Can Attitudes Predict Outcomes? Public Opinion, Democratic Institutions and Environmental Policy

Robert Y. Shum*
School of Advanced International Studies, Johns Hopkins University, Washington, DC, USA

ABSTRACT

The 'post-materialist' value hypothesis, positing heightened concern for the environment, should predict eventual convergence in environmental policies. In the meantime, surprisingly wide variations persist, even when controlling for income levels. Is there a role for public opinion to explain better the divergences and outcomes observed in environmental policies? This paper explores a possible mechanism by which widely hypothesized income effects on policy can occur via pressure from public opinion. By building upon a median-voter model of environmental policy-making and developing an extension to include voter-information characteristics, we test these effects on air pollution outcomes of varying (global, regional and local) scales. The results provide evidence of significant effects, but suggest two antecedent conditions necessary for political and opinion variables to have an effect: redistributive opportunities, and credible frameworks for addressing collective action problems. The implication is that relying on democratic reform alone may not suffice to improve environmental performance if underlying collective action problems are not addressed. Copyright © 2009 John Wiley & Sons, Ltd and ERP Environment.

Introduction

THE 'POST-MATERIALIST' VALUE HYPOTHESIS ANTICIPATES HEIGHTENED CONCERN FOR THE ENVIRONMENT AS societies undergo industrialization and its aftermath (Inglehart, 1990, 1997). Some observers such as Giddens (1990) interpret such concern as the inevitable consequence of a 'reflexive modernity' that continually questions its own effects on the future. Regarding the global extent of this concern, others go even further to suggest that 'concern for the environment exists in every country' (Esty and Porter, 2005, p. 391). What, then, determines the variation in environmental policies that we observe? Scholars have devoted much attention to the effects of income and economic growth, and an extensive literature on the 'environmental Kuznets curve' has emerged.[1] Yet variation in environmental policy outcomes occurs even among countries with similar income levels. It is likely that income is only part of the story when it comes to environmental policy-making processes. Further study of the role of other determinants of policy, and of the causal mechanisms whereby actual policies and preferences are formed, is merited.

*Correspondence to: Robert Shum, 14 Chadwick Crescent, Richmond Hill, ON, L4B 2W6, Canada. E-mail: rshum1@jhu.edu
[1] See, e.g., Baumol and Oates (1988), Selden and Song (1994), Grossman and Krueger (1995), Cole, Rayner and Bates (1997), Panayotou (1997), Barrett and Graddy (2000), Stern and Common (2001), Dasgupta *et al.* (2002), Dinda (2004) and Khanna and Plassmann (2004).

This paper proposes and tests the hypothesis that, where voters and citizens express a favorable opinion of increased environmental regulation, governments will enact more stringent policies for ensuring environmental quality. Although the nature and implications of citizen preferences have been the object of serious inquiry by economists, philosophers and social scientists for some time,[2] examination of the relationship between stated preferences and specific policy outcomes has been relatively rare. This is especially surprising in the context of the literature on the environmental Kuznets curve, where it might naturally have been assumed that public attitudes could constitute a mechanism, or at least an influential intervening variable, in the translation of inchoate income effects into policy outputs. We shall therefore in this paper quantitatively test relationships between environmental policy outcomes and measures of public opinion (specifically in terms of attitudes towards the environment), in addition to other variables relating to income levels and political institutions. By doing so, we seek to develop a better understanding of environmental policy divergences and the mechanisms for environmental policy-making.

The research to date into the determinants of environmental policy outcomes has resulted in models that are suitable for further testing. Previous empirical studies have expanded an initial focus on income effects so as to include a progressively greater range of institutions relating to markets and regulatory regimes,[3] civil and political freedoms[4] and democracy.[5] This paper attempts to contribute to this research by examining a large number of countries in both the developed and developing world and by further analyzing possible effects from public opinion on the environment in these countries. Building upon Congleton's (1992) median-voter model of environmental policy-making, we develop an extension to include voter-information characteristics (as suggested by Congleton, 1996) and test its effects by applying the model to outcomes for overall environmental performance as well as for various air pollution issues. The resulting quantitative analysis finds that an information-based model incorporating public opinion effects can be usefully applied in new contexts, and provides evidence for our hypothesis that voter information has significant effects on environmental policy outcomes.

Applications to air pollution problems provide the opportunity to compare cases that vary in the scale of the externality at issue. This analysis further suggests that two critical antecedent conditions are necessary for political–institutional and voter-information variables to have an effect: opportunity for redistribution of costs over time (or across economic sectors), and the presence of a credible framework for addressing collective action problems. The most important implication of this analysis is that relying on democratic reform alone will not suffice to improve environmental policy outcomes if there is a failure to address underlying collective action problems.

This paper proceeds as follows. In the next section, we test our model on the overall measure of environmental policy performance devised by the Environmental Performance Index (EPI) project under the auspices of Yale and Columbia Universities. By scrutinizing our results, we can initially assess the model's 'goodness of fit' and make some preliminary diagnoses of possible shortcomings in our theory. Next, in the third section, further empirical analyses are applied to measures of performance specifically for air pollution problems at the local and regional scales. Finally, we conclude by analyzing the applicability of hypothesized relationships to the rapidly evolving global policy problem of climate change. By applying quantitative analysis to a number of cases of environmental and air pollution issues that vary in context and scale, it is hoped that a better understanding of the dynamics of environmental policy-making and cooperation will emerge. The evidence here suggests that, while domestic political characteristics can have a significant effect on environmental policy outcomes, these effects vary according to the problem, the scale of the externality and the nature of obstacles to collective action.

[2] See, e.g., Sen (1970) and the works cited therein.

[3] See Esty and Porter (2005). Several of the measures they discuss as characteristics of 'regulatory regimes' or their 'economic and legal context' – i.e., property rights protection, rule of law and elimination of corruption – will also be incorporated in the present analysis as part of our 'market institutions' variable. Other works have focussed on specific elements of effective markets and their regulation, such as corruption (López and Mitra, 2000; Cole, 2007), security of property rights (Dasgupta *et al.*, 2001), and openness to trade (Antweiler *et al.*, 2001; Suri and Chapman, 1998; Copeland and Taylor, 2004).

[4] See Barrett and Graddy (2000).

[5] See Congleton (1992), Murdoch and Sandler (1997), Murdoch *et al.* (1997), Midlarsky (1998), Neumayer (2002), Fredriksson *et al.* (2005) and Farzin and Bond (2006).

The Model: Political Institutions and Pollution Control, Extended for Voter Information

Understandings of the link between domestic political institutions and environmental policy outcomes are incomplete.[6] Recent research suggests that openness and liberalization in political institutions can have a positive effect on environmental policy performance even in cases of transboundary pollution problems.[7] Another related branch of studies has devoted attention to the effect of variation within democratic systems on domestic environmental performance.[8] The current analysis builds on this work by expanding the domain of this field of investigation into institutional effects beyond the advanced industrial countries to which it has been hitherto often confined, although it is beyond the scope of this paper to develop common bases of comparison for specific institutional characteristics such as the extent of federal or corporatist features across democratic and non-democratic systems.

