

***Who is willing to pay for the environment?  
An empirical analysis of Europeans willingness to contribute monetarily to  
environmental protection***

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Andrea Kollmann (*corresponding author*)

Energy Institute at the Johannes Kepler University Linz, Department of Energy Economics,  
Austria

Tel.:+43-732-2468-5660, email: kollmann@energieinstitut-linz.at

Johannes Reichl

Energy Institute at the Johannes Kepler University Linz, Department of Energy Economics,  
Austria

Tel.:+43-732-2468-5652, email: reichl@energieinstitut-linz.at

Friedrich Schneider

Johannes Kepler University Linz, Department of Economics, Austria

Tel.:+43-732-2468-8210, email: friedrich.schneider@jku.at

**Abstract:**

*With the ratification of the Kyoto protocol and the installation of the European Emission Trading Scheme, the European Union's governments showed a basic willingness to commit themselves to environmentally friendly policies. But today, the success of these commitments is questionable: all of the EU-27 countries ratified the Kyoto protocol, but only 16 countries have reduced their CO<sub>2</sub> emissions, none of them substantially. In our paper we take a look at the question which individual characteristics determine whether a citizen of the European Union's is willing to contribute monetarily to environmental protection. We analyze the literature to identify factors that influence citizens' willingness to contribute monetarily to environmental protection and use data gathered in the European Value Survey in 2008 to empirically test our findings. Knowing voters' motivation provides valuable insights into how to establish a more efficient environmental policy.*

**Keywords:** Willingness to contribute monetarily to environmental protection; voter behavior; regression analysis; European Value Survey

## 1 Introduction

Up to now 188 countries have ratified the Kyoto protocol. But the greenhouse gas reduction targets laid down in the protocol are only binding until 2012 and the prospects of setting legally binding targets beyond that date are hard to assess. Hence uncertainty is growing about the future of the global climate regime as designed by the Kyoto-Protocol. With the statement of the Intergovernmental Panel on Climate Change (IPCC, 2007) that *“most of the observed increases in globally averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations”* the need for ambitious global action to combat climate change becomes more pressing than ever.

Nevertheless, the UN Climate Change Conference in Copenhagen, held in December 2009, failed to reach its main objective: a legally binding agreement on an amendment to the Kyoto Protocol that would enable a second commitment period to follow the end of the first commitment period in 2012. The so called Copenhagen Accord of 18 December 2009 was neither adopted nor endorsed by the Conference of the Parties, which simply took note of it.

As an important player in the Kyoto process, the E.U. (of which all member countries have ratified the Kyoto-Protocol) decided to base its climate policy on using market-based instruments in environmental policy. Especially the adoption of Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003, establishing a scheme for greenhouse gas emission allowance trading (EU-ETS) within the Community and amending Council Directive 96/61 EC, has affirmed this major shift in the way environmental policy is implemented and publicly perceived. The latest amendment (Directive 2009/29/EC) finally set the course for the time beyond the current Kyoto period, originally based on the assumption that a global and comprehensive post-2012 agreement would be concluded in due time.

Furthermore, in 2008, the E.U. climate and energy package was presented, specifying 1) a reduction in E.U. greenhouse gas emissions of at least 20% below 1990 levels, 2) a 20% share of E.U. energy consumption to come from renewable resources and 3) a 20% reduction in primary energy use to be achieved by improving energy efficiency (known as 20-20-20 targets, see European Commission (2008) for details). Also the discussions about introducing a CO<sub>2</sub> tax in some major European countries have created more political - and especially public - awareness of the importance of choosing adequate instruments for environmental policy.

In our paper we assume - in accordance with Public Choice theory - that any outcome in environmental policy is subject to the interdependences of the economic actors involved: (1) voters, (2) politicians, (3) administration, (4) interest groups. In this paper we take a closer look at the position of voters and aim to identify which individual characteristics form their environmental policy attitudes. We especially examine how competing interests and individual characteristics of voters influence their position towards market-based instruments. In doing so, we firstly discuss literature findings on altruistic, pro-social and pro-environmental attitudes when assessing voters' behavior. Secondly, we empirically test our findings using data gathered in the European Value Study in 2008.

Our paper is organized as follows: Section 2 presents a literature review, section 3 shows the empirical analysis and section 4 gives a summary and draws some policy conclusions.

## **2 Literature review**

We now turn to analyzing explanations for voters' attitudes concerning their individual willingness to contribute monetarily to environmental protection in literature. In doing so, two types of assessments are of interest for our analysis. Firstly, we are interested in what influences the voters' acceptance of an environmental policy instrument and secondly we are interested in which individual characteristics influence the individual willingness to contribute if a market-based instrument like an environmental tax is chosen.

Looking at market-based instruments, three different types are considered in the literature: charges and taxes, subsidies, and tradable permits. In Smith et al. (1997) deposit-refund systems are listed as a fourth instrument, while Stavins (2003) ranks deposit-refund systems among pollution charges and lists market friction reductions (market creation, liability rules, information programs) as a fourth type of instrument instead. In contrast to market-based instruments are command-and-control instruments that dictate a certain behavior for all economic agents or for a group of agents defined by specific characteristics. In the model which we develop in chapter 3, we consider the willingness to contribute monetarily to environmental protection which we interpret as the willingness to comply with an environmental tax system.

Any policy instrument choice is subject to the interactions of the economic agents involved. Public Choice theory usually differs between (1) voters, (2) politicians, (3) administration and (4) interest groups. The intellectual position of all actors involved defines the final outcome. In relation to climate change mitigation for example, Llewellyn (2010) discusses seven different intellectual positions of opponents of a stronger environmental policy: Firstly, he argues, that there is a group of people who generally sees no need for any emission reduction policy and, secondly, some believe that any action comes to late anyway. Both arguments can be overcome by establishing the credibility of science. Thirdly, there is concern, that emission reductions and economic growth are incompatible. The next two positions he describes, are the costs of emission reductions: on the one hand, some argue that emission reductions are too costly and on the other hand they have to be borne 'up-front'. Furthermore, emission reduction targets are considered unrealistic and cannot be achieved due to a lack of political will. Lastly, there is no first mover advantage involved with imposing environmental policy.

