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Martin Halla
Friedrich G. Schneider
Alexander F. Wagner

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Martin Halla
University of Linz and IZA

Friedrich G. Schneider
University of Linz, CESifo, CREMA and IZA

Alexander F. Wagner
University of Zurich and Harvard University

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IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0
Fax: +49-228-3894-180
E-mail: iza@iza.org

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ABSTRACT

Satisfaction with Democracy and Collective Action Problems: The Case of the Environment*

Using modern methods for analyzing multi-level data, we find that, by and large, citizens of OECD countries are more satisfied with the way democracy works in their country if more environmental policies are in place and if environmental quality is higher. We also document that parents care about carbon dioxide emissions more than non-parents and that those with a high willingness to pay for environmental quality deplore intervention through government policies.

JEL Classification: K32, P16, Q21, Q28

Keywords: collective action problems, environmental economics and policy, satisfaction with democracy

Corresponding author:

Martin Halla
Department of Economics
Johannes Kepler University of Linz
Altenbergerstr. 69
A-4040 Linz-Auhof
Austria
E-mail: martin.halla@jku.at

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1 Introduction

In this paper we study how the resolution of an important economic problem – ensuring high environmental quality – plays a role for how citizens perceive the quality and performance of the economic and political system they live in. There is a lot of public discussion about the importance of environmental issues, and it is evident that there is a greater popular awareness for environmental problems today than some decades ago. What is much less known, however, is: Just how important is the environment to individuals' perception of the performance of the regime they live in, taking into account that individuals also want to achieve other, potentially conflicting goals such as economic prosperity? Answering this question is critical because most environmental policies are costly. Therefore, their ultimate acceptance will hinge on the economic value the public assigns to such policies.

Our approach to make progress on this question begins with the observation that collective action problems, by their nature, tend to require collective solutions. Even though most individuals recognize the social benefits of enacting certain (market-based or rules-based) environmental policies, individual considerations are likely to speak against such policies. In economic terms, the marginal social benefits of adopting environmental policies outweigh by far the marginal individual benefits (even though the latter vary across individuals). Importantly, rational individuals are aware of this wedge between what they know would be good for society, and what the optimal individual course of action is. Thus, they know that environmental quality tends to be undersupplied. Consequently, the main hypothesis that we test is that citizens yearn for an effective resolution of this dilemma. Because solutions are available only through a broad consensus on policies, we recognize that the success a country has at tackling collective problems like the environment is a matter, among other things, of how well a political system works. Therefore, we operationalize the research question by asking more specifically: Are citizens more satisfied with the way their political system works when environmental quality is higher and/or more environmental policies are established? And how much do they care compared to other goals, such as personal or country-wide economic welfare?

To answer these questions, we choose as the dependent variable a direct measure of citizens' views on the performance of their respective countries. This measure is 'satisfaction with democracy' (SWD), a survey measure which is available for a wide range of countries. Satisfaction with the way democracy works is not an indicator of system legitimacy *per se*. Rather, it is one indicator of support for the performance of a democratic regime widely used in political science. Survey measures such as life satisfaction and happiness are very popular in economic research (see, among many others, Alesina, Di Tella and MacCulloch (2004), Blanchflower and Oswald (2004), Frey and Stutzer (2002), Gruber and Mullainathan (2005), Ng (2003), Oswald (1997), Di Tella, MacCulloch and Oswald (2003), and Winkelmann and Winkelmann (1998)). By contrast, SWD has hitherto not been broadly applied by economists, despite comparable validity and usefulness (Linde and Ekman, 2003); a recent exception is Wagner, Schneider and Halla (2008). SWD does not attempt to capture whether people support the principles of democracy, but rather how they judge it to work in practice in their concrete experience. It is a summary indicator (Clarke, Dutt and Kornberg, 1993) that measures satisfaction with 'the constitution in

operation' (Klingemann, 1999).[1] As explanatory variables for SWD (besides standard individual and country-level economic controls) we use a broad array of environmental policy and quality variables. We calculate our estimates of the effect of these country-wide environmental variables on individual satisfaction with the best available econometric method.

We find that environmental quality and policy matter to citizens in statistically and economically important ways. Higher environmental quality and more comprehensive environmental policy are associated with higher satisfaction with democracy. For instance, a reduction of CO_2 emissions by one ton per capita (the sample mean being about 9 tons per capita) increases SWD by the same amount as shifting a citizen half a point up on the 10-point income scale. Similarly, the introduction of an additional environmental policy measure (such as a general environmental act) is on average associated with a rise in SWD equivalent to an increase in GDP per capita of $1,000. The positive effect of environmental quality and policy holds irrespective of the inclusion of environmental taxes (which have no significant effect) and expenditures (which tend to have a negative effect). Our findings are robust to numerous controls on the country level and the individual level, including environmental preferences. We also present evidence that parents are more worried about high carbon dioxide emissions than non-parents, and that the SWD-enhancing effect of environmental policy is lower among citizens with a *high* willingness to pay environmental taxes.

Other methods have been and could be employed to answer the question of how important the environment is to individuals. For example, the rise of green parties in many democratic countries indicates the increasing importance of environmental issues, and so tells us something about the cross-country and time-series variation of environmental concerns. Still, in most countries, the green parties receive only a fairly small number of votes in elections, and they have only occasionally entered government. Moreover, votes for green parties are a highly noisy measure of the importance of environmental issues to citizens, because individuals care about a broad array of policy issues, but can only vote for one party.[2] Rather than voting in the booth, people can also vote with their feet (Tiebout, 1956). Banzhaf and Walsh (2008) find support for this notion in a study of how population densities in neighborhoods change when air quality changes.

Our results can also be interpreted as complementary to the existing, rich literature in economics that has addressed the economic value of specific environmental amenities. Freeman (1985) and EPA (2000) provide overviews of methods to measure how individuals value features of the environment that they use, as well as those that they do not use. Standard methods include, on the one hand, revealed preference methods and hedonic pricing (Viscusi, 1993; Bockstael, Hanemann and Kling, 1987; Rosen, 1974), including those based on recreation demand estimation (Bockstael and McConnell, 1983; Morey, Rowe and Watson, 1993), as well as, on the other hand,

[1] Some work following Anderson and Guillory (1997) has considered political system determinants of SWD, but so far no study has considered the implications of specific policy measures. See Canache, Mondak and Seligson (2001) for a critique of SWD and Anderson (2005) for a response.

[2] A vote share of 10 percent for a green party can, for example, indicate (a) that 10 percent of the population care about environmental issues, (b) that 10 percent of the population prefer the other policies of the green party even though these voters actually do not care about environmental policies, or (c) that in fact all of the population care about the environment, but not enough to vote for the greens. Controlling for the various other influences is not easy.

stated preference methods.[3] The latter set of methods, also known as contingent valuation, has occasionally been under severe criticism from economists (Mitchell and Carson, 1989; Portney, 1993; Hanemann, 1994; Diamond and Hausman, 1994).

Our dependent variable is also a survey measure, and as such it is, in principle, subject to the same criticisms as any survey. However, in stark contrast to contingent valuation approaches, the subjects we study answered the questions about their SWD independently of a specific policy context. Thus, our approach does not require that the respondents are aware of any cause-effect relationship. It is not even necessary that respondents know the level of environmental quality. Therefore, our approach is cognitively less demanding than contingent valuation and whatever relationship we find cannot be caused by strategic answers.

Perhaps closest to our study are some economics papers that have studied environmental quality (but not policy) as a determinant of *happiness*. Happiness is measured in these studies as individual life satisfaction. This is, of course, an important dimension, but it is distinct from satisfaction with the way democracy works. One line of work has considered specific environmental amenities. For example, Van Praag and Baarsma (2005) use the happiness approach to value airport noise. A second line of work studies broader environmental measures. Welsch (2006) presents evidence that air pollution such as nitrogen, particles, and lead is negatively associated with subjective well-being for ten European countries (see also Welsch (2002)). Welsch (2007) expands the analysis to a cross-section of 54 countries and calculates the marginal rate of substitution of income for abatement. Rehdanz and Maddison (2005) examine the relationship between climate and happiness in an empirical analysis using data of 67 countries. They find that happiness increases with higher mean temperature in the coldest month and decreases with higher mean temperatures in the hottest month as well as that it decreases with a bigger number of months with very little precipitation. Finally, Ferrer-i-Carbonell and Gowdy (2007) study the relationship between subjective well-being and individual environmental attitudes. Using individual-level British data, they find that concern about ozone pollution affects individuals happiness negatively, while concern for species extinction affects subjective well-being positively.

Our findings on environmental quality are broadly consistent with these studies. However, our results add to the existing literature in four important dimensions. First, this is the first study, to the best of our knowledge, to consider satisfaction with democracy as a measure of how much individuals care about the environment. Because environmental problems are by their nature collective problems, a measure of perceptions of the quality of the constitution in operation provides insight in addition to measures of individual well-being. Second, no study has evaluated the relationship between environmental policy measures and any satisfaction variable. Policies and quality may be related, but there may important time lags, and citizens' evaluation of the effectiveness of the political system should take into account whether the right policies are in place. Third, we estimate a multilevel (or hierarchical) model that explicitly models our two-level data structure (individual and country). Economists studying the effects of state polices and institutions on individual outcomes (such as subjective well being) have long been aware that applying standard OLS can result in underestimation of standard errors (Moulton, 1990). To ad-

[3]More specific methods are available for some environmental amenities; e. g., real options can be used to value forestry investment (Insley, 2002).

dress this, some researchers have used averaged data. However, this assumes homogenous policy effects, reduces the degrees of freedom substantially, and requires the cardinality of satisfaction scores, making it a less than ideal method for the question under study. A much more powerful approach is to account for the presence of clustered data by calculating robust standard errors. We instead employ a multilevel model that explicitly models the error terms in the equations, thus yielding different point estimates, not only different standard errors. Fourth, the richness of our dataset and the multilevel analysis allows us to test for, and find, policy effects that are heterogenous across individuals.

The rest of the paper is organized as follows. Section 2 presents hypotheses, describes the data, and discusses how our method differs from, and hopefully improves on, approaches employed in related studies. Section 3 presents the main quantitative findings, and Section 4 deepens the analysis by studying heterogenous policy effects. Section 5 concludes.

2 Hypotheses, data, and methodology

We begin by deriving our hypotheses. We then discuss our dependent variable. Then, we present our key explanatory variables, and our controls. Finally, we describe our estimation strategy.

