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Do Democracies Exhibit Stronger International Environmental Commitment? A Cross-Country Analysis[*]

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This article tests the hypothesis that democracies exhibit stronger international environmental commitment than non-democracies using multivariate econometric techniques. A number of proxy variables are used in lieu of environmental commitment, a non-observable variable. Strong evidence is found that democracies sign and ratify more multilateral environmental agreements, participate in more environmental intergovernmental organisations, comply better with reporting requirements under the Convention on International Trade in Endangered Species of Fauna and Flora, put a greater percentage of their land area under protections status, are more likely to have a National Council on Sustainable Development in their country and have more environmentally relevant information available than non-democracies. The findings suggest that a spread of democracy around the world will lead to enhanced environmental commitment worldwide. Results are robust with respect to inclusion or exclusion of developed countries in the sample. The use of four different variables for democracy also ensures robustness with respect to the measure of democracy. The strong evidence in favour of a positive link between democracy and environmental commitment stands in contrast to the somewhat weak evidence on such a link between democracy and environmental outcomes. The explanation presumably is that theory predicts a stronger positive link of democracy with environmental commitment than with environmental outcomes.

'I have therefore come to believe that an essential prerequisite for saving the environment is the spread of democratic government to more nations of the world.'

(Ex-US Vice President Al Gore, 1992: 179)

Introduction

Is democracy good or bad for the environment? This is a complex question without a clear cut answer. As Desai (1998a: 301) concedes: 'whether democracies are more likely to be environmentally friendly is not entirely clear'. Indeed, there is only weak statistical evidence in favour of democracy promoting environmental outcomes. Do democracies show stronger international environmental commitment than non-democracies? This question refers only to a subset of the democracy and environment problem area, but it has the advantage that it has a clear affirmative answer as the empirical analysis in this article will show.

After presenting some theoretical considerations on the democracy and environment relationship and reviewing the relevant empirical literature, the case for focusing on international environmental commitment is put forward. The hypothesis that democracies exhibit stronger international environmental commitment is empirically tested and strongly confirmed by the analysis. Of course, it would have been desirable to analyse more comprehensively domestic environmental commitment as well. However, due to lack of comparable cross-sectional data only two of the variables used in the empirical analysis of this article could be interpreted as proxies for domestic environmental commitment.[1] Therefore, while in the following I will simply speak of environmental commitment, the

reader should keep in mind that this article's analysis really establishes a positive impact of democracy on *international* environmental commitment only.

Democracy and Environment: Theoretical Considerations

Payne (1995) has provided what amounts to probably the most comprehensive theoretical treatise in favour of a positive impact of democracy on the environment. The gist of his argument is that in democracies citizens are better informed about environmental problems (freedom of press) and can better express their environmental concerns and demands (freedom of speech), which will facilitate an organisation of environmental interests (freedom of association), which will in turn put pressure on policy entrepreneurs operating in a competitive political system to respond positively to these demands (freedom of vote), both domestically as well as via international cooperation. In non-democratic systems, on the other hand, governments are likely to restrict the access of their population to information, restrict the voicing of concerns and demands, restrict the organisation of interests and isolate themselves from the citizens' preferences. In other words, in democracies if citizens are concerned about environmental problems this will eventually require policy makers to exhibit stronger environmental commitment to address these concerns and honour the demand for environmental protection measures.

The same cannot be said of non-democracies, for which Chadwick (1995: 575) argues that 'environmental signals and concerns which conflict with state development plans may be silenced, and state managers may even fool themselves into thinking such concerns do not exist'. He further suggests that non-democracies tend to de-sensitize themselves from environmental problems concentrated in areas of the excluded and powerless populace, thus systematically neglecting the costs of environmental degradation.

Congleton (1992) examines how the median voter in a democratic system and an authoritarian ruler in a non-democratic system would set environmental regulations so as to maximize their respective utilities. There are two relevant factors. First, Congleton assumes that a shorter time horizon will lead to less strict environmental regulations. This can be justified by the long-term nature of many environmental problems. Since authoritarian rulers tend to have a shorter time horizon for fear of being thrown out of office, he predicts that democracies may have stricter environmental regulations than non-democracies. Second, the authoritarian ruler also appropriates a larger share of income from the economy. The effect of this on the strictness of environmental regulations is ambiguous. On the one hand, a larger national income share might lead to less strict regulations given that such regulations are costly in terms of reducing available national income: 'An increase in the fraction of national income going to the individual of interest increases the marginal cost of environmental standards faced by him, since he will now bear a larger fraction of associated reductions in national income' (ibid.: 416). On the other hand, appropriation of a larger share of the national income might also lead to stricter environmental standards if we assume that environmental quality is a normal, if not luxury, good where a higher income leads to increased demand for environmental quality. The result therefore depends on the net effect. Democracy is therefore not necessarily good for the environment.

From a more dynamic perspective, concern has been raised with regard to the compatibility of democracy and the protection of the environment. Democracies with their emphasis on private property rights and individual liberty provide the opportunities for individuals and businesses to make full use of their potential to expand production and consumption, which, if not sufficiently counter-acted by environmental regulation, will increase pressure on the environment. In a slightly different vein, Desai (1998b: 11)

suspects that ‘as democracy is dependent on economic development, and since economic growth and prosperity generally result in environmental pollution and ecological destruction, democracy would not necessarily be protective of the environment’.

While there is no clear evidence on whether democratic countries as such grow faster than non-democratic countries (Przeworski & Limongi, 1993; Barro, 1997; Durham, 1999), democracy is positively correlated with factors such as security of property rights (Knack & Keefer, 1995) and “social infrastructure” (Hall & Jones, 1999) that cause good economic performance. After all, all developed countries are democracies, even though the reverse is obviously not true. (For the purpose of this article, developed countries means the US, Canada, the member states of the European Union (EU-15) plus Iceland, Norway and Switzerland as well as Japan, Australia and New Zealand.)

Also, while the view that economic growth inevitably leads to increased environmental degradation across the board is overly simplistic, certain environmental problems do exacerbate with economic growth. Generally, while environmental problems directly affecting the health of a country’s population are likely to improve with economic growth (at least after some threshold of income has been achieved), pollutants that can be externalized upon the future and/or people outside a country’s boundaries are likely to worsen (Neumayer, 1999; Panayotou, 2000). An example for the latter would be carbon dioxide (CO_2) emissions.

On a final note, it has been argued by some that it might be more difficult in democracies than in autocracies to constrain environmentally damaging economic activities as well as population growth since in autocracies the government does not have to pay as much attention to its citizens’ rights to engage in such activities and their rights for procreation. It is exactly this writers such as Hardin (1968) or Heilbronner (1974) had in

mind in voicing their early concern on whether democracy could be relied upon to solve environmental problems.

In conclusion, while a good theoretical case can be made for a positive link between democracy and environment, there are a number of considerations pointing in the opposite direction. The link between democracy and environment is therefore a complex one. It is doubtful, to say the least, whether this complexity is fully addressed in simply entering income as a control variable in empirical studies

Unfortunately, the more theoretical contributions do not really distinguish between environmental commitment and its effect on environmental outcomes. This is not surprising since the potential divide between commitment and outcomes is not recognized as a problem. In turning to a review of the relevant literature now we will see that most empirical studies have only looked at environmental outcomes and have found only weak evidence at best for a positive link with democracy which calls for a re-focus of empirical studies on environmental commitment instead.