### **2.1 Literature findings about the influences on voters environmental attitudes**

Large scale public surveys in the European Union indicate that voters' sensitivity towards environmental issues has continuously increased throughout recent decades. Public opinion analysis, undertaken by the European Commission, shows that 50% of European citizens consider climate change a serious problem (see Table 2.1). In another survey for the

European Commission, 97% of respondents considered environmental protection very or fairly important.<sup>1</sup>

*Table 2.1: Results of Eurobarometer survey, January/February 2009*

In your opinion, which of the following do you consider to be the most serious problem currently facing the world as a whole? Firstly? Any others? - % EU				
Rank	Problems	2008	2009	%-change
1	Poverty, lack of food and drinking water	67%	66%	-1%
2	A major global economic downturn	24%	52%	117%
3	Climate change	62%	50%	-19%
4	International terrorism	53%	42%	-21%
5	Armed conflicts	38%	39%	3%

*Source: European Commission (2009a)*

In the European Value Study in 2008 (see chapter 3.1) European citizens were asked whether they think that if things continue on their present course, we will soon experience a major ecological catastrophe. Out of over 38,000 respondents 83% agreed with this statement only 17% disagreed. But when being asked about the overall most important issues for Europe in October / November 2009, those surveyed put unemployment, the economic situation and crime at the top of the list, while environmental and energy issues did not even enter the top 10 (see Table 2.2), they ranked 12<sup>th</sup> and 13<sup>th</sup>. All of these statistics raise the question where this two-facedness among voters comes from and whether the under-provision of effective environmental policy instruments in developed democracies is after all still due to a lack of environmental concern among voters, or due to their competing interests.

One database that allows an interesting view on the shifting interests of voters are the German *Politbarometer* surveys which have been conducted since 1977 and are representative for eligible voters in Germany. They investigate people's attitudes concerning parties, politicians and their political agenda as well as current topics.<sup>2</sup> Figure 2.1 depicts the answers to one of the questions repeatedly asked in these surveys: *'There are different questions and problems that we speak about today in Germany. Which of these questions and problems are particularly important for you personally?'*

<sup>1</sup> See European Commission (2008).

<sup>2</sup> For a detail description and download possibility see the homepage of the Leibniz Institute for the Social Sciences (<http://www.gesis.org>).

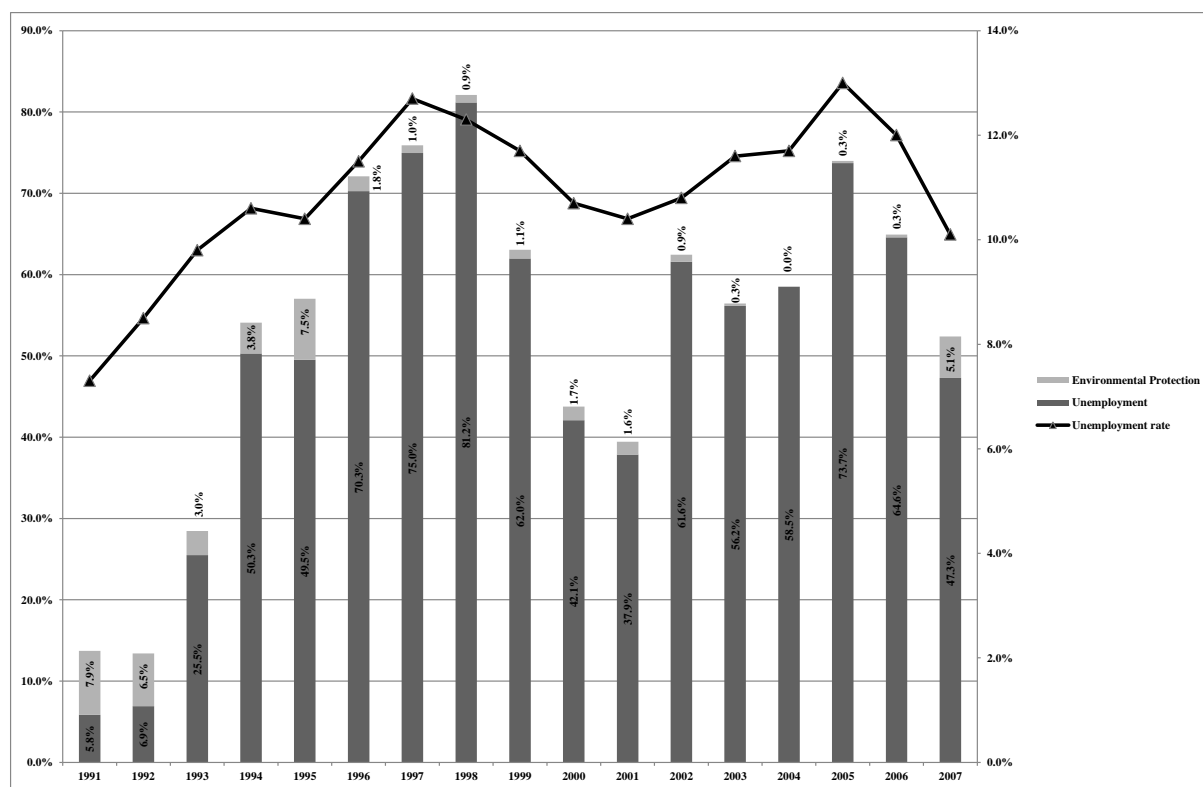
*Table 2.2: Results of Eurobarometer survey, October/November 2009*

What do you think are the two most important issues facing (OUR COUNTRY) at the moment?		
Rank	Issues	Answers in %*
1	Unemployment	51%
2	Economic Situation	40%
3	Crime	19%
4	Rising prices/inflation	19%
5	Healthcare system	14%
6	Immigration	9%
7	Pensions	9%
8	Taxation	8%
9	The educational system	7%
10	Housing	5%
11	Terrorism	4%
12	The environment	4%
13	Energy	3%
14	Defense/foreign affairs	2%