2.1 Hypotheses

We test two simple ideas. Economic theory suggests that collective action problems are never fully resolved. In particular, public goods such as environmental quality will generally be undersupplied, i. e., social marginal benefits will be greater than the social marginal costs even when individual marginal benefits and costs are already equated. Thus, even though there are personal costs of improving the environment, people will generally expect that overall, more environmental quality is part of a better-functioning democracy. Therefore, we hypothesize that higher environmental quality leads to greater satisfaction with democracy. Citizens may also expect from the 'constitution in operation' that it allows the government to provide (at least partially) effective ways towards a resolution of the collective action problem. Thus, we also test the idea that environmental policy is generally seen as an important aspect of a well-functioning democracy and will, therefore, also lead to more SWD. In sum, our two core hypotheses are:

> *Core Hypothesis 1:* Countries with more environmental policy experience higher SWD.

> *Core Hypothesis 2:* Better environmental quality is associated with higher SWD.

2.2 Data

All our data, including the hand-collected items, will be available to other researchers upon publication of this study. Detailed information on all data used can be found in the Data appendix.

2.2.1 Dependent variable

The dependent variable of our empirical analysis is a measure of SWD on an individual-level. We observe data from the third wave of the European and World Values Survey (E/WVS). This survey contains information on basic attitudes, beliefs and human values covering religion, morality, politics, work and leisure. In particular, respondents are asked 'On the whole are you very satisfied, rather satisfied, not very satisfied or not at all satisfied with the way democracy is developing in our country?'. We have information on more than 27,000 respondents from 24 OECD-member countries. The surveys were conducted within the time span from 1997 to 2001. Table 1 gives an overview of the number of observations over years and countries.[4] There is substantial variation across countries in terms of the overall, average level of SWD (see Figure 1). Luxembourg exhibits the highest SWD in the whole OECD, with a mean of 2.94. Austria, Denmark, the Netherlands and Canada (all values above 2.7) also do very well in terms of satisfying their citizens' expectations towards democracy. Most of the large economies, such as the United States, Germany and Great Britain have values above the OECD average of 2.49. France and Japan, however, are below average. The group of countries with the highest levels of average dissatisfaction (values below 2.3) are Italy, Czech Republic, Mexico, Hungary, Slovakia, and Turkey. As we explain in separate sections further below, our results are generally not driven by the least satisfied countries.

2.3 Environmental variables

We collect information from different sources in order to capture **environmental policy** with different measures: (i) the existence of a wide array of certain policy measures, (ii) revenues from environmental taxes as percentage of GDP, (iii) public expenditure on the environment as percentage of GDP, (iv) and the share of votes for green parties. Descriptive statistics are in Table 2.

Information on the existence of certain policy measures to protect the environment are collected from Binder (2002). These policy measures essentially cover the full spectrum of environmental regulation: from subsidies for renewable energy to environmental ministries, from environmental labels to the existence of a nature conservancy act.[5] We employ this information in two ways in our multilevel analysis below. First, we define for each policy measure a binary variable which is equal to one if a country had implemented this measure in a given year. For example, the

[4] As is apparent from the table, the dataset is largely cross-sectional. Ideally, we would have a true panel data setup, such as (Gruber and Mullainathan, 2005), which would then allow us to apply a differences-in-differences approach, like (Bertrand and Mullainathan, 2004), and . Unfortunately we face a tradeoff that we cannot overcome between the number of countries and the number of available years. For example, data from more years is available in the Eurobarometer, but for far fewer countries.

[5] We read this information from the tables and graphs in Binder (2002). The full list of the 21 available policy measures is as follows: quota for electricity from renewable energy sources (REG-quota), energy/CO_2 tax, packaging rules, sustainability council, subsidy for electricity from renewable energy sources (REG-subsidy), energy efficiency labels, environmental plan, ecolabels, environmental office, environmental expert council, general environmental act, environmental reporting rules, waste disposal act, environmental protection as a constitutional goal, nature conservancy act, soil protect act, environmental impact analysis, water protect act, clean air act, environmental information act and ministry of the environment. A detailed description of each policy measure is available upon request, but in most cases the variable names are self-explanatory.

variable energy/CO_2 tax is equal to one when a country had implemented an energy tax in a given year and zero otherwise.[6] Second, we calculate a *summary measure*, which is simply the number of all implemented policy measures in a given year. It encapsulates the degree to which a country has established a comprehensive set of environmental policy measures. It is apparent from the descriptive statistics in column 1 of Table 2 that there is a tremendous variation in the implementation of environmental policies across OECD member countries. The Netherlands had implemented all 16 policy measures by 1999. Turkey comes in at the bottom of the ranking, registering only 5 measures in 2001.[7]

The data on revenues from environmental taxes as percentage of GDP are from the joint database of the OECD and the *European Environment Agency on Instruments Used for Environmental Policy and Natural Resources Management* and data on the public expenditure on the environment as percentage of GDP are primarily from the the OECD database. Columns 3 and 4 of Table 2 provide an overview for these two variables. Notably, the level of public environmental expenditure is lower throughout than the revenues from environmental taxes. The revenues from environmental taxes as percentage of GDP are in a range from 1.03% (United States) to 5.19% (Denmark). Of course, the capability of tax revenues (alone) to capture the degree of environmental friendliness is limited. For instance, low revenues can either be due to little use of environmental taxes, or due to a broad and effective use of such taxes, where high tax rates have altered the citizens' behavior. However, when we employ this variable below, we control for other environmental policy measures, allowing us to draw *ceteris paribus* conclusions.

Finally, we are interested in the relation between the share of votes for green parties and the level of SWD. We want to explore the effect of green parties on SWD with and without controlling for other environmental policy measures. In this case we have *a priori* no clear hypothesis.

As Table 3 shows, our environmental policy measures are moderately positively correlated, with exception of environmental taxes and environmental expenditures (-0.170) and share of green votes and environmental expenditures (-0.062).

To measure **environmental quality** we use data on (i) emissions[8] and on (ii) road network and traffic. In particular, we use data from the *OECD Environmental Data, Compendium 2004* on emissions of sulphur oxides (SO_X), nitrogen oxides (NO_X), carbon monoxide (CO), volatile organic compounds (VOC) and carbon dioxides (CO_2). The main human sources of SO_X are burning fossil fuels, smelting and paper manufacture. SO_X emissions cause adverse effects on respiratory systems of humans and animals, and damage to vegetation. In particular, they con-

[6] We exclude the variable measuring the existence of an environmental impact analysis since it takes on the value one for each country. Moreover, we exclude the measures water protection act and clean air act since Iceland is the only country which has neither a water protect act nor a clean air act. We have also excluded the environmental policy measures environmental information act and ministry of the environment. Only Poland and Turkey do not have an environmental information act and only Japan and the USA do not have a ministry of the environment. The exclusion of these two variables helps convergence and speeds up the estimations.

[7] We also repeated all estimations with the variable summary measure 2, see column 2 of Table 2, that also includes the five measures (environmental impact analysis, water protect act, clean air act, environmental information act and ministry of the environment) which we exclude in our binary variable approach (see below). The results are not sensitive to the choice of the summary variable. These results are available upon request.

[8] Ideally, one would like to use the actually relevant impact for individuals. To the extent that we find emissions to be negatively associated with SWD, this effect, therefore, also captures the positive non-use value of lower emissions.

tribute to acid deposition and thus have negative effects on aquatic ecosystems. NO_X emissions – mainly due to the burning of fossil fuels at high temperatures – play an important role in the production of photochemical oxidants and of smog, and contribute, together with SO_X, to acid precipitation. CO interferes with the absorption of oxygen by red blood cells an cause adverse health effects. Emissions of VOC are considered, along with NO_X, to be the main precursors of photochemical air pollution. Finally, man-made CO_2 emissions are mainly due to burning of fossil fuels. The *World Health Organization* reports that the atmospheric concentration of CO_2 has increased by more than 30 percent since pre-industrial times. This disturbs the balance of the earth's radiative energy budget and is associated with an increase in the earth's surface temperature and related to effects on climate, sea level rise and world agriculture. CO_2 contributes the largest share to global warming (OECD, 2004).

Our descriptive statistics in Table 4 (columns 1 to 5) show that the United States and Canada are the biggest emitters among the OECD-member countries. These two countries can be found in the top three in every category. Of course, the ranking is correlated with a countries' economic output. Poorer countries such as Mexico and Turkey have lower level of emissions. Japan, Germany, and the Netherlands are examples of richer countries with remarkably low levels of emissions in every category, except CO_2. Sweden and France score very well in terms of low CO_2 emissions.

Arguably, traffic plays a major role in day-to-day perceptions of environmental quality. To capture the road network and quality of car traffic we employ the following variables: total length of the road network, length of the motorways, the stock of passenger cars in use and the stock of other motor vehicles in use (see Table 4 columns 6 to 9). This information is collected from the *OECD Environmental Data Compendium*.

2.4 Control variables

2.4.1 Country-level

To control for various determinants of SWD other than environmental factors, we employ a set of economic control variables. Our hypothesis is simple:

> *Hypothesis 3:* Better economic performance is associated with higher SWD.

As proxies for the overall economic performance we use data on GDP per capita, GDP-deflator and unemployment rates. Beyond these variables, it is questionable which economic variables we should control for. After all, hardly any non-economist would seem to care directly for government debt (except perhaps in extreme cases) or openness, to give but two examples.

2.4.2 Individual-level covariates

Since we measure SWD on an individual-level we can control for a set of demographic characteristics, such as age, sex, marital status, number of children, education (captured by school

leaving age), household income, size of place of residence and labor market status (employed, self-employed, unemployed, out of the labor force). Table 5 provides average values for all individual-level covariates by country. For space reasons, the full descriptive statistics are omitted, but they are available on request.

