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Potential Contributions of Political Science to Environmental Economics

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Abstract While political science has much to offer, at least some of its contributions might be difficult to incorporate into economic models. Nevertheless, we argue that environmental economics might benefit from supplementing, combining, or sometimes even replacing the rational choice approach with other approaches commonly used in political science. We develop our argument by examining three core components of political science analysis: *ideas*, *power*, and *institutions*. For each component we review political science approaches and propositions with a view to determining “what’s in it” for environmental economics.

Keywords Environmental economics · Ideas · Institutions · Political science · Power

1 Introduction

Environmental economics is changing. One indication of this is the advance of behavioural economics, an advance that has been motivated by a conviction that providing more realistic psychological underpinnings for economic models can generate new theoretical insights, more precise predictions, and better policy advice (Camerer and Loewenstein 2004, 3). A second indication is the increasing interest that environmental economists take in what other social sciences offer. It is no longer exceptional to find extensive references to work by

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anthropologists, political scientists, or sociologists in articles or books written by environmental economists.¹

What, if anything, can environmental economics learn from our discipline, political science? While rational choice theory remains the core approach in economics, it is only one of several approaches in political science. This multitude of approaches in the discipline means that political science has much to offer. However, at least some of what it has to offer might be difficult to incorporate into economic models. Nevertheless, we suggest that environmental economics might benefit from supplementing, combining, or sometimes even replacing the rational choice approach with other approaches commonly used in political science.

While in this paper we focus on what environmental economics can learn from political science, equally interesting would be to consider what environmental political science can learn from economics. Considering the latter question would obviously require a very different paper from this one. However, we emphasise that economics has had, and will almost certainly continue to have, a major influence on our own discipline, and we certainly welcome this influence.

The reader should bear in mind that the authors have primarily (although certainly not exclusively) been working within the international relations branch of environmental political science. Consequently, many examples we use are drawn from international relations. We believe, however, that the general points we make are relevant not only for the international relations branch of environmental economics, but also for the domestic branch.

In Sect. 2 we describe political science and explain how it differs from economics. The next three sections offer examples of work in political science that we see as potentially helpful for environmental economics. The first example concerns *ideas*, the second *power*, and the third *institutions*.² Ideas, power, and institutions may together be considered the very core of what political science is about.

In Sect. 3 we discuss how the political system uses ideas in policy making, which sometimes departs considerably from the economist's model of rational use of information. Relevant ideas are often ignored or take too long to have an impact because of bounded rationality, institutional constraints, and lack of relevance to key political actors' goals. Further, ideas are not equivalent to information in the economist's sense, but rather shape the mental maps decision makers use, the roles they play and even the identities they adopt.

In Sect. 4 we briefly review three different notions of power—power as control over important goods or events, power through organisations, and power as social constitution. The first notion is inspired by microeconomic concepts of exchange and should be easy to incorporate into economic analysis. The second brings in a wider range of causal mechanisms in a format that should also be compatible with the logic of economic analysis. The third focuses on mechanisms that are likely to be less familiar to economists and harder to incorporate.

In Sect. 5 we outline three different approaches political scientists use to study institutions: rational choice institutionalism, historical institutionalism, and sociological institutionalism. We also offer an example of how combining elements from two very different institutional approaches in a simple model can generate new and interesting predictions about the effects of a particular type of institution; one designed to enforce international environmental agreements.

Finally, in Sect. 6 we conclude.

¹ For two examples, see Barrett (2003, 2007).

² We define 'ideas' in the introduction to Sect. 3, 'power' in the introduction to Sect. 4, and 'institutions' in the introduction to Sect. 5.

2 Political Science: A Highly Diverse Discipline

According to the American Political Science Association's (APSA) website,³ political science is "the study of governments, public policies and political processes, systems, and political behavior". This statement defines the discipline by identifying its *substantive scope*, more precisely the main objects of study. The same type of definition can be found at the website of the American Economic Association (AEA): "Economics...studies the production, distribution, and consumption of goods and services".⁴ The APSA website lists a number of political science subfields, such as political theory, political philosophy, political ideology, political economy, policy studies and analysis, comparative politics,⁵ and international relations. A similar list is provided on the AEA website. Comparing the two presentations, we get a fairly clear idea of the division of labour between the two disciplines.

A "mature" discipline will, however, also claim a distinct *conceptual foundation* and *methodological toolbox*. Regarding the former, a common approach taken by many political scientists has been to start by defining "politics" in functional terms. Thus, building on [Lasswell \(1936\)](#) and others, Easton defined politics as "the authoritative allocation of values" in a society ([Easton 1953](#), 143). Political science may be defined as the study of how authoritative allocation of resources is (or should be) performed. It is commonly held that political science involves the study of "power, rule, or authority" ([Dahl 1965](#), 7). Similarly, economists often point to "scarcity" and "choice" as foundational concepts of their discipline ([Backhouse and Medema 2009](#), 222). Combining these two concepts, we may say that the paramount concern of economics is to determine which choices lead to efficient use of scarce resources.⁶

Methodologically, economists mainly use models of *rational choice*. [Becker \(1976, 5\)](#) makes that clear by arguing that "the combined assumptions of maximising behaviour, market equilibrium, and stable preferences, used relentlessly and unflinchingly, form the heart of the economic approach". Essentially, Becker sees economics as the development and application of rational choice models and theories to study a wide range of social phenomena (also beyond production, distribution, and consumption). Some economists would find Becker's assumptions unduly restrictive; in fact, a "post-autistic economics movement" erupted in France in 2000, advocating greater pluralism to better capture the complexity of the topics addressed by economists. Despite some dissent, however, it seems fair to say that a relatively broad consensus exists within economics as to what constitutes its methodological essence.

No corresponding consensus exists concerning the methodological essence of political science and few would dream of defining political science in terms of a particular methodological approach. Of course, many political scientists use rational choice models, and they would be inclined to consider economics to be the closest neighbouring discipline. Some economists who analyse *political* processes or institutions—Thomas C. Schelling and Scott Barrett are two prominent examples—inspire a number of political science studies (including some work done by the authors of this paper). Many political scientists, however, look to other disciplines—anthropology, history, law, psychology or sociology—for methodological approaches. Some of this methodological divergence seems to reflect the fact that political scientists have different research interests and that different topics call for different

³ http://www.apsanet.org/content_9181.cfm.

⁴ http://www.aeaweb.org/RFE/showCat.php?cat_id=10.

