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New institutional economics and the environment: Conceptual foundations and policy implications

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Abstract

This paper reviews literature in and around new institutional economics to assess its contributions to, and limitations in, research on environmental decision-making and governance. The paper also proposes ways to increase the fruitfulness of new institutional approach for environmental research. The paper identifies the conceptualisation of environmental problems as instances of interdependence and the acknowledgement of positive transaction costs as the hallmarks of new institutional approach to the environment. The paper also discusses how the new institutional approach can be extended so as to acknowledge plural motivations and limited cognitive capacity. The paper investigates how evolutionary and collective action theories frame the choice and change of environmental governance institutions and discusses how the notion of social capital can enrich institutional analyses. The paper concludes that the new institutional approach to the environment is particularly attractive for understanding institutional or policy design and policy implementation.

Keywords: New institutional economics, institutions, environmental governance, environment and development, social capital

JEL Classifications: Q20, D78, B52, Z13

1. Introduction

Policy makers have largely ignored the prescriptions of environmental economists. The lukewarm reception of economic instruments is explained by some scholars as a lock-in of regulatory styles in government agencies, while others attribute it to lack of positive examples and role models for policy-makers to follow (see Hanley, 2001; Pearce, 1998; Panayotou, 1998). In this paper we suggest that conventional prescriptions may not meet the needs of policy-makers as they underplay the role of institutions. We also demonstrate that new institutional economics can offer valuable insights for both positive analysis of environmental issues as well as normative policy prescriptions.

Neoclassical environmental economics has sought to “get the prices right”, holding that better information on external costs will lead to more efficient use of scarce environmental resources. However, the neo-classical approach suffers from conceptual limitations that reduce the usefulness of its prescriptions. It assumes natural and free agency, unlimited cognitive capacity, perfect knowledge and pre-existing and stable preferences that are informed exclusively by welfarist values. Yet agents sometimes pursue environmental goals that are not exhausted by their welfare, suffer from limited cognitive capacity, have to choose on the basis of imperfect knowledge, and their agency and alternatives are importantly shaped by institutional arrangements.

The conceptual framework of new institutional economics has many attractive features for environmental research but it has mainly focused on industrial organisation, public utility regulation, public choice, economic development, and economic history (however, see Ackerman and Hassler, 1981; Crocker, 1971; Elliott, Ackerman, and Millan, 1985; Rose-Ackerman, 1995). However, there is a lively tradition of research informed by new institutional economics on environmental governance under local common property arrangements and international environmental conventions (Baland and Platteau, 1996; Berge and Stenseth, 1999; Bromley, 1992; Keohane and Ostrom, 1995; Ostrom, 1990; Ostrom *et al.*, 2002; Ostrom, Gardner and Walker, 1994; Young, 1994, 2002a, 2002b). This research has shed light on successful establishment of environmental governance institutions and identified under what circumstances they are effective. However, there is little research on national level of environmental governance and understanding of interactions between the levels and contexts of governance remains to be developed (see Young, 2002). For example, blueprint solutions for international action on desertification, deforestation or global pollutants that destroy the ozone layer or cause climate change, cannot simply be transferred downward to national policy strategies. Similarly, as argued by Ostrom *et al.*, (1999), local governance solutions cannot simply be

sealed up: they are inevitably tied to and influenced by other levels and areas of governance. These gaps in contemporary scholarship indicate that its conceptual foundations need to be clarified and elaborated in order to broaden its scope of application.

We argue that the research on environmental governance under local common property arrangements offers a highly useful platform for research on environmental decision-making and governance in general, provided that its conceptual foundations are clarified and extended so as to incorporate the potential contributions of both new and old institutional economics as well as other nearby lines of scholarship. It is the main goal of our paper to do so.

We outline an extended new institutional approach to the governance of all environmental resources, which include conventional renewable and non-renewable natural resources such as forests, groundwater and minerals; recently recognised environmental resources such as biodiversity, the ozone layer, and atmospheric sinks; and the quality of environmental media such as air and water. We demonstrate that environmental governance is necessary to resolve environmental conflicts and that it involves the establishment of governance institutions to facilitate and constrain the use of environmental resources (see Young, 1994: 15). Governance institutions range from informal to formal, and their scale varies from local to national to international. Environmental governance may involve the creation of new organisations such as environmental agencies to undertake governance activities, the delegation of authority to undertake governance activities to existing agents, or both. Finally, governance is what governments do. Sometimes – as when resource users govern themselves under customary institutions – government does not entail the presence of state. However, at other times the state is intimately involved.

In what follows, the second section discusses the concept of interdependence that most fundamentally distinguishes the institutional approach from the neo-classical one. The third section investigates transaction costs and their implications. Fourthly, we examine how and with what consequences plural goals and limited cognitive capacity can be acknowledged. Fifthly, we examine evolutionary and other approaches to collective decisions on environmental governance institutions. Sixth, we distil from research on social capital its contributions for the study of environmental governance. We conclude by discussing the new institutional approach to environmental decision making and its policy implications.

2. From Externality to Interdependence

It may appear paradoxical that the emergence of new institutional economics has to do with the environment, considering that in the main new institutional economists have not been keen to study environmental issues. Ronald Coase developed the concept of transaction costs – a concept of foundational importance for new institutional economics – already in “The Nature of the Firm” (1937). However, it was his critical response in “The Problem of Social Cost” (1960) to Arthur Pigou’s (1920) treatment of externalities – which are at the heart of neoclassical environmental economics – that launched new institutional economics as an intellectual programme. Later in 1974 Coase assaulted in his “Lighthouse in Economics” the theory of public goods, the second cornerstone of neoclassical environmental economics. Another founding father of new institutional economics, Guido Calabresi (1961, 1970), worked on risks, a third area of theory for environmental economics.

Thus it seems that new institutional economics may have had its own approach to environmental problems and policy from the outset. We believe this is a fair assessment. Yet the genuinely new institutional approach to environmental issues became almost lost when new institutional economics (see Eggertsson, 1990; Rutherford, 1994) focused on industrial organisation (Williamson, 1996, 1985), economic development (Harriss *et al.*, 1995; Clague, 1997; Platteau, 2000), public choice (Mueller, 1989), and economic history (North, 1981; 1990). Today research on the management of natural resources under customary common property institutions (see Baland and Platteau, 1996; Bromley *et al.*, 1992; Dahlman, 1980; Ostrom, 1990; Ostrom, Gardner and Walker, 1994) forms the strongest strand of environmental research informed by new institutional economics. A parallel approach studies international environmental governance (Keohane and Ostrom, 1995; Young, 1994, 2002a).

We argue that the new institutional approach to the environment is characterised by two main conceptual departures from the approach of neoclassical environmental economics. First, new institutional economics acknowledges positive transaction costs (see Coase, 1937, 1960) and shows how informal and formal institutional arrangements influence economic (and environmental) outcomes when transaction costs are positive (see North, 1990: 41-42). Second, and less obviously, new institutional economics bases the analysis of environmental problems on the broader concept of interdependence instead of the narrower neoclassical concept of externality. Interdependence prevails when a choice of one agent influences that of another. Interdependent agents cannot simultaneously realise their incompatible interests in scarce environmental resources and their conflict must be resolved by defining (or redefining) initial

endowments (Coase, 1960). This is done either by specifying private property rights as in the so-called "Coase Theorem" or by establishing other kinds of rights through, for example, environmental regulations. In what follows, we will examine the more fundamental notion of interdependence and leave the discussion on transaction costs to the next section.

