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ANALYSIS

Do differences in attitudes explain differences in national climate change policies?[☆]

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ABSTRACT

In meeting the threat posed by climate change nations have responded quite differently. Using an extensive data set this study explores factors that affect individuals' attitudes towards climate change and how those attitudes ultimately affect national climate change policy. The results show that attitudes do indeed matter in implementing policy and that attitudes are shaped not only by how individuals react to the specific attributes of climate change, but also by information, by the openness of society and by attitudes toward the trustworthiness of government.

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1. Introduction

Climate change poses a potentially significant threat to modern society and because it is closely linked with current lifestyles, it is also a very contentious issue. A multitude of views characterize what should or should not be done about climate change, and some nations have done much more about climate change in the past decades than others. For example, the European Union countries have taken a lead in the development of climate change policy and emissions trading, although some will apparently have trouble meeting their reduction commitments (WBCSD, 2005). America, by contrast, as one of the world's largest economies, as well as the most energy and carbon intensive economy on a per capita basis, has yet to commit to significant reductions of green-

house gas emissions and has in fact increased emissions since 1990.¹

Why have nations responded to this challenge so differently? Do diverse national reactions reflect different attitudes towards climate change, differences in the translation of these attitudes into political action, some combination of the two or some other factors altogether? As important as these questions may be, the existing literature supplies few answers.

Climate change represents a particularly interesting and difficult area of environmental policy because it concerns a global problem involving a public good that has a long latency period between actions and consequences. Because public goods exhibit both nonexclusivity and nonrivalry, neither an individual nor a nation who helps produce a public good can take full advantage of the benefits of that production; its

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¹ http://www.eia.doe.gov/oiaf/1605/ggrpt/excel/historical_co2.xls.

production involves positive externalities. Furthermore individuals can reap the benefits of a public good without contributing to its creation, since they cannot be excluded from consuming the good—the “free rider” problem.

A global public good is particularly challenging because the benefits of its production spill over to countries and populations all over the world.² For “national” public goods, national policy intervention can, to a certain extent, correct for these externalities. For global goods, however, no national policy mechanism is sufficient, and no international organization has the force to impact change in the same way that a nation can, which makes these goods even more likely to be undersupplied.

As a policy target, climate change also has an important temporal component. While the costs of taking current action fall on the current generation, the benefits accrue much later.

To understand how these attributes and other factors affect attitudes and how attitudes, in turn, affect policies, this study employs two different models. The first model uses international survey data on individuals to empirically examine what factors matter in determining the formation of attitudes toward climate change. The second model employs macro, national-level data to examine the relationship between the attitudes of a country’s citizens and the magnitude of its action on climate change.

The economic literature to date has focused on the relationship between wealth and environmental concerns as the main determinant of behavior. Little consensus has emerged on the topic, especially since some empirical evidence (Fisher, 2004) suggests that wealth does not explain international differences in per capita emissions of CO₂.

Starting from Maslow’s 1954 “basic need hierarchy”, Inglehart (1971a) argues that once basic physiological needs, such as access to food and the need for physical safety, have been taken care of, humans begin to pursue other goals. The search for love and respect, and intellectual and aesthetic pursuits are examples of such higher needs. Inglehart (1971b) labels this concept of higher needs “post-bourgeois” values (p 991), but subsequent authors have discussed it under the term “postmaterialist values.” The postmaterialist thesis assigns the credit for rising environmental concern almost exclusively to these changing values. A corollary of this view suggests that environmentalism is a predominantly rich-world phenomenon. According to this view, developing nations haven’t yet experienced the affluence and security that are preconditions for postmaterialist values, which in turn are prerequisites for environmental concern.

This assumption has been subject to much debate and critique over the past decade. Martínez-Alier (1995) posits an alternative explanation for why rich countries may exhibit an increased appreciation for environmental resources and services, namely that their economic activities are placing an increasing burden on the environment. He calls this scenario the “effluents of affluence” (p 220), and states that if this is the case, wealth could well promote a paradoxical

increase in environmental degradation, in turn leading to rising awareness and concern for environmental issues.

Brechin and Kempton (1994) use data on grassroots environmental organizations and public opinion surveys in developing countries to argue that environmental values are not merely a product of postmaterialism. They find, contrary to the assumptions of the previous work, that people from poor countries are as concerned about environmental threats as citizens in richer countries. One of the contributing factors they identify is the first-hand observation of the dangers of environmental degradation. Humanity’s impact on the environment has become so tangible and visible in our lives that most of the worlds’ peoples witness it on a daily basis, and therefore develop a concern about it.

Other work (Kempton et al., 1995) uses extensive surveys to discern how values are translated into policy in the American context. They find, for example, that newer environmental problems (such as climate change) are less widely known and therefore more likely to tap into inappropriate cultural models, leading to erroneous conclusions about the nature of the problem.