Review and Critique of Existing Empirical Literature

Both political scientists and economists have addressed the empirical links between democracy and environment. In accordance with the unfortunate, but quite common, disciplinary divide, the economists' research efforts are not recognized by political scientists and vice versa. Congleton (1992) represents one of the earliest empirical contribution by economists. Ideally, in order to test his theory (as described in the last section), he would need to address differences in domestic environmental regulation. For lack of data, he sees himself unable to do so and instead performs ordinary least squares (OLS) regressions on Chlorofluorocarbon (CFC) and methane emissions as well as logit

estimates of signature of the 1985 Vienna Convention for the Protection of the Ozone Layer and the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer, using Freedom House data for the democracy variable. He finds that democratic countries, after controlling for a range of variables, are more likely to sign the Vienna Convention and the Montreal Protocol, but also have higher methane and CFC emissions. Murdoch & Sandler (1997) show, however, that while democracies might have higher absolute levels of CFC emissions, as indicated by Congleton (1992), democracy is also a marginally significant determinant of CFC emission *reductions* between 1986 and 1989.[2]

Both Barrett & Graddy (2000) and Torras & Boyce (1998) use the panel data, with which Grossman & Krueger (1995) in their famous contribution established empirical links between a country's income level and its water and air pollution emissions (laying the foundation for the so-called Environmental Kuznets Curve (EKC) literature).[3] Barrett & Graddy, using Freedom House data and generalized least squares with a random effects estimator, find that countries with high political rights and civil liberties tend to have lower air and water pollution levels. Torras & Boyce, using the same data, come to similar findings using OLS instead. Scruggs (1998), using Freedom House data in OLS estimation, finds that democracy is statistically insignificant once one controls for income inequality in the case of dissolved oxygen, fecal coliform and particulates emissions. It assumes statistical significance only for the case of sulphur dioxide (SO_2) emissions.

On the part of political science, Gleditsch & Sverdrup (1996) run simple bivariate correlations, using Polity data, with a range of environmental variables, such as greenhouse gas emissions, extent of deforestation (both show negative correlation), signature and ratification of environmental treaties and the presence of environmental organizations (both show positive correlation). Midlarsky (1998), using Freedom House, Polity and a third data set based on Bollen (1993) for measuring democracy, runs multivariate OLS regressions

with several environmental aspects as the dependent variable, such as deforestation, CO_2 emissions, soil erosion and land area protection. He finds that democratic countries tend to have higher deforestation rates, higher CO_2 emissions, possibly higher soil erosion, but also protect a higher percentage of their land area. Contrary to Midlarsky (1998), Didia (1997) finds that democracies have lower deforestation rates, but only simple univariate regression analysis is employed.

All these empirical studies suffer from a number of weaknesses. No comprehensive critique is attempted here, rather I will concentrate on the aspects most relevant to this study. Congleton (1992) based his analysis on data from 1988. Were he to repeat his analysis with data from 2001, his attempt to arrive at significant results would be frustrated by the fact that both the Vienna Convention and the Montreal Protocol have achieved almost universal coverage in the meantime. What he would need to do then is to look at whether democracies have signed or ratified these agreements *earlier* in time than non-democracies. These kind of studies have been done employing a proportional hazards model and finding that democracies, as measured by Freedom House data, are more likely than non-democracies to ratify at an early stage the United Nations Framework Climate Change Convention (Fredriksson & Gaston, 2000) as well as the Convention on Biological Diversity and the Convention on International Trade in Endangered Species of Fauna and Flora (Neumayer, 2001).

Even more troublesome, Congleton's original sample is likely to have been biased. This is because at the early stages of multilateral action on ozone layer depletion, it was very much a developed country concern as well as a phenomenon largely caused by developed country emissions. While some developing countries were pro-active from the beginning, most waited to see what developed countries were willing to offer them for curtailing their future growth in consumption of ozone depleting substances (Benedick,

1998). Consequently, in 1988 out of the 28 signatory or contracting parties to the Vienna Convention 19 were developed countries according to the definition used in this article. So were 18 of the 29 parties to the Montreal Protocol. Because all developed countries are democracies, this leads to biased estimates.

Barrett & Graddy (2000) group countries into low, medium and high civil and political freedom, using dummy variables, as well as entering civil and political freedoms as continuous variables in separate regressions. A closer look at their results reveals that the study provides only limited evidence for a positive impact of freedom on the environment First, some of the variables have signs contrary to expectation. Second, and more importantly, practically none of the dummy or continuous variables are statistically significant on their own in spite of the quite high number of observations[4], which all other things equal boosts significance. It is only in their combination that these variables gain some statistical significance in all air pollution regressions. For the water pollution regressions even the combined explanatory power of the freedom variables is statistically insignificant in the majority of cases. Thus, Barrett & Graddy (2000) provide at best some statistical evidence for a negative link between freedom and air and water pollution.

Torras & Boyce (1998) enter freedom only as a continuous variable and estimate separate coefficients for countries above and below $5000 per capita income in purchasing power parity. Out of 14 regressions, the freedom coefficient has six times an unexpected sign, particularly prevalent in the subset of high income countries, and is statistically insignificant in a further three cases. Another weakness of the study is that in spite of using panel data, no time-series for the freedom variable is constructed. Instead the freedom variable is set equal to the 1995 value throughout. The empirical evidence resulting from their study is therefore not particularly strong either. Unfortunately, the two studies are not

directly comparable with each other since differing statistical techniques are used and Torras & Boyce (1998) also control for income inequality and literacy.

The Case for Focusing on Environmental Commitment

The more general problem with much of the empirical literature is that it focuses too much on environmental outcomes instead of looking at environmental commitment. Take Midlarsky's (1998) examination of CO_2 emissions and soil degradation as an example. It suffers from the same kind of problem as Torras & Boyce (1998) and Barrett & Graddy (2000), which similarly concentrate on environmental outcomes. Why would we expect democracies to have more or less severe soil degradation? Soil degradation depends on a plethora of factors including natural ones, most of which have absolutely nothing to do with democracy. No wonder then that no robust statistical relationship can be established. Yes, we would expect democratic countries to engage more in an international agreement addressing soil erosion, if there was one. We would also expect democratic countries to engage more in activities stemming the spread of soil erosion. But we would not necessarily expect them to have less soil degradation, at least not until many years have passed and the prevention activities referred to above have had an impact. Similarly with respect to CO_2 emissions. Why would we expect a significant relationship here? As argued above, it is the quintessential example of an environmental problem that can be externalised upon the future and people outside a country's boundaries. It is also strongly influenced by economic growth and the historic mix of primary energy types in use. Both are difficult for policy makers to control. Midlarsky (1998) finds a strong statistically significant relationship with only one of his democracy variables, namely the Polity variable. Even this result is most likely an artefact of functional mis-specification,

however. As simple a transformation as including squared and cubic GDP per capita in the estimation (a standard procedure in the relevant EKC literature), renders the Polity variable insignificant.[5] Again, we would expect democracies to more actively engage in a MEA addressing global warming such as the Kyoto Protocol (and further below we will see that they actually do), but only years or decades later will this translate into a statistically significant relationship with CO_2 emissions (but, of course, with respect to growth rates of emissions and not with respect to absolute levels, as modelled by Midlarsky, 1998).

Hence, at best there is to be expected only a weak link between democracy and (some) environmental outcomes. This is the ultimate reason, I would submit, why studies examining the impact of democracy on environmental outcomes *in general* provide only weak statistical evidence.[6] Interestingly, the outcome variables for which Torras & Boyce (1998) find the strongest evidence for a significant relationship with democracy are smoke emissions and fecal coliform effluents – two variables that do not suffer from severe time lags between commitment and outcome, that are well within the control of policy makers, that strongly affect the health of citizens and success is easily monitored by the electorate. Similarly, the only dependent environmental outcome variable for which Midlarsky (1998) finds a relatively significant relationship with democracy, namely deforestation, is also the one, where he can put forward a relatively plausible theoretical argument establishing such a link.

A much stronger theoretical argument can be made for a positive relationship between democracy and environmental commitment. In democracies people can express their environmental preferences better, these preferences will be honoured or addressed better by policy makers and this should translate into stronger revealed environmental commitment. But it need not translate into better environmental outcomes. The link between democracy and environmental outcomes is likely to be weaker the more factors outside a government's

control impact upon outcomes, the longer the time span between environmental commitment and its effect on environmental outcomes is and the more difficult environmental outcomes are to monitor. If these conditions hold true, then the electorate in a democracy will appreciate the difficulty of holding governments accountable for environmental outcomes rather than commitment and will look for commitment instead.

What needs to be done therefore is to re-adjust the focus away from environmental outcomes and towards environmental commitment. Congleton (1992) in principle addresses environmental commitment, but his analysis has serious weaknesses as seen above. In one of his variables, namely protected land area (a variable included in this study as well), Midlarsky (1998) himself looks at environmental commitment rather than outcomes. So do Gleditsch & Sverdrup (1996) in some of their variables, but simple bivariate analysis is often misleading and sensitive to the inclusion of control variables. In some sense therefore this work builds upon and extends these earlier attempts. It tries to provide a comprehensive and robust empirical analysis of the impact of democracy on environmental commitment.