Following Pigou (1920), neoclassical economics typically conceptualises environmental problems as unidirectional externalities or physical effects between agents for which no price is paid and no compensation is received (Mishan, 1971). Neo-classical analysis can also be based on the concepts of public goods and risks but we will follow the externality reasoning as it offers the best route to concept of interdependence. Simple partial equilibrium analysis indicates that efficient allocation of resources is not achieved in the presence of externalities. Pigou's suggestion was to impose a tax on the generators of negative externalities and to subsidise the generators of positive externalities in order to reach the efficient allocation of resources. The critics of Pigovian reasoning argue that it is illegitimate because it does not acknowledge the introduction or change of policy instruments such as taxes or subsidies as alteration of initial endowments and thus redistribution of wealth and income (see Calabresi, 1991; Dragun and O'Connor, 1993; Papandreou, 1994; Varian, 1984; Vatn and Bromley, 1994). The Pigovian reasoning also fails to understand that "externalities" are instances of agents' interdependence, a violation of one of the fundamental assumptions of neoclassical economics.

Interdependence clearly lies behind the classic externality examples. Factories belching smoke limit the ways in which laundries can dry their linen, but if the options of laundries are kept open those of factories are constrained. Similarly, sparking engines driven across the countryside mean that farmers' freedom from the risk of fires is compromised, and the elimination of these risks limits the freedom to operate engines as one pleases. A classic is also Hardin's (1968) analysis of the relationship between the users of natural resources such as pastures and fisheries. Units of flows of these resources are rival in consumption, meaning that use by one agent precludes use by another. This may instigate a race for the appropriation of resource units which is individually rational but can decimate the resource. The essence of these often used examples is that one agent's choice limits the range of choices available to another one – this an instance of interdependence.

Coase (1960) acknowledged interdependence – the reciprocal nature of relationships that underlie what are conventionally regarded as externalities – but did not take his analysis to its logical conclusions. He argued that it is necessary to define initial endowments when "an externality" exists - that this

could be done by assigning private property rights to one of the involved parties. However, he and others have recognised that there are also other ways of doing it, such as the introduction of environmental regulations (Bromley, 1991). Coase then demonstrate that under Pigou's own assumption of costless transactions, the establishment of private property rights is all that is needed. Interdependent agents can reach efficient allocation of resources by bargaining after initial endowments are defined. Coase *also* showed how the lesson changes when the costs of using the markets (transaction costs) are introduced. Now the initial assignment of rights influences and can determine the allocation of resources. Moreover, he argued that regulation can entail lower transaction costs than private property rights and markets when interdependence involves numerous agents (Coase 1960, 17-18).

As the implications of interdependence have seldom been fully worked out, they may appear surprising and more congenial to old institutional economists. The interdependence of agents that have incompatible interests in environmental resources results in environmental conflicts (see Schmid, 1987) – this is the institutional conception of environmental problems. Interdependence forces collective environmental choices upon us: we have to choose between conflicting interests in the environment by action or inaction. Environmental conflicts are resolved by affirming or redefining initial endowments through the establishment, reaffirmation or change of governance institutions. Affirmation or redefinition of initial endowments has simultaneously allocative and distributive consequences. As Coase has shown, allocative efficiency will be reached after initial endowments are defined. Thus, distributive consequences and governance outcomes are the most important dimensions of collective choices over environmental governance (see Calabresi, 1991). The importance of distributive consequences and governance outcomes means that efficiency and welfare goals cannot be assumed: attention must be paid to what goals agents actually have with regard to environmental governance. As Coase (1960, 43) has said, "the choice among different social arrangements ... must ultimately dissolve into a study of aesthetics and morals."

Interdependence thus explains the existence of institutions such as property rights and environmental regulations: institutions are needed to resolve interest conflicts whether or not we grant the existence of transaction costs. As interdependence may involve varying number of agents and have different geographic scales, it directly influences the scope of appropriate institutional solutions. Local solutions appear fashionable today but they may not be adequate when interdependence is national or global (of course, it is better to have local solutions than none at all). Similarly, where interdependence is local, national solutions may be wasteful and dysfunctional. Finally, when inter-

dependence is complex, governance may need to be carried out at multiple levels or through multiple governance institutions – there may not be a single, optimal level of environmental governance.

We now turn to transaction costs, the recognition of which has been a hallmark of new institutional economics from its inception.

3. Transaction Costs and Environmental Governance

Coase defined transaction costs as the costs of using the market system when trying to explain the existence of the firm (Coase, 1937). Others have clarified that transaction costs include the costs of seeking information, conducting negotiations, writing up contracts, and monitoring and enforcing compliance with them (Dahlman, 1979; Barzel, 1985). Definitions emphasise the costs of using the markets because most new institutional research focuses on market transactions – despite the interest of Coase (1937, 1974) in explaining the choice between market and non-market solutions. Environmental governance consists largely of non-market transactions, chiefly administrative transactions (see Schmid, 1987). Non-market transactions entail costs just like market transactions, because collecting information, making decisions, formulating (institutional and other) rules, monitoring compliance with these rules, and enforcing these rules are costly undertakings (see Paavola, 2002).

Transaction costs have been argued to exist because information is costly to obtain (see Dahlman, 1979; Barzel, 1985). While this explanation usefully ties transaction costs to the basic set of neoclassical assumptions – interpreting them as a result of a deviation from the assumption of perfect knowledge – it leaves open the further question what makes information costly to obtain? Without making any claim to exhaustiveness, we argue that at least five distinct sources of costly information can be identified:

1. Limited cognitive capacity makes information gathering costly.
2. Self-interested agents do not have incentives to disclose information about their preferences and plans (see Arrow, 1986; Williamson, 1985).
3. Durable goods and resources have multiple attributes (Lancaster, 1966), which can often be learned only over long period of time if at all.
4. Adjustments require learning, time and resources in real time of the real world unlike in the neoclassical models, where time is assumed away.
5. Institutions can make information gathering costly. For example, multiple governance institutions may scatter information across governance regimes or deny or limit the authority of agents to obtain it.

Transaction costs have important implications for environmental governance. First, because of positive transaction costs, governance institutions cannot be designed perfectly *ex ante*. The rights structure generated by governance institutions will omit some interdependencies and new ones not anticipated when governance institutions are established will emerge. When these interdependencies result in environmental conflicts, they have to be addressed *ex post* in the courts or in other social arenas. If the transaction costs of acting

collectively are not too high for those interest groups who are not served by the *status quo*, governance institutions may also be changed.

Transaction costs also influence the effectiveness and outcomes of environmental governance. Attributes of environmental resources, their users and institutional framework present challenges for environmental governance. Many of these governance challenges such as the size of the resource, the number of its uses and users, and the rivalry or non-rivalry of resource uses can be addressed and analysed in transaction cost terms, which helps to generate expectations about the performance of institutional alternatives. For example, salmon fisheries in the Northwest US involve a score of jurisdictions and agencies as the fish fluctuate and migrate between river and ocean over their life course (Feeny, Hanna and McEvoy, 1996). Such complexity makes it difficult and costly to transfer information from one institutional context to another one. The presence of institutional barriers also complicates decision-making.

The effectiveness of governance solutions depends on at least two factors. First, do governance institutions address the relevant interdependencies? A common reason for the ineffectiveness of governance institutions has been an omission of some sources of interdependence. For example, the Clean Water Act in the United States did not originally control non-point sources, although they were responsible for a half of many pollutant loads (see Freeman, 1990: 109-110).

Second, when governance institutions do address the pertinent interdependencies, how do they do it? The way in which governance institutions formulate rules and rights and organise governance functions influences both the level and distribution of transaction costs. Transaction cost implications are considered in policy choices in order to obtain desired governance outcomes. For example, because the measurement of effluents and emissions is costly, effluent and emission charges are not widely used. Instead, environmental charges are often formulated as input fees.