What sets this project apart from the previous literature is not only the individual survey data on which it is based, but also the examination of how those attitudes and other societal characteristics affect action on greenhouse gas emissions that is permitted by this data set. Specifically we examine the influences of such factors as the availability and quality of information, socio-economic characteristics, political and religious values, time preferences, risk perception and trust in government.

Stern (1992) notes that individual choices merely account for a small part of the proximate causes of global environmental change, and that the study of consumer behavior thus can yield only partial knowledge about the causes of large-scale environmental change. He acknowledges, however, that “a neglected, but potentially important area for psychological research concerns the role of individuals in determining what firms, communities, and governments do to the global environment” (p 285). To our knowledge, the link between individuals’ attitudes and their countries’ actions has not been investigated in an international context and this project sheds some light on precisely that relationship.³

2. The models

For the attitudes model the data come from the *International Social Survey program’s 2000* module on the Environment, conducted in 26 countries on topics surrounding environmental concern.⁴ The participating countries are Austria, Bulgaria, Canada, Chile, Czech Republic, Denmark, Finland, Germany, Great Britain, Ireland, Israel, Japan, Latvia, Mexico, Netherlands, New Zealand, Northern Ireland, Norway, Philippines, Portugal, Russia, Slovenia, Spain, Sweden, Switzerland, and the USA. The policy model is based upon the same set of countries in order to link the attitudes data with the policy outcomes.

² Perrings and Hannon (2001) explain that a positive spatial discount rate can be rationalized by the diffusion of environmental externalities in space. They argue that preferences over space can be summarized in a rate of geographical preference analogous to the rate of time preference, and that it affects intragenerational equity in the way that time preferences affect intergenerational equity.

³ For other studies that examine environmental attitudes see Dekker et al. (1997), Fransson and Gärling, (1999), Van Liere and Dunlap (1980) and Weaver (2002).

⁴ Details of the survey can be found at: http://www.gesis.org/en/data_service/issp/data/2000_Environment_II.htm.

Since this study relies heavily on cross-national survey data, it is important to acknowledge the problem of comparability that arises from the cross-cultural nature of the survey. However, by examining correlations between survey data and known geographic factors, [Brechin and Kempton \(1994, pp 260–261\)](#) present evidence that responses to environmental surveys measure something real about environmental views. Since these kinds of responses are a key factor in this examination, it is a comforting result.

2.1. The attitudes model

The determinants of individuals' attitudes towards climate change are investigated in the following probit model:⁵

$$P(y = 1|x) = G(\text{Affinity for the global community,} \\ \text{Support for public goods,} \\ \text{Low demand for long-term goods,} \\ \text{Information, Values,} \\ \text{Socio-economic characteristics}). \quad (1)$$

In Eq. (1), the dependent variable, Greenhouse attitudes, takes on the value 1.0 for individuals who think that “a rise in the world's temperature caused by the ‘greenhouse effect’ is either extremely or very dangerous for the environment”. Respondents indicating that the greenhouse effect is Somewhat dangerous, Not very dangerous, Not dangerous at all, and those who can't choose or decline to answer are assigned a 0. The estimation turns out not to be sensitive to this specification. The independent variables involve the three attributes of the climate change problem (Affinity for the global community, Support for public goods, Low demand for long-term goods), and Information, Values and Socio-economic characteristics, which involve vectors of demographic and explanatory variables.

The variable measuring the global aspect of climate change, Affinity for the global community, is based on a survey question that asks whether or not the respondent agrees with the statement “for environmental problems, there should be international agreements that [the survey country] should be made to follow.” The variable measures a willingness to accept restrictions imposed by an international environmental agreement — a dimension that purely national policies do not need to confront. It is a categorical variable that assigns the value 1.0 to individuals who “strongly agree” or “agree” with this statement, and a 0.0 to all others.⁶ The variable is expected to be positively related to an individual's degree of concern about climate change.

The variable measuring preference for public goods, Support for public goods, is based on respondent response to the statement “It is the responsibility of the government to

reduce the differences in income between people with high incomes and those with low incomes.” A value of 1.0 is assigned to individuals who “strongly agree” or “agree” with this statement, and a 0.0 to all others. Since income inequality is used here as a representative non-environmental public good ([Thurow, 1971](#)), the expected sign would be positive—those who cared about public goods in general would be more likely to care about climate change.

The variable that captures time preferences, Low demand for long-term goods, is based on a survey question that asks about an individual's agreement with the statement “We worry too much about the future of the environment and not enough about prices and jobs today.” A value of 1.0 is assigned to individuals who “strongly agree” or “agree” with this statement, and a 0.0 to all others. Agreement with this statement reflects a low demand for long-term goods, or a high discount rate, so the sign of Low demand for long-term goods is expected to be negative.