⁵ Comparative politics is the joint study of some political phenomenon (the government, public policy, a political process, the political system, or political behaviour) in two or more countries.

⁶ For a chronological account of definitions of economics, see [Backhouse and Medema \(2009\)](#).

approaches. While a student of bargaining might be well advised to consider game theory, a student of collective identities might be better served by turning to psychology and sociology for concepts and models. This, however, only partly explains the divergence. Frequently, political scientists use different approaches even when studying the *same* phenomenon, and do so because their assessments of the approaches' merits diverge.

Divergence need not generate heated controversy, but it sometimes does. A good illustration is the "Perestroika process" in American political science. This process began in October 2000 when a "Mr. Perestroika" circulated an e-mail that was supported by a number of other disgruntled scholars. They complained that political science in America (1) suffered from a "suffocating grip" of mathematical approaches associated with formal rational choice and public choice theory, and (2) largely overlooked important explanatory factors such as culture, institutions, and social norms (Jacobsen 2005).⁷ They also protested against what they saw as the undemocratic dominance of formal theorists in APSA, arguably the world's leading political science association, as well as an allegedly unreasonable proportion of rational-choice-based articles in APSA's flagship journal, *American Political Science Review*. Interestingly, this "Perestroika process" seems to have made a greater impact than the "post-autistic economics movement", even though its supporters arguably had a weaker case. Perhaps the explanation is that in economics the dominance of the rational choice approach is so strong that a critical mass of opposition could not be mobilised. By contrast, political science is a more diverse discipline, providing fertile ground for the kind of attack launched by "Mr. Perestroika" and his supporters.

The "Perestroika process" notwithstanding, we firmly believe that political science has benefited hugely from importing ideas from economics, through game theory and other rational choice approaches. Conversely, we are encouraged to see that some political science research is read with interest by (environmental) economists. The Nobel memorial prize in Economic Sciences awarded to Elinor Ostrom, for her "analysis of economic governance, especially the commons", is the *cas célèbre*. Cross-fertilisation between the two disciplines is most likely where economists and political scientists have common or closely related research interests. This suggests, for example, that economists concerned with questions of *effectiveness* and political *feasibility* will find more of interest in political science research than will those focusing exclusively on *efficiency*. Moreover, interaction and understanding are facilitated by similar theoretical frameworks and methodological strategies. Therefore, political scientists working with rational choice models will likely find a more receptive audience in economics than will political scientists engaged in the art of post-modernist interpretation.

The *value* of cross-fertilisation will, however, not necessarily decline if we dare look beyond the familiar and convenient. In his Presidential Address to the APSA, Robert Axelrod (2008, 3) encouraged fellow political scientists to "...cultivate your curiosity by: reading up in a variety of fields so your mind will be well prepared, teaming up with others who can help you, loading up on research related to your problem, and lightening up when you need to escape from the problem for a while". This paper is written in that spirit. We believe that some of the most important lessons economics can take from political science will come from engaging with *less familiar* models and theories, and exploring how they can combine with, supplement, or perhaps sometimes even replace rational choice theory.

⁷ The Perestroika process was preceded by an intense scholarly debate about the fruitfulness of rational choice theory. See Green and Shapiro (1994) and Friedman (1996).

Each of the next three sections offers an example of political science work that we believe might be potentially helpful for environmental economics. The first example concerns *ideas*, the second *power*, and the third *institutions*.

3 Ideas and the policy process

Keynes said:

The ideas of economists and political philosophers, both when they are right and when they are wrong, are more powerful than is commonly understood. Indeed the world is ruled by little else.....I am sure that the power of vested interests is vastly exaggerated compared with the gradual encroachment of ideas (Keynes 1936, 383).

Keynes was talking here, in terms familiar to most political scientists, about the importance to public policy of ideas—combinations of beliefs and values that come to be held by many individuals, though they may be associated with one person. Political scientists often emphasise: (1) the place in such belief structures of value commitments, loosely formed theories about causality, and poorly empirically grounded assertions about the state of the world; (2) the resistance to change of ideas in the face of ‘objective’ evidence; and (3) their arbitrary nature relative to conventional standards of logical consistency. Modern micro-economics places importance on individuals’ (probabilistic) beliefs about states of the world held in the form of priors, and on incoming information that can modify priors. While not denying that individuals sometimes process information rationally, political scientists emphasise pressures for social conformity of belief and the way in which broader ideologies such as liberalism, conservatism and socialism structure the way ideas change. They are often also concerned with links between ideas, institutions and power: (1) the way that ideas built into institutions’ standard operating procedures prevent demands on the political system being given serious consideration and; (2) ideological processes that can prevent demands arising in the first place by preventing people seeing where their real interests lie (Lukes 1974).

The limited space here prevents our covering all the schools and perspectives on ideas and public policy in political science (but see Moran et al. 2006, part IV). Instead we will emphasise the role ideas play in major shifts in policy, such as a shift is the new emphasis on green infrastructural investment in many governments’ fiscal stimulus packages in response to the credit-crunch recession of 2007/2008. For instance, in November 2008 the incoming Obama administration announced \$18.2 bn in tax cuts and credits for clean energy, a \$9.45 bn extension of tax credits for wind and solar power, and \$2 bn for research on carbon capture, leading to an estimated 2.5 m new jobs, reported as representing together about 12% of the total stimulus package (Bernard et al. 2009). In the conclusion to this section we focus on the domestic politics of the US package. We also contrast the ways that economists and political scientists have explained the spread of market-based environmental regulation; we show how ideas have influenced this spread.

Kingdon (1984) tries to explain why issues and solutions rise to the top of the political agenda after years of languishing in think-tanks and in under-funded programmes run by specialist agencies—a not unreasonable characterisation of *federal* policies related to climate change in the US under George W. Bush’s administrations (Harrison 2007). He modifies Cohen et al.’s (1972) “garbage can” model of decision making to apply to major political decisions. Rather than rational search for efficient solutions, policies are arbitrarily attached to problems, often inappropriately. He characterises politics as consisting of three

process-streams—the policy, problem, and (macro) politics streams. In the policy stream, processes resembling biological natural selection generate policy proposals. Ideas float in a “primeval policy soup” where they replicate and mutate as a consequence of interactions between policy specialists. Whether ideas spread in this environment depends as much on their suitability as rhetorical vehicles as on any objective advantage they have as solutions to well-defined problems. In the problem stream, perception of problems arises from events and from poor performance relative to goals—for example the failure of regulation to affect behaviour. The political stream consists of swings in national mood, changes in the administration, legislative turnover, and interest group campaigns. Generally the three streams develop separately, but they ‘...come together at certain critical times. Solutions become joined to problems, and both solutions and problems are in turn joined to favourable political forces. This coupling is most likely when policy windows—opportunities for pushing pet proposals or conceptions of problems—are open’ (Kingdon 1984, 21). In short, Kingdon suggests that policy responses, when they occur, may be arbitrary and inefficient rather than a means to efficient goal attainment.