Thus, while the nature of interdependence sets basic requirements for governance institutions, transaction costs also importantly influence the choice of institutional responses. Plain interdependence reasoning may replicate an old public finance argument according to which interdependencies (externalities) should for efficiency reasons be addressed by their own governance system that has a jurisdiction matching the scope and incidence of the interdependence. Yet this kind of governance systems may entail high governance costs (which consist of transaction costs and are ignored in conventional economic frameworks) because they do not enjoy economies of scale and scope. The modern state with its effective administrative organisations may, for better or worse, have rendered many (but by no means all) smaller-scale and special-jurisdiction

governance systems obsolete. Conversely, the ineffectiveness of states in, for example, developing world may confine governance solutions to those that are based on local organisations and institutional alternatives. While local solutions are obviously better than no effective governance at all, they remain vulnerable if the interdependence extends outside their jurisdiction. It is no wonder that co-management has evolved into a new catchword (see Abdullah, Kuperan and Pomeroy, 1998; Sekhar 2000) – it promises to combine local relative advantages with the relative advantages of the state in environmental governance.

More generally, transaction costs influence the role of the state in environmental governance. Research on common property management has often been critical of the state. States have indeed often undermined customary regimes of resource management and have frequently failed to replace them with working institutional alternatives. However, from a broader perspective, the state is simply one instrument of and forum for collective action, not unlike the village community. The state will just bring together a greater number of people and exhibit a greater degree of heterogeneity and institutional complexity. As we will discuss below, its workability depends on its institutional solutions and also requires a certain amount of social capital within a heterogeneous pool of people. A state that overcomes obstacles in these areas can effectively deliver important collective services. After all, the emergence of capitalism in the western world has been largely premised on the emergence of the modern state, which established and protected private property rights and markets (see North, 1981; North and Thomas, 1973; Polanyi, 1945). Thus, the scope of interdependence permitting, a functioning state may often have relative advantage in terms of transaction cost vis-à-vis other institutional solutions in environmental governance. Vice versa, dysfunctional state forces institutional choices to focus on other institutional solutions.

To conclude, the recognition of transaction costs in new institutional economics enables detailed analysis of the interaction between policy problems and the formulation of institutional responses. Policy problems – as constituted by the physical attributes of involved environmental resources and the attributes of their users – largely determine the level of transaction costs. However, transaction costs can be influenced and redistributed by the choice and design of institutional solutions. Transaction cost reasoning also helps to understand the implications of particular institutional designs for implementation and effectiveness. It can supply the rationale for the wide use of some institutional solutions despite their theoretical inferiority in neoclassical analyses, as well as to explain why some institutional solutions have frequently failed.

In what follows, we will discuss how motivations and cognitive capacity can be dealt with more robustly in the new institutional approach.

4. Expanding Motivational and Cognitive Assumptions

Like neoclassical economics, new institutional economics assumes that agents are motivated by their personal welfare. However, it acknowledges that agents choose on the basis of imperfect knowledge. Yet it does not usually explicitly admit limited cognitive capacity and attributes imperfect knowledge to reasons that are “external” to the agent. Even this line of reasoning has generated important insights on the relationships between information, behaviour and institutions (see Akerlof, 1970; Barzel, 1982; 1997; Williamson, 1985). However, it does not realise the full potential of new institutional economics in research on environmental governance. In what follows, we will first indicate a way to expand motivational assumptions and then investigate the implications of admitting limited cognitive capacity.

Neoclassical economics assumes that agents are motivated either by the improvement of their personal welfare or the satisfaction of their preferences. These assumptions are often mistakenly treated as the same. The idea that individuals are motivated by their personal welfare stems from the late 19th century notions of “utility” as pleasure and usefulness. Pleasure was associated with psychological satisfaction and usefulness with what materially enhanced the agent’s welfare. While the proponents of pleasure and usefulness notions of utility disagreed on the possibility of making interpersonal comparisons (Cooter and Rappoport, 1984; Georgescu-Roegen, 1968; Sen, 1991), both notions had a clear relationship to agents’ welfare. However, there is no such relationship between agents’ welfare and the contemporary definition of utility as a measure of preference satisfaction (Hicks and Allen, 1934). Preference utilitarianism allows preferences which do not relate to agents’ personal welfare and, as a consequence, the notion of “utility” does not have meaning.

These conventional motivational assumptions are both problematic. Self-centred welfare-seeking is too restrictive an assumption, because it does not admit motivations such as regard for the welfare of others or the respect of rules that many of us find intuitively acceptable (see Paavola, 2002). Preference utilitarianism is in turn too broad and fails to explain connections between motivations, preferences and choice (see Bromley and Paavola, 2002). Preference utilitarianism also treats values underlying preferences as commensurable although they may not be. We suggest to disassemble preference utilitarianism by investigating what kind of values can inform preferences and by examining their implications for choice behaviour.

Unpacking of preference utilitarianism translates to recognition of both intra- and interpersonal pluralism. *Intrapersonal pluralism* means that agents may

hold multiple values and have to decide which values are to inform their preferences in a choice situation. For this reason, Kavka (1991, 1993) has argued that the impossibility theorems of social choice also apply to individual choice. *Interpersonal pluralism* means that agents may be informed by different values in the same choice situation, and arrive at either same or different choices. Economics does not have a difficulty with pluralism as long as values are self- and welfare-centred. Differences in attitudes concerning, for example, the importance of environmental amenities for personal welfare are just one source of benefits from trade. However, values may also differ in terms of their “formal” properties. For example, in many choices we are concerned about our own pleasure or material welfare. But there are also choices which are governed by our concerns for the welfare of others. Still other choices may be informed by what we consider as intrinsically valuable outcomes – preservation of a species from extinction without regard to its welfare implications is an example. Finally, agents may consider certain choices such as vegetarianism right or virtuous without regard to any of their consequences.

The admission of motivational pluralism has several implications for environmental research of which we highlight four. First, if we grant that there are utilitarian, non-utilitarian consequentialist and deontological foundations for preferences, we have to admit that preferences are not revealed by choices: a range of preferences based on different values may result in essentially the same choice (see Bromley and Paavola, 2002; Paavola, 2001, 2002). Second, non-welfarist ethical premises may instigate welfare-reducing behaviour in order to achieve some other goal. This questions the moral force of efficiency arguments and justifies collective action when it does not improve social welfare but the pursuit of other important goals require it. Third, a common metric does not exist for judgements that are based on formally different ethical foundations. This denies the applicability of cost-benefit analysis and other algorithmic methods to arrive at “optimal” social choices. Political decision-making overcomes incommensurability by rules that translate those values that muster most support into collective choices and ultimately institutional rules. This means that institutions resolve conflicts so as to realise those values that are deemed most pertinent in the context of the conflict. Fourth, values are perpetuated through institutional rules: welfarism is embedded in market institutions while non-welfarist values often inform rules that confine the operation of market logic (Bromley and Paavola, 2002; Radin, 1996). As carriers of values, institutions influence on which values agents base their preferences, choices and actions, and ultimately what outcomes are generated (see Titmuss, 1970). This is one reason why economic instruments of environmental policy do not appeal to everybody (see Hodgson, 1997).

We will now move on and emphasise that motivations and cognitive capacity are distinct determinants of behaviour. It is easy to envision agents who have plural motivations and unlimited cognitive capacity. These assumptions would simply expand the neoclassical approach into “mechanics of morals.” Limited cognitive capacity should also be considered distinct from imperfect knowledge: imperfect knowledge has other sources in addition to limited cognitive capacity, and the implications of limited cognitive capacity for choice behaviour are not necessarily the same as those of imperfect knowledge.

Research on cognitive capacity in psychology has discovered several deviations from conventional economic assumptions, such as the use of rules of thumbs, preference reversals, the influence of frames of reference and irrelevant alternatives, and asymmetric valuation of gains and losses (see Bell *et al.*, 1989; van den Bergh *et al.*, 2000; Simon, 1986; Sunstein, 2000; Thaler, 1994; Tversky and Kahneman, 1986). While economists often discount these results of controlled laboratory experiments, they indicate that there is more to individual decision making than economics has been able to reveal.