The role of information in attitude formation is thought to have two components: general knowledge, measured by Years of education, and subject-specific scientific knowledge measured by Unfamiliarity with climate change science. [Sunstein \(forthcoming\)](#) suggests that judgments about precautions are based both on intuitive cost-benefit analysis and on what he calls the “availability heuristic” (p. 2). If the costs of precaution are high, or the benefits low, these precautions will appear less appealing. Also, if a particular risk is “cognitively available” (*ibid*), people will be more concerned about that risk.

According to Sunstein, cognitive availability depends upon both familiarity with a risk and its salience. Knowledge of a particular issue will, according to this logic, increase individuals' concerns with the issue. Salience can instead be seen as a measure of the nature of one's experiences with an issue: seeing a picture of a burning house is expected to have a smaller impact on the perceived risk associated with fires than witnessing the fire first-hand.

Following [Sunstein \(forthcoming\)](#), cognitively available risks are seen as more serious than risks that are not cognitively available. Education is expected to increase one's familiarity with a range of issues, and therefore be positively related to the dependent variable. Unfamiliarity with climate change science is designed to capture a lack of familiarity and is based upon respondents' opinions about the following statement: “Every time we use coal or oil or gas, we contribute to the greenhouse effect” (a scientifically correct statement). The variable is a categorical variable that takes on a value of 1.0 if the respondent believes the statement is “definitely or probably false”, and a 0.0 if the answer is “definitely or probably true”, thereby measuring a lack of subject-specific knowledge about the science of climate change. Ignorance about climate change is expected to decrease the familiarity with the risk, and therefore also one's attitudes toward that risk. Consequently the sign of this variable is expected to be negative.

Values are further divided into religious and political values. Religious values are represented by two binary variables: Belonging to an Abrahamic religion and Buddhism or Hinduism. The term Abrahamic religion is used here to refer to the Semitic tradition attributed to Abraham, a patriarch described in the Torah, the Bible, as well as the Qur'an. This

⁵ A probit model is an econometric model where the dependent variable takes on a one or a zero, and the coefficients on the independent variables reflect a change in the probability of the outcome associated with a change in the left-hand side variable. Probit models rule out negative or greater-than-one probabilities, and allow for a non-linear relationship between the outcome and the explanatory variables.

⁶ Other options were *Neither agree nor disagree*, *Disagree*, *Strongly disagree*, and those respondents who answered *Can't choose*, *Don't know*, or refused to answer were also assigned a value of 0.0.

variable thus takes on the value 1.0 if the respondent belongs to some form of Christianity, Judaism, or Islam, and 0.0 for other religions. According to the “White hypothesis,” (White, 1967) the dualism between humanity and nature existent in the Abrahamic religions could negatively affect environmental attitudes, resulting in a negative sign. Dekker et al. (1997) reject the “White hypothesis” and conclude that the relationship between Christian beliefs and environmental attitudes is not unique. Buddhism or Hinduism takes on the value 1.0 for individuals belonging to one of those two religions, and a 0.0 for all others. Since both of these religions reject a duality between humans and the environment, the expected sign is positive.

Political values are captured by the variable Liberal political views. Respondents are asked about their political beliefs and affiliations. The subsequent in-country analysis places them in one of a number of categories on a political left/right spectrum. Liberal political views is a categorical variable that assigns a 1.0 to individuals whose political affiliation places them in one of the following categories in the survey: “far left (or communist)”, “left/center left”, or “center/liberal”. Conversely, individuals are assigned a 0.0 if placed in the categories “right”, “conservative”, or “far right/fascist”. Based on the connection suggested by the literature⁷ between liberal political views and environmental concern, the expected sign is positive.

Socio-economic characteristics included in the model are Per capita household income, Respondent age, and Urban residence. Per capita household income is monthly household income divided by the number of people in the respondent’s household, first converted to a common currency (USD) and adjusted for purchasing power parity using data from the Penn World Tables.⁸ To test the hypothesis that concern for the environment rises with income, the expected sign for income is positive. Respondent age has generally been found in the literature to negatively influence individuals’ concerns about the environment. (Van Liere and Dunlap, 1980) We include it primarily as a control variable. Urban Residence is a binary variable that is based on respondents’ descriptions of the place where they live. It categorizes “big city”, “small city” or “town” as urban, and “farm” or “home in the country” as non-urban. The variable takes on a value of 1.0 for those individuals in the urban category, and 0.0 for the non-urban. Based on the salience aspect of Sunstein’s familiarity criterion, we hypothesize that urban residents might be more likely to have experienced pollution and other local environmental issues, thus making them more likely to consider the risks of climate change.

Table 1 presents summary statistics for the independent variables for the attitudes model.