Kingdon argues that many solutions in the policy stream have existed in some form for decades before opportunities arise to bring them into play (1984, 173). Policy entrepreneurs attracted, for whatever reason, to a solution will seek strategically to build support for it through diffusion, argumentation and persuasion. However, they may not put much effort into building support unless they think a problem exists (in the problem stream) to which the solution can be attached, and unless a policy window leads to the chance of the problem reaching the decision agenda in Washington. They do not waste time and effort. Opportunities are not pre-given, though. Ultimately something is perceived as a problem only if enough people are convinced that it is, but convincing them depends heavily on how they see the situation, which might be amenable to reframing through lobbying.

Rational choice theorists and economists have developed sophisticated game-theoretic models of lobbying wherein the transfer of information may be inhibited by the inability to bribe legislators (Austen-Smith 1995; Grossman and Helpman 1994) or by a player’s suspicion that he is being misled by someone with different interests in a game with information asymmetry (Potters and van Winden 1992; Austen-Smith 1997). However, Simon (1983, Chap. 1) argues that bounded rationality limits the applicability of such rationalistic models of the policy process. One important bound on rationality arises because of entrenched beliefs. Sabatier and Jenkins-Smith (1999), Sabatier (1993), Jenkins-Smith and Sabatier (1999) argue that value-laden belief systems may prevent groups making rational use of information or experience. Belief systems include: (1) a deep core comprising general theoretical predisposition, beliefs about causal relationships and value commitments; (2) a policy-related core that brings the deep core to bear on a specific policy issue; and (3) a set of secondary beliefs about the policy concerned. The deep and policy-related cores are highly resistant to change; however, secondary beliefs may change. Groups will reject information suggesting that their core beliefs are wrong or that core policy goals are unattainable. Information from experts is often used to bolster core beliefs (Barker and Peters 1992). Change in deep core beliefs is unlikely, and akin to religious conversion. The ‘New Institutionalism’ in political science, perhaps the discipline’s most important development of the last twenty years, emphasises how belief systems get built into institutions’ standard operating procedures, how numerous ideas are ‘filtered out’, and how the process is a factor leading to high degrees of path-dependence in some inefficient and ineffective policies (Pierson and Skocpol 2002).⁸

⁸ This dimension of institutions also needs to be added to our analysis of international regimes in Sect. 5, for they can also be subject to entrenchment of certain policies by the domination of modes of thinking.

While economists recognise that decision makers may not gather all available information because to do so is costly, for them more information is always desirable—so long as it is not irrelevant or false. However, some political scientists argue that in politics the endemic problem for decision makers is that of too much information, not too little or too costly information. Based on empirical evidence from cognitive psychology, [Jones and Baumgartner \(2005\)](#) emphasise the importance of selective attention as a bound on rationality: due to limited short-term processing capacity, individuals can give only serial attention to issues; and while organisations can parallel-process issues, ultimately the issues also suffer limited attention because important integrative policy decisions are still made by small groups of individuals with limited attention. So for an issue to reach the national agenda (macro-politics) rather than remain in a policy subsystem, key actors (such as the executive, legislature, parties or leaders of public opinion) must shift their attention. Issues may get onto the macro agenda simply because they, through neglect, become pressing problems; more likely, however, they reach the macro agenda through skilled attempts to shift attention to certain attributes of the problem and away from others, provoking a shift in perspective. Such ‘heresthetic’ manoeuvres, playing on ideas, may upset political equilibria by splitting majority coalitions opposed to change ([Riker 1986](#)). Bounded rationality makes decision makers relatively poor at considering tradeoffs, leading them to use crude implicit indices to make judgments ([Jones and Baumgartner 2005](#)). These indices can also change because weights given to attributes or the attributes included alter. Such changes tend to be sudden because decision makers resist changing their beliefs and are open to emotional appeal.

If policy ideas get to a political window of opportunity attached to a suitable problem, those that eventually influence policy must be implementable, be compatible with budgetary considerations, and acquire sufficient congressional support ([Kingdon 1984](#)). Here we seem to be on the terrain of interests and constraints, familiar to (political) economists, where the politics of coalition building adds considerable “political friction”, leading to under-response or slow response. However, there may also be disproportionate response to a ‘non-problem’ ([Jones and Baumgartner 2005](#)). One reason for disproportionate response is belief cascades due to decision makers in large numbers changing their views once a tipping point is reached at which enough weight of opinion has built up. These tipping points can result from pressures for conformity in belief and from desires to be on the winning side so as to get side payments ([Barnett and Duvall 2005](#), cf. [Chamley 2004](#)). Sometimes they result from the small-group psychology of those around key decision makers like the president, leading to ‘groupthink’ ([Janis 1982](#)).

Marxists, post-Marxists and social constructivists in political science emphasise ideology viewed as overarching political belief systems, and the attempt to make a certain ideology hegemonic or dominant ([Howarth 2000](#)). From this viewpoint policies may need to be compatible with the core political values of the dominant ideology; and major shifts in the dominant ideology may be required for windows of opportunity to open ([Kingdon 1984](#)). [Edelman \(1974\)](#) argued that besides having instrumental aspects, all public policy also has a symbolic dimension that is important in presenting it to the public and the media and in gaining legitimacy for it.

So what can such an understanding of the role of ideas in the policy process tell us about apparent large-scale shifts in public policy such as Obama’s “Green New Deal”? First, failure to respond efficiently to needs can result from delays caused by the failure of policy, problem and political streams to coincide, the credit-crunch recession and Obama’s victory’s opening opportunities for significant public green investment in the USA. Second, policies may be attached to problems other than those they overtly deal with, as suggested by the

way green public investment has become attached to the need for fiscal stimulus in recession. Third, resistance to efficient policies may arise because of entrenched belief systems, as in the case of climate change denial among George W. Bush's key neo-con advisers. Fourth, policy success can depend as much on a policy's ability to grab attention and draw on political symbolism as on efficiency, as suggested by how Obama used the image of Roosevelt's New Deal and memories of the Great Depression. Finally, policy success can also depend on major ideological shifts; for example, faith in the neo-liberal view—that lightly regulated free markets generate economic success—faltered due to the partial collapse of the lightly regulated US banking and financial sectors. While economists might be less concerned with such major policy shifts than political scientists are, ideas are also crucial in areas of primary concern to environmental economics.

