walker (1994) find that, even in experimental environments where the players are not symmetric but have different endowments, face-to-face communication is a very effective institution for greatly increasing efficiency. Charles Plott (1983) has shown that in the experimental lab it is possible to impose markets or regulatory institutions that enable subjects to achieve close-to-optimal results.

Because we can create conditions in a laboratory that enable subjects to come close to optimality, however, should not encourage us to think that there are optimal solutions that can be imposed on all natural resource problems within large and diversified countries. The complexity of natural settings is immense. The particular features of a natural setting that might effectively be used by local users in selecting rules cannot be included in general models. The likelihood is small that any set of uniform rules for all natural resource systems within a

large territory will produce optimal results. This is unfortunately the case whether or not the particular rules can be shown to generate optimal rules in a sparse theoretical or experimental setting. Rather, theoretical and empirical research can be used to help inform those who are close to particular natural resource systems (as well as those in larger, overarching agencies) about principles they can use to improve performance.

### Design Principles and Robust Institutions

In addition to knowing that various types of institutions can be used to reduce the externalities usually involved in the management and use of natural resource systems, we also are beginning to understand the design principles used by robust institutions. Robust institutions are those in which the systems have survived for very long periods of time and where operational rules have been devised and modified over time according to a set of collective-choice and constitutional-choice rules (Shepsle 1989). Robust institutions tend to be characterized by most of the design principles listed in Table 1. Fragile institutions tend to be characterized by only some of these design principles. Failed institutions are characterized by only a few of these principles. Initial analysis also finds that farmer-governed irrigation systems, which are characterized by most of these principles, are associated with higher agricultural yields and crop intensities, controlling for the physical characteristics of the systems (Lam, Lee, and Ostrom, forthcoming). The theoretical reasons why these design principles work in practice have been presented elsewhere and will not be repeated here (see E. Ostrom 1990; Weissing and Ostrom 1991, 1993; E. Ostrom and Gardner 1993; E. Ostrom, Gardner, and Walker 1994).

The design principles are stated generally. The specific ways that individuals have crafted rules to meet these principles vary in their particulars. Successful, long-enduring irrigation institutions, for example, have developed different ways of meeting the second design principle of achieving congruence or proportionality between the costs of building and maintaining irrigation systems and the distribution of benefits. Some examples will illustrate the diversity of specific rules that meet the second design principle.<sup>2</sup>

#### *The Zanjeras of the Northern Philippines*

*Zanjeras* are self-organized systems that obtain use rights to previously unirrigated land from a large landowner by building a canal

2. The following section draws from my previous work (E. Ostrom 1992, 76-78).



Table 1. Design Principles Illustrated by Long-Enduring CPR Institutions

1. Clearly Defined Boundaries  
Individuals or households with rights to withdraw resource units from the CPR and the boundaries of the CPR itself are clearly defined.
  2. Congruence between Appropriation and Provision Rules and Local Conditions  
Appropriation rules restricting time, place, technology, and/or quantity of resource units are related to local conditions and to provision rules requiring labor, materials, and/or money.
  3. Collective-Choice Arrangements  
Most individuals affected by operational rules can participate in modifying operational rules.
  4. Monitoring  
Monitors, who actively audit CPR conditions and appropriator behavior, are accountable to the appropriators and/or are the appropriators themselves.
  5. Graduated Sanctions  
Appropriators who violate operational rules are likely to receive graduated sanctions (depending on the seriousness and context of the offense) from other appropriators, from officials accountable to other appropriators, or from both.
  6. Conflict Resolution Mechanisms  
Appropriators and their officials have rapid access to low-cost, local arenas in order to resolve conflict among appropriators or between appropriators and officials.
  7. Minimal Recognition of Rights to Organize  
The rights of appropriators to devise their own institutions are not challenged by external governmental authorities.
- For CPRs that are part of larger systems:
8. Nested Enterprises  
Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprises.

SOURCE: E. Ostrom 1990, 90.

that irrigates both the landowner's land and that of the *zanjera*. At the time that the land is allocated, each farmer willing to abide by the rules of the system receives a bundle of rights and duties in the form of *atars*. Each *atar* defines three parcels of land located in the head, middle, and tail sections of the service area where the holder grows his or her crops. Responsibilities for construction and maintenance are allocated by *atars*, as are voting rights. In the rainy seasons, water is allocated freely. In a dry year, water may be allocated only to parcels located in the head and middle portions. Thus, everyone receives water in plenti-

ful and scarce times in rough proportion to the amount of *atars* they possess. *Atars* may be sold to others with the permission of the irrigation association and are inheritable (see Siy 1982; Coward 1979).