2.5 Method: multilevel analysis

Whenever researchers are interested in the effects of state polices and institutions on individual outcomes (such as SWD or subjective well being) the presence of multilevel data structure poses a challenge to statistical analysis. In our specific case, to explore the effect of environmental policy and environmental quality on SWD, we have to deal with data measured on two different levels. While we observe SWD on an individual-level, we measure environmental policy and environmental quality on a country-level.[9] Moulton (1990) drew economists' attention to the fact that applying ordinary least squares in this setup can lead to standard errors that are seriously biased downward. Early work tried to meet this challenge by using averaged data. But this ignores heterogeneity on the individual level and assumes homogenous policy effects. Moreover, it reduces the degrees of freedom substantially and requires the cardinality of satisfaction scores. Therefore, this method is not widely employed anymore. More recently, economists have been using individual-level data and calculating Huber (1967)-White (1980) standard errors or standard errrors robust to clustering (Froot, 1989; Williams, 2000). Robust standard errors are model-agnostic. Like robust standard errors, multilevel models begin with the observation that citizens are clustered in countries, and share within a certain country a specific mix of political institutions, environmental policy and environmental quality. But in addition, multilevel models aim to account for intraclass correlation by explicitly modeling the association between individuals in the same cluster.Through this, they imply a much stronger form of correction than simply calculating so-called robust standard errors. Specifically, in contrast to the method of correcting standard errors, a multilevel analysis corrects the denominator degrees of freedom for the number of clusters and will, therefore, yield different point estimates, not merely different standard errors.[10] In addition to methodological reasons there are also good substantive reasons to use multilevel analysis. Most notably, it allows to explore so-called causal heterogeneity (Western, 1998). Specifically, in Section 4 we study cross-level interactions, and check whether the effect of certain policy measures on satisfaction with democracy varies across different subgroups of citizens.

We start with a random intercept model, including control variables on an individual and a

[9] In fact, we would prefer individual-level data for environmental policy and environmental quality, but this sort of data does not exist, at least not in a dataset that measures individuals' SWD.

[10] The terms cluster-sample model, hierarchical linear model, mixed-effect model and mixed model are synonyms for multilevel models, though the use has been somewhat inconsistent in the literature. This class of models has a long tradition in educational science and bio-statistics. Steenbergen and Jones (2002) give an excellent overview and illustrate why such models are highly valuable for empirical research in economics and political science. Rice and Jones (1997) presents an introductory account of multilevel models and describes applications in health economics. See also UCLA: Academic Technology Services (2008). Wooldridge (2003) and Wooldridge (2006) provide a more technical discussion with an emphasis on fixed effects (which are not directly relevant for our study due to the nature of our data setup).

country level to explore mechanisms operating at both levels,

$$\begin{aligned} SWD_{ij} &= \beta_1 + \beta_2 \mathbf{x}_{ij} + \zeta_{1j} + \varepsilon_{ij} \\ &= (\beta_1 + \zeta_{1j}) + \beta_2 x_{ij} + \varepsilon_{ij}. \end{aligned} \tag{1}$$

where $\zeta_{1j} \sim (0, \psi)$ and $\varepsilon_{ij} \sim (0, \theta)$. The time-constant or permanent error component ζ_{1j} varies only between countries j. The transitory error component ε_{ij} varies over citizens i and countries j. The sum of these two terms, $\xi_{ij} = \zeta_{1j} + \epsilon_{ij}$, is called the total residual. The random-intercept model can be viewed as a model with a country-specific intercept $\beta_1 + \zeta_{1j}$, where ζ_{1j} is called a 'random parameter'. A parameter of special interest is the so-called intraclass correlation,

$$\rho = \frac{Var(\zeta_{1j})}{Var(\gamma_{ij})} \tag{2}$$

This within-country correlation measures the 'closeness' of citizens from the same country relative to the closeness of individuals from different countries.

It is straightforward to include country-level covariates $\mathbf{w}_j$:

$$\begin{aligned} SWD_{ij} &= \beta_1 + \beta_2 \mathbf{x}_{ij} + \beta_3 \mathbf{w}_j + \zeta_{1j} + \zeta_{2j} \mathbf{x}_{ij} + \varepsilon_{ij} \\ &= (\beta_1 + \zeta_{1j}) + (\beta_2 + \zeta_{2j}) \mathbf{x}_{ij} + \beta_3 \mathbf{w}_{1j} + \varepsilon_{ij}. \end{aligned} \tag{3}$$

Our dependent variable SWD is measured on a four-point scale. To take account of the ordinal data type, we estimate a multilevel proportional-odds models.[11]

3 Estimation results

3.1 Individual and country-level characteristics

We begin with an estimation including only our control variables in order to verify that they yield the expected signs (see Table 6, column (I)). As regards the individual-level characteristics, it is worth noting we find very robust effects. That is, the qualitative and quantitative results concerning the demographic covariates are very similar in all estimations. This is in contrast to other studies (e. g. Anderson and Guillory, 1997). We suspect that our superior method yields these more robust results.

Substantively, we find that females have a lower level of satisfaction with democracy (minus 0.06 points).[12] Married citizens are on average more satisfied (plus 0.11 points). Interestingly, parents are considerably less satisfied with democracy (minus 0.19 points per child). The coefficients of the variables capturing the individual economic situation are all statistically significant and show the expected sign. Unemployed citizens are – compared to employed citizens – less satisfied (minus 0.30 points). As expected, satisfaction rises with household income. An increase in income one the ten-point scale by one is associated with an increase in SWD by 0.06 points. Citizens

[11] For details see Chapter 5 of Rabe-Hesketh and Skrondal (2005).

[12] It is outside the scope of this paper to determine whether this may be explained by discrimination of women in various aspects of live, such as the labor market, but this would appear to be an important question for further research.

out of the labor force have a comparable higher level of SWD (plus 0.11 points). This result makes sense since we control for income. The citizen's age, his or her level of education and the size of his or her place of residence have no statistically significant impact on SWD. Somewhat surprisingly, self-employed individuals are less satisfied with the way democracy works.

The results for the country-level characteristics are also very robust and statistically significant throughout. Moreover, they show the expected sign: GDP per capita (positive), GDP-deflator (negative) and unemployment rate (negative).

3.2 The need for a multi-level model

The estimated intraclass-correlations ρ, shown in the second to last row in the tables, imply that between 5% and 9% of the total variance in SWD can be explained by information on the country-level. To judge whether this data structure necessitate a multilevel estimation, we calculate the design effect, defined as $1+(\text{average cluster size}-1)*\rho$. A design effect greater than 2 indicates that the clustering in the data needs to be taken into account (Muthen and Satorra, 1995). Even for our lowest observed intraclass-correlation we get a design effect of about 57 $(= 1 + (1,128 - 1) * 0.05)$. Ignoring the multi-level nature of the dataset simply is not an option.

3.3 Environmental policy

Columns (II) to (V) of Table 6 provide the estimates for regressions including all the individual policy measures. Of course, many of them are correlated, but this horserace nonetheless allows a first understanding of the impact of policy on SWD. A few individual policy measures seem to have a consistently positive effect on SWD, in particular, a quota for electricity from renewable energy sources, packaging rules, the existence of a general environmental protection act, environmental protection embodied in the constitution, and a soil protection act. An energy and CO_2 tax is in principal also favored by citizens, however not when controlling for the level of general environmental spending and environmental taxes. By contrast, citizens deplore the existence of environmental offices, and there is some evidence that ecolables are negatively associated with SWD. It is hard to rationalize these two specific findings, and we need to leave them as somewhat puzzling results that may arise simply as an artefact due to the correlations between the many policy variables included in the horserace. The first two rows of Table 6 (as well as results from regressions available on request that do not include individual policy variables) indicate that higher general environmental taxes and higher environmental spending are greeted either neutrally or unfavorably by citizens.

Of course, an estimation with sixteen related explanatory variables may obscure a more general, common link between environmental policy and SWD. Therefore, Table 7 looks at the relationship between our summary measure of environmental policy and SWD. The strong and robust result that emerges is that, controlling for a large variety of individual and country-level explanatory variables, a more developed environmental policy is applauded by citizens. The summary measure enters as a highly statistically significant determinant of SWD. The implementation of

an additional environmental policy measure increases SWD by nearly 0.05 points. This quantitative effect is fairly important compared to the gender-gap in SWD (about 0.06), and it is equivalent to about two thirds of a one point jump up on the 10 point income scale (about 0.06). Comparing the results in column (I) with those in the columns (III) and (IV) of this table, another interesting observation emerges: While policy itself is strongly positively related to SWD, citizens seem to favor it especially when it comes with low expenditures. Both environmental taxes and expenditures enter with a negative sign, where the latter is highly statistically significant. (The correlation between policy and taxes is positive but not very high, see Table 3.) The point estimates imply that an increase in environmental expenditure (measured as the share of GDP) by a half percentage point is associated with a decrease in SWD by 0.06 points, i.e., by approximately the same amount by that an additional environmental policy would increase SWD. The positive coefficient on the summary measure and the negative coefficient on environmental expenditures are consistent with an economic understanding of environmental problems as collective action problems, i.e., with the notion that most individuals care about the environment but few are willing to pay the costs to protect it.

In a next step we incorporate the share of votes for green parties in the most recent national (parliamentary) elections. Column (I) in Table 8 indicates that the vote share of green parties *per se* is not related to SWD.[13] When including environmental policy measures, however, green parties are positively related to SWD (see column (II)). This finding suggests that citizens appear to value green parties as playing a role for SWD in addition to (or possibly independent of) their potential role in pushing for environmental policy measures. This result also holds when we use the summary measure, as in column (III). Notably, the results on the effect of environmental policy (measures) on SWD remain unchanged when controlling for the share of votes for green parties. This is important because the vote for green parties could be interpreted as a measure of environmental preferences.

Overall, we find substantial support for the the hypothesis that environmental policy enhances SWD.

3.4 Environmental quality

The second hypothesis that we test is that environmental quality should have a positive impact on SWD. Table 9 shows the results for this hypothesis, first introducing measures of the road network and traffic, then introducing various emissions, and then including all measures. A number of interesting findings emerge from studying the variables both individually and jointly.

Consider first the relationship between traffic and SWD. Column (I) implies that the number of passenger cars is, by itself, positively related to SWD. However, column (III) shows that traffic has no effect when controlling for emissions. This is consistent with an economic understanding of the role of traffic: Individuals benefit from transportation, but they do take into account the negative impact on the environment. To our knowledge, this is the first study that documents this ambiguous effect of traffic on a measure of self-perceived welfare. For the average citizen, other measures of road network and traffic do not have a negative impact on SWD.

[13] For space reasons, we omit the control variables in the presentation, but they retain the same signs as before.

A similar insight can be gleaned from the effects of emissions. Column (II) suggests that NO_x and CO_2 affect SWD negatively (as expected), while VOC has a positive effect. But both the puzzling positive effect of VOC and the plausible negative effect of NO_x are not robust to controlling for the road network and traffic, as can be seen from column (III). These emissions are correlated with SWD-enhancing mobility factors.

The strongest – and especially topical – result is that individuals are substantially less satisfied with the way democracy works when CO_2 emissions are higher. An additional ton of CO_2 per capita (where the sample mean is about 9 tons per capita) decreases SWD by about 0.02 points. This is quantitatively comparable to a third of the gender-gap in SWD we documented earlier. Notably, this effect is robust to controlling for the various measures related to traffic (and for the other individual and country-level economic controls).