Source: European Commission (2009b), \* multiple answers possible

The respondents have the possibility to choose out of 95 different topics covering all aspects of political and societal life. Figure 1.1 only shows how many of the total answers concerned unemployment and environmental protection.<sup>3</sup> The bold line above the bars shows the yearly average of the unemployment rate in Germany in each year. Respondents' answers clearly reflect the development of the unemployment rate, the rank analysis underneath the figure also shows that from 1993 on, with respect to voters' perspective, unemployment was the dominant issue. When looking at their position concerning environmental protection, a clear picture is not identifiable. In the first half of the 1990ies environmental protection ranked among the Top10 but steadily declined throughout the next 10 years to reach the overall period's lowest point in the year 2004. In 2007, environmental protection is the number 2 of that year's survey which may be attributable to the significant impact of the hurricane Kyrill that killed 13 people and caused damages of 2.3 billion € in Germany alone. In contrast to the European surveys presented above, in which specific questions about environmental issues were asked, we also conclude from the lower interest of the respondents in German survey, that environmental protection is a topic among many in citizens' points of view and not necessarily one that is considered as important as the more tangible economic situation and its impacts on daily life.

<sup>3</sup> The number of total respondents varies between 10,800 in 1991 and 16,400 in 2007.

**Figure 2.1:** Unemployment versus environmental protection in Germany

RANK (among 95 issues)	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Unemployment	7	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Environmental Protection	4	5	9	5	3	9	10	8	13	10	11	17	21	40	23	21	2

Source: Politbarometer 1977-2007, [www.gesis.org](http://www.gesis.org), own calculations and figure

Nevertheless, looking at the comparatively new happiness research literature one finds evidence that environmental pollution negatively affects individual well-being, which supports the view that the general public is motivated to act in an environmentally friendly way.<sup>4</sup> Halla et al. (2008) analyze the relationship between citizens' satisfaction with the quality and performance of the economic and political system they live in and environmental quality. They find that '[...] both a focus on environmental policy and higher environmental quality (in terms of lower emissions, in particular, of CO<sub>2</sub>, and less traffic) increase satisfaction with democracy in statistically and economically important ways.' But they also report that a rise in public environmental expenditure tends to decrease average satisfaction, which they interpret as a confirmation for the public good characteristics of environmental policy and environmental quality. Furthermore, Layton and Levine (2003) show empirically that the public's willingness to pay to prevent small negative impacts on the ecosystem is insignificantly different from zero but significantly positive with larger impacts.

A lack of information about market-based instruments in environmental policy, especially about energy taxes, is found in several studies and considered a major obstacle in environmental policy.<sup>5</sup> One line of arguments why market-based instruments are not

<sup>4</sup> Compare Welsch (2006 and 2009).

<sup>5</sup> For France see Deroubaix and Leveque (2004), for Ireland see Clinch and Dunne (2006), for Germany see Beuermann and Santarius (2006).

satisfactorily incorporated in environmental policies is, that this lack of information on the voters' side is too costly to be overcome. Understanding the complexity of environmental issues requires higher education, interest and time to learn, therefore acquiring information is subject to high opportunity costs.<sup>6</sup> Klok et al. (2006) report that participants in a Danish survey about market-based instruments in environmental policy argued that 'they could not accept something they did not understand'. The importance of education and knowledge about the environment for explaining individual environmental concern is also found by Franzen and Meyer (2010) who analyze environmental attitudes in a cross-national dataset of 26 countries.

However, Owens and Driffil (2008) argue that information about 'the need for, or characteristics of, controversial developments has not notably delivered acquiescence on the part of local communities. On the contrary, it can fuel distrust [...]' . If only information can raise acceptance for new instruments but heterogeneous information also triggers distrust, the key target issue according to several studies is seeking trust, as voters may simply not trust their governments. One question posed in the European Value Study in 2008 was 'How much confidence do you have in the following institutions?' As Table 2.3 shows over 60% of the respondents have either not very much confidence in their government or none at all. Similar answers were given for the confidence in parliaments and political parties. Only environmental organizations performed slightly better than the other groups. Furthermore, studies for a number of European countries show that voters not only distrust their governments they especially either do not trust them to use the extra taxes in a meaningful way or see no reason for any additional taxation.

**Table 2.3:** How much confidence do citizens have in various institutions?

	Parliament <i>n</i> =53.543	Major Companies <i>n</i> =50.027	Environmental Organizations <i>n</i> =51.184	Political Parties <i>n</i> =53.249	Government <i>n</i> =53.640
A great deal	6,5%	5,6%	9,9%	3,6%	6,6%
Quite a lot	32,3%	33,0%	<b>45,8%</b>	19,3%	30,9%
Not very much	<b>40,1%</b>	<b>43,2%</b>	32,9%	<b>45,6%</b>	<b>38,5%</b>
None at all	21,1%	18,2%	11,5%	31,5%	24,0%

Source: data from the European Value Study 2008, downloaded from <http://zacat.gesis.org/> [10.11.2010], own calculations.

In a study for Ireland, Clinch and Dunne (2006) for example report that on the one hand voters are suspicious and distrustful of their government when it comes to tax policy and on the other hand they already feel overtaxed. Deroubaix and Leveque (2004) report that the participants in their French survey suggested 'that politicians always thwart the allocation of taxes'. Even stronger is a study result for Denmark in which participants suppose that environmental taxes are just another way for obtaining public revenues and that their environmental effects were only a fake.<sup>7</sup> A similar response is reported by Dresner et al. (2006) for the United Kingdom.

Another aspect of this issue is that voters believe they alone have to bear the costs. This line of argument does have some substance. Especially if price elasticity is low, the tax

<sup>6</sup> Compare also Anthoff and Hahn (2010).

<sup>7</sup> Compare Klok et al. (2006).

burden can be transferred from producers to consumers (which – in most cases – would offend the polluter-pays principle). But if price elasticity is high, the tax burden will be borne by producers as well as workers (see Table 2.4). Especially, the price elasticity for gasoline demand, for which a large body of literature is available, tend to support the view that environmental taxes may at least partly be borne by voters alone (see Table 2.4).

