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Strategic Interdependence in Models of Property Rights

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Crusoe is given a number of data which are "dead;" they are the unalterable physical background of the situation . . . Not a single datum with which he has to deal reflects another person's will or intention of an economic kind - based on motives of the same nature as his own. A participant in a social exchange economy, on the other hand, faces data of this last type as well. They are the product of other participant's actions and volitions (like prices). His actions will be influenced by his expectation of these, and they in turn reflect the other participant's expectation of his actions.

von Neumann and Morgenstern, 1953, pp. 11-12

The concept of strategic interdependence has opened a wide spectrum of explanation beyond the Robinson Crusoe economy. This essay explores the implications of strategic interdependence for the theory of property rights and the "new institutional economics" (see Schotter, 1980). It attempts to clarify some of the linkages from institutional economics to micro and macroeconomic theory by considering how property institutions result from strategic interdependence, confer payoffs to individual agents, and reflect collective choices based on individual preferences.

Institutions, Property Rights, and Institutional Innovation: Definitions

Property
Institutions are defined as a public system of rules that specify certain forms of action as permissible, others as forbidden, and provide for certain penalties and defenses when violations occur (Rawls, 1971, p. 55). Institutions channel the behavior of people with respect to each other and their belongings, possessions and property, providing assurance by setting the "rules of the game." They increase the value of a stream of benefits associated with economic activity by coordinating behavior and reducing uncertainty in the realm of human interaction. Accordingly, property institutions are a public system of rules specifying permissible and

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forbidden actions in relation to ownership, use-rights, responsibilities and obligations of individuals and groups (Bromley, 1978). Property rights are the particular characteristics of property institutions that channel streams of net benefits to particular agents in a given situation. More formally, a vector of property rights describes the characteristics of a particular property institution; property institutions are a subset of the set of all institutions.^{1/}

Two characteristic property rights are rights to be included in, and to exclude others from, particular benefits streams (see Macpherson, 1975). Different types of property institutions reflect these rights in varying degrees. Land is an example of a particular type of productive resource that provides a stream of net benefits channeled to various agents depending on the structure of property rights (see Higgs, 1978). Rights to exclude others provide the assurance that they will not benefit from the land. Rights to be included provide the assurance of a secure claim on these benefits. Rights of exclusion include "no trespassing" injunctions and the right to fence out a neighbor's cattle; rights to inclusion include guaranteed access to public lands or joint use rights over commonly held rangeland. In addition to preferences over benefits streams, individuals hold preferences over arrangements of rights to be included in or excluded from these streams. Preferences defined over property institutions reveal judgements about mechanisms of redistribution, often expressed in terms of what is considered "fair." Arguments about institutions involve contrary views over whether individuals are fairly entitled to exclude others (e.g., Nozick, 1979) and over how to justify rights to be fairly included in particular social benefits (e.g., Rawls, 1971).

The attempt to alter property rights in order to gain a greater share of a benefits stream has been termed "rent seeking" (Krueger, 1974; Buchanan, Tollison and Tullock, 1980). The rent seeking literature reinforces the claim that property is the result of social choice. Social choices over property are based both on preferences for benefits (what's in it for me?) and on preferences for the arrangement of rights which channel these benefits (is this arrangement of property fair?)

My claim to exclude others or to be included therefore depends on my preferences for benefits and on the interaction of my preferences with those of others concerning questions of fairness. A purely individualistic choice of property institutions is possible only in the case of dictatorship.

Property institutions characterized by rights of exclusion are often called "private" property; while those characterized by rights of inclusion are termed "public" or "common" property. Unfortunately, rights of inclusion are often confused with no rights (e.g., Demsetz, 1967) and termed "open access" (Ciriacy-Wantrup and Bishop, 1975; Runge, 1981). Which rights are in force is often difficult to discern because formal and informal rights to exclude and to be included commingle. Riparian water rights guarantee that those who do not own private land situated on a stream will be excluded from certain uses, yet the same stream, if navigable, is open to a wide range of public uses. Public lands by definition are lands on which U.S. citizens have certain rights to be included, yet mineral leasing law provides rights to exclude these same individuals from certain claims on these lands. Careful elaboration of the rights in force in a particular institutional setting is therefore important.