Simon (1955; 1978; 1986) argues that procedural rationality and satisficing are the central implications of limited cognitive capacity. The conventional notion of rationality sets a substantive requirement for rational choices of actually maximising the welfare or utility of the choosing agent. Simon argues that agents often have multiple goals, use these goals to eliminate alternatives from the choice set in order to make choice more manageable, and satisfy their goals rather than maximise their utility (Simon, 1955). Amos Tversky (1972) has argued in parallel that individuals use aspects of choice alternatives to reduce the size of choice set. Simon also argues that when agents sequence their choices in order to establish structure to and economise on their decision-making, they learn sequentially of alternatives and may revise their ambitions (Simon, 1955). This underlines the importance of learning for choice behaviour and that choice may depend on the order in which alternatives are encountered.

Similarly, Heiner (1983) argues that a gap between our cognitive capacity and the challenges posed by choice problems forces us to use a narrow set of behavioural and decision rules. For Heiner, this gap creates uncertainty that explains the existence of many social institutions. Earlier we argued that interest conflicts explain the existence of many institutional arrangements. Interest conflicts result from interdependent but incompatible interests and typically pose a collective choice problem akin to a Prisoner’s Dilemma. Heiner’s uncertainty explanation refers to solving coordination problems, which often share the features of assurance games (see Schelling, 1978; Kreps, 1990).

Research on limited cognitive capacity underlines that agents need time and learning to clarify their goals and preferences. It also highlights the importance of procedures in environmental decision making in general and those for participation and deliberation in particular. In fact, increasing provisions for participation and learning processes such as the work of Intergovernmental Panel for Climate Change (IPCC) reflect sensitivity to issues raised by work on limited cognitive capacity. It is also possible to find justification for policy principles such as the precautionary principle from this line of research.

Combining plural motivations and limited cognitive capacity yields additional insights. When agents can play several moral games – of which selfish welfare maximisation is but one example – and their capability of deciphering what games other agents are playing is limited, signalling one’s intentions becomes a means to elicit reciprocal behaviour. Axelrod’s (1984) observation on the good performance of the “tit for tat” strategy attests this. Many experiments also document the importance of fairness for choice behaviour (see Kahneman, Knetsch and Thaler, 1986). The detection of “fraudulent” signals and an ability to demonstrate one’s sincerity also become important. Robert Frank (1988) and others (Elster 1998; Loewenstein, 2000) argue that this is where emotions play a role. These insights are applicable for example to the study of interest groups both in national and international political arenas where decisions on environmental policy are made.

Furthermore, as Heiner (1983) has suggested, institutions are established in part to increase the predictability of behaviour. They demarcate fields of action where different rules are supposed to apply – agents not only take behavioural cues from each other, they also read them from the institutional context of their actions. For example, we may act on different motivations in the market, in the polity, and among family and friends. However, institutions do not determine behaviour. Markets can sustain other-regarding behaviour as solidarity boycotts and preferential choices of fair trade items demonstrate. Similarly, corruption is an example of self- and welfare-centred behaviour in polities. Social units portray varying degrees of consensus concerning the rules of conduct and compliance with them. High degree of such consensus translates to high predictability of behaviour. It can also be characterised as high level of social capital – a determinant of social stability and economic growth (Putnam, 1993).

Before moving on to discuss social capital in greater detail, we will take up theories of institutional change and choice.

5. Change and Choice of Environmental Governance Institutions

We have already indicated the importance of interdependence, transaction costs, plural motivations and limited cognitive capacity for the new institutional approach to environmental governance. Analysis of how institutions emerge and evolve needs additional insights. Institutional change and choice is increasingly important issue as industrialisation and commodification of environmental resources has reached global scale and has thrown up new governance challenges beyond the experience of markets, governments and agencies (Ostrom *et al.*, 1999).

Some theories understand institutional change as a result of evolutionary macro-processes (see Langlois, 1986; Nelson and Winter, 1982; Schotter, 1980; Taylor, 1987), while others approach institutional change through the lens of deliberated collective choice and collective action (Olson, 1971; Sandler, 1992). Both general strategies exhibit wide theoretical diversity. Evolutionary theories range from those informed by Marxian political economy to those informed by Hayekian Austrian Economics (see Hodgson, 1993). Similarly, theories of institutional choice range from libertarian theories of Buchanan and Tullock (1965) to the reformist theories of John R. Commons (1950; see also Orchard and Stretton, 1997). We will discuss below the central features of these theories, recognising that such a short account cannot do justice to them.

Evolutionary economics has diverse roots in early neoclassical economics, Austrian economics, German historicism, and American institutionalism (see Foster, 1997; Hodgson, 1993; Nelson and Winter, 1982). The legacy of historicism and institutionalism in evolutionary economics is an emphasis on institutions and institutional change. Neoclassical inheritance in turn identifies scarcity and relative prices as drivers of institutional change. Austrian and Schumpeterian influences in evolutionary economics include an emphasis on technological change as an evolutionary force.

A common denominator for all evolutionary theories is their emphasis on explaining change over time – “the analysis is expressly dynamic (Dosi and Nelson, 1994: 154).” Dosi and Nelson discuss a Darwinian evolutionary framework that identifies a fundamental unit or “genotype” of selection, such as behaviours or institutional arrangements. There are processes such as learning or discovery that introduce variation to genotypes. Variation in the fundamental units of selection introduces variation to higher level units (phenotypes) such as households, firms or human communities that directly face selection. Finally, there are selection processes such as market competition that eliminate phenotypes not performing well in terms of pertinent selection criteria. Selection process applies indirectly also to genotypes.

This kind of two-tier Darwinian model is not always followed, because it is not obvious what the “genotypes” and “phenotypes” are. The Darwinian model suggest that human communities face selection and that institutional solutions introduce variations in their performance. This kind of reasoning is sometimes used to explain institutions that have engendered sustainable use of natural resources (see Ostrom, 1990): communities have learned to improve their institutional arrangements over time or have been wiped out. At other times, differential survival is attributed to “sorting” or “Lamarckian evolution” instead of selection (see van den Bergh and Gowdy, 2000). Finally, sometimes a stylised evolutionary model is used simply as a heuristic device to explain change. Whichever form they take, evolutionary models can be used to investigate a wide variety of phenomena. Recall that Veblen (1899) examined the role of consumption choices in gaining status and power in the society, while Alchian (1950) argued that competition weeds out firms that do not maximise profits.

If both the natural and the social world evolve, there can be synergies, symbiosis and coevolution between them (see Norgaard, 1984; 1994). In ecology co-evolution refers to simultaneous evolution of interacting species or ecosystems, while in economics coevolution means mutual adjustment and development of ecological and economic systems (see Adger, 1999; Erickson and Gowdy, 2000; Fairhead and Leach, 2000). That is, learning, adaptation and selection processes “fine-tune” surviving economic systems to their resource base. Yet the resource base is not given but rather co-evolves with human use. Rotating slash and burn cultures, Alpine pastoralism, Asian rice culture are examples of where the resource base is largely a human artefact. Social systems in turn often reflect the peculiarities and constraints imposed by the resource on which they depend (see Harris, 1974).

We will now take a closer look at volitional institutional choice, which has been researched at least since the days of Commons (1924; 1934). Today public choice tradition (see Buchanan and Tullock, 1965; Laver and Shepsle, 1996; Orchard and Stretton, 1997) and the theory of collective action (see Olson, 1971; Hardin, 1982; Sandler, 1992) are the predominant approaches to the choice of institutional arrangements.