3.5 Robustness to sample choice

As is apparent from Figure 1, Slovakia and Turkey have particularly low SWD scores. To check the robustness of our results not only to specification but also to sample choice, we ran all estimations omitting these two countries. For space reasons, we cannot replicate all the tables here, but the results are available on request. The overall picture that emerges is that our main findings are not driven by these two countries. Instead, as one might expect from a typical sample, some of the results are stronger without Turkey and Slovakia, while others are weaker. Specifically, we find that: (1) the summary measure of environmental policy still remains strongly positively significant in the vast majority of estimations; (2) environmental expenditures and (when controlling for the summary measure of environmental policy) environmental taxes are more strongly negatively associated with SWD than before; (3) some of the individual policy measures switch signs, and their inclusion occasionally makes the coefficient on environmental taxes positive, a result that is hard to rationalize; (4) the results on traffic become stronger in that an extensive road network is positively associated with SWD, while the number of cars is occasionally negatively associated with SWD; (5) CO_2 emissions continue to be the only type of emissions robustly associated with SWD; their effect is strongly negative. None of the emissions have a positive effect.

4 Heterogenous environmental preferences

Citizens' preferences over environmental issues may not only differ across countries but also within countries. Heterogenous preferences result in a differential willingness to pay for environmental quality (and, thus, for policy). In this section, we integrate heterogenous views over environmental issues in our analysis. To do this, we extend our multilevel model and include cross-level interactions to explore so-called causal heterogeneity (Western, 1998). We study two types of heterogeneity. First, we consider preferences for the environment based on survey questions directly. Second, we consider whether parents differ from non-parents in their assessment of the importance of environmental policy for a well-functioning economic and political system.

4.1 Hypotheses

4.1.1 Environmental preferences

The theoretical impact of stronger environmental preferences is ambiguous: One hypothesis is that those with stronger preferences for the environment derive greater satisfaction from more developed environmental policies. The alternative hypothesis is that those with a higher willingness to pay (both financially or in terms of time invested for the environment) may deplore the fact that government has to step in with more extensive policy measures. In particular, they would be willing to pay themselves, rather than have government do so (especially because the government's actions may distract attention from other topics the citizen really wants government to get involved in). If environmental quality is a good for all citizens, then those who do not wish to pay for it themselves will feel more satisfied with more policy and more governmental spending than those who would be willing to pay themselves. Which of the two effects dominates is, therefore, an empirical question.

> *Hypothesis $\mathcal{4}_0$ (Null):* The impact of environmental policy and quality on citizens' SWD increases with their environmental preferences.

> *Hypothesis $\mathcal{4}_a$ (Alternative):* The impact of environmental policy and quality on citizens' SWD decreases with their environmental preferences.

To test these two competing hypotheses, we consider two measures of environmental preferences. First, we employ information on the individual willingness to make financial sacrifices for the sake of environmental protection. Respondents were asked whether they agree strongly, agree, disagree or strongly disagree with the following statements,

(I) I would give part of my income if I were certain that the money would be used to prevent environmental pollution.

(II) I would agree to an increase in taxes if the extra money were used to prevent environmental pollution.

These measures of willingness to pay are coded as WTP I and WTP II, respectively. Table 10 shows the percentage of respondents from each country who strongly agree or who at least agree with each of these statements. As expected, the two measures are highly positively correlated. On average citizens from Denmark, Sweden, the Netherlands and (perhaps especially interestingly) Greece claim to have high willingness to pay for environmental quality. Perhaps surprisingly, the average citizen in countries such as Spain, France, and Germany has a very low stated willingness to pay.

Our second measure of environmental preferences draws on the notion that being prepared to make direct financial sacrifices for the sake of environmental protection may not be the only indicator for environmental preferences. Instead of donating money, individuals can also donate time by engaging in private pro-environment behavior such as recycling, forgoing facilitating

but environmentally harmful commodities, attending public meetings or volunteering for pro-environmental organizations. All of these bring opportunity costs with them, and consequently are well suited for our hypotheses tests. In the E/WVS, respondents were asked whether they belong to any voluntary organization concerned with conservation, environment, or animal rights, and also if they are currently doing unpaid voluntary work for such an organization (see Table 11). Based on these two questions we define two variables capturing (i) being a member of any pro-environmental organization and (ii) being a volunteer of any pro-environmental organization. It is *a priori* not clear whether donating money and time are complements or substitutes. In our sample, we find a positive correlation between the two, suggesting that they are complements.

4.1.2 Parents

Many environmental problems are inherently long-term challenges. A purely selfish individual might simply not care about what happens after he or she dies. Even rational economic models frequently assume, however, that individuals have a bequest motive, as they think about the welfare of their offspring. If individuals expect environmental problems to mainly concern the next generations, not their own, this would suggest that those with children should care more about environmental policy.

> *Hypothesis 5:* Parents' SWD reacts more strongly to environmental policy and quality than SWD of non-parents.

4.2 Results

To operationalize causal heterogeneity with respect to environmental preferences we interact our measures of environmental policy and quality with the variables capturing environmental preferences on an individual-level. Econometrically, the two variants of *Hypothesis 4* imply that for each interaction term between the policy and quality measures and the preference variable dummy we expect a significant effect with a positive sign (in case of the null hypothesis) or a negative sign (in case of the alternative hypothesis). *Hypothesis 5* unambiguously implies that for each interaction term between the policy and quality measures and the parents dummy variable we expect a significantly positive coefficient. Table 12 provides results showing the effect of our environmental policy measures on SWD across our sub-groups of citizens with different environmental preferences. Table 13 summarizes the estimation results with environmental quality as the key variable of interest. Recall that emissions are negatively related to environmental quality, and the coefficients therefore need to be interpreted in the opposite manner as those for the policy variables. In both sets of estimations all non-binary variables that are interacted are centered around their mean. Figure 2 summarizes some of the results graphically.

Table 12 (perhaps surprisingly) shows that citizen with high environmental preferences have a considerably lower baseline level of SWD: volunteers (minus 0.14 points), club members (minus 0.11 points), citizen with a high WTP I (minus 0.11 points) and parents (minus 0.19 points). With the exception of column (III), including measures of preferences for the environment does

not alter the primary finding that environmental policy is associated with greater SWD. We find no evidence that the marginal effect of environmental policy on SWD is greater for those with stronger environmental preferences, contradicting *Hypothesis* 4_0. For instance, according to column (I), an additional environmental policy measure increases SWD of volunteers and non-volunteers alike by about 0.05 points. This is depicted in the top left panel of Figure 2. However, columns (III) and (IV) provide some evidence in favor of *Hypothesis* 4_a: An additional policy measure increases citizens' SWD with a low WTP II by about 0.05 points, while the effect for their counterparts with a high WTP II is only $0.02(= 0.05 - 0.03)$ points. This is shown in the top right panel of Figure 2. That is, the marginal impact of environmental policy on citizens' SWD decreases with their willingness to pay for environmental issues.

In interpreting these results, recall that SWD is not a measure of support for a particular party or for the government. Nonetheless, this result is important from a policy, and from a political perspective: Support for environmental policies is unlikely to come from those who are willing to incur personal costs for improving environmental quality.

The results on environmental expenditures and taxes are mixed. We do not observe heterogenous effects of environmental expenditures or taxes on SWD across citizens with varying environmental preferences. However, the overall effect of environmental expenditure on SWD changes when controlling for environmental preferences. In the estimations above we observed that SWD decreases with higher environmental expenditures. Interestingly, with the new control variables for environmental preferences, environmental expenditures now seem positively related to SWD, in the case of pro-environmental behavior (columns (I) and (II), and insignificantly so in the case of the measure WTP II (column (IV)) and the child dummy (column (V)).

We can also improve our understanding of the effect of environmental quality by including environmental preferences. Table 13 first implies that the most robust result obtained so far – that CO_2 affect SWD negatively – is primarily due to parents. We plot the relationship between CO_2 and SWD separately for parents and non-parents in the bottom left panel of Figure 2. This result is highly intuitive, but this paper is, to our knowledge, the first to document that citizens' views on climate change as a problem may vary markedly, and predictably, according to whether they have children or not. Much as in the case of policy, willingness to pay plays an important role: Those with a high WTP are less worried about CO_2 in terms of their SWD – perhaps because they believe that addressing climate change is not so much a societal, but an individual-level problem. This is shown in the bottom right panel of Figure 2.

For the other emissions, we find somewhat confusing results. For example, in the light of the result that those with a high WTP are more satisfied with higher CO_2, it is not clear why the same individuals are also less satisfied with high NO_x emissions. When controlling for environmental preferences, we also observe some changes with respect to the effect of road network and traffic on SWD. Specifically, now other vehicles (such as trucks) do have a statistically significant negative impact on SWD in each specification. When controlling for a high WTP I (column III) we find further that individuals appear to prefer fewer in-land roads, but more motorways (highways). This is not a finding we expected a priori, and further research could profitably be conducted

into exactly what sort of transportation network is most consistent with citizens' preferences.[14]

Overall, these results do not unambiguously provide support for either set of hypotheses on heterogenous policy and quality effects. In some sense, this is not surprising, given the broad array of variables that we use to proxy for environmental preferences. Conversely, in the presence of a number of non-robust results, it is noteworthy that the result for willingness to pay and the (intuitive) finding for how the role of CO_2 varies for parents and non-parents arises in virtually all specifications.

4.3 Robustness to sample choice

We again ran all estimations excluding Slovakia and Turkey (results available on request). Overall, when controlling for environmental preferences in this reduced sample, the results for environmental policy remain very similar as before. As for environmental quality, there seems to be a neutral or, in some specifications, a slightly positive association between SWD and CO_2 emissions for the average citizen. But the findings on causal heterogeneity go in the same direction as before: Specifically, we can confirm that in the reduced sample those with a higher willingness to pay again tend to deplore environmental policies more and tend to appreciate CO_2 emissions less than those with a lower willingness to pay. We also again find support for parents appreciating CO_2 emissions less than non-parents. As before, we do not find significant interaction effects for the other environmental quality and preference variables.

5 Conclusion and policy implications

This paper investigates citizens' satisfaction with the ability of states to solve collective action problems. As an especially important and topical collective action problem we study the environment. In particular, we explore the relationship between environmental policy and quality and reported satisfaction with democracy in 24 OECD countries. Our first set of new results shows that, by and large, both a focus on environmental policy and higher environmental quality (in terms of lower emissions, in particular, of CO_2, and less traffic) increase satisfaction with democracy in statistically and economically important ways. Higher public expenditures on the environment tend to decrease an average citizen's satisfaction score. This dual result confirms the public good characteristics of environmental policy and environmental quality.