2.2. The policy model

This analysis is based upon a linear regression model of the effect of private attitudes on changes in greenhouse gas

Table 1 – Descriptive statistics: Attitudes model

Variable	Mean	Standard deviation	Minimum	Maximum
Greenhouse attitudes	0.628	0.483	0	1
Affinity for the global community	0.898	0.303	0	1
Support for public goods	0.624	0.484	0	1
Low demand for long-term goods	0.368	0.482	0	1
Years of education	12.3	4.3	0	21
Unfamiliarity with climate change science	0.158	0.365	0	1
Belonging to an Abrahamic religion	0.599	0.490	0	1
Buddhism or Hinduism	0.016	0.127	0	1
Liberal political views	0.697	0.460	0	1
Per capita household income (\$)	1628.5	4040.3	3.0	83,333.3
Age of respondent	45.8	17.1	15	96
Urban residence	0.702	0.457	0	1

emissions, Greenhouse gas emissions_i between 1997 and 2000, in country *i*, using Ordinary Least Squares.

$$\text{Greenhouse gas emissions}_i = f(\text{Greenhouse attitudes, Time preference, Per capita GDP, Freedom of the press, Government trust, Share of coal, PRESS*ATT}). \quad (2)$$

The data for the dependent variable Greenhouse gas emissions_i come from World Resources Institute,⁹ compiled from the International Energy Agency, the Carbon Dioxide Information Analysis Center and the Energy Information Agency, and GDP data come from the World Bank¹⁰.

To counteract any omitted variable bias in the policy model a fixed effects approach was used. Since fixed effects control for all fixed factors that are shared in common by groups, in this case nations, they eliminate omitted variable bias, at least at the country level.

Greenhouse gas emissions_i is country *i*’s change in greenhouse gas emissions per GDP (in constant US dollars) in the three-year period preceding the survey years: between 1997 and 2000.

Greenhouse attitudes is the percentage of people in each country who, in the survey, report thinking that “a rise in the world’s temperature caused by the ‘greenhouse effect’ is either extremely or very dangerous for the environment.” This variable contains the global and public aspects of climate change and is

⁷ See for example, Van Liere and Dunlap (1980) and Weaver (2002).

⁸ http://pwt.econ.upenn.edu/php_site/pwt61_form.php.

⁹ http://earthtrends.wri.org/searchable_db/index.php?theme=3&variable_ID=468&action=select_countries.

¹⁰ <http://devdata.worldbank.org/data-query/>.

our direct measure of how attitudes about climate change affect policy outcomes. Since the hypothesis is that larger proportions of agreement with this view would be associated with a reduction in emissions, the expected sign of this variable is negative.

A proxy for Time preference is included in the model to isolate any separate effect that time preferences might have on policy in addition to their effect on attitudes. The Time preference variable is a measure of adjusted private savings, a proxy for private time preference, as a percentage of disposal household income. The household savings data for the time preference come from the *OECD Economic Outlook 2005*.

Recognizing that private savings is a function not only of time preference, but a host of other influences (Schmidt-Hebbel, Webb and Corsetti, 1992), an adjusted time preference variable is generated that attempts to purge the private savings data of these other influences. Specifically, private savings is regressed on the dependency ratio – the share of the total population of a country that is made up of individuals under the age of 15 or over 65 – and GDP (as a proxy for national income). The residual from this regression is used as a purer form of time preference. Since higher preferences for long-term goods would likely mirror a low discount rate, the expected sign of Time preference is negative.

Since incomes should matter, both in terms of setting policy priorities and in the availability of resources to implement those priorities, Per capita GDP (in 2000 dollars) is included in the model. Since reductions in greenhouse gas emissions are presumed to be normal goods, the expected sign is negative.

Freedom of the press is a measure created from Freedom House's reports that have been conducted for almost 200 countries over the past 25 years.¹¹ Countries are given a total score from 0 (best) to 100 (worst). "Freedom House" scores countries' press freedom on the basis of a set of 23 methodology questions, divided into three subcategories: "Legal Environment," "Political Environment," and "Economic Environment". The degree to which each country permits the free flow of news and information determines the classification of its media as "Free," "Partly Free," or "Not Free." Countries scoring 0 to 30 are regarded as having "Free" media; 31 to 60, "Partly Free" media; and 61 to 100, "Not Free" media.

In order to facilitate interpretation, however, the variable was recoded based on the original data, so that the worst score would be the lowest, and vice versa. The extent to which the press in a country is free will measure how well citizens have access to information and also their right to voice their preferences for the environment. Consistent with the findings of Barrett and Graddy (2000), a higher score is expected to lead to greater reductions in greenhouse gas emissions. Therefore we expect a negative sign.

One question from the survey asks how much trust the respondent would have in government departments to give them correct information about causes of pollution. Government trust is the percent of people who state that they would have a "great deal of trust". Whereas the previous variable measures how accessible the information is, this variable would measure how trustworthy it is. If citizens do not have faith in their governments' information about the causes of pollution, they are also unlikely to believe that their government will act in accordance with their environmental preferences. Since the transformation of citizens' attitudes into policy requires that governments act

Table 2 – Descriptive statistics: Policy model

Variable	Mean	Standard deviation	Minimum	Maximum
Greenhouse gas emissions	−0.098	0.089	−0.329	0.063
Percent who consider the green house effect dangerous	0.639	0.145	0.406	0.879
Private rate of time preference	0.000	2.707	−4.065	5.049
Per capita GDP in 2000 dollars	21,911.4	14177.3	1173.1	46,815.5
Share of total energy consumption from coal in 1990	0.208	0.144	0.014	0.630
Freedom of the press	−20.3	12.3	−60.0	−5.0
Percent who trust government information on pollution	0.243	0.105	0.078	0.519

reliably upon their citizens' preferences, the expected sign for this variable would be negative (greater reductions).