Economists' preference for parsimonious models with micro-foundations in individuals' preferences and beliefs has proven extremely useful. However, this approach is of limited value in explaining why efficient policies are not always adopted. Consider market- (or incentive-) based environmental regulation. Oates' and Portney's (2003) survey of the environmental-economics literature argues that the best way to understand such regulation is through a model in which interest groups contend to influence policymakers. Assuming that the government maximises a convex combination of the utility functions of an industry and an environmental group over (1) an environmental quality standard and (2) how market-oriented the form of regulation is, typically the standard will be too lax and, because of industry's preference for command and control, too little use will be made of market-based regulation (Hahn 1990; Fredriksson 1997). If all groups were to organise fully, policy would be socially efficient; in reality, inefficiency results from differential failure to organise (Aidt 1998). Such differential failure to organise is likely because policy tends to generate concentrated costs for producers and dispersed benefits for citizens (Felder and Schleiniger 2002).

Political scientists looking at environmental regulation might appreciate the astringent simplicity of the economists' explanation while agreeing with Keynes' assertion, cited in the introduction to this section, that economists tend to exaggerate the power of special interests relative to that of ideas. First, political scientists focus on the way ideas about market-based regulation were spread by the OECD and the EU, and by diffusion from front-runner states (Busch and Jörgens 2005; Holzinger and Knill 2004). Second, they emphasise that institutions impede environmental regulatory change, because ideas get built into the way they operate (Kern et al. 2001; Tews et al. 2003; Jordan et al. 2003). Third, Hajer (1995) argues that the move towards market-based environmental regulation in some countries formed part of a wider set of ideological developments. The discourse about 'ecological modernisation' concerns the idea that pollution is a systematic, not incidental, problem of industrial societies, that it is economically inefficient, and that sustainable economic growth is possible once the power of market-based environmental regulation is recognised. According to Hajer (1995) this discourse spread partly because of the collapse of belief in the Keynesian/social-democratic paradigm, with its associated idea of direct state intervention in markets, and partly because of the spread of neo-liberal ideas about the need to rely on the market to provide socially efficient outcomes. A factor (by no means the only one) limiting the spread of market-based environmental regulation is more wide-spread public resistance to higher taxes (OECD 2008). Framing higher taxes in the key term, 'polluter pays', has certainly helped legitimate environmental taxes and charges, because this term invokes widely held ideological beliefs about the legitimacy of markets.

4 Power

Power—broadly defined as the ability to get others to do something you want them to do, and which they would otherwise not have done—is one of the key concepts of political science. In this section we shall briefly review three notions of power. The first is inspired by microeconomic concepts of exchange and should therefore be easy to integrate into economic analysis. The second brings in a wider range of causal mechanisms in a format that should be compatible with the logic of economic analysis. The third focuses on mechanisms that are less familiar and much harder to fit into established economic frameworks and models.

4.1 Power as control over important goods or events

Power can be seen as a function of two key factors: *interests* and *control*. Actors have *interests*—defined broadly as preferences over alternative outcomes—and some amount of *control* over activities that determine these outcomes. Control over outcomes important to oneself is the basis for autonomy. Control over outcomes important to some other party is the basis for power over that party.

From these very simple propositions, a set of more precise formulas for measuring and analysing different dimensions of power can easily be derived (Coleman 1973; Bacharach and Lawler 1984). Consider first a strictly *bilateral* relationship. In such a setting, actor A's *absolute power* over another party, B, within a certain issue area, can be expressed as $\sum_i (U_i^b \cdot K_i^a)$, where U_i^b is B's relative interest in issue i ($0 \leq U_i^b \leq 1$) and K_i^a is A's proportion of control over the outcome of this issue ($0 \leq K_i^a \leq 1$).⁹ For some purposes we need a notion of *relative power*. In a strictly bilateral relationship, A's relative power vis-à-vis B can be calculated as $\sum_i (U_i^b \cdot K_i^a) / \sum_i (U_i^a \cdot K_i^b)$, or as A's share of total power in the relationship.¹⁰ In bilateral bargaining, this coefficient will determine the “exchange rate” (for contributions to a cooperative solution).¹¹

In a multilateral setting, A's *aggregate power* over B may depend also on their mutual relationships with third parties. A, for example, may have power over B through control over goods or events important to party C, on which B is dependent. The strength of this *indirect* path would be $\sum_i [(U_i^c \cdot K_i^a)(U_i^b \cdot K_i^c)]$. The larger the number of parties, the more complex becomes the web of power relationships. For large-N settings, political scientists therefore usually resort to some kind of aggregate power index, measuring each party's relative control over a set of important resources.¹² In the study of negotiations and some other decision-making processes, the power coefficients derived from such an index can be used to *weight* the interests of different parties. If we know the distribution of power over the configuration of interests, we should—in principle—be able to predict outcomes, for a given institutional setting (Underdal 2009).

Empirical research leaves no doubt that control over goods or outcomes valued by others is a very important source of power. Statistical support can be found in, inter alia, Miles (2002), and compelling case-based evidence is provided by, inter alia, Mitchell (1994). The latter study is particularly instructive. Attempts at reducing pollution from tankers by regulating discharges at sea had largely failed, mainly because of enforcement problems. Faced with a

⁹ When the analysis is not confined to bilateral relationships, this notion is referred to also as “direct” power (to distinguish it from “indirect” paths involving one or more third parties).

¹⁰ One advantage of the latter option is that it yields a standardised coefficient varying between 0 and 1.

¹¹ Note, though, that no assumption of *linearity* is warranted.