Most importantly, however, a gap in knowledge and theory remains: do the results to date assume that differences in public opinion or voter information have no effect? Democratic theory, and pluralist approaches especially, would suggest that democratic institutions in general are merely the proximate mechanism for aggregating the underlying preferences of citizens, who still ultimately determine policy.[9] Moreover, governments everywhere face pressures from public opinion. As Giddens (1990, p. 167) notes, 'there are virtually no states in the world today that do not call themselves "democratic"', and such modern states 'always have some procedures for involving the citizenry in procedures of government, however minimal such involvement may be in practice'. The reasons for this are fundamental: under conditions of modernity, 'effective government demands the active acquiescence of subject populations in ways that were neither possible nor necessary in pre-modern states'.[10] One can therefore detect a trend towards polyarchy, defined as 'the continuing responsiveness of the government to the preferences of its citizens considered as political equals' (Dahl, 1971, pp. 1–2; cited by Giddens, 1990, pp. 167–168).

More specifically, one would suppose that, even in the most parsimonious reduced-form models of environmental policy-making, citizen preferences could provide a specific and distinct mechanism through which income levels can manifest their influence or otherwise result in change. As Barrett and Graddy (2000, p. 434, emphasis added) note, 'there is kind of consensus on the principal mechanism at work':

> This is that there is an induced policy response: as nations become richer, their citizens demand that the non-material aspects of their standard of living be improved. But if this reasoning is correct, then the observed levels of environmental quality will depend on more than a nation's prosperity. They will depend also on citizens being able to acquire *information* about the quality of their environment, to assemble and organize, and to give voice to their preferences for environmental quality; and on governments having an incentive to satisfy these preferences by changing policy, perhaps the most powerful incentive being the desire to get elected or re-elected.

In other words, Barrett and Graddy have identified an implicitly hypothesized determinant of environmental performance that is based on the information available to a country's citizens or decision-makers. Yet consideration of public information as a causal variable in the literature is rare.[11] This paper attempts to integrate an informational element into an existing theoretical framework of environmental policy-making, and then to test this model in a variety of environmental issue contexts.

To analyze and test such possible relationships, we adopt the theoretical model presented by Congleton (1992), wherein a median-voter model shows how environmental standards could be set according to a stylized decision-

---

[6] See Barrett (2003b), p. 1511, on this aspect of the literature on international environmental problems in particular.
[7] See *op cit*. notes 3–5.
[8] See Crepaz (1995), Jahn (1998), Lijphart (1999), Scruggs (1999, 2001, 2003), Fredriksson and Millimet (2004a, 2004b), Wälti (2004) and Poloni-Staudinger (2008).
[9] See, e.g., Dahl (1956).
[10] See also Giddens (1985).
[11] On the general 'paucity of empirical studies of outcomes' in environmental policy, Scruggs (2003, p. 19) speculates that this may be due to a lack of internationally comparable data until recently, but notes in addition that, even within the United States, 'the first major empirical work on political determinants of environmental outcomes [at the state level] was not published until the 1990s (Ringquist 1993)'. In a subsequent chapter, Scruggs (2003) goes on to give a ground-breaking examination of a possible role for public opinion. Bimonte (2002) includes an information-related measure of newspapers sold per 1000 people in his analysis of inequality and the environmental Kuznets curve in land protection. Rohrschneider (1990, 1991) and Dalton (1994) use European public opinion data to interpret trends in public support for environmental groups.

maker's preferences regarding the ideal level of environmental regulation.[12] Within such an analytical framework, the decision-maker could be an individual voter in a democracy, or a singular autocrat; their preferences can still be compared in terms of personal characteristics such as their levels of income, the relative time-horizons upon which decisions are based, or the information that is available to them.

In this paper, we specifically extend the model by allowing for a subjective element in an individual's preferences – as Congleton (1996, pp. 11–13) subsequently proposed – namely, through her 'cultural knowledge' or information, I, on pollution's 'harmful or unattractive nature'. In Congleton's original model, the 'link between environmental standard E^* and environmental quality is assumed to be probabilistic' (Congleton, 1992, p. 414). That is, a given level of environmental regulation is expected to have an effect on actual environmental quality according to a probability distribution that is conditional on national income as well as the level of regulation. If we explicitly account for an information variable, I, we would naturally incorporate this as a factor in the 'individual's assessment of the probability of environmental deterioration', and therefore model this variable within a conditional probability function, P, representing the probability distribution of environmental quality outcomes. In other words, an individual's subjective assessment of the desirable effects of regulation on environmental quality is likely to increase with the individual's knowledge of pollution's harmful nature.[13] Thus, through an information-based theoretical approach, the state of public opinion on environmental quality can be analyzed as having a potentially broadly applicable effect on a variety of decision-making processes.

We incorporate information, I, into the utility-maximization framework established by Congleton (1992, p. 416) in order to derive a new model of an individual's preferred level of environmental regulation, one that is still a function of 'variables beyond his control', but which is now more precisely specified in terms of its subjective elements. The variables defined in the earlier framework are 'the individual's share of national income, v, his time horizon, T, the resource base of the country, R, and its market institutions, M'. Thus, in addition to the standard measures of a country's wealth and prosperity, this framework incorporates two key variables: the first concerns market institutions that are relevant insofar as national income increases 'as market arrangements become less centrally managed';[14] the second relates to the decision-maker's time horizon, since it 'is often argued that the time stream of benefits from environmental standards is such that the costs of environmental standards are concentrated in the early periods while the benefits are concentrated in later time periods' (Congleton, 1992, p. 416). It is this effect from time horizons that makes political institutions relevant, since authoritarian decision-makers are likely to have 'a shorter than average time horizon' compared with democratic median voters, 'given the high turnover of authoritarian regimes' (Congleton, 1992, p. 417). The advantage of this approach to modeling a possible effect from political institutions lies in its precision and ability to be applied to both autocracies and democracies within a unified utility-maximizing framework; this is useful for analysis, but it also does not exclude alternative

[12] In this model, 'individuals are assumed to maximize a two-dimensional utility function defined over measured real income . . . and environmental quality':

> Measured real income is a pure private good measured as an index of goods purchased in markets. Environmental quality is a public good measured as an index of the average density of undesired (often toxic) chemicals in the voter's environment. These two areas of choice, while technologically linked, are disjoint since environmental quality is not normally included in measured real income (Congleton, 1992, p. 413).

Income 'is a function of environmental regulations, E^*, market institutions, M, and resource base, R, in the country of interest', and 'increases as economic resources increase, and as market arrangements become less centrally managed'. Thus environmental regulations have effects on both income and environmental quality: first, they 'affect the size of a voter's opportunity set through relative and absolute price effects that affect the size of national GNP'. Second, they are assumed to have a probabilistic association with environmental quality:

> This reflects stochastic elements of the underlying natural processes and scientific uncertainty about the physical and social mechanisms involved. An individual's assessment of the probability of environmental deterioration, $P = p(E|E^*, Y)$, falls as the environmental standard, E^*, becomes more stringent, and increases as national output, Y, increases (Congleton, 1992, p. 414)

These effects from environmental regulation are balanced by maximizing 'life-time expected utility':

> Each individual prefers the environmental standard that sets the expected present value of his subjective marginal cost for the standard in terms of reduced measured income (consumption) equal to the present discounted value of the time stream of marginal utility from greater environmental quality (Congleton, 1992, p. 415).

For a complete formal treatment of the model, see Congleton, 1992, pp. 414–416.

[13] While this is the most intuitive interpretation of the effect of voter information, it is also possible that voter information can have an effect on utility maximization through potentially positive effects on income, if it is believed that environmental regulation can improve the overall efficiency and performance of the economy. This, after all, is the argument behind 'ecological modernization'. (See, e.g., Gouldson and Murphy, 1996; Barry and Paterson, 2004.)