In all cases, the function of property institutions is to establish rules regarding what any agent can expect to receive (and not to receive) in benefits flowing from a particular resource. The primitive concept underlying property is thus expectation. Alchian and Allen (1969, p. 158), for example, define property in terms of "the expectations a person has that his decisions about uses of certain resources will be effective." Bentham noted in his Theory of Legislation that: "The idea of property consists in an established expectation; in the persuasion of being able to draw such or such an advantage from the thing possessed, according to the nature of the case" (Berger, 1974, p. 3). Expectations are defined both in terms of benefits to be received as well as the fairness of receiving them.

In order to establish expectations, institutions including property must be stable for extended periods, yet also must adapt to changes in the economic and

social environment. Changing factor endowments or technology, for example, may create disequilibrium in the structure of expectations established according to an older set of institutions. This disequilibrium will be manifest in judgements that the current structure of rights is inefficient, or unfair, or both. These disequilibria create incentives for institutional innovations that alter these rules. Institutional innovations occur when advantages (rents) can be gained by institutional entrepreneurs prepared to alter the way in which property channels benefits streams. Naturally, this alteration may not be free from conflict or the uses of power and influence. Differential access to legal talent and the courts, for example, can determine the outcome of this innovation process. Nonetheless, institutional innovation in property may be understood as similar to innovations in technology (for a more complete analysis, see Ruttan and Hayami, 1984). Institutional innovations may be in the direction of either rights to exclude or to be included, depending on "market demand." These innovations occur in the imperfectly competitive market for political influence and are affected by the physical and social environment, including attitudes towards fairness.

Property and Strategic Interdependence

The relationship between property and strategic interdependence arises from the role of expectations. To recognize this link, we must overcome the customary notion that economic agents act independently. As Arrow has emphasized, "the very notion of control over one's 'own' property, as is apparent upon the most casual inspection, itself acquires its meaning through the regulation of society" (Arrow, 1969, pp. 219-220). In welfare theory, it is well known that a particular allocative efficiency outcome is conditional on the structure of property rights determining the initial distribution of resources. These rights are necessary to the market outcome, and represent information over and above market prices which must be processed by rational economic agents. This point is increasingly recognized in the literature on rational expectations forecasts, as I will discuss in a moment.

If efficiency outcomes are conditional on property rights, what determines the structure of rights which economists generally take as "given?" Decisions about how much to produce, sell, purchase and transport require coordination. Because economic choices are conditional on the behavior of others, expectations of this behavior are crucial, and information predicting it is valuable precisely because it allows coordination. Property institutions are endogenous responses to this need for coordination, built on the need for assurance. In a dynamic social setting, property institutions provide information which allows agents to operate in a decision environment in which benefits streams are more predictable. Wherever the strategies of agents in an economy depend on the strategies of others (as well as the state of nature) innovating new property institutions takes the form of a strategically interdependent dynamic game (see Sargent, 1984).

Information and Property

The information contained in property institutions, as Wunderlich (1974) observed, defines their role in affecting economic decisions. As first described by Stigler (1961), information has economic value because it affects the certainty with which a particular stream of income can be captured by economic agents. This assurance will be measured by the moments of a probability density function defined over expected benefits. The more certain property institutions make the gains from economic interaction, the more predictable individual benefits become. (Of course, I may still regard the distribution of benefits as unfair, and may be willing to trade off greater "noise" or uncertainty for a more "fair" distribution of these benefits and vice versa.) When considered over time, this prediction problem is a problem of Bayesian statistical inference, in which information provided by property allows prior estimates of the distribution of benefits streams to be more well-defined, and updated as more information becomes available. In this sense, the dynamic game referred to above may be described as a Bayesian game with incomplete information (Harsanyi, 1967-68).