PRESS*ATT is a variable that is designed to capture the interaction between freedom of the press and attitudes. It is calculated by multiplying the PRESS variable by the ATT variable and is intended to allow the relationship between attitudes and action to be dependent on the degree of the freedom of the press. The general premise is that in the absence of a freedom of the press, attitudes have little chance of being either formed or communicated, so it would be less likely that attitudes would result in policy change. The reason for including this variable is the possibility that the effect of attitudes on policy depends upon the level of press freedom. Generally a freer press is expected to strengthen the effect of attitudes on public action, so we would expect a negative sign.

Since a country's response to climate change probably depends upon its energy situation as well as its attitudes, we have included an energy share variable.¹² Coal share controls for the share of total energy consumption in country *i* that came from coal in 1990. The choice of 1990 was dictated by the desire to use this variable to measure the energy mix at the beginning of the period being examined. The role of coal is likely to be important, but its sign is ambiguous.¹³ On the one

¹² These data come from Earthtrends, and can be found at the following URL: http://earthtrends.wri.org/searchable_db/index.php?Ftheme3D6.

¹³ We also examined the effect of the share of nuclear in a country's energy production in 1990, to capture an argument put forth by some countries with high amounts of nuclear energy. This argument suggests that treaties forcing them to reduce greenhouse gas emissions would put them at a disadvantage, because nuclear energy investments have already cut their emissions, and that reducing them further would be relatively more difficult. Since this variable turned out to have absolutely no explanatory power, it was dropped from further analysis.

¹¹ <http://freedomhouse.org/>.

hand, countries with a high proportion of coal-based energy, coupled with low substitution possibilities, could be expected to typically find it harder and more costly to reduce greenhouse gas emissions, meaning that the expected sign would be positive. On the other hand when it is relatively easy to substitute natural gas for coal in electrical generation, the sign should be negative.

Table 2 shows summary statistics for the policy model.

3. Results

3.1. Determinants of climate change attitudes

Table 3 shows the results for the fixed-effects probit model with greenhouse attitudes as the dependent variable. The coefficients of all variables are statistically significant and of the expected signs, apart from the religion variables and per capita income.

A higher level of education is associated with a higher probability of expressing concern about climate change. This was the expected result. One additional year of education at the mean results in an increase in the probability of thinking that the greenhouse effect is dangerous.

Also as expected, the probability that urban residents are concerned about climate change is higher than for their rural counterparts.¹⁴

Being unfamiliar with climate change science has the single largest effect on the probability of being concerned about climate change: the probability of being concerned is .21 lower for individuals who respond incorrectly that using coal or oil or gas does not contribute to the greenhouse effect. This finding coincides very well with the theoretical predictions of the model: individuals who are unfamiliar with a specific risk tend to be less likely to associate the risk with something that requires precaution.

One surprising result is the fact that household income, although statistically significant, appears to be negatively related to individuals' attitudes. This is not the sign we expected. It is possible that these results are consistent with Steininger's (2002) findings that concern for geographically distant effects decreases with income. The Steininger effect might work against the typical expected wealth effects, in this case outweighing the income effect and resulting in a negative overall effect. It seems as though the unique attributes of climate change complicate the role of income.

The three attribute variables (the first three variables in Table 3) also turn out to be important determinants of attitudes toward climate change and all have the expected sign. In particular, respondents' demand for global goods matters a great deal: individuals with an affinity for the global

Table 3 – Probit regressions for greenhouse attitude

Independent variable	Fixed effects model
Affinity for the global community ^a	0.140*** (0.058)
Support for public goods ^a	0.062*** (0.032)
Low demand for long-term goods ^a	–0.092*** (0.032)
Years of education	0.005*** (0.004)
Unfamiliarity with climate change science ^a	–0.209*** (0.040)
Belonging to an Abrahamic religion ^a	–0.005 (0.035)
Buddhism or Hinduism ^a	0.024 (0.155)
Liberal political views ^a	0.080*** (0.033)
Per capita household income	–0.024*** (0.020)
Age of respondent	–0.002*** (0.001)
Urban residence ^a	0.034*** (0.033)
	n = 8934 Pseudo R ² = 0.1227
Notes:	
The above coefficients are the <i>marginal effects</i> of the independent variables on the probability of believing that the greenhouse effect is dangerous.	
Standard errors in parentheses.	
^a Coefficient is for a discrete change of the dummy variable from 0 to 1.	
*** 99% significance.	

community have a probability of being concerned about climate change that is .14 higher than those who do not. In general, this model strongly supports the expectation that the individual attributes of climate change do in fact matter in attitude formation.