[14] Congleton (1992), p. 414. Similarly, and intuitively, national income should increase as economic resources increase.

interpretations of the effects of political institutions in terms of the availability of information or direct electoral incentives (Barrett and Graddy, 2000, p. 434), or else explicitly modeled as a 'taste parameter' (Murdoch and Sandler, 1997, pp. 336–337).

Thus after having incorporated the subjective information variable, I, in our model, we arrive at the following reduced-form equation for the determinants of environmental policy-making:

$$E^{**} = e(v, T, R, M, I), \tag{1}$$

where E^{**} represents an individual's preferred level of emission regulation expressed as a function of the variables described above. The model outlined above provides a framework for testing the hypothesis that where voters and citizens express a favorable opinion of increased environmental regulation they will demand, and governments will enact, higher standards for environmental quality. Equation (1) is our reduced form equation for environmental policy formulation, where in general emissions standards are functions of national endowments, voter characteristics and economic or political institutions. If environmentally favorable voter opinion leads to stricter standards, then estimates of Equation (1) should have positive coefficients for public opinion variables. The estimates reported in the rest of this paper are broadly consistent with these predicted results, although certain caveats about the data should be in advance.

First, comparable measures of public opinion are problematic because of the risk of reverse causation.[15] This possibility should clearly be recognized, and caution in attributing causation must surely be carefully exercised. At the same time, however, it should be noted that similar arguments could be made for other independent variables, including those already analyzed in the existing literature, such as income level. As in other cases, recognition of the risks should not prevent further analysis altogether.

Second, measures of public opinion across different countries are scarce, especially outside of the advanced industrialized countries, or beyond a specific region. Where comparable questions are used across different countries, cross-sectional analysis is feasible, but other problems concerning the representativeness of the countries sampled may arise. This is a relevant concern for the data used here, drawn from the World Values Survey (WVS, 2008) from 1995–2005, which covers the largest number of countries currently available, with relevant data having been collected for 80 countries.[16] WVS case selection is not random. However, it is based on considerations of regional representativeness. Thus, while some bias is likely as a result of this non-random sampling, case selection was nonetheless clearly not made with considerations of environmental policy outcomes in mind (as far as we know), and the resulting problems are unlikely to be more insuperable than similar studies based on treaty participation, for example. The possibility of bias at this level is also addressed by the decision to employ robust ordinary least squares estimation in our analysis.

Among the questions asked in the WVS is the following:

> Here are two statements people sometimes make when discussing the environment and economic growth. Which of them comes closer to your own point of view? (read out and code one answer):
> 1 Protecting the environment should be given priority, even if it causes slower economic growth and some loss of jobs.
> 2 Economic growth and creating jobs should be the top priority, even if the environment suffers to some extent.
> 3 Other answer (code if volunteered only!).[17]

It is the responses to this question that are used here. For our analysis, we take the difference between the numbers of respondents answering the two options offered by subtracting the number of those answering withg the latter

---

[15] For a discussion, see Wright *et al.* (1987, p. 992). See also Page and Shapiro (1983), where it is argued that similar concerns are alleviated by the use of 'temporal asymmetries' – that is, there is a lag between the time when public opinion is measured, and when outcomes are measured, which is also the case in our present analysis. Other examples of analyses examining public opinion measures as independent variables and policy outcomes as dependent variables include Stimson *et al.* (1995) and Blinder and Krueger (2004). For an overview of issues in political science research into public opinion, see Jacobs and Shapiro (1994).

[16] It should be noted that one of these countries was Germany, where the results continue to be broken down for the western and eastern parts of the country; in our analysis, these results are combined into a single observation for Germany after weighting the separate results according to a four-to-one west-to-east population ratio.

[17] The text in parentheses is the instructions to the survey administrators; the punctuation is from the original.

(Option 2) from the number of those agreeing to the former (Option 1). (We disregard any responses coded as Option 3, including 'don't know' responses.) While clearly stated in terms of a trade-off between economic growth and environmental protection, and thereby requiring the expression of an ordinal preference (a key attribute to help control for variations in interpersonal preference intensity; see, e.g., Sen, 1970), this question is still not necessarily ideal, since a given response is likely not only to reflect individual assessments of the likelihood and seriousness of environmental damage in the absence of regulation, but also to include personal calculations of the objective tradeoffs in income and utility that would result from stricter environmental regulations. In other words, the effect and significance of variables relating to 'objective' determinants of preferences (that is, the market institution, income and resource endowment variables) might be underestimated by being partly accounted for in the opinion measure, giving rise to an increased risk of simultaneous equation bias. As we shall see, however, our estimates for these variables are surprisingly larger and more significant than those estimated by Congleton (1992) while omitting any informational variables.

As a measure of our dependent variable, we begin with the country scores for the 2008 Environmental Performance Index (EPI), in the first year that this index was compiled. This index provides a unique and unprecedented picture of environmental performance and policy outcomes on a state-by-state basis for countries throughout the world (and not just the members of the Organization for Economic Cooperation and Development, or OECD); prior to development of this index, the analysis here could not be (and was not) attempted.[18] Subsequent sections of this paper will also examine the causal relationships of interest to us in greater detail, and in relation to specific problems, within the context of various air pollution subcategories that are constituent elements of the overall EPI. We analyze air pollution outcomes because they provide distinct but comparable cases with sufficient variation in terms of the scale of externalities (i.e. local, regional and global).

For their own analytical use, the developers of the EPI also incorporated data on *per capita* gross domestic product (GDP) in US dollar terms and on resource endowments, specifically country population size (in thousands of persons) and land area (in square kilometers), within the EPI dataset. Our analysis will draw upon this data as well; similar measures were also used in Congleton's (1992) analysis.[19]

Finally, two measures will be utilized to represent the model's variables for political and market institutions respectively. The political–institutional variable will be represented by the combined democracy–autocracy indicator developed under the Polity IV project (2008). This regime type indicator is computed along a scale from −10 (strongly autocratic) to +10 (strongly democratic); the latest available dataset and scores for 2007 are used. To measure variation in market institutions, we employ the Index of Economic Freedom (IEF) overall country scores for 2008. These scores fall on a zero-to-one-hundred scale. Although other indices, such as the Economic Freedom of the World (EFW), are available, the IEF is used because of its complete coverage of countries included in the EPI and WVS data, but omitted from the EFW dataset (e.g. Belarus).

Empirical Testing: Overall Environmental Performance

Starting from the basis of Congleton's (1992, 1996) median-voter model of environmental policy-making, we begin by incorporating a voter-information variable into the model and test its effects by applying the model to

[18] Two recent studies in the environmental Kuznets curve literature have utilized an alternative aggregate measure of environmental performance, the 'ecological footprint' index (Bagliani *et al*., 2008; Caviglia-Harris *et al*., in press). This index is centred on measures of sustainability in the land and water ecosystems, and therefore does not directly account for emissions of, for example, ozone, methane or sulphur. Interestingly, the results using this measure tend to refute the environmental Kuznets curve hypothesis. Earlier, Palmer (1997) devised a novel 'concern for environment' country score for his work on the consequences of economic development; this score was based on four indicators relatively widely available at the time: forest growth, population-density-weighted carbon dioxide emissions, fertilizer consumption and growth in fertilizer consumption.