#### *Thulo Kulo, Nepal*

When the Thulo Kulo system was first constructed in 1928, twenty-seven households contributed to a fund to construct the canal and received shares of the resulting system proportionate to the amount they invested. Since then, the system has been expanded several times by selling additional shares. Measurement and diversion weirs or gates are installed at key locations so that water is automatically allocated to each farmer according to the proportion of shares owned. Routine monitoring and maintenance is allocated to work teams so that everyone participates proportionally, but emergency repairs require labor input from all shareholders regardless of the size of their share (see E. Martin and Yoder 1983; E. Martin 1986).

#### *The Huerta of Valencia, Spain*

In 1435, eighty-four irrigators, served by two interrelated canals in Valencia, gathered at the monastery of St. Francis to draw up and approve formal regulations to specify who had rights to water from these canals, how the water would be shared in good and bad years, and how responsibilities for maintenance would be shared. The modern *Huerta* of Valencia, composed of these plus six additional canals, now serves about sixteen thousand hectares and fifteen thousand farmers. The right to water inheres in the land itself and cannot be bought and sold independently of the land. Rights to water are approximately proportionate to the amount of land owned, as are obligations to contribute to the cost of monitoring and maintenance activities (see Maass and Anderson 1986).

These three systems differ substantially from one another. The *zanjeras* are institutional devices for landless laborers to acquire use rights to land and water, and this system could be called a communal system. The Thulo Kulo system comes as close to allocating private and separable property rights to water as is feasible in an irrigation system. The *Huerta* of Valencia has maintained centuries-old land and water rights that forbid the separation of water rights from the land being served. The Valencian system differs both from "communal" and from "private property" systems because water rights are firmly attached to private ownership of land. Underlying these differences,



however, is the basic design principle that the costs of constructing, operating, and maintaining the system are roughly proportional to the benefits that irrigators obtain.

It is important to keep these differences in mind when making policy prescriptions. Slogans such as "privatization" may mask important underlying principles rather than provide useful guides for reform. Strict privatization of water rights is not a feasible option within the broad institutional framework of many countries. On the other hand, authorizing the suppliers and users of irrigation water to participate in the design of their own systems—design principles 3 and 7 combined—is a feasible reform within the broad institutional framework of many countries.

Not only is a substantial variety of rules used to reduce the cost of externalities from unregulated use of natural resources, but neighboring systems that appear to face similar situations frequently adopt different solutions. Within a few miles of Valencia is Alicante, where irrigators long ago adopted rules separating water from the land and still participate in an active weekly market for water. Adjacent to Thulo Kulo is Raj Kulo, where the allocation of water (and labor responsibilities) is in accord with the amount of land owned. Near the *zanjeras* of the northern Philippines are many irrigation systems with quite different rules for distributing water and input responsibilities.

### The Importance of Social Capital

Searching for outside solutions to problems of collective action, instead of elucidating the design principles that underlie robust institutions in use around the world, has led to an emphasis on physical capital without much attention to the social capital that may already exist in a location. All forms of capital are created by spending time and effort in transformation and transaction activities (E. Ostrom, Schroeder, and Wynne 1993). In other words, all forms of capital are created as the result of an investment process whereby resources that could be used for current consumption are invested instead in activities that have long-term consequences.

*Physical capital* is the stock of material resources that can be used to produce a flow of future income (Lachmann 1978). The origin of physical capital is the process of spending time and other resources to construct tools, plants, facilities, and other material resources that can, in turn, be used to produce other products. The construction of physical capital establishes physical restraints that (1) create the possibilities for some events to occur that would not otherwise occur (e.g., channeling water from a distant source to a farmer's field) and (2) constrain

physical events to a more restricted domain (e.g., water is held within a channel rather than being allowed to spread out). Physical capital thus opens up some opportunities while restricting others.

*Human capital* is the acquired knowledge and skills that any individual brings to productive activity. Human capital is formed consciously through education and training and unconsciously through experience. Human capital also opens up some opportunities while restricting others. The acquisition of new skills enables an artisan to create artifacts that he or she could not have created prior to the acquisition of the new skill. The pursuit of any skill, however, precludes certain activities from occurring. One has to learn what *not* to do as much as what to do.