¹² One example is the National Material Capabilities data set, available at www.correlatesofwar.org.

poor performance record and growing public concern, some governments came to favour regulation by means of equipment standards. The United States even threatened to impose such standards unilaterally, a move that would effectively close a very attractive market to tankers that failed to comply with the new requirements. As other states joined the campaign (in part to benefit from side effects), exclusion from major segments of the international market became a very real prospect, and a chain of falling dominoes was set in motion. The equipment standard approach raised costs significantly by requiring new up-front investments and reducing cargo-carrying capacity, and it is not one recommended by environmental economists as *generally* efficient. Nevertheless, in this case it spread rapidly and brought about a major improvement in compliance rates and in overall regime effectiveness. It did so by changing power relationships and thereby the incentives of ship owners as well as governments. More specifically, equipment standards provided effective sanctioning mechanisms to port states and (through control over certificates) also to classification societies and insurers. Faced with a credible threat of exclusion from business, even the most reluctant ship owners found strong incentives for compliance.

Several other conclusions emerge from research working with this notion of power. First, even though the presence of one dominant actor can significantly enhance the capacity for collective action, it is not generally a *necessary* condition (Hasenclever et al. 1997, 103). Second, power is largely an *issue-specific* relationship. A company or a state may be a truly important player in one issue-area but insignificant in another. As a consequence, notions of overall power often yield poor predictions when applied to specific problems or policy domains (Keohane and Nye 1977). Third, studies of international negotiations show that “weak” states tend to do better than conventional measures of relative power would indicate (Habeeb 1988; Zartman and Rubin 2000). Insofar as collective goods are concerned, this finding supports Mancur Olson’s proposition that “Where small groups with common interests are concerned, *there is a systematic tendency for ‘exploitation’ of the great by the small!*” (Olson 1968, 29; italics and exclamation point in original). Concerning private goods, the tendency to underestimate achievements of the “weak” seems partly due to failure to accurately specify the interest-control relationship. In particular, scholars have pointed to (1) differences in the *intensity* of interests in the issue, leading the weaker party to make the greater effort, and (2) the weaker party’s ability to get “help”—perhaps in the form of a free ride—from other powerful actors (Bacharach and Lawler 1984; Zartman and Rubin 2000; see also Barry 1980).¹³ More fundamentally, prediction errors probably also reflect limitations inherent in this particular notion of power, notably its narrow conception of the role of institutions and ideas.

4.2 Power through organisations

Since we examine the role of institutions more broadly in Sect. 5, we shall focus this overview on *organisations*. Political science conceives of organisations as “intervening variables”, meaning that they are shaped by the preferences and beliefs of powerful actors but—once established—capable of leaving their own imprint on processes and outcomes. By implication, the power that an actor (A) can obtain through a certain organisation (O) with regard to a specific issue (j), can be seen as a function of A’s proportion of control over the organisation’s handling of issue j ($K_{j,o}^a$) and O’s relative control over the outcome of that issue (K_j^o). A party can, in other words, exert power only through influential organisations over which it has a significant amount of control.

¹³ The economic literature on contest success functions (see e.g. Skaperdas 1996) provides complementary insight.

Organisations can shape outcomes by serving as arenas and as actors. In the role of *arena*, an organisation provides a stage for particular types of political processes and specifies the rules by which these processes are to be conducted (including rules of access and rules of decision making). To qualify as *actor*, an organisation must—through its bodies and officers—provide independent, substantive inputs to decision-making processes and/or somehow amplify outputs of these processes. All organisations serve as arenas, but only some can be considered significant actors in their own right.

Decision rules of political institutions most often favour (a) continuation of the *status quo* over change, and—for organisations designed to represent others—(b) *small* member units over large ones. The former bias is stronger the more demanding the decision rule; where unanimity is required, any single actor can—at least in principle—veto any new decision. By deliberate design, constitutions normally set more demanding rules for decisions that are seen as particularly important (such as revision of the constitution itself). By default, loosely integrated systems (including most international organisations) are confined to working with demanding decision rules, usually consensus. A bias in favour of small units over large ones can be found in the distribution of *seats* in, inter alia, the US Senate (each state elects two senators), and in the distribution of *votes* in the Council of the European Union. Such constitutional provisions distribute power in a decision game in a way that may differ substantially from the distribution of control over the activities to be governed.

To determine the significance of such a difference we need first of all to map the distribution of votes over the configuration of preferences. What a shift from consensus to majority voting can do is enable proponents of change (for example, NGOs or governments advocating a more ambitious environmental policy) to translate votes into formal regulatory decisions. The combination of majority voting practices and a favourable configuration of preferences may enable “Pushers” to win a decision game. Decision makers often value such a victory for its intrinsic gratification, but most often the substantive results achieved will be more important. The substantive significance of success in decision games depends on the impact of formal decisions upon the behaviour of main actors in the “basic game”. As proponents of the New International Order reform package learned three decades ago, Stein Rokkan’s (1966, 105) old dictum, “votes count, but resources decide”, is still valid, at least for loosely integrated systems. Nevertheless, studies of international environmental regimes indicate that majority voting practices *can* help coalitions of Pushers achieve significant change. For example, in the Miles et al. (2002) database, the correlation between a distribution of basic game power in favour of Pushers and regime effectiveness (measured as improvement in the behaviour regulated) increases from .20 to .61** when we move from consensus to majority voting systems (and control for the political “malignancy” of the problem).¹⁴

The significance of organisations as *actors* has been a matter of some controversy among political scientists, particularly in the study of international politics. So-called “realists” have argued that international organisations (IGOs) are best understood as *tools*, reflecting rather than actors shaping configurations of interests and power (e.g. Mearsheimer 1995). This proposition has been challenged and modified by other scholars, on different grounds. Some (e.g. Abbott and Snidal 1998) have argued that for an IGO to serve as a useful tool it will need a certain amount of independence from its principals. Rational principals will therefore grant that much autonomy. Others (e.g. Keohane and Martin 2003) have pointed out that even without the approval of its principals, an agent will in fact often succeed in obtaining some “slack”. Empirical studies give most IGOs low scores on autonomy, but Haftel and Thompson (2006) find that autonomy tends to increase as organisations mature. In-depth

¹⁴ * Indicates $P < .05$, ** Indicates $p < .01$.

case studies (e.g. Biermann and Siebenhüner 2009) show that secretariats of environmental IGOs *can* make a non-trivial difference through performing quite different functions, most of which do not make headlines. A good example is the contribution of the OECD Environment Directorate to organising meetings and providing substantive inputs to discussions that helped member governments converge on the Polluter Pays Principle and appreciate the cost-effectiveness of incentive instruments of environmental policy (such as taxes, fees, and quota trading).