Although the religious beliefs variable has the correct sign, it is not statistically significant. Liberal political values do, however, increase the probability of being concerned about climate change by .08. The lack of significance of religious beliefs may or may not be surprising to the reader. Religious beliefs have been discussed intensely, but no consensus has been reached on their importance. Because the variation in religious beliefs is so heavily correlated with the countries, it is difficult to isolate the separate effects of religious beliefs in a fixed-effects model. For the purposes of this analysis the distinction is not of primary importance, but interesting to note.

3.2. The robustness of the model

These results are robust to a number of changes in the model specification. In the results in Table 3, the dependent variable is constructed from an answer with ordered categories (the greenhouse effect is extremely dangerous, very dangerous, somewhat dangerous, etc.), and takes on the value of 1.0 if the respondent considers the greenhouse effect extremely or very dangerous for the environment. This construction implements our initial belief that belonging to the group of people who are

¹⁴ When the country fixed effects are not included, the years of education variable exhibits an unexpected sign, which implies that the education variable is picking up some systematic country differences that the fixed effects model controls for. In addition, urban residence is not statistically significant in the model without fixed effects. Both these results seem to confirm the decision to use a fixed effects model.

concerned about the greenhouse effect is more important than the relative differences between answering extremely or very dangerous. The outcomes are consistent, however, if an ordered probit model is employed. They are similarly consistent if the dependent variable is recoded to take on a 1.0 only for individuals who indicate that the greenhouse effect is extremely dangerous, or if respondents who think the greenhouse effect is only somewhat dangerous are included. The only significant change is that Years of education is slightly less significant when the dependent variable only includes those respondents who think that the greenhouse effect is extremely dangerous. Similarly, all coefficients of binary independent variables in Table 3 are based on the respondent agreeing or strongly agreeing with the statement in question, but the results are robust if these variables are recoded. In other words, the results are insensitive to discretionary coding choices.

3.3. Explaining differences in national policy outcomes

The previous model established a number of political, socio-economic and demographic determinants of environmental attitudes. We now turn to the question of whether environmental attitudes matter in the implementation of national policies. If so, what factors affect the degree of influence? Even though the formation of attitudes is a fascinating topic in and of itself, it would certainly carry much more weight if we had some evidence that individuals' attitudes actually have an impact on the ways countries behave with regard to environmental issues.

Table 4 shows the results from the OLS regression of countries' changes in greenhouse gas emissions in the three years preceding the ISSP survey. Column 1 shows the results of a basic model. Column 2 shows the preferred model, which includes variables measuring freedom of the press and the

percentage of people in a country who trust government information on pollution, as well as an interaction term between the level of press freedom and environmental attitudes.

Overall, given the number of observations and the fact that the data are cross-sectional, the fit of the equation is noteworthy, and several of the theoretically important variables are statistically significant with the expected signs. Briefly, individual concerns about climate change in a country are significantly associated with lower greenhouse gases. A one percentage-point increase of people in a country who think that climate change is an important issue is associated with a .49 percentage point reduction in greenhouse gas emissions. Keeping in mind that the mean reduction in the sample over the three-year period is 9.8%, that is a significant reduction.

The variables Press freedom and the interaction term between Press freedom and Greenhouse attitudes are jointly significant and, the marginal effect of attitudes is negative over all values of Press freedom. This implies, as expected, that the magnitude of the marginal effect of environmental attitudes depends upon the level of press freedom in a country; all other things being equal, greater press freedom leads to larger reductions in greenhouse gases.

Also, the percentage of people who trust government information on pollution has a significant effect on greenhouse gas emissions. A one percentage-point increase in the share of people who trust their government is associated with a .34 percentage-point reduction in emissions.

Underlying structural differences also seem to matter in determining how successful a country is in reducing greenhouse gas emissions, since the share of energy consumption from coal turns out to be a crucial predictor of that success — a one percentage-point increase in the share of coal is associated with a .38 percentage point reduction in greenhouse gas emissions. It seems as though coal, rather than making it hard for countries in this data set to reduce their emissions, provides them with a window of opportunity for relatively low cost fuel switching, substituting other available technologies for coal in electrical generation.

Significantly, it appears from these results that attitudes *do* matter in the implementation of national policy, but that they are not the only important category of influential factors, and they certainly do not operate in isolation. Different kinds of democratic channels also matter a great deal in how these attitudes affect policy — the access to a free press, and the existence of a government that you can trust — seem to be vital pieces in the puzzle. Beyond the kind of information citizens have access to and no matter what the underlying preference structure, it is important that the government can be trusted. Perhaps a government that is not believed to supply trustworthy information on such basic issues as pollution is likely to fail its population on fulfilling other duties too.