*Social capital* is the shared knowledge, understandings, and patterns of interaction that a group of individuals brings to any productive activity (Coleman 1988; Putnam 1993). Social capital is created when individuals learn to trust each other so that they are able to make credible commitments and rely on generalized forms of reciprocity rather than on narrow sequences of specific quid pro quo relationships. "Smith and Jones" can accomplish far more per unit of time if they do not have to negotiate each and every task in an arm's-length relationship. They can be far more productive with whatever physical and human capital they bring to the joint activity if they can covenant with one another and credibly commit themselves to a sequence of future actions. This covenant may be negotiated overtly. Or it may be based on mutual learning that both understand implicitly but have never tried to put into explicit language. It can be based on an agreement that Smith will follow Jones's commands (or vice versa) pertaining to the activity. Or it can be based on the evolution or construction of a set of norms or rules for how the activity will be carried out over time and how commitments will be monitored and sanctions imposed if nonperformance should occur.

Social capital also opens up some opportunities while restricting others. A decision to establish majority rule as the decision rule for making particular collective choices about a joint facility, for example, opens up opportunities that did not previously exist. Majority-rule decisionmaking does not exist in nature. The opportunity to use majority-rule voting is created by rules. A rule that forbids a driver from exceeding seventy miles an hour, or a participant in a discussion from speaking until recognized by the chair, limits alternative actions to a smaller set than was available before the creation of the rule.

The shared cognitive aspects of social capital help to account for two of its unusual characteristics that differ from those of physical capital. First, social capital does not wear out upon being used more and



more. It may, in fact, improve with use so long as participants continue to keep prior commitments. Using social capital for an initial purpose creates mutual understandings and ways of relating that frequently can be used to accomplish entirely different joint activities at much lower start-up costs. It is not that learning curves for new activities disappear entirely. Rather, one of the steepest sections of a learning curve—learning to make commitments and to trust one another in a joint undertaking—has already been surmounted. A group that has learned to work together effectively in one task can take on other similar tasks at a cost in time and effort that is far less than that of bringing together an entirely new group of people who must learn everything from scratch. The fungibility of social capital, of course, is limited to broadly similar activities. No tool is useful for all tasks. Social capital that is well adapted to one broad set of joint activities may not be easily molded to other activities that require vastly different patterns of expectation, authority, and distribution of rewards and costs.

Second, social capital, if unused, deteriorates at a rapid rate. Individuals who do not exercise their own skills can lose human capital rapidly. When several individuals must all remember the same routine in the same manner, however, the probability that at least one of them will forget some aspect increases rapidly over time. Further, as time goes on, some individuals leave and others enter any social aggregation. If newcomers are not introduced to an established pattern of interaction as they enter (through job training, initiation, or any of the myriad of other ways that social capital is passed from one generation to the next), social capital can dissipate through nonuse. No one is quite sure how they used to get a particular joint activity done. Either the group has to pay some of the start-up costs all over again, or it must forgo the joint advantages that had once been achieved.

### Factors Affecting the Creation of New Social Capital

Recent empirical research provides evidence that individuals frequently do design new institutional arrangements—and thus create social capital themselves through covenantal processes. Strong evidence also exists that effective formation of social capital does not always occur when it is needed. A major factor affecting whether individuals are able to develop new institutions for coping with CPR problems is the set of metarules at a collective-choice or constitutional level that is used for changing old rules or creating new ones (Knight 1992; E. Ostrom 1990). The metarules may assign differential advantages to participants in the rule-changing process. Those with the most voice in a covenantal process may not benefit from rule changes even

though the aggregate benefits are greater. To explain a change in rules one needs to analyze not only the status quo distribution of costs and benefits, but also the distributional effects of the proposed rules (Libecap 1989) and how these relate to the metarules used for making and changing rules.

Thus, to explain investments in social capital—or institutional change—one needs to analyze the relationships between variables characterizing the resource, the community of individuals involved, and the metarules for making and changing rules. Sufficient theoretical and empirical research has been conducted on this and the closely related theory of collective action to enable us to specify important variables and the direction of their impact (E. Ostrom 1990). The following variables appear to be conducive to the selection of institutions and norms that reduce the externalities:

1. Accurate information about the condition of the resource and about the expected flow of benefits and costs are available at low cost.
2. Participants are relatively homogeneous in regard to asset structure, information, and preferences.
3. Participants share an understanding about the potential benefits and risks associated with the continuance of the status quo as contrasted with feasible changes in norms and rules.
4. Participants share generalized norms of reciprocity and trust that can be used as initial social capital.
5. The group using the resource is small and stable.
6. Participants' discounting of the future is sufficiently low.
7. Participants have the autonomy to make many of their own operational rules, and if made legitimately those rules will be supported and potentially enforced by external authorities.
8. Participants use collective-choice rules that fall between the extremes of unanimity or control by a few (or even by a bare majority) and thus avoid high transaction or high deprivation costs.
9. Participants can develop accurate and low-cost monitoring and sanctioning arrangements.