4.3 Power as social construction

Political scientists have long recognized that power is, in important respects, a social construction—created and made effective by virtue of being *attributed* by someone to someone. Power as social construction is “constitutive” in the sense that it works through people’s internalisation of particular conceptions of identity and authority. Authority—an important form of power—is something societies *assign* to institutions or individuals, on the basis of shared conceptions of “...what kinds of beings social actors are” (Barnett and Duvall 2005:18). An individual may be assigned authority in his or her own right. The most clear-cut case would probably be Nelson Mandela, who even late into his retirement is empowered by people’s conceptions of “what kind of being” he is. In environmental politics, former US Vice President Al Gore enjoys a similar kind of authority, although not of equal stature. More often, individuals have authority by virtue of their (formal) *roles*. For example, most people probably assign authority primarily to the roles of President or Chief Justice rather than to the persons currently serving in those roles.

States, companies, and other organisations could hardly function without ideas of authority and other types of socially constructed power. Arguably, the importance of such power in politics and social life has been enhanced by the revolution in information and communication technology. It seems fair to say, however, that our ability to measure power as a social construct and determine its impact has not enhanced to the same extent.

4.4 From power base to actual impact

So far, we have conceptualised power in terms of its *base* and the *mechanisms* through which it works. Often, however, we will be as interested in its actual *impact*. Impact depends also on behaviour, on the *activation* of power bases and mechanisms. Activation depends on, inter alia, the intensity of preferences, the amount and nature of externalities, and—insofar as collective action is concerned—the organisational capacity and social capital of the group. Experimental research in cognitive psychology has produced substantial evidence indicating that most people tend to react more strongly to the prospect of a given loss than to the prospect of an equally large gain (Kahneman and Tversky 1979). From Olson (1968) and others we have learned that—at least in the absence of selective incentives and/or some form of coercion—we can expect less (effective) efforts to provide collective goods than when private goods are at stake. Combining these propositions, we can see that in business-as-usual circumstances the policy measures that are most easily adopted tend to be those that offer selective (private) benefits to specific and well-organised sectors of the economy or groups in society, while costs are either collective or indeterminate (cell 4 in Table 1). The misfortune of conventional environmental policy is that it works primarily with measures that produce concentrated costs and collective benefits (cell 1). Measures to reduce the role of fossile fuels in energy production or ban certain substances (e.g. CFCs) impose immediate costs on producers of these goods. The good news is that the same measures can also create

Table 1 Four configurations of consequences

	Benefits	Costs	
		Concentrated (private)	Collective (or indeterminate)
Collective (or indeterminate)		1	2
Concentrated (private)		3	4

Based on [Wilson \(1973\)](#)

significant opportunities for others. In many areas significant leeway exists for designing environmental policy measures that generate a more favourable configuration of interests.

4.5 Take home messages

The notion of power as control over important goods or events is inspired by microeconomic concepts of exchange and can easily be integrated into environmental economics. Also power exerted through organisations can at least to some extent be analysed in terms familiar to economists. Power as a social construction is, however, a less familiar notion and much harder to fit into economic frameworks and models. Environmental economists would be well advised to recognise the potential importance of this type of power but also to rely on other disciplines to lead in improving our understanding of the mechanisms at work.

5 Institutions

Following [Hodgson \(2006, 2\)](#), we define institutions as “systems of established and prevalent social rules that structure social interactions”. In the 1980s political scientists began to take an increasing (or rather renewed) interest in institutions. Considering the diverse nature of the discipline, it is unsurprising that this development triggered three more or less independent “new institutionalisms”. Parallel to the new institutionalism in economics (e.g. [North 1990](#); [Rutherford 1994](#)), *rational choice institutionalism* uses formal or informal models where the key elements are instrumental rationality,¹⁵ strategic interaction,¹⁶ exogenous preferences, information, and equilibrium. Rational choice institutionalism looks upon politics as a “series of collective action dilemmas” ([Hall and Taylor 1996, 945](#)), and views institutions as coordination devices that generate, sustain, or modify the equilibrium outcomes resulting from attempts at solving such dilemmas ([Thelen 1999, 381](#)). Moreover, it considers that the emergence and design of institutions can also be analysed as equilibrium outcomes; cf. [Shepsle’s \(1986\)](#) distinction between “institutional equilibrium” and “equilibrium institutions”.

In contrast, *historical institutionalism* eschews formal models and rejects the notion that behaviour is guided primarily by rational calculation based on fixed preferences. Instead it uses the comparative historical method to identify causal mechanisms underlying observed empirical patterns. It considers that preferences are endogenously determined by historical circumstance, such as the dominant system of norms, emphasises that institutions emerge from and are embedded in temporal processes, and deems that the development of political

¹⁵ Instrumentally rational behaviour is determined by the decision maker’s expectations of states of nature or the behaviour of other decision makers; expectations that enter into the decision maker’s calculation of the best means to achieve “rationally pursued and calculated ends” ([Lyons and Mehta 1997, 243–244](#)).

¹⁶ Strategic interaction takes place when two or more decision makers “are aware that their decisions affect one another” ([Gates and Humes 1997, 1](#)).

institutions involves “path dependency”, “critical junctures”, and “feedback effects” (Thelen 1999; Peters and Pierre 1998).

Finally, *sociological institutionalism* argues that a number of institutional forms or procedures are best seen as “culturally specific practices, akin to the myths and ceremonies devised by many societies” (Hall and Taylor 1996, 946). It claims that such culturally specific practices are “assimilated into organizations, not necessarily to enhance their formal means-ends efficiency, but as a result of the kind of processes associated with the transmission of cultural practices more generally” (ibid, 947). Hence, sociological institutionalists study why organisations display particular institutional forms, procedures or symbols, and analyse how such forms, procedures or symbols spread across organisations or countries. Moreover, they downplay institutions’ roles in creating and modifying actors’ incentives (what March and Olsen 1989 refer to as “the logic of consequences”), while highlighting how institutions might change actors’ preferences and identities and create new norms for behaviour (the “logic of appropriateness”).

Much of the political science literature focuses on *domestic* institutions. Examples include how rules of procedure in the US Congress influence policy outcomes, how veto and agenda power affect decision making in the EU political system, how electoral systems influence party systems, and how institutional differences can explain differences in (1) taxation and public spending or (2) policy responses to specific historical events such as the oil crisis in 1973 or more general external processes such as climate change.