[19] See, for example, Congleton's description of the testing function that these measures can contribute, at p. 418:

The model implies that a country's resource base plays a role in determining national standards insofar as resources affect personal income and the marginal cost of environmental regulation. However, reliable data on a nation's mineral reserves and labour force are available for relatively few countries. For example, complete data on recoverable fossil fuel reserves are available for only 46 countries from the World Petroleum Institute. However, resource endowments are largely the result of geological accidents more or less uniformly distributed about resource base. Consequently, resource endowment is proxied using area. (Area is highly correlated with proven fossil fuel reserves.) Labour force numbers are similarly problematic, and are proxied by national population.

Variable name	Robust OLS (1)	Robust OLS (2)	Robust OLS (3)
C	68.511 69	53.244 55	52.023 45
	(12.66)***	(7.46)***	(6.99)***
Pro-environmental opinion differential	10.524 3	11.627 57	
	(3.84)***	(3.35)***	
Polity score	0.206 911 7	0.401 465 4	0.486 729 2
	(1.24)	(2.11)**	(2.54)**
GDP per capita	0.000 555 1		
	(5.29)***		
Population size	−0.000 010 4	−0.000 011 4	−0.000 010 5
	(−3.17)***	(−2.83)**	(−2.27)**
Land area	4.19×10^{-8}	3.53×10^{-7}	4.73×10^{-7}
	(0.11)	(1.19)	(1.76)
Economic freedom score	−0.003 509 5	0.324 941 2	0.353 954 8
	(0.04)	(2.97)***	(3.08)***
Sample size	77	77	77
R^2	0.5432	0.4084	0.3441
F-statistic	27.47	13.68	10.76

Table 1. Environmental performance index (EPI)
(Robust t-statistics in parentheses.)
* Significant at the 10% level.
** Significant at the 5% level.
*** Significant at the 1% level.

overall environmental policy outcomes as measured by the Environmental Performance Index (EPI). The results are consistent with the basic logic of Congleton's model, and confirm the significance of voter-information or public-opinion effects. The results also differ in certain key aspects from the findings reported by Congleton (1992) and Scruggs (2003). These differences, as well as the information to be gained from comparing the alternative specifications, are discussed below. First, however, robust linear estimates of our reduced-form equation pertaining to an EPI dependent variable are reported (Table 1).

The first issue that arises concerns the significance of public opinion as a determinant of overall environmental performance. In our results, public opinion is significant regardless of whether or not an income level variable is explicitly specified. We see this by comparing Columns (1) and (2), where the model is specified with and without a measure of *per capita* GDP, respectively. The similar estimates for the opinion parameter that are observed on both sides of this comparison are consistent with the relatively low correlation coefficient of 0.15 between public opinion and *per capita* GDP. These results represent a marked contrast with Scruggs' (2003) conclusion that effects from public opinion are virtually indistinguishable from income effects. The explanation for this contrast lies in the different groups of countries being compared: Scruggs' analysis is restricted to advanced industrialized countries in Europe and North America whereas the present study includes developing as well as developed countries. Once we include developing countries in the analysis, we find that public opinion effects are distinct and not merely an artifact of differences in income levels. From a global perspective, the role of public attitudes toward the environment as a determinant of environmental policy outcomes everywhere is worthy of further consideration and attention. Outside of the advanced industrialized countries, one cannot assume that citizens of richer countries have systematically more positive attitudes towards environmental protection policies than citizens of poorer countries.

Our results also differ from Congleton's. While the latter includes developing countries in its analysis, it does not include a variable for public opinion. This has consequences not only for the significance of public opinion, but potentially also for estimates of the other independent variables, given the possibility of omitted variable bias. Comparing our specifications in Columns (2) and (3) with and without the public opinion variable, we find similar estimates for the other independent variables in terms of sign and significance, suggesting that the results for public opinion are robust and distinct from these other variables – including those representing political and

economic institutions – as well. Moreover, we find in all three columns that there is a significant effect from population size (a proxy variable for the labor force element of a country's resource endowment). This is consistent with our model, but differs from Congleton's empirical results, which could not find any significant effect from the resource endowment variables (1992, pp. 419–420).

The main difference among the alternative specifications occurs between Column (1) on the one hand and Columns (2) and (3) on the other. This difference concerns the political and economic institutional variables. These variables tend to be more significant when the income variable is omitted, and less so when *per capita* GDP is included. This suggests that there is a risk that multicollinearity exists among these variables. The plausibility of this risk is reinforced by the relatively high correlation coefficients between income and political institutions, 0.49, as well as between income and economic institutions, 0.72. (The correlation between the political and economic institutional variables themselves is also a relatively high 0.5.) The ambiguity and lack of robustness for these estimates of the institutional variables only partially resemble Congleton's results. Congleton (1992, pp. 419–420) found the effect of economic institutions to be insignificant, but found significance for political institutions. The ambiguity of the present study's results for political institutions is more similar to the findings by Murdoch *et al.* (1997), Midlarsky (1998) and Barrett and Graddy (2000), where the significance of political effects varied according to the specific pollution issue for which performance was being measured as the dependent variable. The next sections of this paper pursue a similar analytical strategy: we shall probe deeper and seek to identify any additional patterns or conclusions that could emerge by applying our model to a variety of specific air pollution problems.

Income, Institutions and Air Pollution

For the next series of tests, we begin by applying our model to a dependent variable measuring local air pollution. Within the EPI is a subcategory described as 'air pollution (effects on humans)' and composed of three aspects of local air pollution directly affecting human health (as distinct from air pollution making an impact indirectly and on a larger ecosystem level): urban particulates, indoor air pollution and local ozone. The results for local air pollution are shown in Table 2.

Variable name	Robust OLS (1)	Robust OLS (2)	Robust OLS (3)
C	66.857 38	32.955 81	32.686 94
	(5.45)***	(2.31)**	(2.27)**
Pro-environmental opinion differential	15.485 71	17.440 96	
	(2.02)**	(1.92)*	
Polity score	0.106 803 2	0.471 371 6	0.644 626 7
	(0.24)	(1.01)	(1.48)
GDP per capita	0.001 170 6		
	(6.00)***		
Population size	−0.000 026 7	−0.000 028 7	−0.000 027 4
	(−4.89)***	(−5.15)***	(−4.41)***
Land area	0.000 000 493	0.000 001 14	0.000 001 33
	(0.83)	(2.44)**	(3.42)***
Economic freedom score	−0.652 807 2	0.603 797 1	0.666 295 5
	(−0.36)	(2.98)***	(3.07)***
Sample size	78	78	78
R^2	0.4957	0.3384	0.2998
F-statistic	24.51	17.47	16.44

Table 2. Local air pollution (EPI 'effects on humans' subcategory)
(Robust *t*-statistics in parentheses.)
* Significant at the 10% level.
** Significant at the 5% level.
*** Significant at the 1% level.

First, we note that similarly significant effects are obtained for public opinion and population size across the alternative specifications. These two independent variables seem to play a significant role in local air pollution outcomes, as they do for the aggregate EPI index of overall environmental performance. Second, we observe that political institutions have no statistically significant effect on local air pollution outcomes regardless of whether or not we explicitly control for income. This contrasts with the more ambiguous effects of political institutions on outcomes in terms of the aggregate EPI; this variation across issue areas echoes the results of earlier studies. Such variation is discussed in greater detail below, in conjunction with a third issue area relating to regional air pollution.