Consider the demand for and supply of information which property institutions provide. Just as technology affects the decisions of agents by lowering the supply price of permanent income streams (Schultz, 1964), property institutions lower the supply price of assurance regarding the way in which these income streams will be channeled to various agents. The demand for property thus results from the marginal benefits of assurance. This demand is derived from the demand for the benefits stream itself, but also reflects preferences defined directly over property institutions. Property institutions thus set parameters on the probability distribution defining expected benefits. Clearly, the precise impact (including the "fairness") of property institutions depends on the rights which characterize them. A vector of characteristic rights defining a particular property institution confers specialized information regarding the benefits channeled to various agents by this institution.

These characteristic rights may be described following Lancaster (1966), who argued that utility was derived not just from goods per se, but from the vector of characteristics describing these goods, so that demand may be defined in characteristics space. If property institutions are defined in terms of a vector of characteristic rights, then the demand for property institutions is a function of the rights they provide. For example, we may think of "property characteristics space" as offering a set of options ranging from exclusive to inclusive property rights. These institutional alternatives may reflect cultural and ideological differences over "fairness," as well as factor endowments, technology, or conditions in the physical environment. In different settings, different combinations of characteristics would be demanded.

If the demand for particular property rights is derived from more secure expectations of benefits, supply is a function of the relative costs of providing such property rights in various settings. As the marginal cost of a particular vector of property rights falls, institutional innovations can result in more socially efficient channeling of benefits streams by adopting the lower cost arrangement. Rising marginal costs will stimulate a search for institutional alternatives.

Another type of innovation may result when a new combination of characteristic rights, previously unknown or unachievable, becomes available. If this allows more efficient or equitable adjustments to changes in the environment, institutional entrepreneurs can gain by offering the new combination of characteristics. In a set of institutional options, new forms of property rights may make other arrangements obsolete, analogous to cases of technological obsolescence. Just as in technology, however, institutional changes may not be immediately responsive to a changed environment. Some reasons for this lack of smooth adjustment are explored below.

Property and Predictable Behavior

If the demand for property institutions results from the assurance which certain arrangements of rights provide, and the supply is a function of the relative cost of providing particular rights adapted to the conditions under which collective choices are made, we may say that the market for property institutions is based on the demand for, and supply of, predictable behavior (see Heiner, 1983). It is useful to explore how successful prediction is demanded and supplied under various conditions, using some examples from the literature.

In a situation of strategic interdependence, property rights restrict the flexibility of agents to choose certain actions, in return for information which makes overall coordination more possible. As Elster (1977) notes, like Ulysses, we bind ourselves to the mast of property institutions, lest passing distractions lead us to veer from a chosen course. Yet innovating and maintaining these institutions is not costless, and must respect principles of parsimony. Analogous to statistical inference, a premium is attached to property institutions which forecast behavior without requiring revisions suited to each particular situation.

Numerous examples in the game and decision theory literature support this interpretation. In studies of sequential prisoner's dilemma games, the simplest rule for deciding whether to contribute or defect, tit-for-tat, dominates all others (Axelrod and Hamilton, 1981). Experts at solving Rubik's cube have evolved pre-

determined hierarchial sequences that are largely independent of the initial scrambled position. Simon's research on "satisficing" rules also suggests that the information provided to agents who bind themselves to simple standard operating procedures helps them to navigate uncertain environments.

Consider the game theoretic reflective equilibrium concept emerging from Rawls' original position, in which agents must select a set of property rights which will bind them in the future in the absence of information concerning their place, position, and status in this future state. Rawls argues that "fairness" in this situation of strategic interdependence under uncertainty will lead to a set of property rights characterized by two simple principles: equal division and concern for the worst off. Any member of the group would prefer to be helped if he or she ends up at the bottom of the social ladder; otherwise, equal access to resources is preferred. This preference for the right to be included (assuming risk aversion) drives the demand for rules which channel streams of future benefits according to Rawls' two principles of justice.