**Table 2.4:** *Price-elasticity from consumers in various European countries*

Source	Country	Time	Electricity tax	District heating tax	Oil tax	Gasoline/transport fuels tax
Ghalwash (2005)	Sweden	1980-2002 (yearly)	-1.8	-1.83	-1.58	--
Graham and Glaister (2005)	Meta Study	Years covered 1980-2002	-1.2	--	-1.21	-0.6 to -1.0
Romero-Jordán et al. (2010)	Spain	1998-2001 (quarterly)	-1.09	--	-1.06	-0.32 to -0.75
Brons et al. (2008), meta study from 45 studies	Meta Study	Years covered 1974-1999				-0.34 <sup>1)</sup> to -0.84 <sup>2)</sup>

Source: see reference list; <sup>1)</sup> Short-run and <sup>2)</sup> long run elasticity

Kirchgässner and Schneider (2010) argue that selfish voting is a major obstacle to any kind of environmental policy. A data set that allows the analysis of individual characteristics of voting behavior was collected in Switzerland in the year 2000, when 4.7 Swiss citizens had the possibility to vote on three proposals for taxes on fossil energy. All proposals were rejected, but one by only 3.4%.

Thalmann (2004) analyzed the data and found that political affinity and education played a role in voter behavior. Both citizens with an affinity to green and left-of-center parties and citizens with higher education had higher rates of participation in the referenda and also higher rates of approval of the proposals, whereas income – ceteris paribus – did not significantly influence voting behavior. In another analysis of the votes on the three Swiss environmental proposals, Bornstein and Lanz (2008) found that socially accepted norms and ideology do play a role in the referendum outcome and that price and/or income effects are not the main factors taken into account by voters.

The Swiss voting data are unique as they reflect real-world behavior of voters combined with their individual characteristics. Such data cannot – to the authors' knowledge – be found for other European countries. But there is an interesting body of literature especially with a sociological and psychological background about how characteristics of individuals influence their environmental concern for environmental policy gathered in large national or cross-national surveys.

We will look at the characteristics analyzed in the Swiss proposal in turn and compare them with findings from other survey analysis. The first factor is whether political affinity actually influences willingness to contribute monetarily to environmental protection. We find support for this notion in Neumayer (2004) who analyzed a large cross national data sample of 45 countries and concludes that left-wing oriented individuals are willing to pay higher prices and taxes to protect the environment. Dietz et al. (1998) conclude from their analysis of the US General Social Survey 1993 that 'political liberalism increases awareness of consequences and choice of the environment over economic progress. The influence of

education on environmental concern is straightforward. The Swiss proposal showed that higher education also led to higher rates of approval for the environmental tax proposals. Support for the effect of education on environmental concern, willingness to pay and pro-environmental behavior can be found in Neumayer (2004); Franzen and Meyer (2010) and Dietz et al. (1998).

Among the most interesting outcomes of the Swiss proposal data is that income did not play an essential role in the election outcome. But this point of view is challenged by survey analysis: Franzen and Meyer (2010) conclude from their analysis of the International Social Survey Programme (ISSP) 1993 and 2000 that household who have a comparatively better income situation also report a higher concern for the environment. They also report that these in-country differences are much larger than any cross-country differences in relative income but nevertheless report that richer nations have higher levels of environmental concern. Gelissen (2007) comes to the opposite conclusion: richer nations are less willing to pay for environmental protection. He argues that this result of his multi-level analysis of 50 nations may be explainable with the already relatively high share of income given up for environmental protection or with the exploitation hypothesis which states 'that publics of countries, which have acquired wealth by high levels of environmental exploitation, are not willing to pay the external costs related to exploitation'. For individual income he finds the expected positive relation with support for environmental protection. This result is also supported by Haller and Troy (2003) who analyzed the ISSP 2000 data. They confirm the results of Franzen and Meyer (2010) concerning the cross-country differences stating that relatively richer nations have a higher willingness to sacrifice for environmental protection.

The influence of gender, marital status and age were analyzed by Gelissen (2007), Dietz et al. (1998) as well as Franzen and Meyer (2010). Gelissen (2007) found a significant influence of age on individual support for environmental protection with the younger having a higher support. He finds no significant influence of gender. Dietz and al. (1998) report that from their results one can conclude that women have stronger environmental beliefs but are less willing to sacrifice for environmental protection than men. They furthermore find no consistent relationship between age and pro-environmentalism. In contrast, Franzen and Mayer (2010) find a significant influence of gender as well as age, whereas women and the younger have a higher environmental concern. Thalmann (2004) reports no significant gender or age differences in the votes for the three Swiss tax proposals. We found no studies looking at the effect of the marital status.

Considering the values of social discount rates discussed in the literature, voters care more about the here and now than about the future: In an overview of relevant papers, van der Bergh (2009) reports values of discount rates varying between 3 and 6%, where any social discount rate greater than 0% implies that a higher weight (importance) is given to early generations than to generations in the distant future.<sup>8</sup> Layton and Levine (2003) calculate a public discount rate of nearly 1%. Even though there is an ongoing dispute in the literature about the use and size of social discount rates, especially in view of the costs of fighting climate change, there is a widespread tendency to assume that voters at least to some extent attach more value to the present than to some unknown future. Halla et al. (2008) find that parents worry significantly more about CO<sub>2</sub> emissions than citizens without

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<sup>8</sup> Compare Howarth (2001) and Ackerman et al. (2009).

children, which may be an argument in favor of a low but non-zero inter-temporal discount rate. Summing up our discussion, we find a number of interesting influencing factors on individual willingness to contribute to environmental protection: education, political affinity, income, relative wealth of a nation and an implicit discount rate may explain why voters do or do not explicitly vote for the environment. We also conclude that the provision of the public good 'environment' allows free-rider behavior, that the need for environmental protection given the time delay between costs and benefits of environmental policies (especially CO<sub>2</sub> emission reduction) may be difficult to explain given information asymmetries and non-zero social discount rates diminish the future's importance and thirdly, other more urgent issues, like unemployment or income growth, have a higher priority than less tangible environmental issues.