Finally, the effects of market institutions on local air pollution are similar to those for the aggregate EPI insofar as these effects are impossible to separate from those of *per capita* income levels and hence of economic well-being generally. We see some evidence that income levels or economic institutions have an effect on local air pollution outcomes, although we cannot reliably identify or break down the constituent elements of this income effect. In the specification that includes a *per capita* GDP variable (Column (1)), the effect of economic institutions is not statistically significant. In the other specifications where *per capita* GDP is omitted, however, the market institutions score becomes highly significant. Among these two specifications, the results in Column (3) for the specification omitting both public opinion and income variables is generally similar to the results for the other specification omitting only income (Column (2)); thus inclusion of the public opinion variable again appears to be unproblematic for identifying the effects of other variables, and its inclusion would appear to create little risk of multicollinearity. The ambiguity among the results is created entirely by the possibility of multicollinearity between the income level and market institution variables (especially with the correlation coefficient for the two variables at a relatively high 0.72, as already noted earlier in the previous section). As in the EPI case, caution should be exercised before interpreting significance for variables producing possibly spurious effects that are mere artefacts of higher income levels; in the local air pollution case, it is the market institutions variable for which we cannot conclusively infer significance or reject the possibility that its effects are illusory.

Next, we apply the model to the case of regional air pollution,[20] where fewer ambiguities are apparent. For these results, shown in Table 3, economic institutions are significant in all three specifications regardless of the inclusion or exclusion of the per *capita* GDP measure. Effects from public opinion and population size are also significant. Political institutions and land area consistently lack significance.

There are several observations to be made concerning these results; they deserve further scrutiny on their own terms as well as in comparison with the other cases. The starting point for further analysis is the contrast in significance between the effects of political and economic institutions; this is robust across the three specifications for regional air pollution. Like Congleton's (1992) results for stratospheric ozone, the overall results for regional air pollution are broadly consistent with the predictions of his model, with a significant role to be found in addition for public opinion. The contrast in the regional air pollution case between significant economic institutional effects and insignificant political institutional effects (with the latter also being unambiguously insignificant for local air pollution), however, marks a pattern that is the opposite of Congleton's findings of significant and stronger effects from political rather than economic institutions.

To explain this finding and its divergence from earlier research, it may be worthwhile to examine more closely the underlying logic of the model being applied. In our model, political institutions are expected to affect environmental policy outcomes by reflecting differences in the time horizons of decision-makers; Congleton (1992, p. 417) hypothesizes that autocrats will tend to have shorter time horizons than democratic median voters, since autocrats have incentives to maximize rents and exploitation of natural resources while they are in power, and also to discount heavily the present value of future national wealth (and undamaged natural resources) after they are out of power. Meanwhile, market or economic institutions are hypothesized to influence decision-making through an entirely distinct causal mechanism, by affecting the decision-maker's (either democratic or autocratic) share of national income.

How applicable is this logic to the empirical cases at hand? In Congleton's stratospheric ozone case, the time horizon interpretation of political differences seems plausible: an autocrat could well decide to gain from

---

[20] The values for dependent variable used in this analysis are from the EPI sub-index for 'air pollution – effects on nature' composed of measures for regional ozone and sulfur dioxide emissions.

Variable name	Robust OLS (1)	Robust OLS (2)	Robust OLS (3)
C	115.603 2 (12.74)***	125.733 5 (11.62)***	126.446 5 (10.59)***
Pro-environmental opinion differential	14.472 16 (2.26)**	14.001 57 (2.12)**	
Polity score	0.287 919 7 (0.99)	0.187 974 8 (0.66)	0.343 557 4 (1.16)
GDP per capita	−0.000 337 7 (−2.09)**		
Population size	−0.000 010 5 (−2.43)**	−0.000 024 9 (−2.25)**	−0.000 023 8 (−2.38)**
Land area	−0.000 001 09 (−1.17)	−0.000 001 27 (−1.38)	−0.000 001 11 (−1.26)
Economic freedom score	−0.346 338 7 (−2.08)**	−0.562 123 2 (−3.57)***	−0.568 290 5 (−2.67)***
Sample size	79	79	79
R^2	0.3810	0.3536	0.3011
F-statistic	5.54	5.40	5.78

Table 3. Regional air pollution (EPI 'effects on nature' subcategory)
(Robust t-statistics in parentheses.)
* Significant at the 10% level.
** Significant at the 5% level.
*** Significant at the 1% level.

permitting present-day manufacturing of ozone-depleting chemicals, without having to bear the increased future health-care costs of higher incidences of skin cancer that will result from ozone depletion.

In the case of local and regional air pollution, however, the costs of continued pollution differ in two key respects. First, they are closer in time. There is no lag between current emissions of sulfur dioxide and local or regionally transported ozone as an input into the atmosphere, and the deterioration in air quality that occurs as a consequence; the costs are incurred immediately. This is unlike the lag between current emissions of chlorofluorocarbons (CFCs) leading to increased health care costs decades in the future. Second, the costs of local and regional air pollution are also diffuse, and it is not easy to shift the burden of adjustment; autocrats cannot avoid today's smog as easily as they can the future tax burdens from increased health care costs.

Thus the time horizon effect of varying political institutions is simply not uniformly relevant across all environmental problems. The logic of the model is therefore sound, and one could argue that this logic even predicts the diminished effects from political institutions for local and regional air pollution outcomes that we have observed. By understanding how such a causal mechanism might operate, variations in institutional effects can appear less puzzling. Fundamentally, the lesson from this analysis is that the nature of the externality being considered is a critical factor for the salience of institutional variables in environmental policy-making. This lesson will also be relevant for the final analysis in the next section concerning climate change policies.

Public Opinion, Climate Change and the Problem of Collective Action

The next case to be tested is perhaps the most problematic environmental issue area of all: climate change. The scale of the externality and collective action problems involved is extreme: the time horizon for costs and effects are likely to extend centuries into the future, while the spatial distribution of costs is highly uncertain, but likely also to be highly unequal. Results with the EPI's sub-index on greenhouse gas emissions as the dependent variable are shown in Table 4.

Variable name	Robust OLS (1)	Robust OLS (2)	Robust OLS (3)
C	73.800 84	81.081 32	81.402 13
	(8.03)***	(10.30)***	(10.47)***
Pro-environmental opinion differential	6.638 805	6.300 601	
	(1.10)	(1.00)	
Polity score	0.317 135	0.245 306 6	0.315 317 6
	(1.27)	(0.99)	(1.23)
GDP per capita	−0.000 242 7		
	(−1.18)		
Population size	−0.000 011 7	−0.000 011 3	−0.000 010 9
	(−2.93)***	(−3.28)***	(−2.98)***
Land area	−0.000 000 834	−0.000 000 967	−0.000 000 896
	(−1.74)*	(−2.03)**	(−1.92)*
Economic freedom score	0.025 168 3	−0.129 911 5	−0.132 686 8
	(0.14)	(−1.00)	(−1.01)
Sample size	79	79	79
R^2	0.1323	0.1151	0.1021
F-statistic	6.65	8.67	8.11

Table 4. Climate change (EPI 'climate change' subcategory)
(Robust *t*-statistics in parentheses.)
* Significant at the 10% level.
** Significant at the 5% level.
*** Significant at the 1% level.

