

Environmental Tax Reform and willingness to pay for the environment: an empirical analysis on European micro data

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Abstract

Using micro data from the European Value Survey (EVS) over 2008-2010, the paper investigates the individual and country variables that might affect the WTP for the environment of the 27 European Union (EU) Member States and in particular on the correlation of individual preferences to the existence/inexistence of the Environmental Tax Reform (ETR). Analyses, carried out by means of ordered logit OLS, logit and partial generalized ordered logit, provide useful insights to policy makers in fostering the tool of ETR, strongly promoted by the EU. Among others, our results show that WTP for the environment is higher in countries where an ETR has not been implemented. Moreover, further analyses conducted on the role of information highlight that being presumably aware of the ETR has a null/negative impact on the WTP for the environment.

JEL codes: R220, Z130, H23

Keywords: Decision making, Environment, Environmental tax reform, European Value Survey, Willingness to pay.

1. Introduction

As empirical studies employing survey data have demonstrated, several determinants, beyond individual socio economic characteristics, might affect the Willingness To Pay (WTP) the environment¹. Regardless its limits (i.e. information bias), this approach provides remarkable

¹ Depending on the question, the WTP might be related to the protection of the environment or to the prevention of pollution. In this paper we will refer to the second option.

insights in understanding the sources of heterogenic individual attitudes towards the environment.

Based on this literature, the paper explores the correlation between the WTP for the environment of the 27 European Union (EU) Member States and a wide set of variables reflecting individual and country characteristics. In particular, it focuses on investigating whether the WTP for the environment is lower/higher in countries where an Environmental Tax Reforms (ETR) has been carried out. From a methodological point of view, results, obtained by ordered logit OLS and logit models, are supported and made even clearer, thanks to the employment of the partial generalized ordered logit model, that, relaxing the parallel lines assumption, checks for possible variations of effect of the variables by the level of WTP.

The ETR mainly consists in offsetting the introduction or the increase of environmental related taxes, by reducing taxes on labour or capital, thanks to a revenue recycling system. The shift from “goods” to “bads” is aimed to jointly bring about environmental and political economy’s objectives (Ashiabor et al. 2005; Bosquet 2000; Ekins and Speck 2011), such as energy savings, employment boosting and innovation increasing (EEA 2011a, EEA 2011b). The relevance of the ETR has been recognized by the European Union, that in the “20 20 Strategy” (European Commission 2010), strongly promote this fiscal tool². Moreover it has been endorsed as a crucial instrument to consolidate the budget in the current context of financial crisis³.

Several studies accounted for the effects of ETR on competitiveness (Barker et al. 2007, 2009; FitzGerald et al., 2009), on equity (Barker and Kohler 1998) and investigated its social acceptance (Clinch et al. 2006a, 2006b; Dresner et al. 2006), but, as far as we are currently aware, there are no studies analyzing the correlation between the existence/inexistence of an ETR and individual WTP for the environment. Nevertheless, it seems reasonable to suppose that individuals’ WTP for the environment might be correlated to the existence of fiscal arrangements included in the ETR, as its aim is to affect the individual behaviour, giving a signal of the prices of non marketed natural resources and increasing the cost of polluting activities. The understanding of the determinants of WTP and the analysis of the correlation of individual preferences and ETR, might have relevant implications in the decision making process, seeking to introduce or improve the ETR.

We analyzed micro data provided by the 2008-2010 waves of the European Values Survey (EVS), where people have been asked about their own willingness to give part of their income in order to prevent environmental pollution. Our hypothesis is that people living in countries in which the ETR has been already set out, might show a lower WTP for preventing environmental pollution, at the margin. This does not imply that their environmental awareness is lower -otherwise the ETR would not have been employed- but simply that they

² In 2010 the total revenue from environmental taxes in the EU-27 was equal to the 6.2 % of the total revenues derived from all taxes and social contributions (Eurostat 2011). David Gee, Senior adviser European Environment Agency (EEA) states that “In the next 15 years, the aim is to reduce the portion coming from labour and increase the one coming from environmental related taxes of 25%” (www.eea.europa.eu › Multimedia centre).

³ “To minimise the cost of reaching the agreed EU climate and energy policy targets, it is crucial to utilise the taxation framework as efficiently as possible. This is particularly acute in the context of austerity measures and budget consolidation, which reduces the possibility to undertake environmental policy measures on the expenditure side of the budget” (European Commission, 2011, p. 111). Prof. Mikael Skou Andersen, senior economist at the European Environment Agency (EEA), explains that “traditionally the revenue from these taxes means to lower other taxes, especially on labour, to make it more competitive. However due to the financial crisis, the Eco taxes might represent a relief so to not increase labour taxes. This strategy was successful in Ireland, where the rose of taxes of packaging allowed at keeping low taxes to companies” (<http://www.eea.europa.eu/multimedia/what-are-the-challenges-in/view>).

probably assume to have sufficiently contributed to the environment⁴ and they are not willing to pay for additional interventions for preventing environmental pollution.

Results show that several individual variables, such as socio economic characteristics and personal beliefs and values, are significantly correlated to the MWTP for the environment. Looking at the country level variables - which control for institutional features, fiscal pressure, quality of the environment and efforts in the environmental domain incurred by citizens and institutions – a remarkable result, among others, is that the MWTP for the environment is higher in countries in which the ETR has not been implemented. Moreover, investigating the role of information, using the level of education as a proxy measure of knowledge about the reform, results show that only in countries where the ETR has not been implemented a positive correlation between educational level and MWTP for the environment can be accounted.

The remainder of the paper is organised as follows. Section 2 presents an overview of the existing literature on the use of survey data to investigate the determinants of WTP for the environment. Section 3 illustrates the ETR and its contents. Data and methodology are presented in sections 4 and 5, while results are shown in sections 6 and 7. Sections 8 and 9 are dedicated to discussion and final remarks.

2. Determinants of the individual Willingness To Pay for the environment: the existing literature

In order to investigate the determinants of WTP for the environment, survey data from several sources have been employed. They “allow an assessment of individual support for the environment as well as international comparisons” (Franzen and Vogl 2012, p. 2). *Ad hoc* surveys can be set up for single country’ analyses level (Witzke and Urfei, 2001⁵), while world wide on line available surveys⁶ are mostly used for cross countries analyses (Auci et al. 2006; Dorsch 2011; Duroy 2005; Franzen and Meyer 2010; Israel and Levinson 2004, Kollman et al. 2012). In both cases and differently from the contingent analysis, questions do not provide a precise measure of WTP for the environment, but an approximation of the intention to contribute in monetary terms to the protection of the environment. The most used source is “World Value Survey (WWS)” (Auci et al.2006, Torgler and Garcia-Valiñas 2007, Dorsch 2011, Duroy 2005, Israel and Levinson 2004), that provides several questions⁷ used, jointly or alternatively, as proxy of the total or marginal WTP for the environment⁸. Other noteworthy

⁴ In this sense, the environment is seen as normal good (See section 2).

⁵ Witzke and Urfei (2001) employ a survey on “Environmental Consciousness and Behaviour” by the Federal Environmental Agency, in which the following question is asked “Would you be willing to pay higher taxes or mandatory fees in support of a better environmental protection, if it were guaranteed that your payments would directly However, the all encompassing nature of environmental protection?”.

⁶ <http://www.worldvaluessurvey.org/>; <http://www.europeanvaluesstudy.eu/>; <http://www.issp.org/>.

⁷ Questions are: “I would agree to an increase in taxes if the extra money were used to prevent environmental damage”, “I would agree to an increase in taxes if the extra money were used to prevent environmental pollution”, “I would give part of my income if I were certain that the money would be used to prevent environmental pollution”, “Would you be willing to pay 20 percent higher prices to protect the environment?”.