## 2.2 Hypotheses

From the literature analysis in section 2.1 we derive the following four hypothesis:

*Hypothesis 1: Individuals whose political orientation is green have a higher willingness to contribute monetarily to environmental protection than individuals without a green affinity.*

The literature review showed evidence that individuals with a political green affinity are more willing to give up on their income than people with other political orientations. In the EVS 2008 individuals were asked which party they would vote for. We analyzed the answers and identified those parties who are green parties in the individual countries (see a list of these parties in the appendix). The given variable was recoded to a dummy variable that is 1 if the respondent said he would vote a green party and 0 for all other parties.

Furthermore we use two other variables to depict the overall point of view of the respondent. The answers to the question "If things continue we will experience an environmental catastrophe" are used to assess the perception of the respondent concerning the need and urgency of a stricter environmental policy. The variable is categorical with the possible answers 'strongly agree', 'agree', 'disagree' and 'strongly disagree'. To also be able to differ between the individual's political point of view and his willingness to act we use the answers to the dummy variable „Do you belong to an environmental organization“.

*Hypothesis 2: Individual willingness to contribute is subject to the individual characteristics that influence the individual life situation.*

According to the literature presented in chapter 2 we choose a set of individual characteristics to test their influences on the willingness to contribute monetarily to environmental protection. These variables are *yearly household income* and *having children* as well as the fundamental demographic variables *gender*, *marital status*, *age* and the individual's *employment situation*. All of these data were collected in the EVS 2008. *Gender*, *marital status* and the *employment situation* are included as dummy variables. The *yearly household income* is metric, the variable *having children* is coded as a dummy and reflects whether the respondent has children or not. The variable *age* is categorical.

*Hypothesis 3: Individual education influences willingness to contribute monetarily to environmental protection.*

Literature proposes that individual education has a major influence on being able to understand the importance of effective environmental policy, even though evidence is not completely conclusive. As we discussed in chapter 2 environmental issues are partly difficult to assess for laymen especially in context with global issues like climate change. It would have been interesting to be able to differ between individual education and state-of-knowledge about for example climate change. As no such data is available in the EVS2008 we use the variable individual education as a proxy for how well individuals are apt to understand the complexity and importance of environmental protection regionally as well as globally.

*Hypothesis 4: Individual willingness to contribute is subject to a country's energy price level.*

With our fifth model, we assess the question how the current environmental dues given in a country at the time of the EVS 2008 influence individual willingness to contribute monetarily to environmental protection. We draw from the findings of Gelissen (2007) who argued that relatively wealthier nations are less willing to pay for environmental protection, which can be explained with the already high share of income devoted to environmental protection. We tried to create a variable that depicts the overall share of income that a given individual in the data sample is already giving up for environmental protection, but did not succeed due to the complexity and heterogeneity of environmental taxation in the EU-27, Norway and Switzerland. Therefore we decided to use the average of the *gasoline price* in the six months prior to the survey as an indicator for individuals' self-perceived existing burden. We are aware that this approach has shortcomings but assume that the visibility of gasoline prices to everyone makes this variable the best available proxy.

### **3 Empirical analysis**

#### **3.1 Data**

To empirically test the literature findings presented above we use a dataset that allows an aggregated look at what influences voters decision making process. This dataset was gathered in the European Value Study. The European Value Study (ESV) was firstly conducted in 1981 and provides cross-national data on human values, ideas and preferences etc. for European citizens. Up to now four waves were conducted in the years 1981, 1991, 1998 and 2008. We use data drawn from the fourth ESV in 2008 that provides data for 39 countries and more than 56,000 citizens. For the sake of our analysis we only used respondents from one of the EU-27 member countries, Switzerland and Norway.

One question asked in this survey was "*I would give part of my income if I were certain that the money would be used to prevent environmental pollution*". Even though this question does not directly target the use of environmental taxes and makes the condition that the money is

used to prevent environmental pollution, we consider the answers to this question a proxy for voters' acceptance of environmental taxes.

**Table 3.1:** "I would give part of my income if I were certain that the money would be used to prevent environmental pollution"

	No. of valid answers	
1	agree strongly	5,405
2	agree	18,019
3	disagree	10,478
4	disagree strongly	5,726
	Total	39,628

In the survey respondents also had the possibility to not answer this question. In the following models only those cases in which one of the answers in Table 3.1 was given are considered.

The aim of our analysis is to identify the factors influencing the individual answers to this question. Within the ESV 2008 a large set of individual characteristics was part of the query as well as numerous categorical variables about issues ranging from religious affairs to people's happiness with democracy.

### 3.2 The model specification

As described above, the endogenous variable in our model is categorical whereas the exogenous variables are metric, categorical or binary. A regression method that allows the estimation of a categorical variable with different kind of exogenous variables is the ordinal regression model. In our study we analyse respondents' choices  $y_i$  by a random utility model (RUM), such that the utility of alternative  $j$  for respondent  $i$  is given by

$$y_i = j \quad \text{if} \quad c_{j-1} < u_i < c_j, \quad (1)$$

with

$$u_i = x_i\beta + \varepsilon_i, \quad \varepsilon_i \sim N(0, \sigma^2), \quad (2)$$

where  $x_i$  refers to the vector holding the characteristics of the decision maker  $i$ .  $K$  is the number of alternatives revealed to the respondents,  $\beta$  is the coefficients vector common for all respondents, and  $\varepsilon$  denotes the error term. Identification of the model is achieved by standardizing the scale to  $\sigma^2 = 1$ , which is standard in the econometric literature. Hence, in the subsequent analyses  $\varphi$  refers to the cumulative distribution function of a standard normal distribution. The probability of respondent  $i$  choosing alternative  $j$  is then given by

$$P(y_i = j) = P(c_{j-1} < u_{ij} < c_j) = \varphi(c_j - x_i\beta) - \varphi(c_{j-1} - x_i\beta), \quad (3)$$

where  $c_j$  refers to the upper cut-off point (of alternative  $j$ , such that  $c_0 = -Inf$  and  $c_K = Inf$ ). The log likelihood of the resulting ordered probit model is then given by

$$\ln L = \sum_{i=1}^n \sum_{j=1}^k z_{ij} * \ln[\varphi(c_j - x_i\beta) - \varphi(c_{j-1} - x_i\beta)] \quad (4)$$

where  $z_{ij}$  is 1 if  $y_i=j$  and 0 else.  $c_j$  is also called the threshold parameter.