These results are strikingly different from the results concerning the other air pollution problems described earlier. First, it appears that only the two resource endowment variables, population size and land area, can be considered significant. These results are consistent across the three specifications. This overwhelming influence of the resource endowment variables is perhaps not surprising given that efforts to develop climate change policy interventions are only at an initial experimental stage; existing outcomes are likely to be the result of 'natural' structural determinants such as population size and land area rather than from factors relating to active human agency and the policy- or decision-making process. (However, it is also interesting that *per capita* income levels are not statistically significant in this case either; it is resource endowments – which according to theory are determinants of national income – that are alone significant.)

Between these two resource endowment variables, it is population size that is more significant (at a 99 percent confidence level) than land area (at a 90 percent confidence level). Moreover, it is only in the climate change case that we find a significance for the land area variable that is negative in its sign. Land area had a positive (or no) effect on local pollution (and no significant effect at all on outcomes in the other cases); but here, on the global scale, land area has a negative effect on climate change outcomes. This is not entirely unexpected, and can be explained upon further examination of the climate change case's unique characteristics: smaller land areas might encourage more stringent restrictions on emissions such as soot, volatile organic compounds (VOCs) and local (not stratospheric) ozone, since these emissions cannot be spread out and diffused over a greater area. At the same time, in larger land areas, carbon emissions from sources in the transportation sector might rise given greater distances required for travel. Analysis of such real-world effects on pollution from an increase in land area go beyond the simple income effects hypothesized in the stylized model presented here, but they may be worth accounting for in more detailed future analysis.

Turning to the opinion variables, in contrast to the other cases, we note their lack of significance in the climate change context, and will now investigate some possible reasons. Can our theoretical framework explain the different results observed across issue areas? Our theory suggests that public opinion, by representing voter information concerning the state of the environment, affects policy decision-making concerning the environment by

changing subjective assessments of the likely benefits and effectiveness of environmental regulation. This causal mechanism therefore depends on whether or not there is a perception that *any* effective regulation is possible. The theory predicts that, if there are any exogenous reasons for doubting the potential efficacy of regulation, then public opinion regarding the state of the environment will be irrelevant to domestic policy outcomes. Similarly, questions of effectiveness could neutralize the effect of domestic political institutions, since it would not be rational to incur costs in order to implement ineffective measures, regardless of one's time horizon.

Climate change is an example of a problem that could give rise to such doubts about the effectiveness of domestic regulation. If voters or decision-makers believe that the problem cannot be solved – or even meaningfully affected – by domestic efforts to limit greenhouse gas emissions, then they are unlikely to support costly regulations to do so notwithstanding their concern and awareness of the problem. It is the absence of the functioning global framework that is necessary to coordinate effective action against climate change that renders the question of public opinion and domestic policies moot.

This analysis suggests an additional factor to consider before assessing the roles of public opinion and political institutions in environmental policy outcomes. We have seen in the previous section that we must be sensitive to the nature, timing and incidence of costs created by an externality. Now, in addition, we must also consider the scale of the externality and the presence or credibility of efforts to overcome the collective action problems involved in its resolution. Given a problem on a global scale, global coordination may be a necessary precondition to effective action, and domestic reforms or information campaigns may be no substitute for international cooperation.

Conclusion

This paper has investigated the effect of public opinion and political institutions on environmental policy outcomes in a variety of contexts in order to produce a number of findings. First, our results confirm the overall logic and 'goodness-of-fit' for Congleton's median-voter model of environmental policy-making in air pollution cases outside of the basic ozone-depletion case he considers. Second, we have also confirmed the significance of public opinion and voter information variables when they are incorporated within this basic model. By applying the logic of our model to differing cases of air pollution problems, additional nuances are revealed regarding the causal mechanism by which public opinion exerts influence: for example, the differential effects of public opinion and voter information when applied to climate change as compared to other air pollution policies are consistent with an understanding that voter information affects the decision-maker's assessment of the efficacy and desirability of regulation. In the case of a global externality such as carbon dioxide emissions, it can be predicted that, in the absence of international coordination, this factor would be overwhelmed by the knowledge that domestic policy would have a negligible effect on probable environmental quality outcomes. Overall, our results reveal a statistically significant effect from public opinion in the general case that nonetheless requires certain conditions in the scale or nature of an externality to be present when specific problem settings are considered. By incorporating these relationships into our theory, certain puzzles can be explained, and a better understanding of the political economy of environmental policy-making can be achieved.

Ultimately, by comparing how these causal relationships operate within varying air pollution contexts, two fundamental refinements to theory are suggested. Both are characterized by the understanding that while political variables (in terms of either institutions or public awareness) can have a significant effect, this requires certain antecedent conditions to be present. First, costs and benefits have to vary over time or across sectors: politics only matters if costs or benefits are amenable to redistribution either across sectors in the economy or else between generations of decision-makers. Second, there must be a credible framework for addressing collective action problems, since support for domestic regulations can only be mobilized if it is apparent that they can make an overall difference in improving environmental quality.

In other words, political institutions and the varying time horizons they imply can affect environmental policies, but the relevance of this effect is determined by the pre-existing demand for political institutions to mediate and apportion the domestic costs of regulation within an accepted system of international coordination. This demand is shaped by the nature of the externality involved, and cannot be assumed to be constant across all kinds of

environmental problem.[21] In terms of international relations theory, this can also be stated in another way: that international environmental policy problems have a 'third-image' dimension dependent on systemic attributes rather than domestically determined interests and values within and among individual and state unit-level actors.[22] More concretely, this theoretical refinement has the policy implication that exclusive reliance on local efforts in democratic reform or increasing environmental awareness is unlikely to be sufficient to achieve improved environmental policy outcomes in the absence of a credible framework for addressing the underlying collective action problem.

This study developed out of the recent literature concerning the effects on environmental policies of institution-related independent variables such as national regime types or relative country rankings on indices of civil or political freedoms.[23] This literature has generally tended to find an association between democratic political institutions and more stringent environmental regulation. In a way, these earlier findings suggest a 'democratic greenness' hypothesis that is a corollary to the 'democratic peace' hypothesis that democracies are less likely to go to war with each other.[24]

The analysis described in this paper demonstrates the need to qualify the democratic greenness argument with an understanding that it applies only within a framework where collective action problems are being credibly addressed. In contrasting circumstances where free-riding is rampant, there is no evidence in theory or practice that democratic polities are more willing to incur disproportionate costs in reducing emissions where no warrant exists for believing that environmental quality will improve as a result.

Acknowledgements

References

Antweiler W, Copeland BR, Taylor, MS. 2001. Is free trade good for the environment? *American Economic Review* **91**(4): 877–908.

Bagliani M, Bravo G, Dalmazzone S. 2008. A consumption-based approach to environmental Kuznets curves using the ecological footprint indicator. *Ecological Economics* **65**(3): 650–661.

Barrett S. 2003a. *Environment and Statecraft*. Oxford University Press: Oxford.

Barrett S. 2003b. The theory of international environmental agreements. In *Handbook of Environmental Economics*, Maler K-G, Vincent JR (eds). Elsevier: Amsterdam; 1458–1512.

Barrett S. 2007. *Why Cooperate? The Incentive to Supply Global Public Goods.* Oxford University Press: Oxford.

Barrett S, Graddy K. 2000. Freedom, growth, and the environment. *Environment and Development Economics* **5**: 433–456.