⁸ Using questions form WWS, Israel and Levinson (2004) and Dorsh (2011) intend the individual WTP as marginal. Israel and Levinson (2004) use the question “would you be willing to pay 20 percent higher prices to protect the environment”, while Dorsh (2011)’ interpretation of marginal WTP is related to the question: “I would be willing to pay higher taxes if I were certain that the money would be used prevent environmental pollution”. The reason is that, carrying out the analyses for high income and low income countries and controlling for the individual income and other demographic variables “the proportion of respondents answering “yes” is lower for richer countries”- in which there is already a certain level of

sources are “European Value Survey” (EVS)⁹ and “International Social Survey Programme” (ISSP)¹⁰.

Schematically, determinants can be divided in two broad categories: individual and country specific. The former are related to the individual characteristics of the population sample, such as economic and social conditions (income, age, gender, education, etc). In addition variables related to values, beliefs and interests (i.e. politics) are also taken into account. The latter concern whole country’ characteristics, mainly reported as aggregated economic and social indicators or representative of the quality of the environment (i.e. level of emissions, environmental sustainability indicators).

Among the individual variables, income, age, gender and education are all frequently employed. However, depending on the data and the geographical scale, results are in some case contradictory. Israel and Levinson (2004), through linear probability models, find that support for the environment is generally greater for the higher income respondents, but examining different income category coefficients, the trend is not uniformly positive. The multilevel regression analyses run by Franzen and Meyer (2010) show that the “relative income within country”¹¹ affect significantly and positively the environmental concern expressed by their aggregated indicator. Auci et al. (2006) demonstrate that the WTP for the environment grows as far as income¹² gets higher. Results in Kollman et al. (2012) highlight that that higher income¹³ “goes along with a higher willingness to contribute for environmental protection” (Ibidem, p. 14). About age and gender, Togler and Garcia-Valiñas (2007), observing behavior of respondents in Spain, find a negative correlation between age and environmental attitudes; while female report a higher preference to contribute than men. Female are more likely to pay for the environment also in Israel and Levinson (2004), while Kollman et al. (2012), using an European database, find that male have a higher willingness to contribute than female. Other variables as “marital and parenthood status” are also employed, in Kollman et al. 2012, respondents who are married and have children show a higher WTP, while Togler and Garcia-Valiñas (2007), find no statistically significant differences among the marital variables. Usually a positive correlation is found between education and WTP for the environment: Auci et al. (2006) use a dummy for those who completed secondary education, Togler and Garcia-Valiñas (2007) use a proxy for “formal education”¹⁴ as the age at which individuals completed or will complete their full time education, Franzen and Meyer (2010), measuring education in the number of years respondents spent in school, highlight that “every year of additional schooling increases an individual’s environmental concern”(Ibidem, p.227).

environmental protection-. Thus, considering the environment as a normal good “this pattern only makes sense if the question is interpreted as a marginal increase in quality, and richer countries have cleaner environments” (Israel and Levinson, 2004, p.10).

⁹ The question from EVS is “I would give part of my income if I were certain that the money would be used to prevent environmental pollution”. Kollman et al. (2012) consider answers on WTP for the environment as a proxy for voters’ acceptance of environmental taxes.

¹⁰ From ISSP’ questions, Franzen and Mayer (2010) build up a WTP index .The additive index is built up on 9 sub indicators (questions). Among these: “How willing would you be to pay much higher prices in order to protect the environment?”; “How willing would you be to pay much higher taxes in order to protect the environment? “;How willing would you be to accept cuts in your standard of living in order to protect the environment?”.

¹¹ Household income excluding the highest and lowest percent divided by the square root of the number of persons living in the household, z-transformed.

¹² They introduce income in two ways: a continuous measure of (income class median) equivalent income expressed in year 2000 US dollar purchasing power parities in levels and in squares and a relative income measure by introducing four dummies measuring individual position in the relevant income quintile (Auci et al.,2006, p. 7).

¹³ The variable used is “Yearly household income in 1000 euro”.

¹⁴ They consider as “informal education” the interest in politics.

Individual values and attitudes are broadly and differently measured. Variables related to the political sphere have a strong correlation with environmental attitude and WTP for the environment. Several variables have been employed in order to measure individual political values, such as interest in politics – “discussing politics and political orientation” (Torgler and Garcia-Valiñas 2007); political affinity – “numbers of voters of green parties”¹⁵ - (Kollmann et al. 2012); political ideology and party identification (Witzke and Urfei 2001). Other individual variables measure the role of individual social capital in affecting WTP, through “individual opinion on tax evasion” (Auci et al. 2006), “trusts the national government” (Dorsh 2011), “trust”¹⁶ and “membership in a voluntary organization” (Togler and Garcia-Valiñas 2007), to provide some examples. “Religion” is included as a significant proxy for civic values (Greeley 1993), while among the individual values the “sense of belonging to a certain community” (global/local) and the perception of the environmental risk are also investigated. Auci et al. (2006) find that the sense of belonging to a wider regional group, national pride and individual blame on tax evasion are strongly positively correlated with the WTP for the environment. Dorsh (2011) states that people who view themselves as world citizens show high WTP for the environment than others. Kollman et al. 2012, find higher tendency to contribute to environmental protection from person with a pessimistic view¹⁷ and high perception of environmental risks.

In order to test the correlation between the context where the respondents live and their declared WTP for the environment, models usually include country variables. Beside index of the country’s wealth (i.e. GDP), other variables are employed, such as “countries’ income inequality” (Duroy, 2005¹⁸; Franzen and Mayers, 2010), measure of domestic corruption, of quality of institutions and of tax pressure¹⁹ (Auci et al. 2006). In addition, variables related to the status of the environment are also accounted: Environmental Sustainability Index 2001 (Franzen and Mayers, 2010), measures of domestic pollution (CO₂pc, in Auci et al. 2006), of noise and waste (Witzke and Urfei, 2001), the level of environmental protection through the Environmental Protection Index (EPI) (Dorsh 2011)²⁰.

Studies using surveys present some limitations and contradictory finding, mostly due to the database itself. Franzen and Vogl (2012) point out that “WTP for environmental protection is comparatively higher in the WVS and EVS than in the ISSP, likely due to a slight variation in the answering scales of the surveys (four-point vs. five-point scales), differences in the sample of countries in each survey, and varying levels of acquiescence in each country” (Ibidem, p.20). Moreover questions of the mentioned surveys may show the same strategic and information bias of contingent valuation²¹, as the answer of the respondents may not be exactly correspondent with the actual intention. Nevertheless, all these studies are determining a new branch of literature, which our paper aims at contributing, meant at understanding the numerous and variegated aspects correlated to the individual support for the environment.

¹⁵They consider the EVS 2008 question that asks which party they would vote for and then they identified those parties who are green parties in the individual countries (Kollman et al., 2012, p. 10).

¹⁶“Question: ‘Generally speaking, would you say that most people can be trusted or that you can’t be too careful in dealing with people?’ (Togler and Garcia-Valiñas 2007, p. 15).

¹⁷ They use the answer to the question “If things continue we will experience an environmental catastrophe”.

¹⁸ This is to demonstrate that a “more equal society is likely to yield a more environmentally conscious population (Duroy 2005 p.19).

¹⁹ Results confirm the direct causality for which higher tax pressure affect negatively the WTP additional taxes against pollution.

²⁰ Dorsh (2011) finds out that the perception of perception of local environmental problems (poor water quality, poor air quality, poor sewage and sanitation) does not explain the individual WTP for the environment which is more correlated to the perception of global problems, such as warming - loss of plant/animal biodiversity, pollution of lakes and oceans, and greenhouse effect.

²¹ For an analysis of limits of contingent valuation see Carson et al. (2003).