Four Measures of Democracy

What exactly is democracy and how can it be measured best? This is difficult to answer and it would be vastly beyond the scope of this article to provide an original contribution to this complex question. Instead, I will simply employ four different measures of democracy that are implicitly based on different conceptions of what constitutes democracy and hope that together they cover comprehensively the complexity of democracy. Connected to this, the use of four different measures is also motivated by a desire to ensure robustness of the results. We put more confidence in the results if they hold true independent of the specific

measure of democracy chosen. If not, then this would have to be explained at least with reference to differences in the underlying conception of democracy. If no satisfactory explanation could be given, it would also put the results themselves into doubt. The four measures of democracy to be used in this study are:

- A combined index of political rights and civil liberties based on Freedom House data.
- A combined index of democracy and autocracy based on the Polity project.
- Vanhanen's index of democracy based on the so-called polyarchy dataset.
- A governance indicator named "voice and accountability", developed by World Bank staff.

While, obviously and expectedly so, there is positive correlation among the various measures of democracy, it is less than perfect (see appendix 1).[7] More importantly, each measure is based on a somewhat different conception of what constitutes democracy. The Freedom House data are based on expert assessments of the extent to which a country effectively provides for political rights and civil liberties, both measured on a 1 to 7 scale (Karatnycky, 1999: 546-553). Political rights refer to, for example, the existence and fairness of elections, existence of opposition and the possibility to take over power via elections. Civil liberties refer to, for example, the freedom of assembly, the right to open and free discussion, the independence of media, protection from political terror and the prevalence of the rule of law.

The Polity data are also based on expert judgement on aspects of institutionalized democracy and autocracy within a country, both measured on an additive 0 to 10 scale (Jaggers & Gurr, 1995). The criteria of assessment for the democracy score include the competitiveness of political participation (1-3), the competitiveness (1-2) and openness (1)

of executive recruitment as well as the constraints on the chief executive (1-4). The autocracy score consists of restrictions on the competitiveness (1-2) and regulation (1-2) of political participation, the restrictions on the competitiveness (1-2) and lack of openness (1) of executive recruitment and the lack of constraints on the chief executive (1-3).

The governance indicator combines seven indicators measuring, for example, the extent of civil liberties, political rights and independence of media, the involvement of military forces in politics and the responsiveness of government to its people as well as transparency of government decisions particularly with respect to decisions affecting and concerning business (Kaufmann, Kraay & Zoido-Lobatón, 1999a, b). Some of these base indicators stem from expert assessments, others from surveys of entrepreneurs. One of the indicators entering is the Freedom House indicator. Hence there is some overlap between the two. Because the indicators differ in their coverage of countries and therefore in their "representativeness", they are combined into one single indicator through a linear unobserved components model. It is standardized to have a mean of zero and a standard deviation of one.

Finally, contrary to the other measures the data for the Vanhanen (2000) index are not based on expert evaluations. It consists of two variables: a competition variable, calculated by subtracting the percentage of votes won by the largest party from 100, and a participation variable, taken as the percentage of the total population participating in elections. A democracy variable is then constructed as the product of the competition and the participation variable divided by 100. The multiplication is because Vanhanen, like Dahl (1971), regards both competition and participation as necessary requirements for democracy; adding the two variables up would have implied instead that a high score on one variable can compensate for a low score on the other.

The Dependent Variables and the Hypotheses to be Tested

Of course, environmental commitment is a non-observable variable. I therefore use a range of variables, which are supposed to function as proxy variables. More specifically, these variables include:

- The signing and ratification of multilateral environmental agreements (MEAs).
- The membership in environmental intergovernmental organisations (EIOs).
- The extent to which reporting requirements for the Convention on International Trade in Endangered Species of Fauna and Flora (CITES) are met.
- The percentage of a country's land area under protection status.
- The existence of a National Council on Sustainable Development (NCSD) in a country.
- The availability of environmentally relevant information concerning a country.

Our basic hypothesis to be tested throughout is that democratic countries are more environmentally committed as measured by these proxy variables than non-democratic countries.

Multilateral environmental agreements and environmental intergovernmental organisations

One revelation of environmental commitment is the signing and ratification of MEAs. Of the more than 180 or so existing MEAs only few are suitable for our purpose here. First, many of these MEAs are regional rather than global. Second, we want to look here at MEAs that do not have quasi-universal membership. This is because it is exactly these

MEAs where environmental commitment is needed on behalf of countries to join. MEAs with quasi-universal membership, on the other hand, are often agreements that can be joined without commitment to incurring any costly action, where costs could be either monetary or opportunity costs.

Having examined a great many MEAs, I decided to pick four that fulfil these criteria: the Kyoto Protocol (84 signatures as of 27 November 2000; www.unfccc.org), the Copenhagen Amendment to the Montreal Protocol (115 ratifications as of 8 December 2000; www.unep.org/ozone), the Rotterdam Convention (73 signatures as of 17 January 2001; www.chem.unep.ch); and the Cartagena Protocol on Biosafety (81 signatures as of 22 December 2000; www.biodiv.org).[8] These agreements cover four important areas of recent multilateral environmental concern, namely climate change, ozone layer depletion, trade in hazardous chemicals and pesticides, and danger to biodiversity posed by genetically modified organisms.[9] Data on the status of signature and ratification are from the homepages of the respective MEAs. A dummy for each MEA was created, which was set to 1 if a country had signed (or ratified in the case of the Montreal Amendment) the agreement and 0 otherwise.

Whether a country signs a particular MEA obviously depends on a great many factors that might differ from MEA to MEA. In looking at the four MEAs taken together, we would therefore hope to get a more systematic result on what factors impact upon a country's willingness to sign or ratify MEAs. A further variable was therefore created as the sum of the dummy variables for the MEAs, so that it ranges from 0 to 4 depending on how many of these MEAs a country has signed/ratified, if any.

Environmentally committed countries can also be expected to participate strongly in environmental intergovernmental organisations (EIOs) for the same kind of reasoning that leads us to expect that they are more willing to sign and ratify MEAs than non-committed

countries. The number of memberships in EIOs as of 1998 is taken from WEF (2001, annex 6), based on a codification of 100 intergovernmental organisations as "environmental" and data from the Yearbook of International Organisations.[10] This leads us to our first two hypotheses to be tested:

H1: Democracies are more likely to sign or ratify MEAs than non-democracies.

H2: Democracies participate in more EIOs than non-democracies.

CITES reporting requirements

Besides the signing and ratification of MEAs a good test for the extent of environmental commitment is a country's compliance with the requirements of a MEA. Those requirements are usually costly to comply with, hence more committed countries will be more willing to incur the costs. Unfortunately, quantitative compliance data for a large sample of countries is usually not available. However, there is one MEA for which such data exist, namely the percentage of reporting requirements CITES parties have met. Data as of 1997 are from WRI (2000, table BI.4). This leads us to our third hypothesis:

H3: Democracies meet a higher percentage of their reporting requirements under CITES than non-democracies.

Land area under protection status

Land area under protection status is another variable concerned with more traditional nature conservation and wildlife protection. Data on the percentage of land area a country has put under protection according to any of the five management categories of the

International Union for the Conservation of Nature (IUCN) as of 1997 come from WRI (2000, table BI.1). We postulate as our fourth hypothesis:

H4: Democracies put a higher percentage of their land area under protection status than non-democracies.

Presence of a National Council on Sustainable Development

In the wake of the 1992 Earth Summit in Rio de Janeiro, many countries started to set up a National Council on Sustainable Development (NCSD) (132 countries as of 9 February 2001 had such a council; www.ecouncil.ac.cr). A dummy was created, which was set to 1 if a country had a NCSD, and 0 otherwise. The objective of these councils is the promotion and implementation of sustainable development at the national level, thus translating Agenda 21 into national strategies. The NCSDs can be regarded as the country level counterpart to the United Nations Commission on Sustainable Development (UNCSD), which was established after the Earth Summit. In almost all countries the NCSD is set up and coordinated by some governmental agency. The existence of a NCSD can thus be interpreted as a sign for a country's environmental commitment. This leads us to the following hypothesis:

H5: Democracies are more likely to have a National Council on Sustainable Development than non-democracies.