In our analysis the model in (1) is applied in four nested specifications, where only the vectors  $x_i$  differ between the four models. Coefficients of all specifications are given in Table 3.2.

### 3.3 Results

In Model 1 we include three more variables that capture the individuals green affinity, their 'philosophical' point of view on the urgency of environmental protection as well as their engagement in an environmental group. The model furthermore comprises dummies for each country (EU-27, Norway and Switzerland) to correct for an unobservable heterogeneity in country specific attitudes towards environmental protection. The variable green affinity, that we constructed from the answers to the question which party the respondent would vote is a dummy (1 = vote green party, 0 = do not vote a green party). Its coefficient is highly significant. The variable '*If things continue we will experience a catastrophe*' is categorical.

Respondents were asked to say how strongly they agree or disagree with this statement. For all of the answer categories we see a highly significant coefficient. The third variable, coded as a dummy (1= *I belong to an environmental group*) is significant as well. The results support the study results we presented in chapter 2. Respondents who declared that they would vote a green party are more willing to pay for environmental protection than those who vote other parties. The same is true for respondents who belong to environmental groups. Finally, respondents who have a pessimistic point of view on the environmental situation also have a higher tendency to agree with giving part of their income for environmental protection than persons with a more optimistic point of view. The results for this variable are ambiguous. On the one hand we have to note that the coefficients for all of the categories of this variable have a negative sign, whereas we expected at least for the category *disagree* a positive sign. But on the other hand the magnitude of the coefficients strongly declines from *agree strongly* to *disagree*. Our interpretation of this result is that even though having an optimistic point of view still goes along with a positive willingness to pay, it also represents a weaker acceptance of giving up on income than for the categories *strongly agree* and *agree*.

**Table 3.2: Results of the ordinal regression, Model 1 to 4**

	Model 1			Model 2			Model 3		
c <sub>1</sub>	-1,965	(0,079)	***	-1,706	(0,101)	***	-1,266	(0,127)	***
c <sub>2</sub>	-0,518	(0,079)	***	-0,257	(0,101)	**	0,193	(0,127)	
c <sub>3</sub>	0,36	(0,079)	***	0,634	(0,101)	***	1,088	(0,127)	***
Austria	0,202	(0,077)	***	0,137	(0,089)		0,177	(0,093)	*
Belgium	-0,128	(0,076)	*	-0,149	(0,088)	*	-0,105	(0,092)	
Bulgaria	-0,704	(0,078)	***	-0,854	(0,091)	***	-0,737	(0,096)	***
Cyprus	-0,767	(0,081)	***	-0,795	(0,093)	***	-0,777	(0,098)	***
Northern Cyprus	-0,760	(0,089)	***	-0,846	(0,101)	***	-0,815	(0,105)	***
Czech Republic	-0,129	(0,077)	*	-0,244	(0,09)	***	-0,155	(0,094)	*
Denmark	-0,603	(0,077)	***	-0,623	(0,09)	***	-0,567	(0,094)	***
Estonia	-0,082	(0,077)		-0,200	(0,089)	**	-0,112	(0,093)	
Finland	0,186	(0,080)	**	0,222	(0,091)	**	0,323	(0,096)	***
France	-0,009	(0,076)		-0,067	(0,088)		-0,009	(0,092)	
West Germany	0,231	(0,079)	***	0,245	(0,091)	***	0,293	(0,095)	***
East Germany	0,572	(0,081)	***	0,496	(0,092)	***	0,600	(0,096)	***
Greece	-0,778	(0,077)	***	-0,824	(0,089)	***	-0,801	(0,093)	***
Hungary	0,030	(0,076)		-0,089	(0,089)		0,010	(0,093)	
Ireland	-0,005	(0,091)		-0,144	(0,111)		-0,112	(0,115)	
Italy	-0,450	(0,077)	***	-0,529	(0,091)	***	-0,505	(0,095)	***
Latvia	-0,264	(0,077)	***	-0,395	(0,090)	***	-0,263	(0,094)	***
Lithuania	0,113	(0,079)		-0,018	(0,091)		0,133	(0,096)	
Luxembourg	-0,415	(0,076)	***	-0,350	(0,089)	***	-0,366	(0,094)	***
Malta	-0,434	(0,078)	***	-0,518	(0,093)	***	-0,500	(0,097)	***
Netherlands	-0,107	(0,077)		-0,122	(0,089)		-0,088	(0,093)	
Norway	-0,323	(0,078)	***	-0,325	(0,090)	***	-0,255	(0,094)	***
Poland	-0,007	(0,078)		-0,065	(0,091)		0,032	(0,095)	
Portugal	0,069	(0,078)		0,117	(0,094)		0,077	(0,099)	
Romania	-0,471	(0,078)	***	-0,566	(0,092)	***	-0,476	(0,096)	***
Slovak Republic	-0,034	(0,078)		-0,155	(0,091)	*	-0,054	(0,096)	
Slovenia	-0,551	(0,077)	***	-0,666	(0,091)	***	-0,636	(0,096)	***
Spain	-0,134	(0,077)	*	-0,240	(0,091)	***	-0,226	(0,096)	**
Sweden	-0,347	(0,079)	***	-0,332	(0,091)	***	-0,265	(0,096)	***
Switzerland	-0,272	(0,078)	***	-0,268	(0,091)	***	-0,250	(0,095)	***
Great Britain	0,053	(0,077)		-0,041	(0,09)		0,000	(0,095)	
<b>Individual Level variables</b>									
<b>Model 1</b>									
No Voter of Green Party	0,466	(0,03)	***	0,478	(0,032)	***	0,444	(0,033)	***
Belongs to environmental group	-0,405	(0,025)	***	-0,387	(0,027)	***	-0,355	(0,028)	***
If things continue we will experience catastrophy: strongly agree	-0,763	(0,037)	***	-0,726	(0,042)	***	-0,726	(0,042)	***
If things continue we will experience catastrophy: agree	-0,552	(0,036)	***	-0,515	(0,041)	***	-0,511	(0,041)	***
If things continue we will experience catastrophy: disagree	-0,314	(0,038)	***	-0,27	(0,043)	***	-0,266	(0,043)	***
<b>Model 2</b>									
Not Married				0,033	(0,016)	**	0,036	(0,016)	**
younger than 29 years				-0,018	(0,025)		-0,006	(0,025)	
between 30 and 39 years				0,009	(0,023)		0,04	(0,024)	*
between 40 and 49 years				0,001	(0,022)		0,016	(0,023)	
between 50 and 59 years				-0,026	(0,022)		-0,021	(0,022)	
No children				-0,039	(0,019)	**	-0,015	(0,019)	
Male				-0,023	(0,013)	*	-0,03	(0,013)	**
Paid Employment				-0,028	(0,017)	*	0,01	(0,017)	
Yearly household income in 1.000€				-0,003	(0,004)	***	-0,001	(0,004)	**
<b>Model 3</b>									
Pre- primary education or none education							0,486	(0,083)	***
Primary education or first stage of basic education							0,456	(0,074)	***
Lower secondary or second stage of basic education							0,386	(0,072)	***
(Upper) secondary education							0,283	(0,071)	***
Post- secondary non- tertiary education							0,219	(0,076)	***
First stage of tertiary education							0,071	(0,071)	
N	39.628	35.529		28.141			27.991		
Model fit (-2Log-Likelihood)	1,542.702	6,082.52		51,739.273			58,305.067		