Public choice has its origins in James Buchanan and Gordon Tullock's *Calculus of Consent* (1965) and there has always been a libertarian streak in it. Much of public choice simply extends new institutional economics to administrative and political decision making by treating politicians and politics as similar to firms and markets, while granting for differences in the rules of decision making and representation (see Laver and Shepsle, 1996; Orchard and Stretton, 1997;

Shepsle and Weingast, 1982, 1984). Public choice theory shares the view according to which non-market institutions are responses to market failures. However, it is sceptical of the wisdom of establishing non-market institutions: this negative attitude is conveyed by concepts such as rent seeking and government failure (see Krueger, 1974; Shepsle and Weingast, 1984: 417).

Observations of instances of "market failure" may indeed result in uncritical suggestions for non-market responses. Yet their workability is not self-evident if markets have failed, because factors such as transaction costs, social capital and the rule of law influence the performance of all institutional alternatives. When taken to its logical conclusions, the scepticism of public choice should lead to a recognition that institutions are not ideal and that judgements concerning them must be based on careful and detailed analysis in the light of goals that they are supposed to forward (see Demsetz, 1969). Moreover, by divesting market and non-market alternatives of the "sanctity" they enjoy in the eyes of their proponents, and by identifying factors affecting the success of both kinds of institutional alternatives, the scepticism of public choice tradition may foster broad-based comparative institutional analysis.

We will now turn to theory of collective action which was pioneered by Mancur Olson's *The Logic of Collective Action* (1965/1971). Collective choice scholars recognise interdependence and trace it to the characteristics of collective goals (Sandler, 1992). However, they have often viewed public goods or "club goods" as the only pertinent sources of interdependence, despite the existence of broader accounts of the sources of interdependence and their implications (Schlager and Ostrom, 1992; Schlager, Blomquist and Tang, 1994; Schmid, 1987). Because of the centrality of interdependence reasoning, contemporary research on collective action relies heavily on game theory (Sandler, 1992). Game theoretic reasoning can accommodate non-conventional behavioural motivations (Gintis, 2000; Chapter 11) and clarify their implications for collective action, but it decreases the ability of collective choice tradition to make full use of transaction cost reasoning.

To summarise, for the theory of collective action, the pursuit of public goods – of which institutional change is one example – creates an interdependence among the affected agents. If the public good has differential effects, it may divide agents into coalitions. This may also happen if agents have heterogeneous preferences. Those agents who stand to benefit from institutional change are influenced by the choice of others to join or not to join collective action. Those who stand to lose face a pressure to organise themselves because of the proponents' collective action. While all stand to benefit from collective action to protect their interests, individuals still have incentives to ride free

because of the nonexclusive character of public goods: when made available for one agent, the benefits of a public good can be enjoyed also by others who do not contribute to its provision. If exclusive side benefits cannot be provided or motivations altered so as to avoid free riding, the public good will not be offered, at least not in optimal amounts. The chances of success are greater in small groups than in large ones. When agents are heterogeneous, actors who have large stakes or intensive preferences can offer the public good for themselves and for free riders, although not in optimal amounts from the collective viewpoint (see Olson, 1971).

The theory of collective action offers several contributions to research on environmental decision making. First, the approach enables to investigate the implications of behavioural goals for collective action and choice. Second, the theory of collective action starts from the assumption of interdependence and identifies the characteristics of public goods as their source. This makes it easy to transfer theoretical ideas from the theory of collective action to new institutional research and vice versa. Thirdly, the theory of collective action acknowledges that collective action takes place within institutional framework and that choices are made according to particular decision rules. Therefore, it allows to take into consideration and to investigate the role of prevailing institutional framework for the outcomes of collective action.

To conclude, the evolutionary approach sets institutional change to its broader context. Ordinary new institutional theories recognise the role of population growth, technological change, and changes in relative prices (or scarcity), power structure and preferences as factors that influence institutional change. Yet there is a tendency to focus on collective action motivated by private interests and to ignore other sources of change (see e.g. North 1990; 1981; North and Thomas 1973 on economic development in Spain). Evolutionary approaches identify pressures for institutional change more broadly and balance micro- and macro-explanations of institutional change. They also make only weak assumptions of rationality and cognitive capacity: agents do not have a central role in explanations and they are understood to learn as if by trial and error. This feature helps to avoid overemphasis of volitional explanations of institutional change. Collective action theories are prone to it, because they explain institutional change as the result of collective action. However, the weaknesses of the evolutionary approach mirror its strengths: it has a weak grip on volitional decision-making on the course of institutional change and on the institutional framework within which this decision-making is embedded. This is also one reason why evolutionary and collective action approaches are complementary.

6. Social Capital and Environmental Decisions

We have shown that new institutional economics offers an understanding of the interdependence of agents and the relationships between agents, institutions, and resource base on which they depend. Social sciences have had difficulties to grasp these relationships when attempting to identify ways to improve human well-being and sustainability of resource use. Relationships between agents are increasingly conceptualised as networks, information flows and agreements. The density and rate of information flows has been termed social capital, though the concept itself is contested. Ostrom (2000: 188) has argued that social capital, though useful, 'is not easy to find, see and measure as is physical capital.' Arrow (2000) in turn argues that social capital is a misnomer as it does not share the characteristics of other forms of capital.

We argue that social capital has to be an integral part of a new institutional approach to the environment. The concept has two attractive features. First, it draws attention to the quality social relationships as an asset and enables to compare their contribution to economic performance with that of other forms of capital. Second, it can help to shed light on the performance of institutional arrangements involved in coping with variability and uncertainty inherent in interactions with the natural world. We consider each of these in turn.

Dasgupta (2001) argues that many analyses of social capital misunderstand it because they conflate its private and public dimensions. The private dimensions of social capital reside with individuals and are close to human capital. The public dimensions relate to networks that are public goods enhancing overall economic performance rather than that of specific agents. Differences in emphasis on these two dimensions result in disagreements on whether social capital is bound up with institutions or is an asset that can be created and passed on by individuals. The private and public aspects of social capital have been subject to many empirical analyses that have documented how social capital reduces transactions costs by engendering trust and facilitating the circulation of information (Narayan and Pritchett, 1999). For example, Fafchamps and Minten (2000) have argued that social capital is mostly a private asset for agricultural traders.

The conceptualisation discussed earlier indicates that social capital is an important determinant of human well-being together with the traditional factors of production and what is termed natural capital. Natural capital includes environmental goods and services on which both economic processes and the very basis of human and non-human life depends (Ekins, 2000; Daily, 1997). Social capital does not share all the characteristics of other forms of capital but, nevertheless, it plays an important role in securing the access of individuals and

communities to natural capital. For example, traditional communal management of fisheries, forests and rangelands under informal institutions provide rules, knowledge and obligations mediated through social capital. Traditional management of these environmental resources is a manifestation of social capital, while traditional environmental knowledge is akin to human capital (Berkes *et al.*, 2000).

Social capital and networks, although not specifically designed for the purpose, can also play an important role in coping with environmental change and stresses and contributes to risk management (Pretty and Ward, 2001). For example, networks of reciprocity assist in coping with the impacts of extreme weather events and other catastrophic environmental events. However, social capital is not always needed to facilitate pro-active adaptation to environmental impacts, for example those caused by changing climate (Adger, 2002; Dasgupta, 2001; Paldam, 2000). International migration assists small island states in both coping with extreme weather events when they occur and in furthering the stability and resilience of their populations. Such migration strategies have been utilised throughout human history in such regions to promote resilience.

Another insight of social capital research is that 'the very capacity of social groups to act in their collective interest depends on the quality of the formal institutions under which they reside' (Woolcock and Narayan, 2000, p. 234). Quantitative cross-national studies have been undertaken to examine how social capital affects economic growth. The proxies of social capital used in these studies include indicators of political freedom and more specific indicators of adherence to law and risks associated with asset ownership. These studies have found that social capital is associated with lower rates of poverty and inequality (Knack and Keefer, 1997). They also suggest that social capital may be even more important to economic growth than human capital because of its positive effects on the performance of government: high levels of social capital can reduce corruption and ameliorate health inequalities, for example (Mohan and Mohan, 2002; Bayart *et al.*, 1999). Such analysis has also been used to examine environmental performance. Deacon (1994), Bhattarai and Hammig (2001) and others have found that proxies of social capital explain differences in rates of tropical forest cover loss between Latin America and other regions.