3. Brief overview on the Environmental Tax Reform

The Environmental tax reform (ETR) consists in the tax shifting from “goods” (labour or capital) to “bads” (pollution, resource depletion) (Ashiabor et al. 2005; Bosquet 2000; EEA 2011a; Ekins and Speck 2011), in order to combine the reduction of environmental degradation with political economy’ objectives (EEA 2011a, Eurostat 2011). It is based on a “revenue recycling system”, that allows at using the revenues from environmental taxes for reducing taxes on labour or capital, boosting the employment and incentivizing the innovation (EEA 2011b). In this case, the “double dividend hypothesis”²² (Andersen et al. 2011; Ceriani and Franco 2011) would theoretically take place: “the cleaner environment is the first dividend while the increase in employment or GDP is the second dividend” (Clinch et al. 2006b, p. 961). Alternatively revenues can be allocated in advance to finance specific environmental programmes (e.g., environmental funds, environmental projects, R&D activities) (Dresner et al. 2006).

Since the nineties, Denmark, Finland, Sweden, Germany, The Netherlands and the United Kingdom (Andersen and Ekins 2009; Ekins and Speck 2011) have implemented the ETR²³, applying different systems of recycling revenues (Speck et al. 2011): depending on the aim of the reform, the shift took place between environmental taxes and alternatively Personal Income tax (PIT), Social security contribution (SSC) or corporation taxes (tab. 1).

The “revenue recycling system” is what determine the difference between the ETR and simple environmental related taxes, set up to reduce greenhouse gases emissions and to sustainably manage resources. The environmental taxation in Europe has a long tradition (Ekins and Speck, 2011) and the concept of ETR, in particular, rose after the Jacques Delors' White Paper on Growth, Competitiveness and Employment in 1993 (Eurostat 2011). Recently the Energy taxation directive (Directive 2003/96/EC) and the Eurovignette directive (Directive 1999/62/EC, revised by the Directive 2006/38/EC) (Eurostat 2010) endorsed the use of fiscal tools²⁴. Taxes are mainly related on energy, CO₂ and the management of water (taxes on ground water) and waste (landfill tax) (Eurostat 2010)²⁵. However, in 2010 the total revenue from environmental taxes in the EU-27 was equal only to the 6.2 % of the total revenues derived from all taxes and social contributions (Eurostat 2011) (fig.1). The aim of the UE is to rise this percentage in the next years in order to reach EU climate and energy policy targets. In the current austerity contest, using efficiently the taxation framework, rather than measures based on the expenditure side of the budget (Eurostat 2011), allows at “induce behavioral changes and serve both fiscal and environmental purposes” (European Commission 2011, p.111).

The effects of the ETR have been analyzed from different points of view, such as on competitiveness (Barker et al. 2007, 2009; FitzGerald et al., 2009) and on social acceptance

²² The double dividend hypothesis has always been highly debated (Carraro et al. 1996, Pezzey and Park 1998, Bosello et al. 2001).

²³ The implementation of the reform depends on several factors, such as macroeconomic and labour market conditions (Clinch et al. 2006a). Despite “experience shows that ETR is a potential policy tool for all EU” (Speck et al. 2011) and studies highlight the positive impacts on economic growth and innovation and on reduction of emissions (Baranzini et al. 2000, EEA 2011a), there are several difficulties of its implementation, related mainly to social and political conditions and the design of a proper revenue recycling system (Ashiabor et al 2005), as well as complementary measures for acceptance and equity (Clinch et al., 2006a, 2006b).

²⁴ All EU member states, following the Directive 2003/96/EC are obliged to uses environmental taxes, however for new member states exemptions and transitional periods are allowed (Speeck et al. 2011).

²⁵ In recent years, the predominance of energy taxes is common to most Member States and households have been the sector paying the most of total energy and transport taxes (Eurostat 2010, 2011).

and equity²⁶ (Barker and Kohler 1998; Clinch et al. 2006a, 2006b; Dresner et al. 2006, Speck 1999; Klok et al. 2006; Leicester 2006; Ekins and Speck 2011). Even if the shift has involved so far only a few percent of tax revenues, significant and positive effects have been estimated, particularly on energy efficiency, emissions reduction, and employment increase (Ekins et al. 2011b). However, as far as we are currently aware, there are no studies analyzing the correlation between the existence/inexistence of an EFR and individual WTP for the environment. Nevertheless, it seems reasonable to suppose that individuals' WTP for the environment might be correlated to the existence of fiscal arrangements included in the ETR, as its aim is to affect the individual behaviour, giving a signal of the prices of non marketed natural resources and increasing the cost of polluting activities.

The understanding of the determinants of WTP and the analysis of the correlation of individual preferences and ETR, might have relevant implications in the decision making process, seeking to introduce or improve the ETR.

4. Data and descriptive analysis

Individual data for the empirical analysis have been collected from the European Value Survey database (EVS 2011), for the 2008-2010 wave. EVS represents "the most comprehensive research project on human values in Europe"²⁷. It is based on interviews to representative samples of population in European countries and collects data on socioeconomic characteristics of the interviewee together with information about personal beliefs, cultural tendencies and ideas about political, religious and economic issues.

Data are related to the EU-27²⁸ countries. As already discussed in section 3, six among them have been carried out, by the 2008, an explicit ETR²⁹: Denmark, Finland, Germany, The Netherlands, Sweden, United Kingdom.

The individual WTP for the environment has been measured through the answer given to the question: "*I would give part of my income if I were certain that the money would be used to prevent environmental pollution*" (**ENVIRONMENT**). Following the literature that relies to the environment as a normal good (see Section 2) and considering decreasing the WTP for additional interventions for preventing environmental pollution, we interpret the individual WTP as marginal. More in detail, considering the answers as reflecting the individuals'

²⁶ "The distributional effects that need to be considered in relation to ETR have various facets: 1) those due to the environmental taxes themselves; 2) those due to any tax reductions or revenue distribution associated with the ETR; 3) those that arise from the broader, economic and environmental impacts of ETR, including price changes of goods and services and macroeconomic effects such as impacts on employment levels; 4) those due to exemptions and other specific provisions that may have been made in the tax design for various purposes (e.g. competitiveness, social concerns or environmental considerations); 5) the distribution of the environmental improvements brought about by the ETR"(Ekins. et al. 2011a, p.2473).

²⁷ <http://www.europeanvaluesstudy.eu/>

²⁸ More in detail, countries are: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxemburg, Malta, Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden, United Kingdom, the latter being formed by the data collected in England plus the ones collected in Northern Ireland.

²⁹ Estonia and Czech Republic recently (2005 and 2008 respectively) have implemented the shift from conventional taxes on labour to environmental ones (Speck et al. 2011). The implementation of the ETR in Estonia, consisting in cutting personal income taxes, has been organized in two phases and the second phase will take place in 2013, while the Czech Republic would increase the tax rates of most energy products by the end of 2012 (Eurostat 2011). As the ETR implementation was not completed by the end of 2008, we decided to take into account only the 6 countries in which the ETR has been implemented since the nineties.

marginal willingness to pay (MWTP) for the environment, our hypothesis is that people living in countries in which the ETR has been already set out, might show a lower WTP for preventing environmental pollution, at the margin. This does not imply that their environmental awareness is lower, otherwise the ETR would not have been employed, but simply that they probably assume to have sufficiently contributed to the environment and they are not willing to pay for additional interventions against pollution. Thus in the following part of the paper we will refer to the Marginal Willingness To Pay (MWTP) for the environment.

Answers to this question may assume 4 values (disagree strongly, disagree, agree, strongly agree) Fig. 2 reports the frequencies registered for each answer in the whole sample and by country (fig.3).