Method: ordered probit model; Numbers in parentheses are standard errors, statistical significance level is shown with \*\*\* representing a 1% significance, \*\* a 5% significance and \* a 10% significance level. Significance of model fit tested with chi-test (\*\*\* representing a 1% significance).

Interpretation of coefficients: The endogenous variable is categorical with four answer possibilities (1) agree strongly, (2) agree, (3) disagree and (4) disagree strongly. A negative coefficient represents a shift to the left, in this case a shift towards (1) agree strongly. A positive coefficient represents a shift to the right; in this case towards (4) disagree strongly.

In Model 2 the *country dummies* are nearly similar to those in Model 1 with the exemption that the coefficient for Austria turns insignificant while the coefficient for Estonia turns

significant. Again, the signs of the significant coefficients have not changed in comparison to Model 1. The variables introduced in Model 1 are again all highly significant and their coefficients are robust considering their sign and magnitude. Model 2 now extends Model 1 with demographic variables: the *marital status*, *gender*, *employment status* and *having children* are coded as dummies and all show significant coefficients. Only the coefficients for the categorical variable *age* are all insignificant.

From the sign of the significant coefficient we can deduce the following: unmarried respondents have a lower willingness to contribute monetarily to environmental protection. Respondents who have children, a paid employment and are male have a higher willingness to contribute than respondents without children, without paid employment and are female. Considering our discussion in chapter 2 about the various results concerning the influence of income on willingness to contribute, our results support the hypothesis that higher income goes along with a higher willingness to contribute for environmental protection. Another aspect of this model that we also see in Model 3 and 4 is that we do not find a significant influence of *age*. This is not surprising in comparison to the literature review given in chapter 2 that partly tends to confirm the notion that younger people have a higher willingness to contribute to environmental protection but is not fully conclusive.

Model 3 expands Model 2 by a variable depicting the *educational status* of the respondents. Firstly, we see that the number of insignificant coefficients for the *country dummies* rises to 12, again magnitude and sign of the significant coefficients have not changed. The three variables representing environmental attitudes are again significant as well as is the *marital status* and *gender*. Apart from the age category 30-39, the *age* variable again shows insignificant coefficients.

In contrast to Model 2 now the coefficient for the *employment status* is insignificant. The coefficients for the *educational status* are highly significant except for the category „*First stage of tertiary education*“. But we see that the tendency to be willing to contribute monetarily rises with better education. That the coefficient for „*First stage of tertiary education*“ is insignificant may be interpreted as showing that there is an upper bound to how educated someone has to be to understand the importance of environmental protection.

We have already argued that the dummies for the individual countries capture a matrix of unknown cross-country differences. To see how the coefficients of all other variables changes we formulated Model 4 in which no *country dummies* are used. Furthermore we use Model 4 to test another assumption we found in the literature review: that the individual willingness to contribute monetarily to environmental protection is subject to how high the given and self-perceived burden through existing environmental dues is. For this we include a variable depicting the average *petrol price* in the individual countries in the six months prior to the survey. The variable *petrol price* is used as categorical variable. Table 3.3 shows the regression outcome. Firstly, we see that the signs of the significant variables are the same as in the already presented Models 1 to 3. Insignificant coefficients are reported for the variables *having no children*, *having a paid employment* and for three of the four *age* categories (and this fourth category is barely significant). The newly incorporated variable *petrol price* shows significant and negative coefficients for all categories. The sign of the coefficients is surprising but its magnitude for the four categories shown tends to undermine the assumption that respondents from countries with a higher share of environmental dues on

income have a lower willingness to contribute than respondents from countries with lower petrol prices.. We are very well aware of the fact that this variable is only a proxy for the underlying relationship between the willingness to contribute monetarily to environmental protection and each countries (or each respondents) initial position with environmental dues. Nevertheless, our preliminary analysis shows that a deeper look into this matter may be worthwhile.