Wherever property rights are reliable predictors of others' actions, incentives exist to maintain them as coordination mechanisms. The more complex these rules, the more costly they are to change and the greater the incentive to keep them. An original choice of either private or public ownership, once established, generates assurance of a continued stream of rents to (some) individual agents. The benefits of this assurance make it difficult to dislodge, even when altered conditions make it less efficient or fair. When the costs of the original institution clearly outweigh the benefits of retaining it, new institutions may be innovated. Even inefficient or apparently unfair property institutions may be retained for some time, however, if alternatives seem to offer greater uncertainty, or if the status quo appeals to powerful interests. Both costs of adjustment and vested interests imply that changes in property rights are unlikely to be smoothly achieved, especially because of their distributional consequences. Unless the net benefits (rents) resulting from a change in property rights are clearly favorable to a

sufficiently large (or powerful) group, there is a conservative tendency to retain property rules in the face of changes in the environment. This phenomenon has been explored in various contexts as a cause of unemployment and other forms of "stickiness" in social custom (Akerlof, 1980, 1983). Eventually, declining coordination conferred by existing property institutions' or their perceived unfairness may lead to major innovations (e.g., revolution). The fact that this revision in property institutions is likely to be a discontinuous adjustment suggests that it may be a sequential equilibrium process (Kreps and Wilson, 1982).

Rapid innovations in property rights appear to require high payoffs (rents) to change, and/or the absence of an existing structure of rights supported by powerful interests that can form a "blocking coalition." The California gold rush of 1848, explored by John Umbeck (1981), provides a useful example. The transformation from a situation of near anarchy in the gold fields to a system of rights to exclude others, based on miner's districts, depended crucially on the six-shooter (which equalized the capacity for coercion) and labor intensive gold panning technology (which prevented any single miner from gaining undue advantage). These symmetries made "fairness" easier to achieve (see Varian, 1975). Since no property rights were in force at the time of the first gold strikes, the equalization of coercive authority and technology, together with the fact that no established interests had formed, reduced the possibility of blocking coalitions. The absence of an existing structure of rights created a high degree of uncertainty, placing a premium on some form of assurance regarding others' actions. The demand for divisions in the stream of benefits in the form of individual property claims was derived from the demand for expected benefits yielded by the Sierra gold. The fact that these expected benefits were (ex ante) very high induced a rapid transformation of property rights. These rights provided key prior information which allowed subsequent and more complex transactions in the market for land and gold to proceed.

In other settings, however, the low rents and high levels of uncertainty associated with changes in property rights provide less incentive to change, and/or the existence of vested interests leads to blocking coalitions. The failure of the movement for "privatization" of U.S. public lands appears to be derived from the rents which current users of these lands have received from their rights to be included, the low prospective payoffs to various forms of exploitation, the uncertainty associated with rapid changes, and environmental interest groups that have helped to create blocking coalitions in Congress, in part by raising issues of fairness (Runge, 1984a, 1984b). Other examples can be drawn from the economic development literature. In the Kalahari Desert of Botswana, for example, irregular rainfall and water sources make pastoral common property grazing consistent with the biophysical environment. Colonization, technical change and population pressure have stressed this structure of rights, yet adoption of new systems has occurred slowly, and only with major costs of adjustment (Runge, 1981). These examples also suggest that public or common property rights may be much more robust than previously imagined, due to the strong preference held by many for rights to be included. Arrow notes that informal rights to be included are the foundation of many of our own arrangements of voluntarism and relate strongly to a sense of fairness. As he observes, "There is certainly a whole complex of obligations implied by the concept of a "good neighbor" (Arrow, 1969, p. 220).

Conclusion: Property, Preference and Prediction

The structure of strategic interdependence within which property institutions are innovated makes their impact collective as well as individual. If I do not commit myself to the rules of the game, I make the rules less efficient and less fair for all. It is natural therefore that where rights of exclusion or inclusion are enforced under law, violations may lead to penalties. These penalties are tangible indicators of social commitment to property rules. Yet obeying the rules depends on more than the penalties, and represents what Schelling (1984) has recently called "self-command." In order fully to integrate property rights with

economic analysis, we must recognize individual commitment to property rules as the result of preference orderings. But without commitment the concept of preference is too limiting. Individual choice, in a sense made fundamental by strategic interdependence, always reflects commitment to collective rules such as property institutions (Sen, 1973).