The multi-level model that we employ to obtain these results is superior to all other methods that have so far been applied to study related questions on how country-wide variables affect individuals. Because it uses more information and models the relation between individuals within countries more carefully than standard approaches, the results should be more reliable. Perhaps the primary limitation of this study is that it does not exploit time series variation. With the existing data, this is not possible as the surveys are not conducted with the same individuals

[14] We might speculate, for example, that one factor behind the result we find may be that being able to bridge large distances fast is something most value highly (thus requiring motorways), while the general and smaller road network is seen, on balance, as a negative. This may be, among other reasons, because these roads often cut through the countryside.

every year. As such, our results still have uncertainties, which of course leaves much work for future generations of scholars to pursue.

A second set of novel findings arises when we account for environmental preferences. The overall insights we obtain are somewhat mixed. Despite the economically intuitive and statistically strong set of results for some environmental policy and quality variables, not all the regressions paint the same picture. This is simultaneously disappointing and comforting: It is disappointing because it limits policy implications to a subset of the possible measures. It is comforting because a complex phenomenon such as the environment is highly unlikely to have unambiguous effects on all dimensions that we observed through our many measures. Too clear results would raise our suspicion. What we do find to be robust results are the following: first, those with a high willingness to pay do not appreciate environmental policy as much as those with a low willingness to pay; second, parents worry significantly more about CO_2 emissions (and thus, presumably, about climate change) than those citizens without children.

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6 Data appendix

The information on the **individual-level** on satisfaction with democracy, age, sex, marital status, children, education, household income (measured on a ten-point scale), size of the place of residence (measured on a three-point scale) and employment status (employed, self-employed, unemployed and out of the labor force) is from the *European and World Values Survey* (E/WVS). In particular, we use the *European and World Values Surveys Four-wave Integrated Data File, 1981-2004*. We have selected all OECD-member countries for which a measure of satisfaction with democracy is available, except for Portugal and South Korea. Portugal had to be excluded since information on household income was available on a six-point scale only. We excluded South Korea since no comparable information on environmental policy was obtainable. Our sample of estimation consists of all observations from respondents from these OECD-member countries for which information on these basic individual characteristics was available. (Table 1 shows the number of observations over years and countries.)

A special comment is in order for the measurement of education. The E/WVS includes two questions on education: (i) 'What is the highest educational level that you have attained?' and (ii) 'At what age did you (or will you) complete your full time education?'. While the former question would be preferable to measure the level of education, there are considerably more missing answers compared to the latter one. In order to exploit all the available information on education and to save observations we construct a variable capturing the actual or the regular school leaving age. In particular, if information on the second question was available we used it. In the cases where the answer on the second question was missing, but information on the first question was available we have imputed the regular school leaving age of the respective educational level. We distinguished two cases: (i) If there was information on both questions for other respondents from the same country and year available, we have imputed the average school leaving age among those with the same highest educational level attained. (ii) If there where no respondents from the same country and year available with information on both questions we imputed the regular school living age of the respective educational level. Full details are available upon request.

The primary source for the **macroeconomic variables** (GDP per capita, GDP-deflator and unemployment rate) is the *OECD Factbook 2007*. However, for Iceland (1999), Mexico (2000) and Turkey (2001) no information on unemployment rates was available and we retrieved this information from the OECD database (on 10/30/07).

Our measures of **environmental policy** are from different sources. First, information on the existence of a quote for electricity form renewable energy sources (REG-quota), an energy/CO_2 tax, a packaging rules, a sustainability council, a subsidy for electricity from renewable sources (REG-subsidy), energy efficiency labels, environmental plan, ecolabel, UVP, environmental information act, an environmental office, an environmental expert council, a general environmental act, environmental reporting rules, a waste disposal act, environmental protection as a constitutional goal, a ministry of the environment, a nature conservance act, a water protection act a soil protection act, a clean air act is collected from (Binder, 2002). We obtained the information by reading them from the graphs. The graphs are fortunately of the quality that they allow the unambiguous identification of all cases. Second, the data on revenues from environmental taxes as percentage of GDP is from the joint Database of the OECD and the *European Environment Agency on Instruments Used for Environmental Policy and Natural Resources Management*. The Eurostat database includes an equivalent variable for all EU-member countries. The correlation between these two variables for the countries/years data points which are included in both sources is 0.985. In order to construct the variable on governmental expenditure on the environment as percentage of GDP we primarily used data from the OECD Database. In particular, we derived the variable as the share of total government expenditure for environment protection of GDP

(both measured in national currency at current prices). We imputed the missing information on expenditures for the year 2000 with data from the year 1999. For Poland (1999), Slovakia (1999) and Turkey (2001) we use data from the Eurostat Database. In order to construct an equivalent variable for Canada (2000), Czech Republic (1999), Hungary (1999) and Mexico (2000) we had to rely on respective national sources. Details are available upon request. (All data from databases was retrieved on 11/1/07)

The main source of information on the **green parties** is from the web-page of the European Green Party. From there we retrieved information on the share of votes of green parties in the latest national parliamentary elections for Austria, Belgium (sum of two parties), Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands (sum of two parties), Poland, Slovakia, Spain, Sweden, and the United Kingdom (sum of two parties). The equivalent information for Canada, Iceland, Japan, Mexico, Turkey and the United States is obtained from the respective national web-sites. For example, for the US we use the popular vote share for Ralph Nader in the year 1996. (Details are available upon request.)

Our measures of **environmental quality** are from two primary sources. Firstly, the information on emissions of SO_X, NO_X, CO, VOC and CO_2 from energy use is collected from the *OECD Environmental Data, Compendium 2004*. For Mexico and Turkey no data is available on SO_X, NO_X, CO and VOC for the years 2000 and 2001. We imputed the missing values with the latest information available. For Mexico we use data from the year 1998 and for Turkey from the year 2000. For Luxembourg we had to impute the missing value of VOC for 1999 with data from the year 1998. Secondly, the information on the road network (total length of road networks, length of motorway networks) and on the stock of road vehicles (total number of passenger cars in use, total number of other motor vehicles in use) is obtained from the *OECD Environmental Data, Compendium 2006/2007*. There is no information on the length of the motorway network in Iceland included. However, Chris's British Road Directory reports that there are no motorways in Iceland. For Canada (1999) we used the latest available information on the total length of road networks from the year 1995.

7 Appendix

Table 1: Number of available observations per country and year.

	1997	1999	2000	2001	
Austria	0	1,163	0	0	1,163
Belgium	0	1,399	0	0	1,399
Canada	0	0	1,619	0	1,619
Czech Republic	0	1,673	0	0	1,673
Denmark	0	847	0	0	847
Finland	0	0	789	0	789
France	0	1,191	0	0	1,191
Germany	1,645	1,507	0	0	3,152
Great Britain	0	560	0	0	560
Greece	0	877	0	0	877
Hungary	0	913	0	0	913
Iceland	0	815	0	0	815
Ireland	0	737	0	0	737
Italy	0	1,380	0	0	1,380
Japan	0	0	1,021	0	1,021
Luxembourg	0	535	0	0	535
Mexico	0	0	920	0	920
Netherlands	0	899	0	0	899
Poland	0	966	0	0	966
Slovakia	0	1,177	0	0	1,177
Spain	0	753	830	0	1,583
Sweden	0	604	0	0	604
Turkey	0	0	0	1,160	1,160
United States	0	1,101	0	0	1,101
	1,645	19,097	5,179	1,160	**27,081**

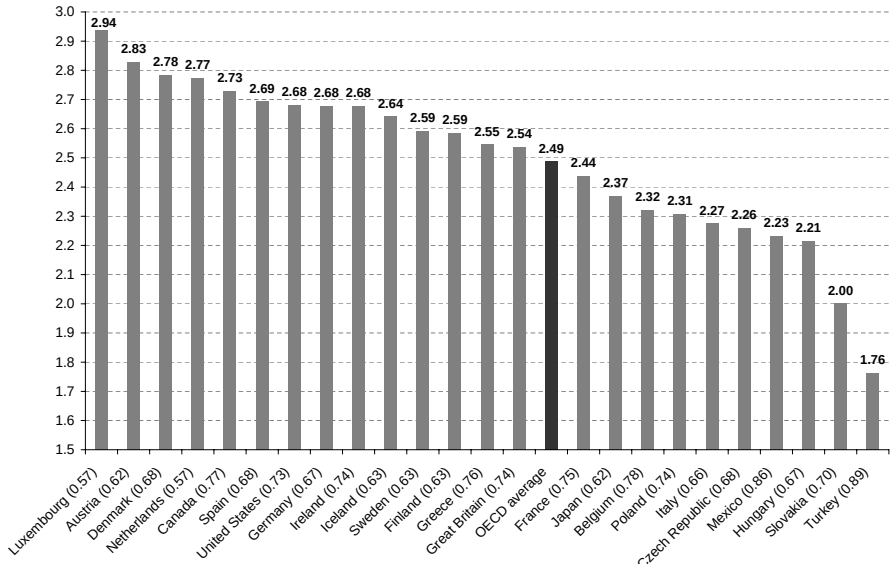

Figure 1: **Satisfaction with democracy in OECD-member countries.** The numbers on top of the bars show average SWD, while the numbers in parentheses after country names show standard deviations.