To conclude, research on social capital can make important contributions to an institutional approach to the environment. It can take analysis far beyond informal institutions for resource management to the intimate nature of the relationships between culture, beliefs, institutions, behaviour and environmental and other outcomes (see Ruttan, 1999, 2001). Although research on social capital has been criticised as intellectual imperialism by economics (see Ruttan,

1988, 2001), the expansion of models and insights that shed light on policy problems and outcomes can, we argue, only be beneficial.

7. Implications of the New Institutional Approach for Research and Policy

The new institutional approach offers a number of promises for research on environmental decision making and governance. It enables us to examine in detail how the attributes of environmental resources create interdependence and conflicts between their users that have to be resolved by making collective choices and by implementing them through the establishment, change or reaffirmation of governance institutions. The new institutional approach also sheds light on the motivations that inform collective choices and on the way in which such choices are limited by cognitive capacity. At a more general level, theories of social capital and institutional choice and change balance micro- and macro-explanations regarding environmental governance institutions.

These general features of the new institutional approach translate into a number of specific advantages in research. First, the concepts of interdependence and institutional arrangements illuminate the nature of environmental problems and governance in an increasingly complex and globalising world. Interdependence and the forms of governance increasingly span several levels of space and political decision-making and may require simultaneous albeit different responses at each level. This is the case with policy problems such as adaptation to climate change. The new institutional approach highlights the relationships between levels, such as the role of subsidiarity in collective action or the design of insurance markets to cope with risk, and raises the question what are the proper responses at each level.

Another advantage of the new institutional approach is its capability to shed light on policy implementation and factors that determine governance outcomes. The conventional economic approach has largely ignored implementation because it conflates all policy concerns to the choice of instrument. In contrast, the new institutional approach draws attention to the compatibility of governance solutions and underlying patterns of interdependence as well as the transaction cost implications of governance solutions. It also highlights that social capital influences transaction costs and thus the effectiveness and outcomes of governance.

The new institutional approach also offers an open-ended strategy to policy analysis. Instead of limiting policy analysis to the welfare implications of governance alternatives, the traditional approach in cost-benefit analyses, the new institutional approach can assess governance outcomes in the light of governance goals that are actually held by decision-makers and stakeholders. With its analytical understanding of relationships between resource attributes,

interdependence, institutions and human behaviour, the approach can facilitate the achievement of governance goals, whatever they are.

Perhaps the greatest shortcoming of the new institutional approach is the thinness of research informed by it. This is especially true of research on environmental governance at the national and international levels. The approach has now achieved maturity in the study of local resource management under common property institutions. Widening the scope of new institutional research requires taking up the conceptual and empirical challenges of bending the approach to suit new objects of research. The greatest obstacle for the use of new institutional approach to research on national level of environmental governance is the relatively undeveloped conceptual understanding of the state and its relationships to government and collective action. These shortcomings are not insurmountable and will be overcome in research that seeks to present workable policy prescriptions for perplexed and frustrated policy-makers.

References

- Abdullah, N.M.R., Kuperan, K. and Pomeroy, R.S. (1998). Transaction Costs and Fisheries Co-management, *Marine Resource Economics*, vol. 13, 103-114.
- Ackerman, B.A. and Hassler, W.T. (1981). *Clean Coal / Dirty Air*, New Haven, Yale University Press.
- Adger, W.N. (1999). Evolution of Economy and the Environment: An Application to Land Use in Lowland Vietnam, *Ecological Economics*, vol. 31, 365-379.
- Adger, W.N. (2002). Social capital, collective action and adaptation to climate change. *Economic Geography*, forthcoming.
- Akerlof, G.A. (1970). The Market for 'Lemons': Quality, Uncertainty and the Market Mechanism, *Quarterly Journal of Economics* vol. 84, 488-500.
- Alchian, A.A. (1950). Uncertainty, Evolution, and Economic Theory, *Journal of Political Economy*, vol. 58, 211-222.
- Arrow, K. J. (1986). Rationality of Self and Others in an Economic System, *Journal of Business*, vol. 59, S385-S399.
- Arrow, K.J. (2000). Observations on social capital, in Dasgupta, P. and Stiglitz, J. (eds.), *Social Capital: A Multi-Faceted Perspective*, World Bank, Washington DC, pp. 3-5.
- Axelrod, R. (1984). *The Evolution of Cooperation*, New York, BasicBooks.
- Baland, J.-M. and Platteau, J.-P. (1996). *Halting Degradation of Natural Resources: Is There a Role for Rural Communities?*, Oxford, Clarendon Press.
- Barzel, Y. (1982). Measurement Costs and the Organization of Markets, *Journal of Law and Economics*, vol. 25, 87-110.
- Barzel, Y. (1985). Transaction Costs: Are They Just Costs?, *Journal of Institutional and Theoretical Economics*, vol. 141, 4-16.
- Barzel, Y. (1997). *Economic Analysis of Property Rights*, 2nd edition, Cambridge, Cambridge University Press.
- Bayart, J., Ellis, S. and Hibou, B. (1999). *The Criminalisation of the State in Africa*, Oxford, James Currey.
- Bell, D.E., Raiffa, H. and Tversky, A. (1989). *Decision Making*, Cambridge, Cambridge University Press.
- Berge, E., and Stenseth, N. C., eds. (1999). *Law and the Governance of Natural Resources: Studies from Northern Europe and Africa*, San Francisco: ICS Press.

van den Bergh, J. C. J. M., Ferrer-i-Carbonell, A. and Munda, G. (2000). Alternative Models of Individual Behaviour and Implications for Environmental Policy, *Ecological Economics*, vol. 32, 43-61.

van den Bergh, J.C.J.M. and Gowdy, J.M. (2000). Evolutionary Theories in Environmental and Resource Economics: Approaches and Applications, *Environmental and Resource Economics*, vol. 17, 37-57.

Berkes, F., Colding, J. and Folke, C. (2000). Rediscovery of traditional ecological knowledge as adaptive management, *Ecological Applications*, vol. 10, 1251-1262.

Bhattarai, M. and Hammig, M. (2001). Institutions and the Environmental Kuznets curve for deforestation: a cross-country analysis for Latin America, Africa and Asia, *World Development*, vol. 29, 995-1010.

Bromley, D.W. (1991). *Environment and Economy: Property Rights and Public Policy*, Cambridge, Blackwell.

Bromley, D.W., ed. (1992). *Making the Commons Work: Theory, Practice, and Policy*, San Francisco, ICS Press.

Bromley, D.W. and Paavola, J. (2002). Economics, Ethics and Environmental Policy, in Bromley, D. W. and Paavola, J. (eds.), *Economics, Ethics, and Environmental Policy: Contested Choices*, Malden, Blackwell, 261-276.

Buchanan, J.M. and Tullock, G. (1965). *The Calculus of Consent: The Logical Foundations of Constitutional Democracy*, Ann Arbor, University of Michigan Press.

Calabresi, G. (1961). Some Thoughts on Risk Distribution and the Law of Torts, *Yale Law Journal*, vol. 70, 499-553.

Calabresi, G. (1970). *The Costs of Accidents: A Legal and Economic Analysis*, New Haven, Yale University Press.

Calabresi, G. (1991). The Pointlessness of Pareto: Carrying Coase Further, *Yale Law Journal*, vol. 100, 1211-37.

Clague, C., ed. (1997). *Institutions and Economic Development: Growth and Governance in Less-Developed and Post-Socialist Countries*, Baltimore, Johns Hopkins University Press.