The key role of property in economic behavior also implies that market prices are only a subset of the information required by rational economic agents. Coordinating mechanisms such as property institutions also are required, because they provide key information about how the benefits of economic efficiency decisions can be expected to be channeled. Information of the sort contained in property rights is necessary, for example, to guarantee convergence of market prices to a rational expectations equilibrium price. This has been formally demonstrated by Roman Frydman (1982), who shows that what he calls a "consensus condition" provides necessary prior information about the expected behavior of other agents, allowing expectations to be coordinated according to an ex ante forecast. Frydman's conclusions are directly relevant to the role of property rights in establishing this type of ex ante consensus.^{2/}

Finally, capturing the impact of property institutions on economic behavior will improve the capacity of economists to describe and predict the role of fairness in rational economic choice. Models incorporating the impact of property rights on distribution, utilizing a "named-goods" approach (defining who gets what), have been developed by A. K. Sen (1976) which are compatible with an Arrow-Debreu formulation of the economy. Using these models, explicit rank order weightings of alternative property rights structures can be developed that are implicit in the welfare interpretation of the Gini coefficient and can be used in applied work (see Rogers and Martin, 1984). Which in an array of property rights alternatives will be both most efficient and most fair in a particular choice environment can then be rigorously addressed. This question provides an appropriate focus for future work in applied economics.

Footnotes

1/ Definitions of property institutions in the literature reflect considerable confusion. For example, Furubotn and Pejovich (1972, p. 1139) define property as "the sanctioned behavioral relations among men that arise from the existence of things and pertain to their use . . . (which) specify the norms of behavior with respect to things that each and every person must observe in his interactions with other persons, or bear the cost of nonobservance." This definition implies that a failure to observe property rules will be noted and costs imposed accordingly. Mueller (1979, p. 13) notes, however, that "A system of property rights and procedures are a Samuelsonian public good in 'that each individual's consumption leads to no subtraction from any other individual's consumption of that good.'" These definitions are inconsistent, since the first implies that no free riding is possible, while the second faces the classic free rider dilemma associated with public goods.

2/ Frydman offers two general conclusions: "First, the possibility of convergence to the rational expectations equilibrium appears to be remote in the context of models of decentralized competitive markets in which agents are assumed to be making individual decisions on the basis of market prices and their private information. Second, and perhaps more significantly, the description of market behavior suggests that, in addition to information contained in market prices, social norms (in particular business practices) imposing some restrictions and coherence on the individual decisions and information generated by institutions external to the market may play important roles in understanding decentralized market processes," (1982, p. 664).

References

- Akerlof, G.A., "Loyalty Filters," American Economic Review 73(1) (March 1983):54-63.
- Akerlof, G.A., "A Theory of Social Custom, of Which Unemployment May Be One Consequence," Quarterly Journal of Economics 94(1980):749-75.
- Alchian, A.A. and W.R. Allen, Exchange and Production, Theory in Use. Belmont, Wadsworth Publishing Co., Inc., 1969.
- Arrow, K.J., "Values and Collective Decision-making," in P. Laslett and W.G. Runciman, Philosophy, Politics and Society, 3rd series, Oxford, Basil Blackwell, 1969.
- Axelrod, R. and W.D. Hamilton, "The Evolution of Cooperation," Science 211(1981):1390-96.
- Berger, Curtis J., Land Ownership and Use. Boston: Little, Brown and Co., 2nd ed., 1975.
- Bromley, D.W., "Property Rules, Liability Rules, and Environmental Economics," Journal of Economic Issues 12(March 1978):43-60.
- Buchanan, J.M., R.D. Tollison, and G. Tullock, Toward a Theory of the Rent Seeking Society. College Station, Texas: Texas A&M University Press, 1980.
- Ciriacy-Wantrup, S.V., and R.C. Bishop, "Common Property as a Concept in Natural Resource Policy," Natural Resources Journal 15(1975):713-27.
- Demsetz, Howard, "Toward a Theory of Property Rights," American Economic Review 57(1967):347-59.
- Elster, J., Ulysses and the Sirens: Studies in Rationality and Irrationality. Cambridge: Cambridge University Press, 1979.
- Frydman, R., "Toward an Understanding of Market Processes, Individual Expectations, Learning, and Convergence to Rational Expectations Equilibrium," American Economic Review 72(4) (September 1982):652-68.
- Furubotn, E. and S. Pejovich, "Property Rights and Economic Theory: A Survey of Recent Literature," Journal of Economic Literature 10(4) (December 1972):1137-62.
- Harsanyi, J.C., "Games with Incomplete Information Played by 'Bayesian' Players," Management Science 14(1967-68):159-82, 320-34, 436-502.
- Heiner, R.A., "The Origin of Predictable Behavior," American Economic Review 83(4) (September 1983):560-95.