Table 2: Summary of environmental policy measures.[a]

		Summary measure	Summary measure 2	Environ. taxes	Environ. expend.	Share of green votes
Austria	1999	11	16	2.32	0.43	7.40
Belgium	1999	8	13	2.41	0.72	14.50
Canada	2000	7	12	1.39	0.86	0.80
Czech Republic	1999	9	14	3.03	0.48	1.10
Denmark	1999	12	17	5.19	0.65	0.30
Finland	2000	12	17	3.18	0.31	7.30
France	1999	12	17	2.55	0.62	5.10
Germany	1997	9	14	2.19	0.70	7.30
Germany	1999	12	17	2.29	0.74	6.70
Great Britain	1999	11	16	3.21	0.58	1.40
Greece	1999	10	15	3.11	0.51	0.00
Hungary	1999	12	17	3.21	0.62	0.60
Iceland	1999	7	10	3.30	0.00	9.10
Ireland	1999	10	15	2.95	0.45	2.80
Italy	1999	11	16	3.34	0.77	2.50
Japan	2000	12	16	1.71	1.71	0.00
Luxembourg	1999	9	14	2.95	1.18	9.10
Mexico	2000	10	15	1.72	0.50	4.02
Netherlands	1999	16	21	3.76	0.87	7.40
Poland	1999	12	16	1.94	0.83	0.00
Slovakia	1999	10	15	2.00	0.71	2.50
Spain	1999	9	14	2.31	0.88	0.70
Spain	2000	9	14	2.13	0.71	1.10
Sweden	1999	14	19	2.89	0.16	4.50
Turkey	2001	5	9	3.57	0.27	0.00
United States	1999	8	12	1.03	0.00	0.71
		10.27	15.04	2.68	0.63	3.73

[a] Summary measure is the number of all implemented policy measures in a given year which we consider in the our binary variable approach. These comprise the existence of a quote for electricity form renewable energy sources (REG-quota), an energy/CO_2 tax, a packaging rules, a sustainability council, a subsidy for electricity from renewable sources (REG-subsidy), energy efficiency labels, environmental plan, ecolabel, an environmental office, an environmental expert council, a general environmental act, environmental reporting rules, a waste disposal act, environmental protection as a constitutional goal, a nature conservance act, and a soil protection act. Summary measure 2 also includes the five measures (environmental impact analysis, water protect act, clean air act, environmental information act and ministry of the environment) which we exclude in our binary variable approach. Environmental taxes are the revenues from environmental taxes as percentage of GDP. Environmental expenditure are the share of total government expenditure for environment protection of GDP (both measured in national currency at current prices). Share of green votes are the share of votes for green parties in the latest national parliamentary elections. Detailed information on all sources can be found in the Data appendix.

Table 3: Correlation of environmental policy measures.[a]

	Summary measure	Summary measure 2	Environ. taxes	Environ. expend.	Share of green votes
Summary measure	1				
Summary measure 2	0.983	1			
Environ. taxes	0.256	0.253	1		
Environ. expend.	0.280	0.298	-0.170	1	
Share of green votes	0.057	0.079	0.017	-0.062	1

[a] For details on the measures see Table 2.

Table 4: Summary of environmental quality measures.

		Emissions in tons per 1,000 capita					Road network and traffic (per 1,000 capita)			
		So_X	No_X	CO	VOC	CO2 (energy use)	Roads in km	Motorways in meters	Passenger cars	Other vehicles
Austria	1999	4.8	22.8	110.1	23.2	7,905.3	13.1	201.9	495.5	103.6
Belgium	1999	17.2	29.8	100.7	23.6	11,671.2	14.4	166.4	448.2	52.7
Canada	2000	77.5	83.0	336.6	86.2	16,798.9	29.4	540.7	465.6	128.5
Czech Republic	1999	26.1	30.4	69.6	22.8	10,694.4	5.4	48.5	334.5	27.9
Denmark	1999	10.0	40.7	113.8	25.7	10,110.9	13.5	173.2	346.3	97.0
Finland	2000	14.6	45.5	103.4	31.3	10,711.0	15.1	106.1	412.4	64.0
France	1999	12.0	25.7	120.5	28.4	6,156.4	16.8	164.1	468.5	95.6
Germany	1997	12.7	21.2	73.0	24.9	10,670.3	8.0	137.8	504.2	32.5
Germany	1999	9.0	19.9	63.4	22.5	10,166.5	8.0	140.4	516.0	33.0
Great Britain	1999	21.0	30.9	77.1	25.2	9,232.2	7.1	60.6	419.7	76.0
Greece	1999	49.3	29.8	122.8	27.0	7,423.5	3.8	62.2	269.1	96.6
Hungary	1999	57.6	19.6	70.5	16.6	5,634.9	6.3	43.8	220.3	44.0
Iceland	1999	31.8	99.2	80.3	27.8	7,436.8	45.8	0.0	546.6	70.1
Ireland	1999	42.0	31.3	75.2	25.2	10,630.7	25.6	30.7	339.2	55.7
Italy	1999	16.2	25.4	102.5	29.9	7,378.7	5.4	113.5	561.3	59.8
Japan	2000	6.8	16.3	28.8	14.4	9,200.6	9.2	52.1	413.2	145.5
Luxembourg	1999	9.2	37.0	115.5	30.9	17,297.9	12.0	265.6	584.3	124.7
Mexico	2000	11.9	11.7	60.1	10.8	3,649.7	3.4	66.9	105.9	51.1
Netherlands	1999	6.6	29.4	46.1	18.1	10,576.8	8.0	142.7	396.9	52.0
Poland	1999	44.5	24.6	112.9	18.9	8,040.6	9.6	8.2	240.2	45.6
Slovakia	1999	31.7	21.9	59.7	23.0	6,924.9	7.9	54.7	229.2	31.3
Spain	2000	37.8	35.2	71.7	29.7	7,091.2	4.3	261.2	433.4	91.1
Spain	1999	41.1	35.0	75.1	30.3	6,830.5	4.1	258.1	422.0	94.2
Sweden	1999	6.6	29.5	101.3	35.9	5,340.9	15.6	162.5	439.1	41.7
Turkey	2001	30.9	13.9	55.3	10.6	2,725.2	0.9	27.1	66.3	23.2
United States	1999	56.8	73.5	338.2	57.2	19,846.8	22.6	319.7	744.7	28.9
		26.4	34.0	103.2	27.7	9,236.4	12.1	138.8	400.9	67.9

Table 5: Means of individual level characteristics.

	Age	Female	Married	No. of children	School leaving age	Income	Town size	Employed	Self employed	Unemployed	Out of the labor force
Austria	47.24	0.55	0.68	1.82	17.43	5.41	1.50	0.50	0.05	0.03	0.41
Belgium	47.50	0.52	0.60	1.74	19.20	5.45	1.32	0.52	0.04	0.09	0.35
Canada	45.86	0.58	0.51	1.91	21.95	5.04	1.89	0.57	0.05	0.08	0.30
Czech Republic	47.98	0.52	0.62	1.72	18.15	4.25	1.48	0.54	0.05	0.04	0.37
Denmark	45.66	0.49	0.55	1.72	16.86	5.41	1.35	0.69	0.03	0.04	0.24
Finland	43.71	0.49	0.47	1.77	21.00	4.83	1.48	0.56	0.07	0.08	0.28
France	45.76	0.47	0.54	1.85	18.23	4.22	1.80	0.53	0.01	0.07	0.39
Germany	46.68	0.56	0.55	1.52	17.48	4.59	1.74	0.51	0.03	0.10	0.37
Greece	36.03	0.57	0.44	0.91	20.43	5.48	2.36	0.71	0.08	0.04	0.17
Great Britain	43.85	0.53	0.55	2.00	18.01	5.33	1.81	0.58	0.03	0.06	0.32
Hungary	46.72	0.52	0.62	1.62	17.39	3.96	1.55	0.48	0.03	0.06	0.43
Iceland	42.26	0.48	0.49	2.14	23.01	5.35	1.42	0.68	0.16	0.01	0.16
Ireland	47.41	0.52	0.61	2.63	17.33	5.79	1.29	0.49	0.12	0.04	0.35
Italy	47.06	0.50	0.64	1.44	17.52	5.10	1.49	0.49	0.11	0.04	0.36
Japan	47.97	0.50	0.77	1.69	19.27	5.09	1.97	0.56	0.13	0.01	0.30
Luxembourg	42.74	0.50	0.61	1.38	18.45	5.48	1.23	0.64	0.03	0.01	0.32
Mexico	36.73	0.48	0.59	2.31	17.47	5.33	1.78	0.54	0.15	0.03	0.28
Netherlands	46.17	0.50	0.55	1.58	20.51	6.39	1.67	0.59	0.08	0.02	0.32
Poland	47.02	0.53	0.66	1.94	18.18	3.86	1.47	0.46	0.06	0.08	0.39
Slovakia	43.66	0.52	0.65	1.80	18.10	5.38	1.26	0.60	0.03	0.10	0.27
Spain	46.67	0.50	0.59	1.72	16.38	4.36	1.62	0.44	0.06	0.08	0.43
Sweden	44.77	0.50	0.48	1.53	23.21	5.67	2.18	0.74	0.02	0.04	0.19
Turkey	35.56	0.49	0.68	2.33	15.19	3.30	1.91	0.29	0.15	0.12	0.44
United States	42.49	0.57	0.49	1.76	23.92	5.59	2.01	0.68	0.05	0.06	0.21
	44.93	0.52	0.58	1.76	18.72	4.92	1.65	0.54	0.06	0.06	0.33

Table 6: Satisfaction with democracy and environmental policy: Individual policy measures.[a]