Coase, R.H. (1937). The Theory of the Firm, *Economica*, vol. 4, 386-405.

Coase, R.H. (1960). The Problem of Social Cost, *Journal of Law and Economics*, vol. 3, 1-44.

Coase, R.H. (1974). The Lighthouse in Economics, *Journal of Law and Economics*, vol. 17, 357-376.

Commons, J.R. (1924). *The Legal Foundations of Capitalism*, Madison, University of Wisconsin Press.

Commons, J.R. (1934). *Institutional Economics: Its Place in Political Economy*, Madison: University of Wisconsin Press.

Commons, J.R. (1950). *The Economics of Collective Action*, New York, Macmillan.

Cooter, R. and Rappoport, P. (1984). Were the Ordinalists Wrong About Welfare Economics?, *Journal of Economic Literature*, vol. 22, 507-530.

Crocker, T.D. (1971). Externalities, Property Rights, and Transaction Costs: An Empirical Study, *Journal of Law and Economics*, vol. 14, 451- 464.

Dahlman, C. (1979). Problem of Externality, *Journal of Law and Economics*, vol. 22, 141-162.

Dahlman, C. (1980). *The Open Field System and Beyond: A Property Rights Analysis of an Economic Institution*, Cambridge, Cambridge University Press.

Daily, G.C., ed. (1997). *Nature's Services: Societal Dependence on Natural Ecosystems*, Washington DC, Island Press.

Dasgupta, P. (2001). Social Capital and Economic Performance: Analytics. Unpublished. Faculty of Economics and Politics, University of Cambridge, Cambridge.

Deacon, R.T. (1994). Deforestation and the rule of law in a cross-section of countries, *Land Economics*, vol. 70, 414-430.

Demsetz, H. (1969). Information and Efficiency: Another Viewpoint, *Journal of Law and Economics*, vol. 12, 1-22.

Dosi, G. and Nelson. R.R. (1994). An Introduction to Evolutionary Theories in Economics, *Evolutionary Economics*, vol. 4, 153-172.

Dragun, A.K. and O'Connor, M.P. (1993). Property Rights, Public Choice, and Pigouvianism, *Journal of Post Keynesian Economics*, vol. 16, 127-152.

Eggertsson, T. (1990). *Economic Behavior and Institutions*, Cambridge, Cambridge University Press.

Ekins, P. (2000). *Economic Growth and Environmental Sustainability: the Prospects for Green Growth*, London, Routledge.

Elliott, E.D., Ackerman, B.A. and Millan, J.C. (1985). Toward a Theory of Statutory Evolution: The Federalization of Environmental Law, *Journal of Law, Economics, and Organization*, vol. 1, 313-340.

Elster, J. (1988). Emotions and Economic Theory, *Journal of Economic Literature*, vol. 36, 47-74.

Erickson, J.D. and Gowdy, J.M. (2000). Resource Use, Institutions and Sustainability: A Tale of Two Pacific Island Cultures, *Land Economics*, vol. 76, 345-354.

Fafchamps, M. and Minten, B. (2002). Returns to social network capital among traders, *Oxford Economic Papers*, vol. 54, 173-206.

Feeny, D. Hanna, S. and McEvoy, A. (1996). Questioning the Assumptions of the ‘Tragedy of the Commons Model of Fisheries. *Land Economics* 72, 187-205.

Foster, J. (1997). The Analytical Foundations of Evolutionary Economics: From Biological Analogy to Economic Self-Organization, *Structural Change and Economic Dynamics*, vol. 8, 427-451.

Frank, R.H. (1988). *Passions within reason: The strategic role of the emotions*, New York and London, W. W. Norton.

Freeman III, A.M. (1990). Water Pollution Policy, in Portney, P. R. (ed.), *Public Policies for Environmental Protection*, Washington DC, Resources for the Future, 97-149.

Georgescu-Roegen, N. (1968). Utility, in Sills D. L. (ed.), *International Encyclopedia of the Social Sciences*. New York: Macmillan and Free Press, vol. 16, 236-267.

Gintis, H. (2000). *Game Theory Evolving: A Problem-Centered Introduction to Modelling Strategic Interaction*, Princeton, Princeton University Press.

Hanley, N. (2001). Cost-benefit analysis and environmental policymaking, *Environment and Planning C: Government and Policy*, vol. 19, 103-118.

Hardin, G. (1968). “The Tragedy of the Commons.” *Science* 162, 1241-1248.

Hardin, R. (1982). *Collective Action*. Baltimore, Johns Hopkins University Press.

Harris, M. (1974). *Cows, Pigs, Wars and Witches: The Riddle of Culture*, New York: Random House.

Harriss, J., Hunter J. and Lewis, C.M., eds. (1995). *The New Institutional Economics and Third World Development*, London, Routledge.

Heiner, R.A. (1983). The Origin of Predictable Behavior, *American Economic Review*, vol. 73, 560-595.

Hicks, J. and Allen, R.G.D. (1934). A Reconsideration of the Theory of Value, *Economica*, vol. 1, 52-76, 196-219.

Hodgson, G.M. (1993). *Economics and Evolution: Bringing Life Back into Economics*, Cambridge, Polity Press.

Hodgson, G.M. (1997). Economics, Environmental Policy, and the Transcendence of Utilitarianism. In John Foster (ed.), *Valuing Nature? Economics, Ethics, and Environment*. London: Routledge, pp. 48-63.

Kahneman, D., Knetsch, J.L. and Thaler, R.H. (1986). Fairness and the Assumptions of Economics, *Journal of Business*, vol. 59, S285-S300.

Kavka, G.S. (1991). Is Individual Choice Less Problematic than Collective Choice?, *Economics and Philosophy*, vol. 7, 143-165.

Kavka, G.S. (1993). Internal Prisoner’s Dilemma Vindicated, *Economics and Philosophy*, vol. 9, 171-174.

Keohane, R.O. and Ostrom, E., eds. (1995). *Local Commons and Global Interdependence: Heterogeneity and Cooperation in Two Domains*, London, Sage.

Knack, S. and Keefer, P. (1997). Does social capital have an economic payoff? a cross-country investigation, *Quarterly Journal of Economics*, vol. 112, 1251-1288.

Kreps, D.M. (1990). *Game Theory and Economic Modelling*. Oxford: Clarendon Press.

Krueger, A.O. (1974). The Political Economy of the Rent-Seeking Society, *American Economic Review*, vol. 64, 291-303.

Lancaster, K.J. (1966). A New Approach to Consumer Theory, *Journal of Political Economy*, vol. 74, 132-57.

Langlois, R.N., (ed.). (1986). *Economics as a Process: Essays in the New Institutional Economics*, Cambridge: Cambridge University Press.

Laver, M. and Shepsle, K.A. (1996). *Making and Breaking Governments: Cabinets and Legislatures in Parliamentary Democracies*, Cambridge, Cambridge University Press.

Leach, M. and Fairhead, J. (2000). Challenging neo-Malthusian deforestation analyses in West Africa’s dynamic forest landscapes. *Population and Development Review* 26, 17-43.

Loewenstein, G. (2000). Emotions in Economic Theory and Economic Behavior, *American Economic Review*, vol. 90, 426-432.

Mishan, E.J. (1971). The Postwar Literature on Externalities: An Interpretative Article, *Journal of Economic Literature*, vol. 9, 1-28.

Mohan, G. and Mohan, J. (2002). Placing social capital, *Progress in Human Geography*, vol. 26, 191-210.

Mueller, D. (1989). *Public Choice II*. Cambridge: Cambridge University Press.

Narayan, D. and Pritchett, L. (1999). Cents and sociability: household income and social capital in rural Tanzania, *Economic Development and Cultural Change*, vol. 47, 871-897.

Nelson, R.R. and Winter, S.G. (1982). *An Evolutionary Theory of Economic Change*, Cambridge, Belknap Press.