According to the existing literature, a wide set of individual level covariates have been employed. They may be grouped in three broad categories:

- *individual socio-demographic characteristics*: age (**AGE**), age squared (**AGE2**), introduced in order to account for non linear effect of **AGE**, gender (**FEMALE**), parenthood status (**CHILDREN**), education (**EDUCATION**);
- *individual economic condition*: natural log of household income corrected for PPP (**INCOME**) and its squared value (**INCOME2**), introduced to take into account non linear effect;
- *personal beliefs and values*: political orientation (**RIGHT**), trust in government (**GOVER_TRUST**), trust in the others (**GEN_TRUST**), religious belonging (**RELIGION**), fear about environmental catastrophe (**ENV_CAT**), sense of belonging to the world as a whole (**WORLD_WHOLE**).

In order to explore the correlation between features of the context and the individual WTP for the environment, the EVS micro data have been integrated with country-level variables collected from other sources or *ad hoc* elaborated. To take the context into account, two alternative strategies have been followed: first countries' dummies (**COUNTRY**) have been included in order to control for unobserved cross country heterogeneity; secondly these countries' dummies have been replaced with a set of country-level variables including:

- Total taxes as percent of GDP (**TAX_GDP**). This variable has been introduced in order to control if any correlation between fiscal pressure and MWTP for the environment might exist;
- CO2 emission per inhabitant (thousand of tons x 10,000, **CO2_PC**), as a proxy of the existing quality of the environment;
- Material recycling as percent of total waste generated (**REC_TOT**), as a pro environmental activity. This variable has been used to test if efforts towards the environment made by citizens and institutions are correlated to the MWTP for the environment;
- Dummy variable taking the value of 1 for post communist countries (**EST**). This variable has been included as, according to some scholars (Nistor, 2010), post communist countries show less environmental concerns compared to the old UE member states' citizens;
- Dummy variable taking the value of 1 for countries where an ETR has not been carried out (**NO_REFORM**). Following our hypothesis, people living in these countries should

have a higher MWTP than the ones living in countries where an ETR has been carried out.

Tab.2 reports codes, detailed description, presentation of the modalities and sources of all these variables, while descriptive statistics are reported in tab. 3. After list wise deletion of incomplete cases, our sample includes 21,264 observations.

As a preliminary analysis, the ANalysis of Homogeneity of VAriance (ANOVA) has been carried out, in order to understand if **NO_REFORM** affects the distribution of the answers recorded by **ENVIRONMENT**. As it is well known, the one-way ANOVA compares the means of a dependent variable between groups and determines whether those means are significantly different from each other.

The significance of the Levene statistics, whose results are reported in tab. 4, provides evidence that the basic ANOVA assumption of homogeneity of variance between the groups (**NO_REFORM**=0 and **NO_REFORM**=1) has been violated; nevertheless, the Brown-Forsythe test and the Welch test (tab. 5) display an alternative version of the F statistic (weighting the groups' variances by the inverse of their sample size). These results highlight the existence of significant differences in the mean values of **ENVIRONMENT** comparing the two groups of countries.

5. Methodology

Given the discrete and ordered nature of our dependent variable, regression analyses have been carried out using a categorical dependent variable model. The assumption is that MWTP for the environment of individual i is characterized by a continuous latent variable:

$$Y_i^* = X_i\beta + \varepsilon_i \quad [1]$$

where X_i is a vector of individual characteristics, β is the parameter to be estimated and ε_i is a random error term. While Y_i^* cannot be observed, we observe a variable Y_i which takes values from 1 to 4, increasing in individual MWTP for the environment. More in detail:

$$Y_i = j \text{ if } \kappa_{j-1} < Y_i^* < \kappa_j \text{ for } j = 1, \dots, 4 \quad [2]$$

where κ_j indicates unknown cut-points to be estimated. The full set of probabilities of the possible outcomes is the following :

$$Pr[y_i = j|x] = F(\kappa_j - X_i\beta) - F(\kappa_{j-1} - X_i\beta) \quad [3]$$

Where we assume that $\kappa_0 = -\infty$ and $\kappa_4 = +\infty$ and F is the cumulative distribution function for the error term. This kind of model may be estimated through maximum likelihood. When the cumulative distribution function for the error term is supposed to be a standard normal, the ordered probit model applies. The ordered logit model, instead, assumes that the cumulative distribution function for the error term is logistic.

In this study, the ordered logit estimates have been applied. They allow at computing odds ratios and making the interpretation of results clearer. The model applies to data meets the parallel lines assumption (proportional odds, Long and Freese, 2006) which states that the effect of the covariates does not vary by the level of the dependent variable.

Given that no exogenous variation is recorded in our data, any causal interpretation of our results is not allowed. Instead, our analysis investigates statistical probabilistic associations.

6. Results

Analyses have been carried out through three models: in the first model ($M1$) only the individual covariates have been used; in the second model ($M2$) also the countries' dummies

have been included, while in the third model (*M3*) these countries' dummies have been replaced by the set of variables controlling for some national characteristics³⁰. Tab. 6 shows the odds ratios and the standard errors of the three specifications: *M1*, *M2* and *M3*.

Overall, almost all the employed covariates are correlated to the MWTP for the environment. Among the individual socio demographic variables, only age (**AGE**, **AGE2**) and the parenthood status (**CHILDREN**) are not significant. We do not find any support for the hypothesis of a relationship between income (**INCOME**, **INCOME2**) and MWTP for the environment.

Concerning all the other variables, we find that females have lower MWTP than men (odds ratio <1 for the **FEMALE** dummy), while the individual MWTP for the environment is significantly correlated to the level of **EDUCATION** (**Middle** and **Upper EDUCATION** show significant and >1 odds ratios). Several variables capturing personal beliefs and values are also significant: **RIGHT** (MWTP decreases when people are more right wing oriented but, interestingly, no significant differences were found between the extreme left and extreme right orientation), **GOVER_TRUST** and **GEN_TRUST** (MWTP is higher when people show trust in the government and trust in the others), **WORLD_WHOLE** (MWTP is higher when people think at themselves as belonging to the world as a whole), **ENV_CAT** (being convinced that an environmental catastrophe is going to happen, leads to significant higher MWTP for preventing pollution). About **RELIGION**, "catholic", "protestant", "orthodox" and the residual "other" category, all show higher MWTP than "not religious". The positive effect seems to be very relevant for the orthodox category.

The inclusion of countries' dummies in the second model (*M2*) does not affect significantly the results. The only relevant difference concerns the "orthodox" category which is not longer significant (due to the inclusion of the dummy for Greece). Countries' dummies show that the MWTP for the environment is significantly higher in Greece, Cyprus, Bulgaria and Slovenia and lower in Germany, Portugal and Finland (the reference category here is France).

Results obtained for the individual variables in the third specification (*M3*) do not significantly differ from the ones found in *M1* and *M2*. The only exception concerns the "catholic" dummy which is no more significant. Results strongly support our hypothesis about the correlation between the MWTP and the ETR. The variable **NO_REFORM**, in fact, shows a significant positive correlation with the MWTP for the environment. This means that citizens living in a country where an ETR has not been carried out register a higher MWTP for the environment than the ones living in countries where an ETR has been implemented. This result has two relevant consequences: 1) environmental fiscal reforms may find popular support in countries where an ETR has not been set out; 2) citizens living in countries where an ETR has been set out, perceive the existing fiscal system as already pro environment oriented: taxes have been already largely used to support the prevention of pollution and this has a negative effect on their propensity to pay more for this purpose.

Among the other country variables used in *M3*, we find a significant and positive correlation for **CO2_PC**, indicating that the individual MWTP for the environment is higher in countries where a high level of pollution is registered and a negative (even if hardly significant) correlation for **REC_TOT**: these results seem to confirm that the individual MWTP for the environment is lower in countries where citizens are already engaged in environmental friendly activities. Controlling for these variables allows at avoiding the risk that our variable of interest, **NO_REFORM**, captures the effect of the quality of environment which is supposed to be higher in countries where the ETR has been carried out.