MFX (SE)	(I)		(II)		(III)		(IV)		(V)	
Environmental policy measures										
Environ. taxes					0.008	(0.064)			0.092	(0.080)
Environ. expend.							-0.124	(0.093)	-0.205*	(0.117)
REG-quota			0.408***	(0.048)	0.405***	(0.054)	0.360***	(0.060)	0.294***	(0.083)
Energy/CO2 tax			0.158***	(0.047)	0.151**	(0.071)	0.135***	(0.050)	0.042	(0.095)
Packaging rules			0.187**	(0.083)	0.196*	(0.108)	0.316**	(0.128)	0.502**	(0.206)
Sustainability council			0.059	(0.141)	0.068	(0.156)	0.048	(0.141)	0.139	(0.162)
REG-subsidy			0.132	(0.105)	0.131	(0.105)	0.144	(0.105)	0.137	(0.105)
Energy efficiency labels			-0.032	(0.064)	-0.034	(0.067)	-0.032	(0.064)	-0.059	(0.068)
Environmental plan			-0.090	(0.074)	-0.101	(0.113)	-0.081	(0.074)	-0.198	(0.126)
Ecolabel			-0.178	(0.132)	-0.192	(0.173)	-0.273*	(0.151)	-0.495**	(0.245)
Environmental office			-0.199***	(0.055)	-0.200***	(0.056)	-0.241***	(0.063)	-0.281***	(0.072)
Environmental expert council			-0.005	(0.060)	-0.014	(0.093)	-0.084	(0.084)	-0.238	(0.159)
General environmental act			0.208***	(0.073)	0.208***	(0.073)	0.229***	(0.075)	0.237***	(0.075)
Environmental reporting rules			0.092	(0.094)	0.094	(0.095)	0.048	(0.100)	0.037	(0.101)
Waste disposal act			-0.069	(0.065)	-0.067	(0.067)	-0.018	(0.076)	0.040	(0.091)
Environ. protection in constitution			0.287**	(0.118)	0.288**	(0.118)	0.249**	(0.121)	0.227*	(0.123)
Nature conservance act			-0.115*	(0.062)	-0.116*	(0.064)	-0.043	(0.083)	-0.015	(0.086)
Soil protect act			0.365***	(0.064)	0.372***	(0.082)	0.428***	(0.080)	0.545***	(0.129)
Country-level covariates										
GDP p.c. (in $1,000)	0.046***	(0.002)	0.064***	(0.006)	0.064***	(0.007)	0.064***	(0.006)	0.070***	(0.008)
GDP deflator	-0.021***	(0.001)	-0.022***	(0.007)	-0.022***	(0.007)	-0.026***	(0.007)	-0.031***	(0.009)
Unemployment rate	-0.048***	(0.004)	-0.041***	(0.006)	-0.041***	(0.008)	-0.041***	(0.006)	-0.032***	(0.010)
Individual-level covariates										
Age	0.002	(0.001)	0.001	(0.001)	0.001	(0.001)	0.001	(0.001)	0.001	(0.001)
Female	-0.064***	(0.025)	-0.066***	(0.025)	-0.066***	(0.025)	-0.066***	(0.025)	-0.066***	(0.025)
Married	0.106***	(0.029)	0.100***	(0.029)	0.100***	(0.029)	0.101***	(0.029)	0.102***	(0.029)
Child	-0.185***	(0.034)	-0.183***	(0.034)	-0.183***	(0.034)	-0.184***	(0.034)	-0.183***	(0.034)
School leave age	0.001	(0.002)	0.001	(0.002)	0.001	(0.002)	0.001	(0.002)	0.001	(0.002)
Household income	0.063***	(0.005)	0.069***	(0.005)	0.069***	(0.005)	0.070***	(0.005)	0.069***	(0.005)
Town size	0.006	(0.016)	-0.017	(0.016)	-0.017	(0.017)	-0.020	(0.017)	-0.019	(0.017)
Out of the labor force	0.107***	(0.034)	0.105***	(0.034)	0.105***	(0.034)	0.105***	(0.034)	0.104***	(0.034)
Unemployed	-0.304***	(0.051)	-0.310***	(0.051)	-0.311***	(0.051)	-0.309***	(0.051)	-0.310***	(0.051)
Self-employed	-0.098**	(0.050)	-0.089*	(0.050)	-0.089*	(0.050)	-0.088*	(0.050)	-0.089*	(0.050)
ψ/ρ	0.220/0.063		0.242/0.069		0.242/0.069		0.235/0.067		0.230/0.065	
Log Likelihood	28,288.872		28,233.122		28,233.114		28,232.247		28,231.584	

[a] Number of observations is in each estimation 27,081. Method of estimation is a random-coefficient proportional-odds model. Standard errors are in parentheses. *, ** and *** indicate statistical significance at the 10-percent level, 5-percent level, and 1-percent level. The marginal effect is the change in SWD caused by an infinitesimal change of each independent continuous variable or, the discrete change in the probability for a changing binary variable with all the other variables fixed at their means.

Table 7: Satisfaction with democracy and environmental policy: Summary policy measure.[a]

MFX (SE)	(I)		(II)		(III)		(IV)	
Environmental policy measures								
Summary measure	0.028***	(0.006)	0.046***	(0.007)	0.046***	(0.006)	0.047***	(0.007)
Environ. taxes		(0.000)	-0.007	(0.017)		(0.000)	-0.007	(0.018)
Environ. expend.					-0.120***	(0.044)	-0.123***	(0.043)
Country-level covariates								
GDP p.c. (in $1,000)	0.060***	(0.002)	0.047***	(0.002)	0.053***	(0.002)	0.053***	(0.002)
GDP deflator	-0.024***	(0.002)	-0.020***	(0.002)	-0.016***	(0.002)	-0.015***	(0.002)
Unemployment rate	-0.060***	(0.004)	-0.047***	(0.004)	-0.045***	(0.004)	-0.045***	(0.004)
Individual-level covariates								
Age	0.001	(0.001)	0.001	(0.001)	0.002*	(0.001)	0.002*	(0.001)
Female	-0.061**	(0.025)	-0.064***	(0.025)	-0.063**	(0.025)	-0.063**	(0.025)
Married	0.103***	(0.029)	0.104***	(0.029)	0.099***	(0.029)	0.099***	(0.029)
Child	-0.192***	(0.034)	-0.183***	(0.034)	-0.186***	(0.034)	-0.186***	(0.034)
School leave age	0.001	(0.002)	0.001	(0.002)	0.001	(0.003)	0.001	(0.002)
Household income	0.067***	(0.005)	0.063***	(0.005)	0.066***	(0.006)	0.066***	(0.006)
Town size	0.004	(0.016)	0.004	(0.016)	-0.011	(0.017)	-0.011	(0.017)
Out of the labor force	0.108***	(0.034)	0.106***	(0.034)	0.112***	(0.034)	0.111***	(0.034)
Unemployed	-0.299***	(0.051)	-0.303***	(0.051)	-0.295***	(0.051)	-0.296***	(0.051)
Self-employed	-0.085*	(0.050)	-0.097*	(0.050)	-0.080	(0.051)	-0.080	(0.051)
ψ/ρ	0.165/0.048		0.219/0.062		0.232/0.066		0.231/0.066	
Log Likelihood	28,294,333		28,288.050		28272.870		28,272.795	

[a] Number of observations is in each estimation 27,081. Method of estimation is a random-coefficient proportional-odds model. Standard errors are in parentheses. *, ** and *** indicate statistical significance at the 10-percent level, 5-percent level, and 1-percent level. The marginal effect is the change in SWD caused by an infinitesimal change of each independent continuous variable or, the discrete change in the probability for a changing binary variable with all the other variables fixed at their means.

Table 8: Satisfaction with democracy and the share of votes for green parties.[a]

MFX (SE)	(I)		(II)		(III)	
Environmental policy measures						
Share of votes for green parties	0.005	(0.004)	0.049***	(0.018)	0.013***	(0.004)
Environ. taxes			-0.080	(0.101)	-0.008	(0.017)
Environ. expend.			-0.182	(0.117)	-0.090**	(0.041)
Summary measure					0.048***	(0.007)
REG-quota			0.271***	(0.083)		
Energy/CO2 tax			0.066	(0.095)		
Packaging rules			0.322	(0.215)		
Sustainability council			-0.137	(0.189)		
REG-subsidy			0.150	(0.105)		
Energy efficiency labels			0.017	(0.074)		
Environmental plan			0.208	(0.192)		
Ecolabel			-0.036	(0.294)		
Environmental office			-0.432***	(0.090)		
Environmental expert council			0.074	(0.193)		
General environmental act			0.391***	(0.093)		
Environmental reporting rules			-0.032	(0.104)		
Waste disposal act			0.135	(0.097)		
Environ. protection in constitution			0.189	(0.124)		
Nature conservance act			-0.141	(0.097)		
Soil protect act			0.568***	(0.129)		
Country-level covariates	Yes		Yes		Yes	
Individual-level covariates	Yes		Yes		Yes	
ψ/ρ	0.223/0.063		0.317/0.088		0.243/0.069	
Log Likelihood	28,287.942		28,227.642		28,266.605	

[a] Number of observations is in each estimation 27,081. Method of estimation is a random-coefficient proportional-odds model. Standard errors are in parentheses. *, ** and *** indicate statistical significance at the 10-percent level, 5-percent level, and 1-percent level. The marginal effect is the change in SWD caused by an infinitesimal change of each independent continuous variable or, the discrete change in the probability for a changing binary variable with all the other variables fixed at their means.

Table 9: Satisfaction with democracy and environmental quality.[a]

MFX (SE)	(I)		(II)		(III)	
Road network and traffic p.c.						
Roads in km	-1.603	(1.594)			0.400	(2.953)
Motorways in meters	0.037	(0.137)			0.303	(0.306)
Passenger cars	0.357*	(0.208)			0.268	(0.228)
Other vehicles	-0.013	(0.491)			-0.675	(0.583)
Emissions in tons p.c.						
SO_X			0.525	(1.177)	0.997	(1.282)
NO_X			-2.041*	(1.078)	-1.340	(1.691)
CO			-0.336	(0.447)	0.625	(0.472)
VOC			4.988**	(2.244)	-3.027	(3.293)
CO_2			-0.015***	(0.006)	-0.016**	(0.007)
Country-level covariates						
GDP p.c. (in $1,000)	0.041***	(0.004)	0.051***	(0.003)	0.047***	(0.005)
GDP deflator	-0.020***	(0.002)	-0.030***	(0.002)	-0.022***	(0.002)
Unemployment rate	-0.051***	(0.004)	-0.058***	(0.005)	-0.051***	(0.005)
Individual-level covariates						
Age	0.002	(0.001)	0.001	(0.001)	0.002*	(0.001)
Female	-0.064***	(0.025)	-0.063**	(0.025)	-0.062**	(0.025)
Married	0.105***	(0.029)	0.097***	(0.029)	0.106***	(0.029)
Child	-0.185***	(0.034)	-0.186***	(0.034)	-0.183***	(0.034)
School leave age	0.000	(0.002)	-0.001	(0.002)	0.000	(0.002)
Household income	0.064***	(0.005)	0.065***	(0.005)	0.063***	(0.005)
Town size	0.004	(0.016)	0.001	(0.016)	0.001	(0.016)
Out of the labor force	0.105***	(0.034)	0.106***	(0.034)	0.101***	(0.034)
Unemployed	-0.307***	(0.051)	-0.300***	(0.051)	-0.308***	(0.051)
Self-employed	-0.097*	(0.050)	-0.103**	(0.050)	-0.096*	(0.050)
ψ/ρ	0.224/0.064		0.188/0.054		0.221/0.063	
Log Likelihood	28,286.198		28,305.522		28,281.609	

[a] Number of observations is in each estimation 27,081. Method of estimation is a random-coefficient proportional-odds model. Standard errors are in parentheses. *, ** and *** indicate statistical significance at the 10-percent level, 5-percent level, and 1-percent level. The marginal effect is the change in SWD caused by an infinitesimal change of each independent continuous variable or, the discrete change in the probability for a changing binary variable with all the other variables fixed at their means.