- Higgs, R., "Landless by Law: Japanese Immigrants in California Agriculture to 1941," Journal of Economic History 38(1) (March 1978):205-25.
- Kreps, D.M. and R. Wilson, "Sequential Equilibria," Econometrica 50(4) (July 1982): 863-94.
- Krueger, Anne O., "The Political Economy of a Rent-Seeking Society," American Economic Review 64(June 1974):291-303.
- Lancaster, K.J., "A New Approach to Consumer Theory," Journal of Political Economy 74(April 1966):132-57.
- Macpherson, C.B., Democratic Theory: Essays in Retrieval. Oxford: Oxford University Press, 1975.
- Mueller, D., Public Choice. Cambridge: Cambridge University Press, 1979.
- Nozick, Robert, Anarchy, State and Utopia. Oxford: Basil Blackwell, 1979.
- Rawls, J., A Theory of Justice. Harvard: Harvard University Press, 1971.
- Rodgers, J.L. and R. Martin, "The Measurement of Relative Poverty and Inequality in Minnesota." St. Paul, Minnesota: Department of Agricultural and Applied Economics, University of Minnesota, Staff Paper Series, 1984.
- Runge, C.F., "Common Property Externalities: Isolation, Assurance and Resource Depletion in a Traditional Grazing Context," American Journal of Agricultural Economics 63(1981):595-606.
- Runge, C.F., "Energy Exploration on Wilderness: 'Privatization' and Public Lands Management," Land Economics 60(1) (February 1984a):56-68.
- Runge, C.F., "The Fallacy of Privatization," Appendix in "An Exchange on 'Privatization,'" Journal of Contemporary Studies 7(2) (Spring 1984b):89-100.
- Ruttan, V.W. and Y. Hayami, "Toward a Theory of Induced Institutional Innovation," Department of Economics Discussion Paper No. 200, University of Minnesota, February 1984.
- Sargent, T.J., "Autoregressions, Expectations and Advice," American Economic Review, Papers and Proceedings 74(2) (May 1984):408-15.
- Schelling, T.C., "Self-Command in Practice, in Policy, and in a Theory of Rational Choice," American Economic Review, Papers and Proceedings 74(2) (May 1984):1-11.

Schotter, A., The Economic Theory of Social Institutions. New York: Cambridge University Press, 1980.

Schultz, T.W., Transforming Traditional Agriculture. New Haven: Yale University Press, 1964.

Sen, A.K., "Behavior and the Concept of Preference," Inaugural Lecture, London School of Economics, 1973.

Sen, A.K., "Poverty: An Ordinal Approach to Measurement," Econometrica 44(2) (March 1976):219-31.

Stigler, G.J., "The Economics of Information," Journal of Political Economy 69 (June 1961):213-25.

Umbeck, J., "Might Makes Rights: A Theory of the Formation and Initial Distribution of Property Rights," Economic Enquiry 19(1) (1981):38-59.

Varian, Hal R., "Distributive Justice, Welfare Economics, and the Theory of Fairness," Philosophy and Public Affairs 4 (Spring 1975):223-47.

von Neumann, J., and Oskar Morgenstern, Theory of Games and Economic Behavior. Princeton: Princeton University Press, 3rd edition, 1953.

Wunderlich, J., "Property Rights and Information," Annals of the American Academy of Political and Social Sciences 412(March 1974):80-96.