Availability of environmentally relevant information

Lack of standardized and internationally comparable environmentally relevant information has long since represented a problem to researchers. While very often information

collection is undertaken by international organisations with relatively little influence of the domestic country, we would nevertheless expect an environmentally committed country to actively seek provision of environmentally relevant information, if only for the purpose of its own domestic environmental policy making. This could take place either via own data collection or via encouraging international organisations to undertake the research necessary for information provision in their country.

The World Economic Forum (WEF) has commissioned an Environmental Sustainability Index (ESI), which aggregates 67 variables. While not all variables have a direct link to the environment, taken together they provide a good indication of a country's environmental sustainability potential. Information is not available for all the 67 variables for all the 122 countries covered (data taken from WEF, 2001, annex 6). We would expect that in the case of an environmentally committed country information on fewer variables are missing and therefore postulate our sixth hypothesis:

H6: Democracies have more variables available in the set of ESI variables than non-democracies.

Appendix 2 provides a Pearson correlation matrix for the dependent variables (in case of MEAs only the summary variable is included). The correlation coefficients are all positive as expected, which is important since after all they are all supposed to proxy the same underlying non-observable phenomenon environmental commitment. At the same time, the correlations are nowhere near 100%. Anything else would suggest redundancy among the proxy variables.

The Independent Variables

Turning to the independent variables, as concerns the democracy variables, I have grouped countries together and used discrete dummy variables rather than a continuous variable throughout. Use of dummy variables allows for easier interpretation and understanding of the statistical results. One disadvantage of dummy variable use is a loss of variation in the explanatory variables, which usually brings with it greater standard errors in the estimation results. Another problem is the somewhat arbitrary fixation of the dummy variable boundaries. For the purpose of sensitivity analysis all regressions have therefore been run with democracy entered as a continuous variable and with changes in the boundaries of the dummy variables within a reasonable range (results not reported). For practically all regressions reported further below, entering democracy as a continuous variable has confirmed their results with higher statistical significance. Furthermore, results were largely unaffected by modest changes in the boundaries for the dummy variables.

As concerns the Freedom House variables, both their political rights and their civil liberty index runs on a 1 to 7 scale. I have added up the two to create a continuous variable on a 2 to 14 scale. For the dummy variables, I have followed Freedom House in classifying countries into three groups in accordance with their classification of countries as not free, partly free and free. In general, countries are considered not free if their added score is between 11 and 14, as partly free if the score is between 6 and 11, and as free if the score is between 2 and 6. As can be seen, there is some ambiguity if countries have a score of either 6 or 11 and Freedom House uses additional information not included in the score in order to group countries then. I therefore created a dummy variable FREE-low, which was set to 1 if the country was classified by Freedom House as not free, and 0 otherwise, a dummy FREE-mid, which was set to 1 if the country was classified as partly free, and 0 otherwise

as well as FREE-high, which was set equal to 1 if the country was considered free, and 0 otherwise. Data come from Freedom House (2000).

As concerns the Polity data, the original data set provides two indices on a 0 to 10 scale, one for the extent of a country's democratic and the other for its autocratic characteristics. I followed Hauge & Ellingsen (1998) in putting countries into three groups. A dummy variable POLIT-low was created, which was set to 1 if the subtraction of the autocracy score from the democracy score in 1998 led to a result between –10 and –6, and 0 otherwise. Similarly, a POLIT-mid dummy was set to 1 if this result was between –5 and 5, and 0 otherwise and a POLIT-high dummy, set to 1 if the result was above 5, and 0 otherwise. Data are from Gurr & Jaggers (2000).

The governance indicator developed by World Bank staff is standardized to have a mean of zero and a standard deviation of about one, with a minimum of about -1.8 and a maximum of about 1.7. I have constructed a dummy variable GOV-low, which was set to 1 if this indicator was below -.8, and 0 otherwise; a GOV-mid dummy, which was set to 1 if the indicator was between -.8 than 0, and 0 otherwise; and a GOV-high dummy, which was set to 1 if the indicator was above 0, and 0 otherwise.[11] Data come from Kaufmann, Kraay & Zoido-Lobatón (1999a, b).

Following Vanhanen (2000: 257), I have constructed a VAN-autoc dummy variable, which is set to 1 if the competition variable is below 30, the participation value below 10 or the democracy variable below 5, and 0 otherwise. A VAN-demo dummy variable is set to 1 if VAN-autoc is equal to 0 and vice versa. The reader should note that the relevant dummy categories exhaust the full array of countries in order to facilitate reference to any one group of countries, but that for all estimations one of the dummy categories was left out, of course, to avoid the so-called dummy variable trap.

Besides democracy (our hypothesis to be tested), which other factors would one theoretically expect to impact upon the environmental commitment of a country? First, per capita income should have a positive impact upon environmental commitment. In economic terms this would mean that environmental commitment is a luxury good with an income elasticity greater than one.[12] This need not imply that poor countries care less about the environment per se. Rather, because of their poverty they might prioritize issues other than the environment. Income per capita is measured as gross domestic product (GDP) per capita in purchasing power parity (PPP) in US$ in 1998, taken from UNDP (2000).[13]

Second, big and "important" countries should be more environmentally committed than small and "unimportant" ones. As a proxy for this variable one could either take a country's total income or population since, all other things equal, both the economic and the population size of a country should be positively correlated with "importance". Since per capita income is already included and controlled for, I decided to use population size as a proxy.[14] More important countries might show signs of stronger environmental commitment not necessarily due to stronger environmental concern per se. Rather, we hypothesize here that these countries will find it in their interest to demonstrate environmental commitment, particularly with respect to certain proxy variables for commitment, in order to demonstrate their importance in world politics, of which the environment represents one part. In other words, important countries want to be seen as good citizens and leaders in world environmental affairs.[15] Data on the size of a country's population and its population density (population divided by land area in square kilometres) in 1998, which is additionally used in one estimation, stem from World Bank (2000). Appendix 3 provides summary descriptive statistics for all independent and dependent variables, apart from the binary dummy variables for the individual MEAs and the existence of a NCSD.

Statistical Issues

Before results are presented, a short discussion of potential statistical problems seems warranted. Because of the huge variation in GDP per capita and in population size among countries, which could potentially lead to heteroscedasticity, the two variables entered the regressions as their natural logs. Cook-Weisberg tests sometimes still found evidence for heteroscedasticity, however. For that reason all regressions were run with heteroscedasticity robust standard errors.

Two of the dependent variables, namely "% of CITES reporting requirements met" and "% of land area under protection" might cause problems in OLS estimation. While none of them is censored, the fact that the dependent variable is equal to 0 (as well as 100 in case of CITES) for a few countries might nevertheless bias OLS estimates. Tobit estimation, a maximum likelihood technique suitable for dealing with limited dependent variables, was therefore run as well for these two variables. As the results were very similar, only the OLS estimates are shown below.[16]

Developed countries tend to be environmentally committed in the sense that they generally fare well on our proxy indicators. Since, according to the definition used in this article, all developed countries are democracies this represents a potential problem. If we find that democracy is a significant explanatory variable for environmental commitment, then this result might be triggered in part by the presence of developed countries in the sample. In spite of controlling already for income per capita, which is highly correlated with a country being developed or not, I have therefore run most regressions twice: once for the full sample and once for a subset excluding developed countries. Doing so also allows one to examine whether multicollinearity between income and the democracy variables poses a serious problem. Table I shows the correlation between lnGDP, the

income variable, and the four variables of democracy both for the full and for the restricted sample.[17] As can be seen, the correlation coefficients are much lower for the restricted sample.

< Insert Table I here >

Because of the presumed sign of the democracy variables, in principle one-tailed significance tests could have been reported. Instead, I decided to report two-tailed tests, but to take a rather high threshold of 10% as an indication of statistical significance. All OLS regressions were run with a constant included, even though its coefficient is not reported below. *N*, the number of observations, varies across the various regressions. For the same dependent variable, *N* varies due to variances in the availability of the democracy measures. For different dependent variables, *N* varies due to variances in the availability of the dependent variable.