However, there is also a considerable literature on *international* institutions. This literature addresses research questions such as: Why do sovereign states establish international institutions? Why do some international institutions persist while others do not? How can institutional design and institutional change best be explained? Do institutions influence state behaviour and, if so, how (Jönsson and Tallberg 2008)? In the remainder of this section we focus on a special case of the last question.¹⁷ The idea is to provide a simple example showing that combining rational choice theory with elements from a different political science approach can generate new and interesting insights.

A long-standing debate in the international relations branch of political science addresses whether international environmental agreements (IEAs) require enforcement. This debate primarily concerns IEAs regulating what Stein (1982) has termed “collaboration problems”, in particular problems resembling the Prisoners’ Dilemma. In contrast, a general consensus exists that IEAs regulating “coordination problems” do not require enforcement, simply because the members of such IEAs can gain nothing by being non-compliant (e.g. Tallberg 2002, 612).

Two main political science schools offer contending views regarding the need for enforcement of IEAs regulating collaboration problems.¹⁸ The “enforcement school”, which is rooted in rational choice institutionalism, contends that countries must be induced to comply through

¹⁷ The existing literature has generated four competing propositions regarding the effect of international institutions on state behaviour (Mitchell and Deane 2009): (1) Institutions have no impact; (2) Institutions impact on members but not on non-members; (3) Institutions impact differently on leader members than on non-leader members, and (4) Institutions impact on members as well as non-members. The example offered in this section is a special version of proposition 3 in a particular contextual setting and for a particular type of institutions; institutions designed for enforcing international environmental agreements.

¹⁸ Some scholars distinguish three or more explanatory models of compliance; see Underdal (1998) and Breitmeier et al. (2006).

coercive means¹⁹ such as reciprocal measures,²⁰ financial penalties, trade restrictions, other types of issue linkage,²¹ or suspension of privileges (Downs et al. 1996; Barrett and Stavins 2003). In contrast, the managerial school, which is closer to sociological institutionalism, considers that “the effort to devise and incorporate [coercive measures] in treaties is largely a waste of time” (Chayes and Chayes 1995, 2), and recommends a facilitative approach based on capacity building, technical assistance, and transparency (Brown Weiss and Jacobson 1998; Chayes and Chayes 1993, 1995).

Both schools acknowledge that the anarchical nature of the international system makes it difficult for countries to guarantee that they will honour their commitments (Axelrod and Keohane 1985) and consider that it is therefore essential to identify strategies that might enhance cooperation. They also agree that compliance with IEAs has generally been good and that enforcement has apparently played little or no role in achieving that record (Chayes and Chayes 1993; Downs et al. 1996).

However, the two schools disagree on three main issues (cf. Tallberg 2002; Hovi and Aakre 2009). First, they disagree on whether enforcement influences compliance. The managerial school considers enforcement to be largely irrelevant, and argues that states have a “general propensity to comply” with IEAs, due to efficiency concerns, national interests, regime norms, and reputational concerns (Chayes and Chayes 1995). In contrast, the enforcement school contends that “the power of reputation to enforce compliance is usually modest” (Downs and Jones 2002, S113) and that compliance in deep IEAs requires enforcement measures that offset the benefits a state could obtain by not complying. The enforcement school argues that, despite little enforcement, widespread compliance is only to be expected, given states’ reluctance to accept obligations they are unable or unwilling to meet. The enforcement school contends that IEAs are often shallow, in the sense that they commit member states to little more than they would be prepared to do anyway, and that therefore IEAs entail little incentive for being noncompliant (Downs et al. 1996).²² The enforcement school argues that it would be a mistake to infer from high compliance with *shallow* treaties without enforcement that *deep* treaties without enforcement will also achieve high compliance.²³

Second, the two schools have different understandings of those relatively infrequent instances of noncompliance that *are* observed. Rejecting the notion that such instances represent attempted free-riding, the managerial school argues that they are typically caused by IEAs’ ambiguity and indeterminacy, states’ limited capacity to comply, and changing circumstances from when commitments are made to when they need to be carried out. In contrast, the enforcement school argues that the sources of noncompliance may be found in the incentive structure; states choose to be noncompliant when the benefits of noncompliance exceed the expected costs of being found out and punished.

¹⁹ We agree with Brietmeier et al. (2006, 148–149) that there is much to be said for broadening the definition of enforcement to include positive as well as negative incentives. Positive incentives for compliance and participation in IEAs include side payments, issue linkages, and the allocations of entitlements such as emission permits (see Barrett and Stavins 2003).

²⁰ For example, a member of a climate agreement might be induced to comply if it has reason to expect that being noncompliant will cause other member countries to reduce their mitigation efforts.

²¹ See for instance Folmer et al. (1993).

²² See Victor (1998) for a similar interpretation.

²³ Note that many IEAs impose different commitments on different countries. For example, while the Kyoto Protocol requires Annex I countries (industrialised countries) to limit or reduce their emissions (to varying degrees), it imposes no binding emission limitation or reduction targets on non-Annex I countries. Hence, Kyoto may be said to be a deep treaty for some countries and a shallow treaty for other countries.

Finally, these two sources of disagreement impact on what the two schools see as potential remedies for avoiding noncompliance and re-establishing compliance. The enforcement school considers that “a punishment strategy is sufficient to enforce a treaty when each side knows that if it cheats it will suffer enough from the punishment that the net benefit will not be positive” (Downs et al. 1996, 385). In contrast, the managerial school argues that noncompliance is best addressed by providing transparency, good dispute resolution procedures, and technical and financial assistance. It considers that regimes play an “active role...in modifying preferences, generating new options, persuading the parties to move toward increasing compliance with regime norms, and guiding the evolution of the normative structure in the direction of the overall objectives of the regime” (Chayes and Chayes 1995, 229).

Despite the recent advance of behavioural economics, it is probably fair to say that most models used by environmental economists continue to be based on assumptions akin to those of the enforcement school. We now argue that *combining* assumptions from the two schools enables us to reach new and interesting implications about participation, compliance, and enforcement in IEAs. Some of these implications are in keeping with the enforcement school, others are in keeping with the managerial school, and yet others have largely been ignored by both schools (see below).²⁴ Moreover, while the managerial and enforcement schools disagree on *whether* enforcement matters for compliance, a perspective that combines elements from both schools enables us to analyse *when* enforcement matters for compliance as well as for participation. In particular, it allows us to analyse how participation enforcement affects the need for compliance enforcement.