Many of these variables are in turn affected by the type of larger regime in which users are embedded. If the larger regime 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, then



the probability of participants adapting more-effective norms and 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.

### Future Research on Institutions

We now have a reasonably good understanding of the emergence of norms and institutions in simple, small, and isolated natural resource systems characterized by (1) a small and stable set of users able to communicate on a face-to-face basis, (2) predictable and easy-to-measure flows of benefits and costs, and (3) symmetry of information, asset structures, capabilities, and preferences. In field settings approximating the above conditions, those involved are highly likely to invest in social capital and arrive at covenantal agreements leading to the assignment of rights and duties that enhance efficiency.

Many natural resource problems, however, occur in settings that are not so conducive to self-organization. Large natural resource systems, particularly those that cross national borders (Young 1982; Keohane 1989; Dasgupta and Mäler 1992; McGinnis and Ostrom 1992; Haas, Keohane, and Levy 1993), involve substantial difficulties. These are associated with large, heterogeneous numbers of individual and corporate actors and the problem of making credible commitments. Further, many natural resources, particularly multispecies fisheries and forests, manifest complex transformation functions whose structure is hard to determine. No one—neither those directly involved nor external officials—has good enough models or sufficient accurate data to estimate future flows of benefits and costs accurately. Moreover, resources such as forests and the atmosphere have such long time-horizons that the value of future benefits and costs is difficult to assess.

In future work, consequently, it will be important to pursue theoretical and empirical studies that specifically address how heterogeneity of participants, multispecies or multiproduct resource systems, and long time-horizons affect the selection and performance of institutions. One theoretical and empirical program of research that will tackle these questions is the International Forestry Resources and Institutions (IFRI) database developed by a team at Indiana University with extensive input from colleagues at other institutions. We are conducting original field research on the types and performance of local forestry institutions in India, Nepal, Bolivia, and Uganda (as well as other countries if funding permits). These data will be archived and analyzed using a relational database structure (see E. Ostrom, Huckfeldt, Schweik, and Wertme 1993).

Understanding the emergence and performance of forestry institutions does not automatically answer questions about very large natural resource systems. The complexity, long time-horizons, and involvement of heterogeneous actors in the use of forests, however, should enable us to move from analysis of the simpler environments studied previously to the analysis of ever more difficult and complex environments. Further, forests are linked to the global atmospheric commons through their impact on greenhouse gases. If the rate of deforestation is to be reduced in many parts of the world, more must be learned about how individuals do covenant with each other to take collective action concerning local common-pool resources that are linked with global resources. We have come a great distance in understanding covenantal processes among small and homogeneous groups. The next challenge in gaining an effective understanding of such processes is to analyze larger, interlinked, and heterogeneous groups. The survival of the global commons is dependent upon further work on these important questions.

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## CHAPTER TWO

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# *Constitutional Choice, Rational Ignorance, and the Limits of Reason*

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ELEMENTARY TO ANY study of constitutional choice is the distinction between constitutional and subconstitutional *choices* and the corresponding distinction between constitutional and subconstitutional *preferences*. Constitutional choices are choices among alternative rules (constraints); subconstitutional choices are among alternative strategies available within rules (constraints). A chooser's constitutional preferences reflect trade-offs among alternative rules that might be chosen. Subconstitutional preferences reflect trade-offs among alternative courses of action or end objects which are available for choice within a defined set of rules.

For subconstitutional choices, the prevailing rules or constraints are "relatively absolute absolutes" (Buchanan 1988) in the sense that for these choices the rules are taken as parameters that define or limit the set of options. The rules are only "relative absolutes," however, since they can themselves be changed at the categorically separate constitutional level of decision. Constitutional choices, of course, may themselves be constrained by "higher" rules, relative to which they must be considered "subconstitutional." Wherever one deals with a multilayered system of rules (i.e., a system that includes rules for choosing rules) the distinction between constitutional and subconstitutional choices may be applied to any two adjoining levels of choice within a hierarchy.

In a previous paper (Vanberg and Buchanan 1989) we have discussed some of the implications that result from the fact that constitutional preferences, like any other preferences, can be assumed to embody two conceptually separable components: an *interest component* and a *theory component*. This distinction suggests that a person's preferences with respect to alternative rules, among which he can exercise choice,