Results

Multilateral environmental agreements and environmental intergovernmental organisations

Table II reports the results of probit estimates for each of the four MEAs.[18] The reported coefficients are already changes in the probability at the mean of a variable, not the untransformed probit coefficients. For our dummy variables the coefficient gives the probability for a discrete change of the dummy variable from 0 to 1. Only the results for the Freedom House democracy variable are shown. Results for the other three democracy variables can be found in appendix 4.

< Insert Table II here >

As concerns the Kyoto Protocol, all coefficients have the expected sign and all democracy coefficients are statistically significant. To understand the correct interpretation of the coefficients of the democracy variables, refer to the estimate for the full sample case. The estimate for these two dummy variables means that after controlling for differences in per capita income and a country's population size, FREE-low countries are 42% less likely to have signed the Kyoto Protocol than FREE-high countries. Similarly, FREE-mid countries are 35% less likely to have signed.[19]

As concerns the Biosafety Protocol, all coefficients have the expected sign. The FREE-mid dummy is statistically insignificant in the restricted sample on its own, but gains significance in combination with the FREE-low dummy. With respect to the Rotterdam Convention, while the democracy coefficients have the expected signs they are statistically insignificant throughout both on their own and combined. No results for the restricted sample are shown as in these cases a Wald test failed to reject the hypothesis that the explanatory variables taken together have no explanatory power for the POLIT and GOV variables and only marginal power for the FREE variables. As concerns the Copenhagen Amendment to the Montreal Protocol, all coefficients have the expected signs. The FREE-mid variable is insignificant in the restricted sample on its own, but gains combined significance with the FREE-low dummy.

Table III provides an ordered probit estimate for the sum of MEAs variable. Ordered probit is suitable for ordinally ordered data. While a country with a score of 4 cannot be said to exhibit double the environmental commitment as a country scoring 2, it can be said to exhibit a higher commitment. In other words the sum of MEAs can be interpreted as an

ordinal variable, where 4 can be interpreted as excellent, 3 as good, 2 as satisfactory, 1 as poor and 0 as very poor commitment. For reasons of space availability, only the results for the restricted sample are shown here.[20] All coefficients have the expected sign and are statistically significant on their own, apart from the POLIT-mid variable, which gains significance only in combination. The coefficients from ordered probit estimates have no direct meaning. Together with information on the so-called cut points (not reported), they can be used to compute predicted probabilities, however. Such probabilities are shown for illustrative purposes for the FREE dummy variables only. While, for example, FREE-low countries have a predicted probability of 14% of having signed three MEAs (a sign for good commitment), the respective probability for FREE-high countries is much higher at 34%.

<Insert Table III here>

Turning to the number of environmental intergovernmental organisations a country participates in, Table IV presents OLS estimate results. All coefficients have the expected sign apart from the POLIT-mid variables, which are statistically insignificant, however. The GOV-mid dummy is statistically insignificant in the restricted sample, but gains significance in combination. The VAN-autoc variables are insignificant in both samples, if only marginally so. A correct interpretation of the coefficients with reference to the full sample is that FREE-low countries on average participate in 3.38 and FREE-mid countries in 3.07 EIOs less than FREE-high countries. Interpretation of the other coefficients reported in Table IV is analogous.

<Insert Table IV here>

CITES reporting requirements

OLS estimate results for the percentage of CITES reporting requirements met as the dependent variable can be found in Table V. All coefficients have the expected signs and are statistically significant, apart from FREE-mid and POLIT-mid, which are not significant on their own, but in their combination with FREE-low and POLIT-low. The correct interpretation of the coefficients of the democracy variables is illustrated again with respect to the estimate for the FREE variables in the full sample case. FREE-low countries have on average an estimated 23 percentage points and FREE-mid countries an estimated 9 percentage points lower reporting rate than FREE-high countries.

<Insert Table V here>

Land area under protection status

OLS estimate results for the percentage of land area under protection status as the dependent variable can be found in Table VI. For this regression only, a country's population density was added as an explanatory variable. The expectation is that a country with a lower population density can afford to put a higher percentage of its territory under protection status than a country with a high population density. The income variable is sometimes and the population variable is throughout statistically insignificant. The democracy and the population density variables have the expected signs and are statistically significant throughout. Referring to the FREE variables in the full sample case, FREE-low countries have on average an estimated 5.87 and FREE-mid countries an estimated 5.96 percentage points of their total land area less under protection status in

comparison to FREE-high countries. Interpretation for the other reported results in this table is analogous.

<Insert Table VI here>

Existence of a National Council on Sustainable Development (NCSD)

Table VII provides probit estimation results for the existence of a NCSD. All coefficients have the expected sign. All democracy coefficients are statistically significant, apart from FREE-mid and POLIT-mid, which only gain combined significance with the FREE-low and POLIT-low dummies. Referring to the full sample case, FREE-low countries are estimated to have a 30% lower likelihood for the existence of a NCSD than FREE-high countries. Interpretation for the other democracy variables is analogous.

<Insert Table VII here>

Availability of environmentally relevant information

Lastly, OLS estimate results for the number of ESI variables available as the dependent variable can be found in Table VIII. All coefficients have the expected sign and are highly statistically significant, which leads to high R^2 values throughout. Referring to the FREE variables in the full sample case, FREE-low countries have on average an estimated 4.1 ESI variables and FREE-mid countries an estimated 2.5 ESI variables less available than FREE-high countries. Interpretation for the other reported results in this table is analogous.

< Insert Table VIII here >

Discussion and Concluding Observations

Taken together, the results reported in the last section provide strong evidence in favour of our hypothesis that democracies exhibit stronger international environmental commitment than non-democracies. This result appears to be relatively robust with respect to our different measures of environmental commitment. For the great majority of these proxies of environmental commitment the democracy variables not only have the expected sign, but are also statistically significant. It is also quite robust with respect to our different measures of democracy. No single measure of democracy provides systematically different estimates in terms of sign of coefficients and their statistical significance from the other three.[21] Equally satisfying is that the coefficients and their significance remain roughly the same whether developed countries are included in the full sample or excluded in the restricted sample. In other words, the results are not simply triggered by the presence of developed democratic countries.

Almost throughout we observe that the coefficients for the FREE-low, POLIT-low and GOV-low countries indicate less environmental commitment at stronger statistical significance than the coefficients for the FREE-mid, POLIT-mid and GOV-mid countries. In other words, clearly undemocratic countries exhibit even less environmental commitment than countries in the middle group and we can be more certain that their commitment differs significantly from clear democracies than we can be for the group in between. This was to be expected of course.

In conclusion, this study provides a positive message: Democracies clearly show stronger environmental commitment than non-democracies. All other things equal, therefore, a more democratic world will also be a world with stronger environmental commitment. This need not translate into better environmental outcomes, however, at least

not immediately. Theory predicts a stronger link of democracy with environmental commitment than with outcomes. Gleditsch & Sverdrup (1995: 8) suspect this much when they write that 'the crucial point is that regardless of what harm democracies may do to the environment, they are more likely to make corrective action'. As democracy spreads around the world, so will environmental commitment. More environmental commitment will help preventing environmental scarcities from leading to extreme outcomes like violent conflict. There is thus another avenue through which democracy can foster peace.

Interestingly, it is really democracy or political freedom that matters. Pre-testing rejected economic freedom as a relevant variable. Just because a country limits its interference in the economic system and allows its people to engage freely in doing business, does not render it environmentally committed. But allowing its people to receive independent information, to voice and organise their concerns and to dis-elect policy makers for failure to address citizens' preferences leads to enhanced environmental commitment.

This is not to say that democracies do not suffer from deficiencies and even failures with respect to environmental commitment. For example, future generations are affected by environmental degradation, but cannot express their preferences in the political market place of the present. Environmental degradation cuts across national boundaries, which is likely to lead to excessive global environmental pollution in the absence of a central political authority (world government). Environmental degradation also cuts across administrative boundaries within nation-states, which renders policies successfully addressing these problems more difficult (Doeleman 1997). But the point is that non-democracies equally suffer from these deficiencies, if not more. While democracy is less than perfect, there is no better alternative.