Interestingly the per capita GDP of a country does not appear to matter in this specification. Since most of the economic literature to date has focused on the importance of country-level wealth in determining the degree of environmentalism, we consider this further below.

Time preference also turns out to have the wrong sign, but is statistically not significant. This was a surprise to us, since we suspected that differences in time preference could explain differences in policy, especially for a policy like

Table 4 – OLS regressions for greenhouse gas emissions

Independent variable	Simple model	Preferred model
Greenhouse attitudes	−0.304 ^a (0.087)	−0.490 ^b (0.301)
Time preference	0.012 ^c (0.005)	0.006 (0.004)
Per capita GDP	−0.00000306 ^c (0.000)	−0.00000152 (0.000)
Share of total energy consumption from coal in 1990	−0.311 ^{a, d} (0.093)	−0.378 ^{a, d} (0.083)
Freedom of the press		0.030 ^c (0.012)
Government trust		−0.339 ^c (0.160)
PRESS*ATT		−0.053 ^c (0.020)
	n=18 Adjusted R ² =0.588	n=18 Adjusted R ² =0.744

Note:

Standard errors in parentheses.

^a 99% significance.

^b 90% significance.

^c 95% significance.

^d Significance from a two-tailed t-test.

climate change, where the effects of the policy take a long time to be felt. How robust this finding is we leave for future studies to determine.

4. Discussion

4.1. National policy

The most striking result of this study is the fact that individuals' attitudes towards climate change are in fact associated with lowered greenhouse gas emissions, and that democratic institutions and structural conditions have important functions in translation of those attitudes into policy.

As far as we can tell no other study has investigated the effect of individuals' attitudes on national climate change policies, and the finding that attitudes about climate change matter is an important one for anyone who takes an interest in climate change issues, attitude formation, or the implementation of national policy.

The fact that the role of attitudes is mediated by the nation's democratic institutions also has important implications for policy. Given the significance of the interaction term between press freedom and attitudes, if a nation has a free press, the attitudes of its citizens are much more likely to be translated into action. This may be because a greater variety of information and more diverse ways of expressing one's opinion are available to citizens in countries with a freer press. A freer press in this context entails not only minimal political control over the content of news media, but also the existence of legal and constitutional guarantees for freedom of expression, and even how media ownership is structured.

Additionally, the results show that in countries in which citizens have a higher level of trust in information supplied by their government, reductions of greenhouse gas emissions are larger. It is not only the amount of information that is supplied that matters, but also its credibility.

The result that countries with a higher historical reliance on coal for energy production have been more successful in reducing their greenhouse gas emissions suggests that if substitutes are available, countries are much more likely to switch from dirty production processes (involving more greenhouse gas emissions) to cleaner ones. It is important, however, to keep in mind that our sample is drawn mainly from OECD countries, and the wealth of a country may well affect the resources that the countries have available to them in terms of finding substitutes or switching technologies. Knowing whether wealth does indeed matter could be important, as confirmation of this conjecture could provide a powerful incentive to invest in technologies that may provide developing countries with more easily available clean alternatives.

Most researchers who study attitudes, perceptions and preferences do so because they sense that what people believe matters beyond the individuals' lives. To our knowledge, little, if any, research has been carried out investigating the extent to which attitudes about environmental protection actually matter, particularly on a national level, for policy. The finding that people's attitudes do matter is therefore potentially quite important as countries investigate strategies for reducing greenhouse gas emissions.

4.2. Individual attitudes and behaviors

Having established that attitudes are in fact an important component in how effective national policies are in reducing greenhouse gases, a better understanding of the factors that influence these attitudes offers the opportunity to think about ways of influencing attitudes.¹⁵

From the analysis of the determinants of individual attitudes toward climate change, several intriguing results emerge. It seems clear that individual demographic characteristics are, as expected, important predictors of environmental attitudes, but the characteristics of the environmental good in question do matter. A person's preferences for the specific and somewhat unique attributes that characterize climate change turn out to be important determinants of their concern for climate change. People who express a disregard for consequences occurring far in the future are less likely to be concerned about climate change. Similarly, having a high demand for global, public goods in general increases the probability that people will be concerned about climate change.

The finding that attributes matter is important not only for policy, but also for the practice of environmental valuation. One of the debates surrounding the use of environmental valuation methods for policy decision-making concerns the validity of the conclusions drawn from such examinations. Since both the conjoint and hedonic approaches to valuation of the environment assess consumers' values of environmental goods based on the characteristics of that good, support for the link between attributes and preferences reinforces the increasing emphasis being placed on those techniques. From a policy perspective, support for this link between attributes and attitudes also implies that influencing people's preferences about certain issues may have implications for their preferences regarding other goods that exhibit similar characteristics. Since the degree to which that is true remains to be established, we leave that for future studies.

This research also provides an empirical confirmation of the importance of Sunstein's concept of cognitive availability as it relates to both attitudes about and actions taken to reduce the risk of climate change. In this study, variables have been included to capture not only respondents' familiarity with the risk, but also the salience of the risk, measured by where respondents live. Both seem to matter.