**Table 3.3:** Results of the ordinal regression, Model 5

	M5		
c <sub>1</sub>	-1,447	(0,094)	***
c <sub>2</sub>	-0,047	(0,094)	
c <sub>3</sub>	0,829	(0,094)	***
Yearly household income in 1.000 €	0,001	(0,000)	***
Belongs to enviromental group	-0,426	(0,028)	***
Male	-0,047	(0,014)	***
Not Married	0,066	(0,016)	***
No Voter of Green Party	0,410	(0,034)	***
If things continue we will experience catastrophe: strongly agree	-0,723	(0,043)	***
If things continue we will experience catastrophe: agree	-0,492	(0,042)	***
If things continue we will experience catastrophe: disagree	-0,261	(0,045)	***
No children	-0,032	(0,020)	
Paid Employment	-0,002	(0,017)	
younger than 29 years	-0,042	(0,025)	*
between 30 and 39 years	0,018	(0,024)	
between 40 and 49 years	0,009	(0,023)	
between 50 and 59 years	-0,027	(0,022)	
Pre- primary education or none education	0,261	(0,086)	***
Primary education or first stage of basic education	0,213	(0,078)	***
Lower secondary or second stage of basic education	0,274	(0,077)	***
(Upper) secondary education	0,194	(0,076)	***
Post- secondary non- tertiary education	0,205	(0,080)	**
First stage of tertiary education	-0,001	(0,076)	
Petrol Price between 0 and 1,061 €/litre	-0,435	(0,022)	***
Petrol Price between 1,061 and 1,199 €/litre	-0,457	(0,022)	***
Petrol Price between 1,199 and 1,252 €/litre	-0,179	(0,023)	***
Petrol Price between 1,252 and 1,419 €/litre	-0,250	(0,020)	***
N	26.270		
Model fit (-2Log-Likelihood)	55,739.237***		

Method: ordered probit model; Numbers in parentheses are standard errors, statistical significance level is shown with \*\*\* representing a 1% significance, \*\* a 5% significance and \* a 10% significance level. Significance of model fit tested with chi-test (\*\*\* representing a 1% significance).

Interpretation of coefficients: The endogenous variable is categorical with four answer possibilities (1) agree strongly, (2) agree, (3) disagree and (4) disagree strongly. A negative coefficient represents a shift to the left, in this case a shift towards (1) agree strongly. A positive coefficient represents a shift to the right; in this case towards (4) disagree strongly.

## 4 Conclusion

There are challenging times ahead of us. The reports prepared and presented by the International Panel on climate change develop a picture of the future that is frightening – if no action is undertaken now. Throughout the last two decades much as been achieved but we also see that the instruments now in use do not bring the desired results. The European Union has just recently started to base its environmental policy on the use of market-based instruments. But the existing instruments can only be the starting point for a more efficient environmental policy.

We focused our paper on taking a deeper look into what characteristics of voters influence their willingness to contribute monetarily to environmental protection as fighting climate

change but also protecting the environment in a more regional perspective will need to be supported by voters. With voters unwilling to accept a more stringent environment policy, political strategies are probably doomed. The general public, the voters, obviously attach some importance to environmental quality: an empirical fact repeatedly verified in the studies we reviewed.

The growing body of literature about what influences happiness also shows the high positive correlation between individual happiness and environmental quality. In addition, the more tangible willingness-to-pay studies confirm these findings. But even though the value that voters place on the environment surely is high, we also showed that in terms of everyday life, in which one's job, income and security situation have more weight than less tangible aspects, like CO<sub>2</sub> emissions, people's environmental morale or intrinsic motivation may not be high enough for them to actively vote for the environment. Furthermore, the costs of fighting climate change are imposed on today's voters immediately, while it is future generations that will benefit from this effort. While, as argued above, altruistic behavior can surely be assumed for a part of society, it may be less prevalent for environmental policy measures in society as a whole.

The ordered probit models we developed show that firstly there are cross-country differences within the European Union, Norway and Switzerland. Secondly, among the individual characteristics we used as exogenous variables *political affinity*, overall *environmental attitude*, *gender*, *education* and the *yearly household income* are those variables which significantly influence the willingness to contribute monetarily to environmental protection. We found no influence of *age* or *having children*.

In the title of our paper, we asked who would be willing to pay for the environment. What we can deduce from our analysis is that a further strengthening of educational and informational campaigns can positively influence the individual willingness to contribute. We may deduce that there are countries in the European Union in which such campaigns may be more necessary than in other countries. In our literature review we also showed that there is a persisting information asymmetry that remains a major obstacle in environmental policy. Ongoing efforts made especially on the European level, such as 'green labels' for food and non-food products, may help voters to better understand the external effects of their actions on the environment and may therewith positively influence their willingness to contribute.

Lastly, the Swiss environmental tax proposal presented in the literature review may serve as an example of how increasing the influence of voters on environmental policy may serve as a way to accelerate environmental policy. This could be done by pushing the idea of giving voters more rights, such as the introduction of a referendum or the right to an initiative, so that voters can express their preferences on environmental issues more directly. We discussed in chapter that respondents in large surveys impose high importance on environmental issues when no other issues (especially economic ones) are in the focus. Considering referenda on single environmental issues, in which no other aspects of daily life are at stake, may therefore be a way to strengthen environmental policy.

## 5 Appendix

**Table 5.1:** List of Green Parties in the European Union (EU27), Norway and Switzerland used to construct the variable green affinity

<b>Country</b>	<b>Party</b>
AT	The Austrian Greens\Die Grünen
BE	Groen!
BE	Ecolo Ecolo
NO	Socialist Left Party SV
BG	Green Party of Bulgaria
CY	Ecological and Environmental Movement
CZ	Green Party
DK	Red-Green Alliance (Enhedslisten)
EE	Estonian Green Party
FI	Green League - VIHR
FR	Green Party
FR	Other Environmentalist Parties
GR	Coalition of the Radical Left - SYRIZA
IE	Green Party
LV	Union of the Green and Farmers (Zalo un Zemnieku savien
LU	Déi Gréng /Les Verts
MT	Alternattiva Demokratika
NL	Green/Left (GroenLinks)
ES	Verts - IC
SE	Green party (MP)
CH	Green party
CH	Green liberal party
GB	Green Party GRN
NIR	Green Party
DE	The Green Party

## 6 Literature

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