Barry J, Paterson M. 2004. Globalisation, ecological modernisation and new Labour. *Political Studies* **52**: 767–784.

Baumol W, Oates W. 1988. *The Theory of Environmental Policy,* 2nd edn. Cambridge University Press: Cambridge.

Bimonte S. 2002. Information access, income distribution, and the environmental Kuznets curve. *Ecological Economics* **41**(1): 145–156.

Blinder AS, Krueger AB. 2004. What does the public know about economic policy, and how does it know it? *Brookings Papers on Economic Activity* **2004**: 327–387.

Caviglia-Harris JL, Chambers D, Kahn JR. In press. Taking the 'U' out of Kuznets: a comprehensive analysis of the EKC and environmental degradation. *Ecological Economics*.

Cole MA. 2007. Corruption, income and the environment: an empirical analysis. *Ecological Economics* **62**(3/4): 637–647.

Cole MA, Rayner AJ, Bates JM. 1997. The environmental Kuznets curve: an empirical analysis. *Environment and Development Economics* **2**: 401–416.

[21] This finding is consistent with a similar conclusion that resulted from the analysis by Murdoch *et al.* (1997). The implication is that sensitivity to critical aspects of the collective action problem under consideration (see Olson, 1965; Sandler, 1992; Barrett, 2003) is required.
[22] See Waltz (1959).
[23] See Congleton (1992), Murdoch and Sandler (1997), Murdoch *et al.* (1997), Midlarsky (1998), Barrett and Graddy (2000), Neumayer (2002), Fredriksson *et al.* (2005).
[24] A recent and authoritative example of the democratic peace literature is the work of Russett and Oneal (2001). The classic statement of the hypothesis that democratic and commercially interdependent states 'find themselves compelled to promote the noble cause of peace, though not exactly from motives of morality' is by Immanuel Kant in *Perpetual Peace: a Philosophical Sketch* (1970/1795).

Congleton RD. 1992. Political institutions and pollution control. *Review of Economics and Statistics* **74**(3): 412–421.

Congleton RD (ed.). 1996. *The Political Economy of Environmental Protection: Analysis and Evidence*. University of Michigan Press: Ann Arbor, MI.

Copeland BR, Taylor MS. 2004. Trade, growth, and the environment. *Journal of Economic Literature* **42**: 7–71.

Crepaz M. 1995. Explaining national variations of air pollution levels: political institutions and their impact on environmental policy-making. *Environmental Politics* **4** (3): 391–414.

Dahl RA. 1956. *A Preface to Democratic Theory*. University of Chicago Press: Chicago, IL.

Dahl RA. 1971. *Polyarchy: Participation and Opposition*. Yale University Press: New Haven, CT.

Dalton RJ. 1994. *The Green Rainbow: Environmental Groups in Western Europe*. Yale University Press: New Haven, CT.

Dasgupta S, Laplante B, Hua W, Wheeler D. 2002. Confronting the environmental Kuznets curve. *Journal of Economic Perspectives* **16**(1): 147–168.

Dasgupta S, Mody A, Roy S, Wheeler D. 2001. Environmental regulation and development: a cross-country empirical analysis. *Oxford Development Studies* **29**(2): 173–187.

Dinda S. 2004. Environmental Kuznets curve hypothesis: a survey. *Ecological Economics* **49**(4): 431–455.

Esty DC, Levy M, Kim C, de Sherbinin A, Srebotnjak T, Mara V. 2008. *2008 Environmental Performance Index*. Yale Center for Environmental Law and Policy, New Haven, CT. http://epi.yale.edu

Farzin YH, Bond CA. 2006. Democracy and environmental quality. *Journal of Development Economics* **81**(1): 213–235.

Fredriksson PG, Millimet DL. 2004a. Comparative politics and environmental taxation. *Journal of Environmental Economics and Management* **48**: 705–722.

Fredriksson PG, Millimet DL. 2004b. Electoral rules and environmental policy. *Economics Letters* **84**: 237–244.

Fredriksson PG, Neumayer E, Damania R, Gates S. 2005. Environmentalism, democracy and pollution control. *Journal of Environmental Economics and Management* **49**(2): 343–365.

Giddens A. 1985. The nation-state and violence. *A Contemporary Critique of Historical Materialism*, Vol. 2. University of California Press: Berkeley, CA.

Giddens A. 1990. *The Consequences of Modernity*. Stanford University Press: Stanford, CA.

Gouldson A, Murphy J. 1996. Ecological modernization and the European Union. *Geoforum* **27**(1): 11–21.

Grossman GM, Krueger AB. 1995. Economic growth and the environment. *The Quarterly Journal of Economics* **110**(2): 353–377.

Holmes KR, Feulner EJ, O'Grady, MA (eds). 2008. *2008 Index of Economic Freedom*. Heritage Foundation: Washington, DC.

Inglehart R. 1990. *Culture Change in Advanced Industrial Societies*. Princeton University Press: Princeton, NJ.

Inglehart R. 1997. *Modernization and Postmodernization: Cultural, Economic, and Political Change in 43 Societies*. Princeton University Press: Princeton, NJ.

Jacobs LR, Shapiro RY. 1994. Studying substantive democracy. *PS: Political Science and Politics* **27**(1): 9–17.

Jahn D. 1998. Environmental performance and policy regimes: explaining variations in 18 OECD-countries. *Policy Sciences* **31**: 107–131.

Kant I. 1795. Perpetual peace: a philosophical sketch. In *Kant's Political Writings*, 1970 edn, Reiss H (ed.). Cambridge University Press: Cambridge.

Khanna N, Plassmann F. 2004. The demand for environmental quality and the environmental Kuznets curve. *Ecological Economics* **51**(3/4): 225–236.

Lijphart A. 1999. *Patterns of Democracy: Government Forms and Performance in Thirty-Six Countries*. Yale University Press: New Haven, CT.

López R, Mitra S. 2000. Corruption, pollution, and the Kuznets environment curve. *Journal of Environmental Economics and Management* **40**: 137–150.

Marshall MG, Jaggers K. 2007. *Polity IV Project: Political Regime Characteristics and Transitions, 1800–2006, Dataset Users' Manual*. Center for Systemic Peace.

Midlarsky MI. 1998. Democracy and the environment: an empirical assessment. *Journal of Peace Research* **35**(3): 341–361.

Murdoch JC, Sandler T. 1997. Voluntary cutbacks and pretreaty behavior: the Helsinki protocol and sulfur emissions. *Public Finance Review* **25**: 139–162.

Murdoch JC, Sandler T Sargent K. 1997. A tale of two collectives: sulphur versus nitrogen oxides emission reduction in Europe. *Economica* **64**(254): 281–301.

Neumayer E. 2002. Do democracies exhibit stronger international environmental commitment? A cross-country analysis. *Journal of Peace Research* **39**(2): 139–164.

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

Page BI, Shapiro RY. 1983. Effects of public opinion on policy. *American Political Science Review* **77**(1): 175–190.

Palmer M. 1997. *Political Development: Dilemmas and Challenges*. Peacock: Itasca, IL.

Panayotou T. 1997. Demystifying the environmental Kuznets curve: turning a black box into a policy tool. *Environment and Development Economics* **2**: 465–484.

Polity IV Project. 2008. *Political Regime Characteristics and Transitions, 1800–2007*. http://www.systemicpeace.org/inscr/inscr.htm [9 November 2008].