Consider the possibility of an IEA aiming to provide a global and pure public good, such as mitigation of climate change or ozone depletion. Assume that the international system consists of two types of countries: Motivated by norms,²⁵ *N-countries* participate in and comply with IEAs regardless of whether doing so is in their self-interest. Motivated by self-interest, *S-countries* participate in and comply with IEAs only when this maximises their utility. Finally, assume that even a noncompliant participating country must bear a positive cost. We outline and comment on four implications that follow from this simple model.

First, in an IEA that does *not* enforce participation, the participating countries will comply *regardless* of whether the IEA enforces compliance. Because no punishment exists for non-participation, the utility-maximising course of action is to stay out of the IEA. Accordingly, *S-countries* will not participate, while *N-countries* will participate and comply even though doing so does not maximise their utility. As only *N-countries* participate, all participating countries will comply, so there will be no noncompliance, whether the IEA enforces compliance or not. Hence, in IEAs without participation enforcement, compliance enforcement is irrelevant, as argued by the managerial school.

Second, in IEAs *with* participation enforcement, compliance enforcement will cause the number of compliant countries to be higher than it would be without compliance enforcement. If non-participation entails costs that outweigh the benefits, *S-countries* will participate. However, if the IEA does not provide compliance enforcement, the utility-maximising option will be to participate without complying. In contrast, if it also effectively enforces compliance, the utility-maximising option will be to participate *and* comply. Hence, in IEAs with both participation and compliance enforcement *N-countries* as well as *S-countries* will participate and comply. In other words, in IEAs with participation enforcement, enforcing compliance

²⁴ These implications are developed in more detail in Hovi and Aakre (2009); see also Aakre and Hovi (2010).

²⁵ Unlike rational action, “action guided by social norms is not outcome-oriented” (Elster 1989: 113). Elster explicitly mentions as an example the norm saying “if it would be good if all did X, then do X” (ibid.). Participating in and complying with an IEA clearly fits this description.

will cause *some* participating countries (i.e. S-countries) to comply. This implication of the model is in keeping with the enforcement school.

Third, participation enforcement will cause the number of participating countries to be higher than it would be without participation enforcement.²⁶ Because S-countries will participate if and only if participation maximises their utility (i.e. only if the costs of participating are outweighed by the costs of *not* participating), they will participate only if participation is effectively enforced. This implication is also in keeping with the enforcement school. Note, however, that *both* schools have been mostly concerned with compliance enforcement.

Fourth, *participation* enforcement will cause the number of *noncompliant* countries to be higher than it would be without participation enforcement. If the IEA enforces neither participation nor compliance, S-countries will stay out, while N-countries will participate and comply. Hence, no countries will participate without complying. In contrast, if the IEA enforces participation but not compliance, participating without complying will be the utility-maximising option. Hence, the number of participating but noncompliant countries will equal the number of S-countries. It follows from this implication that incorporating provisions for participation enforcement into an IEA will increase the need for compliance enforcement. The evolution of Montreal's enforcement system fits this pattern. The member countries first introduced provisions for participation enforcement by permitting restrictions on trade in ozone-related products with non-members. Only later did they add similar provisions for compliance enforcement.

The simple model outlined in this section illustrates a general point—that combining the rational choice approach with another political science approach can provide new and interesting propositions. In particular, this model suggests that the need for compliance enforcement in an IEA will depend on how its members are recruited. If participation is entirely voluntary, good reasons exist to expect all member countries to do their best to fulfill their commitments. In contrast, if the member countries that participate voluntarily use carrots or sticks to induce other, more reluctant countries to participate, the latter member countries will likely drag their feet unless compliance is also enforced.

6 Conclusion

Political science is a methodologically highly diverse discipline. Although rational choice theory is frequently used in political science, its position is much less dominant than in economics, and other approaches are correspondingly more important. While economists to some extent already communicate or cooperate with political scientists who use rational choice theory (indeed, some of the work of the authors of this paper involves such cooperation), little exchange has so far taken place between economics and other parts of political science. Therefore, the most important potential contributions from political science to environmental economics may well involve *other* approaches than rational choice theory. We have argued that new and interesting insights can be obtained by supplementing, combining,

²⁶ The Montreal Protocol on substances that deplete the ozone layer is one of the relatively few IEAs that actually includes provisions for participation enforcement. The Montreal Protocol first introduced participation enforcement by allowing member countries to impose restrictions on trade with non-members in substances that threaten the ozone layer. Anecdotal evidence suggests that this enforcement system induced some countries to participate. According to Brack (2003, 220) there is “direct evidence from some countries that the trade provisions were important in persuading them to accede to the treaty; a good example is the Republic of Korea, which initially expanded its domestic CFC production, but realising the disadvantages of being shut out of Western markets, became a party”. Later, Montreal also added provisions for using trade restrictions to enforce compliance.

or sometimes perhaps even replacing rational choice theory with such other political science approaches.

While political science has much to offer, some of its contributions may be difficult to incorporate into economic models. One reason is that, except for the rational choice tradition, political science models and theories are rarely specified at a level of precision comparable to that found in many economic models. This is potentially a win-win challenge; since the ability to produce stringent theoretical arguments is one major strength of economics, economists may well be able to add precision to “underspecified” theories borrowed from political science, thus moving both disciplines forward. However, another and more severe obstacle exists. While some political science concepts and models can easily fit into a rational choice framework (for example, the notion of power as control over important goods for events), others do not (e.g. contributions using discourse theory). Economists wanting to draw on concepts and models that cannot easily fit into a rational choice framework seem to be left with the dilemma of trying to “convert” alien concepts and models into a rational choice format or of abandoning the rational choice framework. The latter option is unlikely to be attractive, except perhaps for minor detours, and the former is likely to work only within a fairly narrow range (beyond which the essence of the contribution is likely to get lost or distorted in the conversion).

Interestingly, recent developments within both disciplines seem to provide new opportunities to overcome some of these obstacles. One such development concerns the increasing interest in computational and agent-based modelling. This is a “transdisciplinary” approach that enables the researcher to escape some of the limits of standard micro-economic and game-theoretical models. Precisely because of its transdisciplinary nature, it might provide promising opportunities for incorporating insights about ideas, power and institutions by assuming rules that agents use for making decisions under bounded rationality partly depend on these factors. Another advantage of computational and agent-based models is that they are well suited for the study of *dynamics*—a challenge that is common to environmental economics and political science.

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