Norgaard, R.B. (1984). Coevolutionary Development Potential, *Land Economics*, vol. 60, 160-173.

Norgaard, R.B. (1994). *Development Betrayed: The End of Progress and a Coevolutionary Revisioning of the Future*, London and New York, Routledge.

North, D.C. (1981). *Structure and Change in Economic History*. New York: Norton.

North, D.C. (1990). *Institutions, Institutional Change, and Economic Performance*, Cambridge, Cambridge University Press.

North, D.C. and Thomas, R.P. (1973). *The Rise of the Western World: A New Economic History*, Cambridge, Cambridge University Press.

Olson, M. (1965/1971). *The Logic of Collective Action: Public Goods and the Theory of Groups*, Cambridge, Harvard University Press.

Orchard, L. and Stretton, H. (1997). Public Choice, *Cambridge Journal of Economics*, vol. 21, 409-430.

Ostrom, E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action*, Cambridge, Cambridge University Press.

Ostrom, E. (2000). Social capital: a fad or a fundamental concept, in Dasgupta, P. and Serageldin, I. (eds.), *Social Capital: A Multi-Faceted Perspective*, Washington DC, World Bank, 172-214.

Ostrom, E., Burger, J., Field, C., Norgaard, D.B., and Policansky, D. (1999). Revisiting the commons: local lessons, global challenges, *Science*, vol. 284, 278-282.

Ostrom, E., Dietz, T., Dolsak, N., Stern, P.C., Stonich, S. and Weber, E.U., eds. (2002). *The Drama of The Commons*, Washington DC, National Academy Press.

Ostrom, E., Gardner, R. and Walker, J. (1994). *Rules, Games, and Common-Pool Resources*, Ann Arbor, University of Michigan Press.

Paavola, J. (2002). Rethinking the Choice and Performance of Environmental Policies, in Bromley, D. W. and Paavola J. (eds.), *Economics, Ethics, and Environmental Policy: Contested Choices*, Malden: Blackwell, 87-102.

Paavola, J. (2001). Towards Sustainable Consumption? Economics and Ethical Concerns for the Environment in Consumer Choices, *Review of Social Economy*, vol. 59, 227-248.

Paldam, M. (2000). Social capital: one or many? Definition and measurement, *Journal of Economic Surveys*, vol. 14, 629-653.

Panayotou, T. (1998). *Instruments of Change: Motivating and Financing Sustainable Development*, London, Earthscan.

Papandreou, A.A. (1994). *Externality and Institutions*, Oxford, Clarendon Press.

Pearce, D.W. (1998). Cost-benefit analysis and environmental policy, *Oxford Review of Economic Policy*, vol. 14(4), 84-100.

Pigou, A.C. (1920). *Economics of Welfare*. London: Macmillan and Co.

Platteau, J.-P. (2000). *Institutions, Social Norms, and Economic Development*, Harwood Academic Press.

Polanyi, K. (1945). *Origins of Our Time: The Great Transformation*. London, Gollancz.

Pretty, J. and Ward, H. (2001). Social capital and the environment, *World Development*, vol. 29, 209-227.

Putnam, R.D. (1993). *Making Democracy Work: Civic Traditions in Italy*, Princeton, Princeton University Press.

Radin, M.J. (1996). *Contested Commodities*, Cambridge, Harvard University Press.

Rose-Ackerman, S. (1995). *Controlling Environmental Policy: the Limits of Public Law in Germany and the United States*, New Haven, Yale University Press.

Rutherford, M. (1994). *Institutions in Economics: The Old and The New Institutionalism*, Cambridge, Cambridge University Press.

Ruttan, V.W. (1988). Cultural endowments and economic development: what can we learn from anthropology?, *Economic Development and Cultural Change*, vol. 36 (supplement), 247-271.

Ruttan, V.W. (1999). The new growth theory and development economics: a survey, *Journal of Development Studies*, vol. 35 (2), 1-26.

Ruttan, V.W. (2001). Imperialism and competition in anthropology, sociology, political science and economics: a perspective from development economics, *Journal of Socio-Economics*, vol. 30, 15-29.

Sandler, T. (1992). *Collective Action: Theory and Applications*, Ann Arbor, University of Michigan Press.

Schelling, T.C. (1978). *Micromotives and Macrobehavior*, New York and London, Norton.

Schlager, E., Blomquist, W. and Tang, S.Y. (1994). Mobile Flows, Storage, and Self-Organized Institutions for Governing Common-Pool Resources, *Land Economics*, vol. 70, 294-317.

Schlager, E., and Ostrom, E. (1992). Property-Rights Regimes and Natural Resources: A Conceptual Analysis, *Land Economics*, vol. 68, 249-262.

Schmid, A.A. (1987). *Property, Power, and Public Choice: An Inquiry into Law and Economics*, New York, Praeger, 2nd ed.

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

Sekhar, N.U. (2000). Decentralized Natural Resource Management: From State to Co-management in India, *Journal of Environmental Planning and Management*, vol. 43, 123-138.

Sen, A.K. (1991). Utility: Ideas and Terminology, *Economics and Philosophy*, vol. 7, 277-283.

Shepsle, K.A. and Weingast, B.R. (1982). Institutionalizing Majority Rule: A Social Choice Theory with Policy Implications, *American Economic Review*, vol. 72, 367-371.

Shepsle, K.A. and Weingast, B.R. (1984). Political Solutions to Market Problems, *American Political Science Review*, vol. 78, 417-434.

Simon, H.A. (1955). A Behavioral Model of Rational Choice, *Quarterly Journal of Economics*, vol. 69, 99-118.

Simon, H.A. (1978). Rationality as a process and product of thought, *American Economic Review*, vol. 68, 1-16.

Simon, H.A. (1986). Rationality in Psychology and Economics, *Journal of Business*, vol. 59, S209-S224.

Sunstein, C., ed. (2000). *Behavioral Law and Economics*, Cambridge: Cambridge University Press.

Taylor, M. (1987). *The Possibility of Cooperation*. Cambridge: Cambridge University Press.

Thaler, R.H. (1994). *The Winner's Curse*, Princeton, Princeton University Press.

Titmuss, R.M. (1970). *The Gift Relationship: From Human Blood to Social Policy*, London, Allen and Unwin.

Tversky, A. (1972). Elimination by Aspects: A Theory of Choice, *Psychological Review*, vol. 79, 281-299.

Tversky, A. and Kahneman, D. (1986). Rational Choice and the Framing of Decisions, *Journal of Business*, vol. 59, S251-S278.

Varian, H. (1984). *Microeconomic Analysis*, 2nd edition, New York, Norton.

Vatn, A. and Bromley, D.W. (1994). Choices Without Prices Without Apologies, *Journal of Environmental Economics and Management*, vol. 26, 129-48.

Veblen, T. (1899). *The Theory of the Leisure Class: An Economic Study of Institutions*, New York and London, Macmillan.

Williamson, O.E. (1985). *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*, New York, Free Press.

Williamson, O.E. (1996). *The Mechanisms of Governance*, New York and Oxford, Oxford University Press.

Woolcock, M. and Narayan, D. (2000). Social capital: implications for development theory, research and policy, *World Bank Research Observer*, vol. 15, 225-249.

Young, O.R. (2002a). *The Institutional Dimensions of Environmental Change: Fit, Interplay and Change*, Cambridge, MIT Press.

Young, O.R. (2002b). Institutional interplay: the environmental consequences of cross-scale interactions, in Ostrom, E., Dietz, T., Dolsak, N., Stern, P. C., Stonich, S. and Weber, E. U. (eds.), *The Drama of the Commons*, Washington DC, National Academy Press, 263-291.

Young, O.R. (1994). *International Governance: Protecting the Environment in Stateless Society*, Ithaca, Cornell University Press.