Table 10: Willingness to pay for environmental quality.[a]

	Percentage of respondents who strongly agree with statement		Percentage of respondents who at least agree with statement	
	(I)	(II)	(I)	(II)
Denmark	30.1	22.7	79.5	66.9
Sweden	23.3	28.7	79.5	79.1
Netherlands	16.0	10.3	75.3	56.5
Greece	28.6	18.8	82.5	65.0
Czech Republic	17.4	9.9	78.0	66.1
Luxembourg	23.8	19.9	64.5	57.7
Mexico	27.5	15.3	81.1	58.8
Iceland	9.8	7.2	63.6	58.4
United States	16.4	12.3	69.4	61.3
Japan	10.9	7.8	71.8	64.4
Canada	17.3	11.6	70.2	60.8
Turkey	22.2	12.9	76.5	56.0
Belgium	17.8	11.8	60.5	46.7
Poland	15.4	11.1	61.6	52.3
Finland	10.2	9.0	56.4	53.1
Great Britain	9.1	8.2	52.1	54.1
Ireland	9.3	6.9	56.6	42.2
Italy	10.8	7.1	67.3	44.8
Austria	9.0	6.4	49.7	39.1
Slovakia	15.1	9.0	57.4	40.7
Spain	12.5	9.2	58.3	48.6
France	14.2	10.2	48.2	39.7
Hungary	12.9	7.5	54.2	34.0
Germany	5.2	8.4	28.5	46.1
Mean	16.0	11.8	64.3	53.9
N	24,575	26,251	24,575	26,251

[a] Sorted by average over all four categories. (I) I would give part of my income if I were certain that the money would be used to prevent environmental pollution. (II) I would agree to an increase in taxes if the extra money were used to prevent environmental pollution.

Table 11: Pro-environmental behavior.[a]

		Share of respondents engaged with an environ. organization	
	N	as a member	as a volunteer
Netherlands	966	45.4	2.8
United States	1,101	15.3	8.4
Greece	913	11.1	10.0
Denmark	847	13.8	2.2
Luxembourg	920	9.3	5.6
Belgium	1,399	11.0	3.1
Sweden	1,160	10.6	3.5
Austria	1,163	9.6	2.1
Canada	1,619	7.8	4.0
Czech Republic	1,673	6.8	3.2
Great Britain	877	1.4	8.4
Mexico	899	5.3	3.2
Finland	789	5.3	2.8
Iceland	737	5.0	1.5
Germany	3,137	4.5	1.4
Italy	1,021	3.8	1.7
Slovakia	1,583	2.6	2.0
Japan	535	3.1	1.4
Ireland	1,380	3.1	1.4
Hungary	815	1.9	2.0
Spain	604	2.0	1.0
France	1,191	2.1	0.9
Poland	1,177	1.6	0.7
Turkey	560	0.2	0.2
Mean		7.6	3.1

[a] Sorted by average over both variables.

Table 12: Satisfaction with democracy and environmental policy accounting for heterogenous preferences.[a]

MFX (SE)	(I)		(II)		(III)		(IV)		(V)	
Preference variable	Volunteer		Club member		High WTP I		High WTP II		Children	
Environmental policy measures										
Summary measure	0.047***	(0.007)	0.051***	(0.008)	-0.008	(0.008)	0.052***	(0.008)	0.050***	(0.012)
Environ. taxes	-0.021	(0.018)	-0.014	(0.018)	-0.002	(0.019)	-0.018	(0.019)	-0.016	(0.031)
Environ. expend.	0.098**	(0.043)	0.108**	(0.043)	-0.373***	(0.044)	0.058	(0.046)	0.032	(0.077)
Preference variable	-0.141*	(0.075)	-0.109**	(0.049)	-0.107***	(0.035)	-0.001	(0.039)	-0.187***	(0.034)
Summary measure*preference variable	0.018	(0.044)	-0.006	(0.021)	-0.039**	(0.016)	-0.031*	(0.018)	-0.004	(0.013)
Environ. taxes*preference variable	-0.024	(0.100)	-0.043	(0.060)	0.051	(0.039)	0.005	(0.045)	-0.007	(0.035)
Environ. expend.*preference variable	-0.045	(0.223)	-0.075	(0.152)	0.154	(0.112)	0.103	(0.122)	0.089	(0.087)
Country-level covariates	Yes		Yes		Yes		Yes		Yes	
Individual-level covariates	Yes		Yes		Yes		Yes		Yes	
ψ/ρ	0.196/0.056		0.199/0.057		0.163/0.047		0.193/0.055		0.197/0.066	
Log Likelihood	28,263.063		28,260.896		25,832.996		27,429.896		28,278.656	
No. of observations	27,066		27,066		24,575		26,251		27,081	

[a] Method of estimation is a random-coefficient proportional-odds model. Standard errors are in parentheses. *, ** and *** indicate statistical significance at the 10-percent level, 5-percent level, and 1-percent level. The marginal effect is the change in SWD caused by an infinitesimal change of each independent continuous variable or, the discrete change in the probability for a changing binary variable with all the other variables fixed at their means.

Table 13: Satisfaction with democracy and environmental quality accounting for heterogenous preferences.[a]

MFX (SE)	(I)		(II)		(III)		(IV)		(V)	
Preference variable	Volunteer		Club member		High WTP I		High WTP II		Children	
Environmental policy measures										
SOX	1.805	(1.284)	2.357*	(1.280)	0.637	(1.326)	1.115	(1.324)	2.349	(1.935)
NOX	-0.503	(1.692)	0.915	(1.702)	3.706**	(1.777)	0.153	(1.742)	1.364	(2.347)
CO	0.758	(0.481)	2.478***	(0.504)	0.394	(0.526)	0.693	(0.504)	0.194	(0.842)
VOX	-4.177	(3.320)	-12.304***	(3.322)	-2.071	(3.520)	-4.015	(3.439)	-6.610	(4.662)
CO2	-0.018***	(0.007)	-0.015**	(0.007)	-0.033***	(0.007)	-0.019**	(0.007)	-0.002	(0.010)
Preference variable	-0.104	(0.078)	-0.107**	(0.054)	-0.083**	(0.036)	0.013	(0.040)	-0.179***	(0.034)
SOX*preference variable	-3.524	(5.638)	3.113	(4.028)	5.616**	(2.389)	3.119	(2.750)	-0.907	(1.947)
NOX*preference variable	-11.594	(7.257)	-0.378	(4.149)	-7.580**	(3.058)	-6.618*	(3.471)	-2.769	(2.148)
CO*preference variable	1.548	(2.443)	0.164	(1.604)	-1.495	(1.204)	-0.181	(1.388)	0.696	(0.951)
VOC*preference variable	8.042	(10.834)	1.493	(7.757)	8.294	(5.584)	3.515	(6.216)	4.129	(4.481)
CO_2*preference variable	-0.022	(0.031)	-0.016	(0.019)	0.022*	(0.013)	0.004	(0.015)	-0.024**	(0.011)
Road network and traffic p.c.										
Roads in km	-0.667	(2.967)	-3.847	(2.957)	-6.920**	(3.020)	-0.615	(3.002)	-0.606	(2.961)
Motorways in meters	0.390	(0.305)	0.448	(0.307)	0.658**	(0.304)	0.395	(0.310)	0.378	(0.305)
Passenger cars	0.051	(0.227)	0.332	(0.231)	-0.412*	(0.236)	-0.015	(0.233)	0.055	(0.226)
Other vehicles	-1.083*	(0.580)	-1.801***	(0.579)	-1.536**	(0.608)	-1.286**	(0.605)	-1.042*	(0.581)
Country-level covariates	Yes		Yes		Yes		Yes		Yes	
Individual-level covariates	Yes		Yes		Yes		Yes		Yes	
ψ/ρ	0.217/0.062		0.218/0.062		0.160/0.046		0.214/0.061		0.216/0.062	
Log Likelihood	28,264.059		28,254.014		26,874.829		27,431.633		29,226.03	
No. of observations	27,066		27,066		24,575		26,251		27,081	

[a] Method of estimation is a random-coefficient proportional-odds model. Standard errors are in parentheses. *, ** and *** indicate statistical significance at the 10-percent level, 5-percent level, and 1-percent level. The marginal effect is the change in SWD caused by an infinitesimal change of each independent continuous variable or, the discrete change in the probability for a changing binary variable with all the other variables fixed at their means.

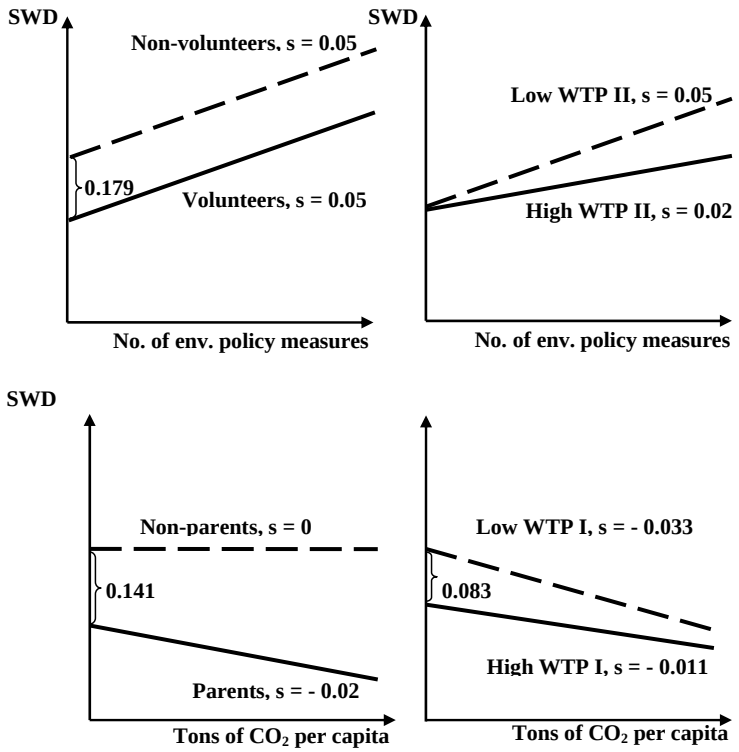

Figure 2: **Heterogenous effects of environmental policy and quality on SWD.** The difference in the intercepts and slopes are calculated based on the results from columns (I) and (IV) of Table 12 and columns (I) and (V) of Table 13, respectively. The top left panel shows that volunteers and non-volunteers care about environmental policy in the same (positive) way. The top right panel indicates that those with a low willingness to pay derive higher marginal benefits in terms of SWD from more environmental policy than those with a high marginal willingness to pay. The bottom left panel shows that parents worry more about CO_2 emissions than non-parents. The bottom right panel shows that those with a high willingness to pay worry less about CO_2 emissions than those with a low willingness to pay.