A negative and significant correlation is also found for the **EST** dummy, confirming that ex communist countries are less inclined to the environment. **TAX_GDP** is not significant, meaning that the MWTP is not correlated to the national level of fiscal pressure.

³⁰ As individuals within each country are, in fact, more similar to one another than individuals from another state, in *M3* the assumption that observations are independent and identically distributed is violated. For this reason, in order to obtain more reliable estimates, clustered standard errors have been applied.

Three kinds of robustness checks have been carried out. First we replicated the estimates by means of OLS. Results, omitted for lack of space, are very similar to the ones we obtained with the ordered logit model. We also checked for multicollinearity by means of the Variance of Inflator Factor (VIF) test³¹. Problems of multicollinearity have not been detected: beside squared variables (**AGE2** and **INCOME2**), which have been included in the specifications in order to account for non linear effects of **AGE** and **INCOME**, no other variable registers a VIF value higher than 6.³²

Second, we dichotomized our dependent variable and run the analyses by means of a standard logit model. Again, we do not account for differences in results, compared with the ones obtained by the ordered logit model³³.

Third, we replicated M3 (of tab. 6) using the partial generalized ordered logit model. The generalized ordered logit model (Williams, 2006) is applied to allow the coefficients to vary across categories of the dependent variable when the parallel lines assumption of the ordered logit model is violated. Looking at equations [1] and [2], this means that the coefficient β is allowed to differ for each of the categories j of the dependent variable.

In the partial generalized ordered logit model the parallel lines constraint is relaxed only for those variables where it is violated; thus the coefficients of the variables, whose effects do not significantly differ across equations have proportionality constraints imposed, do not vary across categories of the dependent variable. The analysis has been run using the *autofit* option of the *gologit2* module provided by Williams (2006).

Results of the partial generalized ordered logit model (tab. 7.), confirm the ones obtained in the previous models but, at the same time, help in deepening the analysis of each covariate. In the interpretation of the results we must be aware that “positive coefficients [odds ratios higher than 1] mean that higher values on the covariates make higher values on the dependent variable more likely” (Williams, 2006, p.10).

Looking at tab. 7, results for **NO_REFORM** gives further empirical support to the hypothesis that people living in a country where an ETR has not been implemented tend to agree to possibility of giving additional contributions for the environment. In fact **NO_REFORM** has a significant impact only on the central positions of the MWTP scale³⁴. More precisely, interviewees are more likely to place themselves in the *agree* and *strongly agree* categories. However, the impact of the inexistence of an ETR decreases across the categories of the dependent variable.

Looking at the other variables, the coefficient for **FEMALE** varies in both sign and magnitude across the range of MWTP attitudes: we find that women tend to show a higher MWTP than **ENVIRONMENT** = 1 but, at the same time, a lower WTP than **ENVIRONMENT**=3. Coefficients for **EDUCATION** are consistently positive but decline across cut-points. Only some of the coefficients for **RIGHT** are significant and indicate that right- wing orientation has a negative correlation especially with higher MWTP attitudes.

The positive coefficients for **GOVER_TRUST** and **GEN_TRUST** significantly decrease across the categories of **ENVIRONMENT**, while the positive coefficient calculated for **WORLD_WHOLE** remarkably increases.

The “orthodox”, “protestant” and “other” categories of **RELIGION**, the remaining individual variables and the country variables **EST**, **CO2_PC** and **REC_TOT**, all meet the parallel lines assumption: their impact does not vary categories across the categories of the dependent variable.

³¹ Results are omitted but available upon request.

³² Results are not affected by the exclusion of squared variables.

³³ Results obtained by the standard logit models are available upon request

³⁴ See table 2. Environmental =1 (disagree strongly), =2 (disagree),=3 (agree),4=(strongly agree).

7. The role of knowledge on Marginal Willingness To Pay

Results presented in the previous section show that MWTP for the environment is higher in countries where an ETR has not been carried out. As already remarked, this result supports the hypothesis that citizens living in countries where an ETR has been set out, perceive that, due to the reform, their national fiscal system is already supporting the prevention of pollution.

According to this interpretation, individual knowledge about the ETR may have, in these countries, a significant and negative correlation with the MWTP for the environment: the more people are aware about the pro environment configuration of their national fiscal system, the less are willing to pay additionally for environmental purposes.

Unfortunately, no questions related to individual knowledge about fiscal issues are recorded in the EVS database. However, it seems reasonable to assume that higher educated people are more informed about the implementation of an ETR in their own country. Therefore, we investigated the correlation between MWTP for the environment and the individual level of education (**EDUCATION**).

Generally speaking, education is expected to be positively correlated to environmental concern, as people aware of the importance of the environment and the consequences of polluting activities might be favorable at changing behavior³⁵ (Danielson et al. 1995, Duroy 2005, Franzes and Myer 2010, Togler and Garcia-Valiñas 2007).

However, our hypothesis is that the correlation between ETR and non ETR countries may differ, because knowledge about the fiscal system may be negatively correlated with the MWTP for the environment.

We tested the effect of **EDUCATION** on **ENVIRONMENTAL** by running the ordered logit regression on two subsamples: one including all the interviews carried out in ETR countries “ETR (YES)” (**NO_REFORM**=0) and a second including all the others “ETR (NO)” (**NO_REFORM**=1). The same specification (M3) has been used (tab. 6³⁶).

Looking at the results (tab.8), **EDUCATION** has a positive effect on **ENVIRONMENT** in non ETR countries: the more people are educated, the higher is their MWTP for the environment. In the ETR countries, the “Middle” category of **EDUCATION** has a negative and highly significant effect, while “Upper” is not significant. Clearly, this result supports the hypothesis that being aware of the existence of the ETR has a negative/null impact on individuals’ MWTP for the environment.

8. Discussion

The MWTP for the environment in the EU-27 varies in view of individual and country characteristics. Distinguishing between ETR and non ETR countries, citizens from the 6 ETR countries show a lower MWTP for the environment. In these countries there is already a certain level of environmental protection³⁷ (being the old EU member states, the environmental legislation has been implemented for longer than others³⁸); moreover the environmental taxation has been using for about 20 years. Thus, the perception that the

³⁵ “Although people may not be able to directly perceive processes such as resource overuse, energy consumption, and CO2 emission, environmental concern should also depend on the belief or knowledge that these processes are taking place. Such knowledge is usually acquired through education” (Franzen and Mayer 2010, p. 222).

³⁶ The variable EST dropped in the REFORM sub sample because no ex communist countries carried out an ETR.

³⁷ See Israel and Levinson, 2004, Dorsh, 2011, on the issue of the environment as a normal good in Section 2.

³⁸ This attitude is confirmed by the significant and positive correlation for CO2_PC and the negative correlation for REC_TOT in our analysis.

existing fiscal system is already pro environment oriented, has a negative effect on their propensity to pay more for this purpose. This is confirmed by the analysis on the correlation between education and MWTP, for which being presumably aware of the pro environment configuration of their national fiscal system has a negative/null impact on individuals' MWTP for the environment.

Overall, results are in line with the relevant literature: about the individual characteristics the type of person more willing to pay for the environment at the margin is a male, educated, left oriented person. Left parties oriented people are more willing to pay for the environment, as in Witzke and Urfei 2001 and Kollman et al. 2012. However not significant differences have been reported between the extreme right and the extreme left. Religious persons, with the perception of belonging to the world as a whole (indicator of care for global public goods, Auci et al. 2006) and pessimistic about environmental risks (catastrophe) show higher MWTP for the environment.