Poloni-Staudinger LM. 2008. Are consensus democracies more environmentally effective? *Environmental Politics* **17**(3): 410–430.

Ringquist EJ. 1993. Testing theories of state policy-making: the case of air quality regulation. *American Politics Quarterly* **21**(3): 320–342.

Rohrschneider R. 1990. The roots of public opinion toward new social movements: an empirical test of competing explanations. *American Journal of Political Science* **34**(1): 1–30.

Rohrschneider R. 1991. Public opinion toward environmental groups in Western Europe: one movement or two? *Social Science Quarterly* **72**(2): 251–266.

Russett BM, Oneal JR. 2001. *Triangulating Peace: Democracy, Interdependence, and International Organizations*. Norton: New York.

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

Scruggs LA. 1999. Institutions and environmental performance in seventeen western democracies. *British Journal of Political Science* **29**: 1–31.

Scruggs LA. 2001. Is there really a link between neo-corporatism and environmental performance? Updated evidence and new data for the 1980s and 1990s. *British Journal of Political Science* **31**(686): 692.

Scruggs LA. 2003. *Sustaining Abundance: Environmental Performance in Industrial Democracies*. Cambridge University Press: Cambridge.

Selden TM, Song D. 1994. Environmental quality and development: is there a Kuznets curve for air pollution emissions? *Journal of Environmental Economics and Management* **27**(2): 147–162.

Sen AK. 1970. *Collective Choice and Social Welfare*. Holden-Day: San Francisco.

Stern DI, Common MS. 2001. Is there an environmental Kuznets curve for sulfur? *Journal of Environmental Economics and Management* **41**(2): 162–178.

Stimson JA, Mackuen MB, Erikson RS. 1995. Dynamic representation. *American Political Science Review* **89**(3): 543–565.

Suri V, Chapman D. 1998. Economic growth, trade and energy: implications for the environmental Kuznets curve. *Ecological Economics* **25**: 195–208.

Tonn B. 2007. Determinants of futures-oriented environmental policies: a multi-country analysis. *Futures* **39**: 773–789.

Wälti S. 2004. How multilevel structures affect environmental policy in industrialized countries. *European Journal of Political Research* **43**(4): 599–634.

Waltz KN. 1959. *Man, the State, and War: a Theoretical Analysis*. Columbia University Press: New York.

World and European Values Surveys. 2006. *Four Wave Integrated Data File, 1981–2004*. The World Values Survey Association and European Values Study Foundation. www.worldvaluessurvey.org [16 October 2008].

World Values Survey (WVS). 2008. *2005 Official Data File*. World Values Survey Association. www.worldvaluessurvey.org [16 October 2008].

Wright GCJ, Erikson RS, McIver JP. 1987. Public opinion and policy liberalism in the American states. *American Journal of Political Science* **31**(4): 980–1001.

Yale Center for Environmental Law and Policy (YCELP), Center for International Earth Science Information Network (CIESIN), Columbia University, with the World Economic Forum and Joint Research Centre (JRC) of the European Commission. 2008. *2008 Environmental Performance Index*. http://sedac.ciesin.columbia.edu/es/epi/ [9 November 2008].

AUTHOR QUERY-FORM

Dear Author:

   During the preparation of your manuscript for publication, the questions listed below have arisen. Please attend to these matters and return this form with your proof.

Many thanks for your assistance.

Query References	Query	Remarks
1.	Author: not found in ref. list – please give details.	
2.	Author: 139–162 in ref. list – which is correct?	
3.	Author: inserted to match ref. list – OK?	
4.	Author: inserted to match ref. list – OK?	
5.	Author: Barrett, 2003 – a, b?	
6.	Author: is this referred to in text?	
7.	Author: is this referred to in text?	
8.	Author: any more details?	
9.	Author: is this referred to in text?	
10.	Author: please check link and give access date.	
11.	Author: is this referred to in text?	
12.	Author: page no(s)?	
13.	Author: town of publication? is this referred to in text?	
14.	Author: 336–337 in text – which is correct?	
15.	Author: is this referred to in text?	
16.	Author: is this referred to in text?	
17.	Author: is this referred to in text?	
18.	Author: please provide revised date.	
19.	Author: please check and advise running head.	

WILEY
Publishers Since 1807

*** PROOF OF YOUR ARTICLE ATTACHED, PLEASE READ CAREFULLY ***

After receipt of your corrections your article will be published initially within the online version of the journal.

PLEASE NOTE THAT THE PROMPT RETURN OF YOUR PROOF CORRECTIONS WILL ENSURE THAT THERE ARE NO UNNECESSARY DELAYS IN THE PUBLICATION OF YOUR ARTICLE

☐ **READ PROOFS CAREFULLY**

ONCE PUBLISHED ONLINE OR IN PRINT IT IS NOT POSSIBLE TO MAKE ANY FURTHER CORRECTIONS TO YOUR ARTICLE

- This will be your only chance to correct your proof
- Please note that the volume and page numbers shown on the proofs are for position only

☐ **ANSWER ALL QUERIES ON PROOFS** (Queries are attached as the last page of your proof.)

- List all corrections and send back via e-mail to the production contact as detailed in the covering e-mail, or mark all corrections directly on the proofs and send the scanned copy via e-mail. Please do not send corrections by fax or post

☐ **CHECK FIGURES AND TABLES CAREFULLY**

- Check sizes, numbering, and orientation of figures
- All images in the PDF are downsampled (reduced to lower resolution and file size) to facilitate Internet delivery. These images will appear at higher resolution and sharpness in the printed article
- Review figure legends to ensure that they are complete
- Check all tables. Review layout, titles, and footnotes

☐ **COMPLETE COPYRIGHT TRANSFER AGREEMENT (CTA) if you have not already signed one**

- Please send a scanned signed copy with your proofs by e-mail. **Your article cannot be published unless we have received the signed CTA**

☐ **AUTHOR SERVICES**

- If you have registered this article in Wiley-Blackwell Author Services, the article's status will be updated shortly after you have returned your proof corrections (you will also receive an e-mail alert if you have opted to receive them). **You are entitled to free access to the PDF from Author Services when your article is published online**. This free access is considered your PDF offprint, and you will only have access from within Author Services; you will not be sent a PDF. You may also nominate up to 10 colleagues for free access. All accesses from Author Services count towards the usage of your article. For options to order print copies or additional electronic access, please see below.

☐ **OFFPRINTS**

- Free access to the final PDF offprint of your article will be available via Author Services only. Please therefore sign up for Author Services if you would like to access your article PDF offprint and enjoy the many other benefits the service offers

Additional reprint and journal issue purchases

- Should you wish to purchase a minimum of 100 copies of your article, please contact author_reprints@wiley.co.uk
- To purchase reprints in smaller quantities, please visit http://www3.interscience.wiley.com/aboutus/ppv-articleselect.html. Restrictions apply to the use of reprints – if you have a specific query, please contact permissionsuk@wiley.com
  Corresponding authors are invited to inform their co-authors of the reprint options available
- To purchase a copy of the issue in which your article appears, please contact cs-journals@wiley.co.uk upon publication, quoting the article and volume/issue details
- Please note that regardless of the form in which they are acquired, reprints should not be resold, nor further disseminated in electronic or print form, nor deployed in part or in whole in any marketing, promotional or educational contexts without authorization from Wiley. Permissions requests should be directed to permissionsuk@wiley.com