Of course, democracy is not a static concept and it evolves over time. Some argue that the modern Western model of representative democracy with infrequent elections, substantial influence of lobby groups benefiting from environmental degradation, little mobilisation of the people and limited participation outside well defined and narrow boundaries is ill equipped to deal with long-term environmental problems and therefore needs to be transformed into a more “deliberative” or “associative” democracy (Lafferty & Meadowcroft, 1996; Doeleman, 1997). Addressing these issues is beyond the limits of this article, however, and is left to future research. Suffice it to say here that, again, while representative democracy might not be perfect, it is surely better than any non-democratic alternative.

Appendix 1. Pearson correlation matrix for democracy variables (full sample)

	FREE	POLIT	GOV	VAN
FREE	1.00			
POLIT	.92	1.00		
GOV	.94	.83	1.00	
VAN	.81	.77	.81	1.00

FREE: Freedom House variable. POLIT: Polity variable. GOV: Governance variable.
VAN: Vanhanen variable.

Appendix 2. Pearson correlation matrix for dependent variables (full sample)

	Sum of MEAs	Number of EIOs	% of CITES reporting requirements	% of land area under protection	Existence of NCSD	ESI variables available
Sum of MEAs	1.00					
Number of EIOs	.49	1.00				
% of CITES reporting requirements	.25	.43	1.00			
% of land area under protection	.23	.19	.32	1.00		
Existence of NCSD	.50	.27	.40	.29	1.00	
ESI variables available	.54	.64	.51	.17	.30	1.00

Appendix 3. Summary descriptive statistics for variables

Dependent variables	**N**	**Mean**	**Std. Dev.**	**Minimum**	**Maximum**
Sum of MEAs	205	1.76	1.37	0	4
Number of EIOs	121	13.64	6.67	2	35
% of CITES requirements met	121	69.61	30.51	0	100
% land area under protection	154	7.43	7.67	0	42.6
Number of ESI variables available	122	54.48	5.03	47	65
Independent variables					
FREE	187	7.09	3.97	2	14
if FREE-low=1	48	12.42	1.23	11	14
if FREE-mid=1	55	8.23	1.45	6	11
if FREE-high=1	84	3.31	1.15	2	6
POLIT	159	2.78	6.77	-10	10
if POLIT-low=1	32	-7.47	1.32	-10	-6
if POLIT-mid=1	46	-.48	2.87	-5	5
if POLIT-high=1	81	8.68	1.34	6	10
GOV	171	0	.96	-1.79	1.69
if GOV-low=1	40	-1.24	.29	-1.79	-.854
if GOV-mid=1	53	-.39	.25	-.778	0
if GOV-high=1	78	.89	.52	.013	1.69
VAN	183	15.74	12.69	0	43.54
if VAN-autoc=1	60	1.96	2.85	0	11.73
if VAN-demo=1	123	22.46	9.88	5.85	43.54
lnGDP	175	8.33	1.10	6.13	10.42
lnPOP	205	15.13	2.26	9.83	20.94
POPdens	183	113.33	153.73	2	965

Appendix 4. Probit estimates for MEA variables (POLIT/GOV/VAN dummies)

	Kyoto Protocol				**Biosafety Protocol**				**Rotterdam Convention**		**Copenhagen Amendment**			
	Full sample		***Restricted sample***		***Full sample***		***Restricted sample***		***Full sample***		***Full sample***		***Restricted sample***	
	dF/dx	**P>|z|**	**dF/dx**	**P>|z|**	**dF/dx**	**P>|z|**	**dF/dx**	**P>|z|**	**dF/dx**	**P>|z|**	**dF/dx**	**P>|z|**	**dF/dx**	**P>|z|**
POLIT-low	-.34	.004	-.29	.009	-.43	.000	-.41	.000	-.08	.431	-.33	.003	-.31	.007
POLIT-mid	-.21	.006	-.18	.080	-.25	.018	-.24	.025	-.12	.101	-.19	.079	-.17	.122
lnGDP	.20	.000	.15	.003	-.01	.767	-.05	.303	.10	.019	.20	.000	.19	.000
lnPOP	.06	.064	.04	.200	.07	.021	.09	.005	.08	.000	.05	.017	.05	.037
	Combined POLIT		Combined POLIT		Combined POLIT		Combined POLIT		Combined POLIT		Combined POLIT		Combined POLIT	
	P-value <.0058		P-value <.0157		P-value <.0003		P-value <.0009		P-value <.7323		P-value <.2457		P-value <.3410	
	P>chi^2=.0000		P>chi^2=.0005		P>chi^2=.0001		P>chi^2=.0002		P>chi^2=.0041		P>chi^2=.0000		P>chi^2=0002	
	Pseudo R^2=.2303		Pseudo R^2=.1278		Pseudo R^2= 1188		Pseudo R^2=.1298		Pseudo R^2=.0757		Pseudo R^2=.2296		Pseudo R^2=.1397	
	N=153		N=130		N=153		N=130		N=153		N=153		N=130	
	Kyoto Protocol				**Biosafety Protocol**				**Rotterdam Convention**		**Copenhagen Amendment**			
	Full sample		***Restricted sample***		***Full sample***		***Restricted sample***		***Full sample***		***Full sample***		***Restricted sample***	
	dF/dx	**P>|z|**	**dF/dx**	**P>|z|**	**dF/dx**	**P>|z|**	**dF/dx**	**P>|z|**	**dF/dx**	**P>|z|**	**dF/dx**	**P>|z|**	**dF/dx**	**P>|z|**
GOV-low	-.28	.025	-.23	.042	-.37	.001	-.37	.002	-.10	.372	-.35	.004	-.33	.007
GOV-mid	-.31	.003	-.26	.011	-.20	.046	-.19	.070	-.14	.168	-.15	.161	-.13	.245
lnGDP	.19	.000	.15	.002	-.01	.778	-.05	.291	.09	.028	.19	.000	.18	.000
lnPOP	.07	.017	.05	.081	.10	.000	.12	.000	.08	002	.07	.020	.07	.035
	Combined GOV		Combined GOV		Combined GOV		Combined GOV		Combined GOV		Combined GOV		Combined GOV	
	P-value <.0051		P-value <.0197		P-value <.0045		P-value <.0058		P-value <.3540		P-value <.0126		P-value <.0236	
	P>chi^2=.0000		P>chi^2=.0003		P>chi^2=.0006		P>chi^2=.0004		P>chi^2=.0009		P>chi^2=.0000		P>chi^2=.0000	
	Pseudo R^2=.2224		Pseudo R^2=.1230		Pseudo R^2=.1131		Pseudo R^2=.1273		Pseudo R^2=.0880		Pseudo R^2=.2275		Pseudo R^2=.1445	
	N=164		N=141		N=164		N=141		N=164		N=164		N=141	
	Kyoto Protocol				**Biosafety Protocol**				**Rotterdam Convention**		**Copenhagen Amendment**			
	Full sample		***Restricted sample***		***Full sample***		***Restricted sample***		***Full sample***		***Full sample***		***Restricted sample***	
	dF/dx	**P>|z|**	**dF/dx**	**P>|z|**	**dF/dx**	**P>|z|**	**dF/dx**	**P>|z|**	**dF/dx**	**P>|z|**	**dF/dx**	**P>|z|**	**dF/dx**	**P>|z|**
VAN-autoc	-.30	.001	-.27	.002	-.36	.000	-.35	.000	-.07	.453	-.25	.006	-.24	.008
lnGDP	.20	.000	.15	.001	-.00	.971	-.04	.370	.11	.004	.21	.000	.19	.000
lnPOP	.04	.048	.03	.220	.07	.001	.08	.001	.97	.000	.05	.024	.05	.051
	P>chi^2=.0000		P>chi^2=.0001		P>chi^2=.0000		P>chi^2=.0000		P>chi^2=.0000		P>chi^2=.0000		P>chi^2=.0000	
	Pseudo R^2=.2038		Pseudo R^2=.1190		Pseudo R^2=.1166		Pseudo R^2=.1200		Pseudo R^2=.0946		Pseudo R^2=.2171		Pseudo R^2=.1394	
	N=175		N=152		N=175		N=152		N=175		N=175		N=152	

Table I. Pearson correlation matrix for income with democracy variables – full versus restricted sample

	lnGDP (full sample)	lnGDP (restricted sample)
FREE	.54	.30
POLIT	.40	.18
GOV	.66	.42
VAN	.61	.40