Personal belief and values play a fundamental role in affecting the MWTP for the environment. This is consistent with a broad sociological and economic literature on the relation between households behavior and environment (Venkataclalam 2008, Shogren and O Taylor 2008, OECD 2008): conscious of the bounded rationality, willpower and self-interest (Kallbekken and Sælen 2010) in taking choices related to the environment, they agree on the fact that what affect them, among others, are beliefs, values and perceptions. These conditions and factors influence the so called pro environmental behavior (-PEB- Clark et. Al 2003).

Looking at the outcomes, the circumstance that the MWTP is higher in countries in which the ETR has not been carried out, might lead at thinking about the possibility of actually introducing it, as promoted by the European Union³⁹. The understanding of the correlations between individual characteristics and MWTP for the environment provides useful insights to policy makers, as they can be crucial in improving the decision making process concerning the implementation of the ETR. Among the accounted individual variables that do not belong strictly to the personal sphere, governments can play a crucial role in fostering the trust and in better communicating the environmental risks of pollutant activities (pessimistic people about environmental catastrophes show higher MWTP and this is higher in more polluted countries). Trust is fundamental for the success and the acceptance of the reform: a number of academic papers state that one of the problem related to the ETR is the perception of the shift and the mistrust that the revenues can be actually used for improving the quality of the environment (Bassi et al. 2009) or achieving effective results⁴⁰. Moreover, a better communication would certainly make people aware of the risks of a non pro environmental behavior and understand the other advantages of the reform, besides the environmental ones.

9. Conclusion

The aim of this paper was to investigate the determinants of WTP for the environment in Europe and in particular to analyze its correlation with ETR, that beside from environmental objectives, attempts at reaching other political economy' objective, such as boosting the employment and increasing the innovation, through a revenue recycling system (EEA 2011a,b). However, as the ETR affects the individual behavior, giving a signal of the prices of non marketed natural resources and increasing the cost of polluting activities, we tested the hypothesis for which the individuals' WTP for the environment might be lower in presence of fiscal arrangements included in the ETR.

³⁹EEA June 2012: EFR- A European Perspective: <http://storify.com/EUEnvironment/environmental-fiscal-reform-a-european-perspective>

⁴⁰ On this argument, Dresner et al. (2006) explains that reactions on the effects of EFR can be skeptical, "independent of whether the interview partner already knew about the double dividend or had just been introduced to the argument" (Ibidem, 2006, p.901).

Using data from European Value Survey for the 2008-2010, we controlled for individual socio-demographic characteristics, individual economic condition and personal beliefs and values. In addition we integrated the EVS micro data with some country level variables, to investigate the correlation between individual MWTP for the environment and features of the context of residence. The set of country level variables includes: total taxes as percent of GDP, CO2 emission per inhabitant, material recycling as percent of total waste generated, a dummy for post communist countries and a dummy for countries where an EFR has not been carried out. Analyses have been conducted by means of ordered logit models and several robustness checks. An important methodological feature of the paper was the employment of the partial generalized ordered logit model, that, relaxing the parallel lines assumption, checks for possible variations of effect of the variables by the level of WTP.

Focusing the attention on ETR, results show that MWTP for the environment is higher in countries where an ETR has not been carried out. Further analysis on the role of information on WTP, highlights that a negative/null effect of individual level of information is found in countries where the ETR has been set out. Conscious of the limit of these kind of analysis, based on value of judgments that might not reflect the real intention of the respondents, we consider the results as an approximation of the reality, by which, however, to understand the sources of heterogenic individual attitudes towards the environment and investigate those variables, on which the decision makers can pay particular attention, in implementing the environmental tax reform.

Acknowledgements

We are grateful for the useful comments received during the “Applied Microeconometrics and Public Policy Conference”, J.E. Cairnes School of Business and Economics, 3rd July 2012, University Of Galway (Ireland), the “24th SIEP Conference: “Informal Economy, Tax Evasion and Corruption”, 24-25 September, University of Pavia (Italy) and the “Conference on the Human Dimensions of Global Environmental Change”, 5-6 October 2012, Berlin (Germany).

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Tables and figures

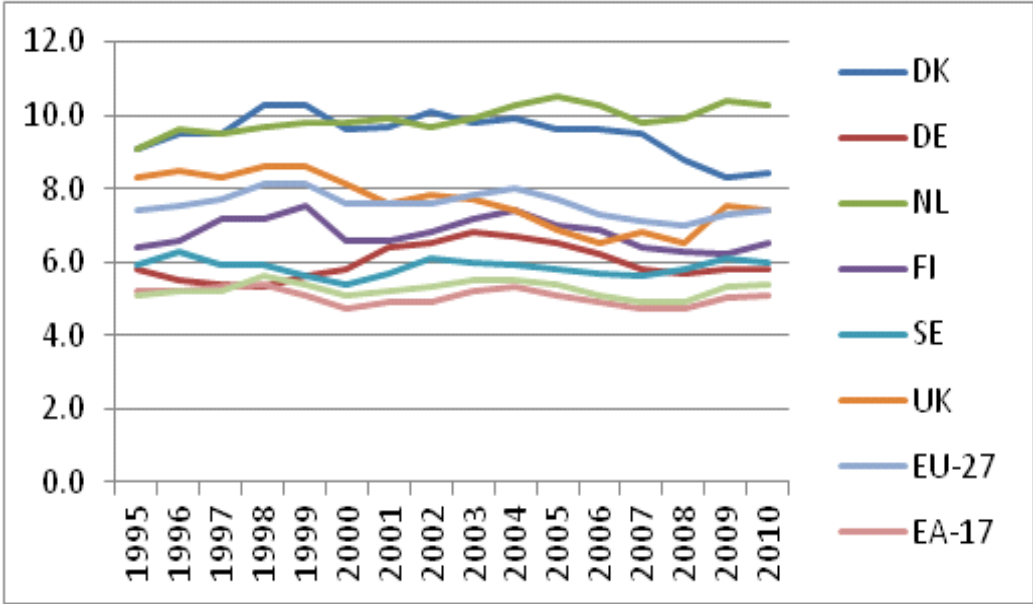


Fig.: Environmental taxes as % of total taxation. Source: Eurostat(2012)

Country	TAX	YEAR	EFR ⁴¹
Denmark	Co2 tax	1992	Tax revenue from income, labour to pollution and scarce environmental resources.
	Energy package (increase of Co2 tax + So2 tax and energy tax on natural gas + on energy used for space heating – households-)	1996	Revenues used to reduce employers' social security contributions and investment aids for energy saving.
	Tax shifting programmes	1994-2002	A three phases programme involving households and industries. Reduction of SSC.
Finland	Co2 tax	1990	Reduction of income tax and social insurance contributions
	Landfill tax	1996	
	ETR s	1997	Reduction of labour taxes and increase of environmental taxes
	ETR s	1998	
Germany	Mineral oil taxes on transport fuels	1999-2003	Reduction of tax wedge on labour through reduced social security contributions for both employers and employees.
	Electricity Tax	1999	
	Taxes on heavy fuels	2000-2003	
	Heating fuel tax on natural gas and on heavy fuel oil	2004	
The Netherlands	Energy regulating tax	1996	Revenue returned to households in terms of reduced social security contributions
Sweden	Energy/excise taxed levied on energy products	1991	Reduction in income tax
	Co2 taxes	1991	
	So2 taxes	1991	
	Nox charge	1992	Revenues refunded to power plants covered by the charge, in proportion to the amount of energy they generate. Reduction of income taxes and increase of environmental related taxes
	Green tax shift	2001 -2006	
	Fiscal policy programme	2007- 2009	
UK	Transport fuel taxes	1990	Reduction of employers national insurance contributions
	Landfill tax	1996	
	Climate change Levy	2001	
	Mineral Aggregated taxes	2002	

Tab. 1: ETR in Denmark, Finland, Germany, Netherlands, Sweden, UK.