The fact that urban residency matters, even after controlling for educational and income differences, lends support to the idea that the immediacy of environmental risks appears to have greater weight than even household income.

The negative sign on income raises questions. On the one hand, according to standard economic theory, an increase in income would lead to an increased demand for normal goods, such as environmental services.¹⁶ On the other hand, Steiner's findings imply that higher income groups are less likely to be concerned about risks that impose spatially distant environmental effects. The reason for and importance of this

¹⁵ Although economists usually consider preferences as exogenous, increasingly the profession is beginning to acknowledge that they may be endogenous. For one example of a model that makes time preference endogenous see [Becker and Mulligan \(1997\)](#).

¹⁶ For "normal" goods demand increases when income increases.

reversed income effect warrant some further thought, and future research might investigate whether income differences occurring over time rather than in cross-sectional samples also are compatible with lower preferences for distant environmental goods.

Whereas general education has an important effect on promoting environmentalism, ignorance about the specific science behind climate change diminishes individual concern in that specific area. Individuals who are unfamiliar with the particular risks involved are less likely to associate it with something that demands action.

From a policy perspective, this finding has a number of important implications. First, education matters. The more we know about the world around us, the more likely we are to care about important risks facing the planet and humanity. But in the case of climate change, general education is not enough. For a scientifically complex subject such as this, the type of education also matters; while general education has a role, focused education is also important.

Interestingly, the age hypothesis also finds support in this study. We find, as have others, that older people are less likely to be concerned about climate change. On the one hand this may be simply due to the fact that climate change impacts take a long time to be manifested and older people have a higher probability of not being around when those consequences occur.

Other explanations exist in the literature, however. Since some of the solutions proposed to halt climate change could be considered threatening to the prevailing social order and current lifestyles, older people, who are more integrated in that order, are thought to be less willing to accept the consequences. (Van Liere and Dunlap, 1980; Fransson and Gärling (1999)) If we accept this explanation, we will also note that the status of solutions to environmental problems in the media and in political discourse becomes crucial to its acceptance by different age groups. Integrating environmental issues into a more mainstream dialogue, and presenting solutions that would be acceptable to different groups within society could be good strategies for increasing their support.

The same is true for political orientation. Whereas religion does not seem to play a role in determining environmental attitudes, political views do matter. This finding suggests that some earlier results for the United States (Greeley, 1993) have a wider applicability. The fact that individuals exhibiting liberal political values are much more likely to demonstrate environmental concern could be seen as support for the link between liberal political views and postmaterialist values that has been proposed in the literature. (Brechin and Kempton, 1994) Another reason for this might be that, at least for the period under study in this research, the attributes of climate change became closely intertwined with political ideologies.

Since attitudes toward public and global goods are so important in the formation of one's attitudes on climate change, and therefore also nations' policies, they will also be closely associated with people's beliefs about the role of government and of international organizations. All of this suggests a need to do a better job of presenting environmental issues in a nonpartisan framework, as they are problems that will affect all humans, regardless of political orientation.

Although no clear patterns become apparent that can explain all of the sample countries' behavior or their respective

decisions to sign or not to sign the Kyoto protocol, the results of the model are of some use. The US, for example, the largest emitter of greenhouse gases in the period covered by this study, has yet to sign the Kyoto protocol or commit to any significant reductions. Can the model shed any light on why the United States lagged behind other nations in its approach to controlling climate change?

4.3. Applying the model to the United States

Some of the results are intriguing. For example, the percentage of people among the US respondents who report concern about climate change is below the mean in the sample. In looking beyond this finding we also note that United States' respondents were below the mean in the percentage of people who trust government information on pollution and in the rate of adjusted private saving, indicating a higher rate of private time discounting than other countries.

Another intriguing result is that US respondents were also below the mean in familiarity with the science behind climate change, despite being above the mean in years of education. Why would a country with higher mean levels of education be less informed about climate change?

One possibility, advanced by Ross Gelbspan (1998), is that US citizens have been subjected to a disinformation campaign designed specifically to sow confusion about the science. Another possibility, advanced by McCright and Dunlap (2003), was the ultimately successful movement by conservative think tanks, in cooperation with climate change skeptics and facilitated by the 1994 Republican take over of Congress, to characterize climate change as a "non-problem" in the United States. If these views are accurate characterizations, the strategies apparently worked, at least in the United States.

One of the biggest obstacles for activism, or even getting citizens to vote in their countries' elections, is a severe coordination failure. Most individuals don't think that they can make a difference. Because they don't think they can make a difference, their belief becomes a self-fulfilling prophecy. This study provides some compelling evidence against this crippling idea that individuals don't matter. Individuals' attitudes do have an effect on countries' policies, even on something as complicated as climate change policy. This, if anything, is an empowering finding — what citizens believe does matter.

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