Table II. Probit estimates for MEA variables (FREE dummies)

	Dependent Variable: Kyoto Protocol				**Dependent Variable: Biosafety Protocol**				**Dependent Variable: Rotterdam Convention**		**Dependent Variable: Copenhagen Amendment**			
	Full sample		***Restricted sample***		***Full sample***		***Restricted sample***		***Full sample***		***Full sample***		***Restricted sample***	
	dF/dx	**P>|z|**	**dF/dx**	**P>|z|**	**dF/dx**	**P>|z|**	**dF/dx**	**P>|z|**	**dF/dx**	**P>|z|**	**dF/dx**	**P>|z|**	**dF/dx**	**P>|z|**
FREE-low	-.42	.000	-.37	.000	-.31	.002	-.29	.005	-.08	.431	-.33	.003	-.31	.007
FREE-mid	-.36	.001	-.31	.002	-.19	.081	-.16	.131	-.12	.101	-.19	.079	-.17	.122
lnGDP	.16	.000	.13	.004	-.00	.990	-.03	.543	.10	.019	.20	.000	.19	.000
lnPOP	.05	.026	.04	.107	.07	.001	.08	.002	.08	.000	.05	.017	.05	.037
	Combined FREE		Combined FREE		Combined FREE		Combined FREE		Combined FREE		Combined FREE		Combined FREE	
	P-value <.0000		P-value <.0003		P-value <.0115		P-value <.0239		P-value <.5075		P-value <.0082		P-value <.0185	
	$P>chi^2$=.0000		$P>chi^2$=.0000		$P>chi^2$=.0015		$P>chi^2$=.0050		$P>chi^2$=.0002		$P>chi^2$=.0000		$P>chi^2$=.0001	
	Pseudo R^2=.2403		Pseudo R^2=.1507		Pseudo R^2=.0862		Pseudo R^2=.0807		Pseudo R^2=.0979		Pseudo R^2=.2231		Pseudo R^2=.1427	
	N=175		N=152		N=175		N=152		N=175		N=175		N=152	

Table III. Ordered probit estimates for sum of MEAs variable

Dependent Variable: Sum of MEAs

Restricted sample

	Coeff.	**P>|z|**		**Coeff.**	**P>|z|**
FREE-low	-1.00	.000	POLIT-low	-.81	.002
FREE-mid	-.72	.005	POLIT-mid	-.31	.161
lnGDP	.30	.001	lnGDP	.37	.000
lnPOP	.20	.001	lnPOP	.17	.019
Combined FREE P-value <.0001			Combined POLIT P-value <.0048		
P>chi^2=.0000 Pseudo R^2=.0865 N=152			P>chi^2=.0000 Pseudo R^2=.0760 N=130		
GOV-low	-.72	.002			
GOV-mid	-.49	.034	VAN-autoc	-.80	.000
lnGDP	.21	.002	lnGDP	.33	.001
lnPOP	.19	.001	lnPOP	.18	.001
Combined GOV P-value <.0056					
P>chi^2=.0001 Pseudo R^2=.0765 N=141			P>chi^2=.0000 Pseudo R^2=.0855 N=152		

	FREE-low countries		FREE-mid countries		FREE-high countries	
# of MEAs	Pred. P.	St. Dev	Pred. P.	St. Dev.	Pred. P.	St. Dev.
0	.30	.14	.23	.13	.05	.06
1	.29	.03	.27	..06	.12	.09
2	.23	.06	.25	.04	.21	.08
3	.14	.08	.19	.10	.33	.07
4	.03	.03	.05	.06	.28	.19

Table IV. OLS estimates for EIO variable

	Dependent Variable: Number of EIOs a country participates in			
	Full sample		***Restricted sample***	
	Coeff.	**P>|t|**	**Coeff.**	**P>|t|**
FREE-low	-3.38	.011	-1.92	.085
FREE-mid	-3.07	.000	-1.56	.021
lnGDP	2.70	.000	.88	.012
lnPOP	2.16	.000	1.82	.000
	Combined FREE P-value <.0005		Combined FREE P-value <.0320	
	P>F=.0000 R^2=.5397 N=121		P>F=.0000 R^2=3831 N=100	
POLIT-low	-3.35	.018	-2.11	.070
POLIT-mid	.39	.701	1.19	.165
lnGDP	3.36	.000	1.24	.001
lnPOP	2.08	.000	1.74	.000
	Combined POLIT P-value <.0390		Combined POLIT P-value <.0431	
	P>F=.0000 R^2=.5302 N=121		P>F=.0000 R^2=.4120 N=100	
GOV-low	-3.61	.004	-2.38	.029
GOV-mid	-1.85	.040	-.49	.526
lnGDP	2.92	.000	.97	.000
lnPOP	2.21	.000	1.84	.000
	Combined GOV P-value <.0087		Combined GOV P-value <.0903	
	P>F=.0000 R^2=.5282 N=121		P>F=.0000 R^2=.3851 N=100	
VAN-autoc	-1.75	.108	-1.46	.121
lnGDP	3.20	.000	.95	.000
lnPOP	2.10	.000	1.78	.000
	P>F=.0000 R^2=.5100 N=121		P>F=.0000 R^2=.3732 N=100	

Table V. OLS estimates for CITES reporting requirements variable

	Dependent Variable: % of CITES reporting requirements met			
	Full sample		***Restricted sample***	
	Coeff.	**P>|t|**	**Coeff.**	**P>|t|**
FREE-low	-22.87	.006	-22.31	.007
FREE-mid	-9.14	.175	-8.50	.218
lnGDP	7.66	.003	6.64	.040
lnPOP	3.87	.013	4.06	.022
	Combined FREE P-value <.0231		Combined FREE P-value <.0257	
	P>F=.0000 R^2=.3091 N=118		P>F=.0001 R^2=.1983 N=98	
POLIT-low	-25.00	.013	-24.52	.016
POLIT-mid	-8.13	.189	-7.82	.213
lnGDP	8.91	.000	7.62	.014
lnPOP	4.46	.010	4.83	.013
	Combined POLIT P-value <.0356		Combined POLIT P-value <.0448	
	P>F=.0000 R^2=.3211 N=115		P>F=.0004 R^2=.2104 N=95	
GOV-low	-27.27	.002	-27.17	.002
GOV-mid	-11.76	.050	-11.28	.067
lnGDP	6.90	.004	5.65	.067
lnPOP	4.46	.003	4.72	.005
	Combined GOV P-value <.0077		Combined GOV P-value <.0073	
	P>F=.0000 R^2=.3205 N=118		P>F=.0000 R^2=.2145 N=98	
VAN-autoc	-17.64	.013	-17.71	.013
lnGDP	8.44	.000	6.63	.032
lnPOP	3.92	.011	4.08	.020
	P>F=.0000 R^2=.2979 N=118		P>F=.0001 R^2=.1901 N=98	

Table VI. OLS estimates for land area under protection status variable

	Dependent Variable: % of land area under protection			
	Full sample		***Restricted sample***	
	Coeff.	**P>|t|**	**Coeff.**	**P>|t|**
FREE-low	-5.87	.001	-5.67	.004
FREE-mid	-5.96	.000	-5.69	.001
lnGDP	.34	.586	-.08	.882
lnPOP	.25	.720	.14	.708
POPdens	-.01	.029	-.01	.041
	Combined FREE P-value <.0009		Combined FREE P-value <.0055	
	P>F=.0003 R^2=.1761 N=145		P>F=.0202 R^2=.1509 N=123	
POLIT-low	-3.51	.040	-3.16	.073
POLIT-mid	-3.67	.007	-3.55	.011
lnGDP	1.02	.085	.26	.643
lnPOP	.13	.731	-.02	.949
POPdens	-.01	.025	-.01	.033
	Combined POLIT P-value <.0203		Combined POLIT P-value <.0376	
	P>F=.0041 R^2=.1162 N=141		P>F=.0963 R^2=.0778 N=119	
GOV-low	-4.10	.022	-3.92	.033
GOV-mid	-3.61	.024	-3.23	.055
lnGDP	.87	.175	.23	.810
lnPOP	.23	.537	.10	.810
POPdens	-.01	.050	-.01	.064
	Combined GOV P-value <.0459		Combined GOV P-value <.0879	
	P>F=.0049 R^2=.1192 N=145		P>F=.1176 R^2=.0790 N=123	
VAN-autoc	-2.39	.056	-2.31	.065
lnGDP	1.40	.016	.56	.327
lnPOP	.12	.754	-.04	.922
POPdens	-.01	.049	-.01	.060
	P>F=.0035 R^2=.0940 N=145		P>F=.0794 R^2=.0523 N=123	