⁴¹ Contents of this table have been mainly drawn by: Ashiabor et al. (2005), Andersen and Ekins (2009), Bosquet (2000), Ekins and Speck (2011).

Code	Question/description	Modalities	Source
ENVIRONMENT*	I would give part of my income if I were certain that the money would be used to prevent environmental pollution	1.disagree strongly 2. disagree 3. agree 4. strongly agree	EVS 2008 EVS 2008 EVS 2008 EVS 2008
FEMALE	Are you male or female	0=male 1=female	EVS 2008 EVS 2008
AGE	How old are you?	<i>continuous</i>	EVS 2008
AGE2	Age squared	<i>continuous</i>	EVS 2008
CHILDREN *	Have you had any children?	0=no 1=yes	EVS 2008 EVS 2008
EDUCATION	What is the highest educational level that you have attained?	Lower (reference) Middle Upper	EVS 2008 EVS 2008 EVS 2008
RIGHT	In political matters, people talk of "the left" and "the right." How would you place your views on this scale, generally speaking?	left (reference) 2 3 4 5 6 7 8 9 right	EVS 2008 EVS 2008 EVS 2008 EVS 2008 EVS 2008 EVS 2008 EVS 2008 EVS 2008 EVS 2008 EVS 2008
GOVER_TRUST *	Could you tell me how much confidence you have in the government of your country?	0= not very much / none at all 1= quite a lot/a great deal	EVS 2008 EVS 2008
GEN_TRUST *	Most people can be trusted or that you need to be very careful in dealing with people?	0=cannot be too careful 1= most people can be trusted	EVS 2008 EVS 2008
ENV_CAT *	Environment: if things continue we will experience a catastrophe	0= disagree or strongly disagree 1= strongly agree or agree	EVS 2008 EVS 2008
RELIGION *	Do you belong to a religion or religious denomination? If yes, which one?	roman catholic protestant ortodox other (free church, buddhist, hindu, jew, etc.) not religious (reference)	EVS 2008 EVS 2008 EVS 2008 EVS 2008 EVS 2008
WORLD_WHOLE	Which of these geographical groups would you say you belong to first of all? The world as a whole	0=no 1= yes	EVS 2008 EVS 2008
INCOME	Log of Monthly household income corrected for PPP (euros)	<i>continuous</i>	EVS 2008
INCOME2	LOG_INCOME squared	<i>continuous</i>	EVS 2008
EST	Dummy =1 for ex communist countries	0= no ex communist country 1= ex communist country	own elaboration
NO_REFORM	Dummy =1 for countries were ETR	0=ETR carried out 1=ETR not carried out	own elaboration
CO2_PC	CO2 emission per inhabitant (thousand of tons * 10,000)	<i>continuous</i>	Eurostat
TAX_GDP	Total taxes as percent of GDP	<i>continuous</i>	Eurostat
REC_TOT	Material recycling as percent of total waste generated	<i>continuous</i>	Eurostat
COUNTRY	Countries' dummies	one dummy for each country: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France (reference), Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxemburg, Malta, Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, United Kingdom	EVS 2008

Tab. 2: codes, detailed description, presentation of the modalities and sources of all the variables. * indicates variables which have been recoded from the original EVS database.

		Obs	Mean	Std. Dev.	Min	Max			Obs	Mean	Std. Dev.	Min	Max
FEMALE		21264	0.52	0.50	0	1	COUNTRY	Austria	21264	0.04	0.20	0	1
AGE		21264	48.94	17.25	16	108		Belgium	21264	0.06	0.23	0	1
AGE2		21264	2692.45	1754.62	256	11664		Bulgaria	21264	0.03	0.18	0	1
CHILDREN		21264	0.73	0.44	0	1		Cyprus	21264	0.02	0.15	0	1
EDUCATION	Lower	21264	0.29	0.45	0	1		Czech Republic	21264	0.04	0.20	0	1
	Middle	21264	0.46	0.50	0	1		Denmark	21264	0.04	0.21	0	1
	Upper	21264	0.26	0.44	0	1		Estonia	21264	0.04	0.20	0	1
RIGHT	left	21264	0.05	0.22	0	1		Finland	21264	0.03	0.18	0	1
	2	21264	0.04	0.20	0	1		France	21264	0.06	0.23	0	1
	3	21264	0.10	0.30	0	1		Germany	21264	0.06	0.24	0	1
	4	21264	0.10	0.30	0	1		Greece	21264	0.05	0.21	0	1
	5	21264	0.31	0.46	0	1		Hungary	21264	0.05	0.23	0	1
	6	21264	0.13	0.34	0	1		Ireland	21264	0.01	0.12	0	1
	7	21264	0.10	0.30	0	1		Italy	21264	0.03	0.17	0	1
	8	21264	0.09	0.29	0	1		Latvia	21264	0.04	0.19	0	1
	9	21264	0.03	0.17	0	1		Lithuania	21264	0.02	0.15	0	1
	right	21264	0.05	0.21	0	1		Luxemburg	21264	0.04	0.20	0	1
GOVER_TRUST		21264	0.35	0.48	0	1		Malta	21264	0.02	0.14	0	1
GEN_TRUST		21264	0.36	0.48	1	2		Netherlands	21264	0.05	0.22	0	1
ENV_CAT		21264	0.81	0.39	0	1		Poland	21264	0.03	0.18	0	1
RELIGION	roman catholic	21264	0.37	0.48	0	1		Portugal	21264	0.02	0.14	0	1
	protestant	21264	0.15	0.36	0	1		Romania	21264	0.02	0.16	0	1
	ortodhox	21264	0.13	0.34	0	1		Slovak Republic	21264	0.03	0.18	0	1
	not religious	21264	0.31	0.46	0	1		Slovenia	21264	0.03	0.17	0	1
	other	21264	0.04	0.19	0	1		Spain	21264	0.03	0.18	0	1
WORLD_WHOLE		21264	0.05	0.22	0	1		Sweden	21264	0.03	0.17	0	1
INCOME		21264	7.07	0.86	3.92	9.60		UK	21264	0.04	0.20	0	1
INCOME2		21264	50.75	11.88	15.34	231							
EST		21264	0.32	0.47	0	1							
NO_REFORM		21264	0.74	0.44	0	1							
CO2_PC		21264	95.99	36.25	42.1	197.6							
TAX_GDP		21264	37.50	5.50	28	47.8							
REC_TOT		21264	0.20	0.13	0	0.47							

Tab. 3: Descriptive statistics

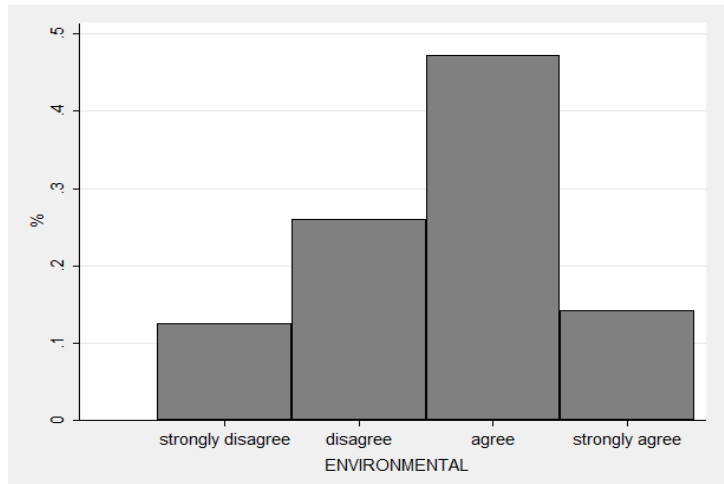


Fig. 1: Willingness to pay for preventing pollution (ENVIRONMENT). Whole sample.
 Source: Own elaboration on EVS data after listwise deletion of incomplete cases.