Table VII. Probit estimates for existence of National Council on Sustainable Development variable

	Dependent Variable: Existence of NCSD			
	Full sample		***Restricted sample***	
	dF/dx	**P>|z|**	**dF/dx**	**P>|z|**
FREE-low	-.30	.002	-.31	.004
FREE-mid	-.09	.301	-.10	.343
lnGDP	.08	.012	.10	.021
lnPOP	.09	.000	.10	.000
	Combined FREE		Combined FREE	
	P-value <.0049		P-value <.0077	
	$P>chi^2$=.0000		$P>chi^2$=.0000	
	Pseudo R^2=.2105		Pseudo R^2=.1678	
	N=175		N=152	
POLIT-low	-.29	.004	-.31	.005
POLIT-mid	-.09	.327	-.10	.337
lnGDP	.09	.012	.10	.024
lnPOP	.08	.001	.08	.003
	Combined POLIT		Combined POLIT	
	P-value <.0117		P-value <.0148	
	$P>chi^2$=.0000		$P>chi^2$=.0005	
	Pseudo R^2=.1964		Pseudo R^2=.1537	
	N=153		N=130	
GOV-low	-.31	.007	-.32	.010
GOV-mid	-.20	.029	-.21	.042
lnGDP	.07	.045	.08	.073
lnPOP	.09	.000	.10	.000
	Combined GOV		Combined GOV	
	P-value <.0065		P-value <.0112	
	$P>chi^2$=.0000		$P>chi^2$=.0002	
	Pseudo R^2=.2020		Pseudo R^2=.1572	
	N=164		N=141	
VAN-autoc	-.19	.012	-.20	.016
lnGDP	.09	.004	.10	.020
lnPOP	.09	.000	.10	.000
	$P>chi^2$=.0000		$P>chi^2$=.0000	
	Pseudo R^2=.1914		Pseudo R^2=.1485	
	N=175		N=152	

Table VIII. OLS estimates for environmental information availability variable

	Dependent Variable: Number of ESI variables available			
	Full sample		***Restricted sample***	
	Coeff.	**P>|t|**	**Coeff.**	**P>|t|**
FREE-low	-4.09	.000	-4.22	.000
FREE-mid	-2.46	.000	-2.57	.000
lnGDP	2.33	.000	2.38	.000
lnPOP	1.69	.000	1.95	.000
	Combined FREE P-value <.0000		Combined FREE P-value <.0000	
	P>F=.0000 R^2=.6936 N=122		P>F=.0000 R^2=.6654 N=100	
POLIT-low	-3.76	.000	-3.79	.000
POLIT-mid	-1.78	.006	-1.80	.006
lnGDP	2.65	.000	2.65	.000
lnPOP	1.62	.000	1.85	.000
	Combined POLIT P-value <.0002		Combined POLIT P-value <.0002	
	P>F=.0000 R^2=.6798 N=122		P>F=.0000 R^2=.6419 N=100	
GOV-low	-3.91	.000	-4.15	.000
GOV-mid	-2.81	.000	-2.94	.000
lnGDP	2.35	.000	2.38	.000
lnPOP	1.76	.000	2.04	.000
	Combined GOV P-value <.0000		Combined GOV P-value <.0000	
	P>F=.0000 R^2=.6920 N=122		P>F=.0000 R^2=.6674 N=100	
VAN-autoc	-2.35	.002	-2.41	.001
lnGDP	2.70	.000	2.57	.000
lnPOP	1.64	.000	1.85	.000
	P>F=.0000 R^2=.6526 N=122		P>F=.0000 R^2=.6048 N=100	

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NOTES

[1] Namely percentage of land area under protection status and availability of environmentally relevant information.

[2] Similar results for NO_x and SO_2 emission reductions are reported in Murdoch, Sandler and Sargent (1997).

[3] For a good overview of this literature, see Panayotou (2000).

[4] In many cases greater than 1000.

[5] The results are available from this author upon request.

[6] The rather ambiguous evidence with respect to the impact of democracy and democratisation on environmental outcomes is not confined to quantitative studies, but can also be found in case studies. See, for example, Potter (1996), Earnhart (1997), Tang and Tang (1999), Walker (1999).

[7] The signs of the correlation coefficients with the freedom variable have been reversed since higher scores in the Freedom House data mean lower freedom.

[8] Some of these agreements have been concluded so recently that either no ratifications exist yet or are so few that we needed to look at signatures instead of ratifications. This is somewhat unfortunate as a country is only bound to an agreement and therefore formally committed once it has ratified the agreement, but it cannot be mended. Experience shows, however, that often countries feel bound by their signature, even if they have never ratified the agreement for whatever reason. The prime example for this type of behaviour is the United States. Ratification encompasses as well accession, acceptance or approval of an agreement.

[9] Somewhat unfortunate is a lack of an agreement more directly addressing nature and wildlife conservation. The Convention on International Trade in Endangered Species of Fauna and Flora, which would otherwise be a good candidate, has quasi-universal membership (152 parties as of 22 March 2000). Fortunately, however, two of our other proxy variables for environmental commitment are connected to nature conservation and wildlife protection.

[10] The list of organisations coded as environmental is available from the author on request.

[11] The cut-off points were chosen with a view to allocate about the same number of countries into the three different groups as is the case for the FREE and POLIT dummy variables.

[12] One might wonder whether income squared should be included as an independent variable as well to allow for a non-linear effect of income on environmental commitment. The Environmental Kuznets Curve (EKC) literature often includes such a term finding that environmental outcomes first worsen with rising income until a threshold is reached after which they improve with rising incomes. However, this non-linearity is mainly due to changes in

the sectoral composition of an economy during the process of industrialisation and there is no reason to presume that similar non-linearity exists with respect to environmental commitment. Nevertheless, in non-reported sensitivity analysis I tried inclusion of squared income. As expected, in almost all cases it tested insignificant.

[13] For a few countries, the income data stem from years earlier than 1998. The bias is likely to be very small and would not have justified taking these countries out of the sample.

[14] Total income and population cannot be used simultaneously as this would lead to perfect multicollinearity given that per capita income is another explanatory variable.

[15] An anonymous referee raised the question how the United States, which regularly fails to sign or ratify multilateral environmental agreements, fits into this proposition. In my view, the US represents a very special case. It is without doubt the foremost power in world politics and in some sense the only world power. It does not need to demonstrate its importance and therefore can easily get away with failing to demonstrate international environmental commitment. On the other hand, lesser countries with an ambition to demonstrate their importance (for example, Brazil, China, Egypt, India, Indonesia, Russia) often find themselves compelled to show commitment whether they are convinced of the environmental cause or not.

[16] For the variable "% of land area under protection" an upper limit was set equal to 25. This is because higher reported percentages seemed somewhat implausible. Again, the estimated results were very similar.

[17] The signs of the correlation coefficients with the freedom variable have been reversed since higher scores in the Freedom House data mean lower freedom.

[18] Alternatively, logit estimates could have been undertaken. The two techniques provide very similar results (Verbeek, 2000).

[19] An anonymous referee suggests that the decision to sign the Kyoto Protocol might be mainly determined by whether a country is a net exporter or importer of fossil fuels. In sensitivity analysis the net fossil fuel import position as a percentage of commercial energy use was entered as a further control variable (data taken from World Bank, 2000). While the coefficient of this variable is positive as expected and statistically significant throughout, income, democracy and population size remain statistically significant determinants for the Kyoto Protocol (detailed results not reported).

[20] Results for the full sample convey the same message with higher statistical significance.

[21] One might think that the VAN dummy fares best throughout in terms of significance. However, this dummy cannot be directly compared to the other variables of democracy, as the former is a dichotomous variable, whereas the latter are trichotomous.