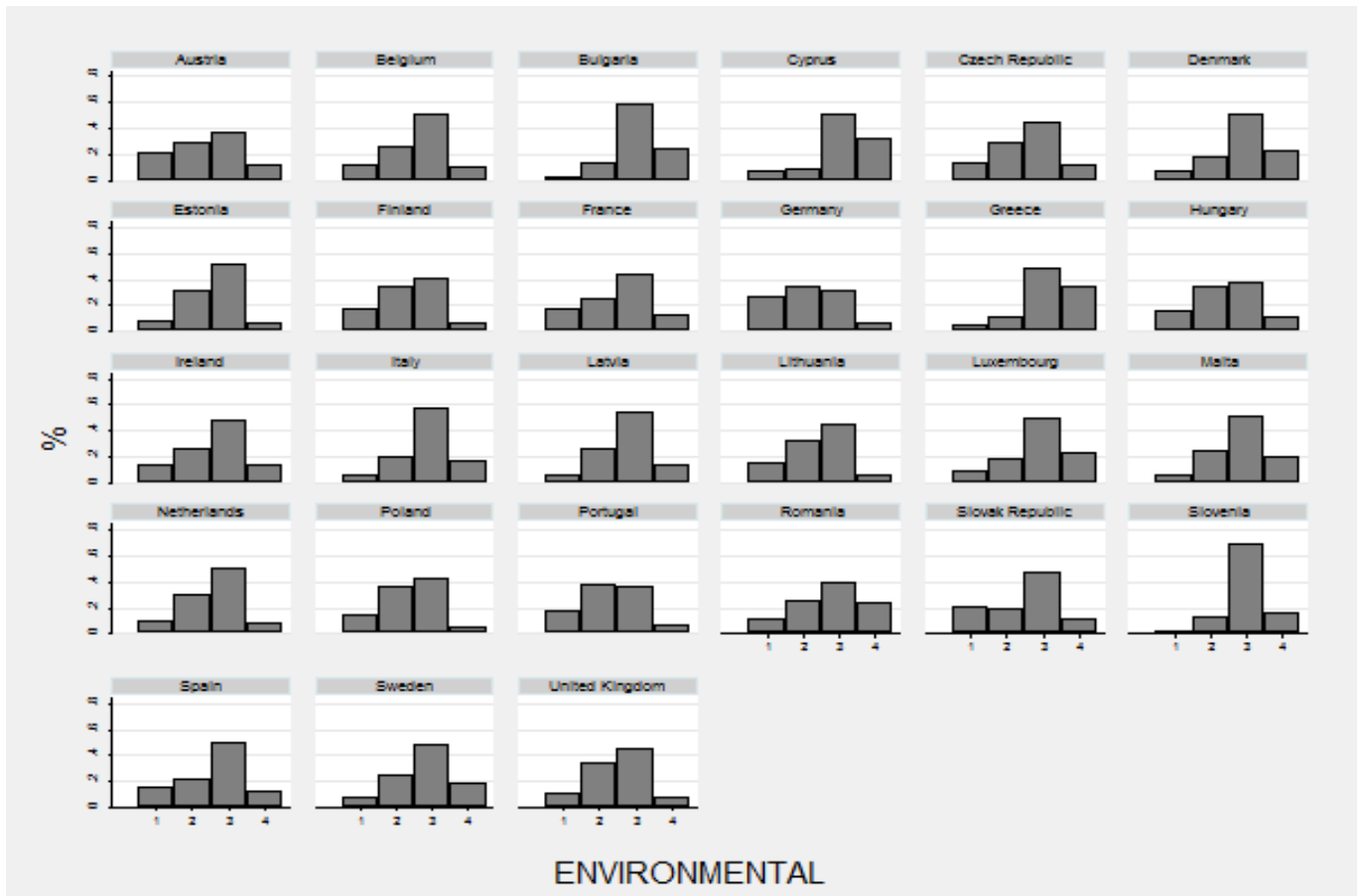


Fig. 2: Willingness to pay for preventing pollution (ENVIRONMENT) by country. Source: Own elaboration on EVS data after listwise deletion of incomplete cases.

Levene Statistic	df1	df2	Sig.
14.323	1	21262	.000

Tab. 4: Test of homogeneity of variances. The dependent variable is ENVIRONMENT while the factor is REFORM.

	Statistic	df1	df2	Sig.
Welch	109.674	1	9690.082	.000
Brown-Forsythe	109.674	1	9690.082	.000

Tab. 5: Robust test of equality of means. The dependent variable is ENVIRONMENT while the factor is REFORM.

		M1		M2		M3 ^a	
FEMALE		0.938**	(0.02)	0.938**	(0.02)	0.931**	(0.03)
AGE		0.997	(0.00)	1,002	(0.00)	1,001	(0.01)
AGE2		1,000	(0.00)	1,000	(0.00)	1,000	(0.00)
CHILDREN		1,012	(0.04)	0.991	(0.04)	1,026	(0.05)
EDUCATION	Middle	1.074**	(0.03)	1.211***	(0.04)	1.176***	(0.07)
	Upper	1.504***	(0.06)	1.720***	(0.07)	1.640***	(0.13)
RIGHT	2	0.972	(0.08)	1,087	(0.10)	1,022	(0.11)
	3	0.882*	(0.06)	0.987	(0.07)	0.931	(0.09)
	4	0.781***	(0.06)	0.894	(0.07)	0.838	(0.10)
	5	0.749***	(0.05)	0.826***	(0.05)	0.794**	(0.07)
	6	0.738***	(0.05)	0.843**	(0.06)	0.796*	(0.10)
	7	0.763***	(0.06)	0.839**	(0.06)	0.826*	(0.09)
	8	0.733***	(0.05)	0.796***	(0.06)	0.779**	(0.10)
	9	0.758***	(0.07)	0.827**	(0.08)	0.807	(0.13)
	right	0.967	(0.08)	1,009	(0.09)	1,010	(0.15)
GEN_TRUST		1.271***	(0.04)	1.291***	(0.04)	1.315***	(0.06)
RELIGION	roman catholic	1.122***	(0.04)	1.095**	(0.04)	1,007	(0.08)
	protestant	1.130***	(0.05)	1.199***	(0.06)	1.306**	(0.18)
	ortodox	2.781***	(0.12)	0.962	(0.07)	2.186***	(0.27)
	other	1.325***	(0.09)	1.206**	(0.09)	1.275**	(0.15)
ENV_CAT		1.987***	(0.07)	1.974***	(0.07)	1.962***	(0.13)
GOVER_TRUST		1.360***	(0.04)	1.248***	(0.04)	1.286***	(0.08)
WORLD_WHOLE		1.631***	(0.10)	1.646***	(0.10)	1.583***	(0.08)
INCOME		0.988	(0.16)	1,049	(0.18)	1,056	(0.33)
INCOME2		1,006	(0.01)	1,001	(0.01)	0.998	(0.02)
COUNTRY	Austria			0.883	(0.08)		
	Belgium			1.267***	(0.10)		
	Bulgaria			4.370***	(0.47)		
	Cyprus			4.843***	(0.62)		
	Czech Republic			1.372***	(0.12)		
	Denmark			2.203***	(0.21)		
	Estonia			1.337***	(0.11)		
	Finland			0.518***	(0.05)		
	Germany			0.489***	(0.04)		
	Greece			5.525***	(0.61)		
	Hungary			0.991	(0.08)		
	Ireland			1.323**	(0.16)		
	Italy			2.265***	(0.21)		
	Latvia			1.876***	(0.17)		
	Lithuania			0.865	(0.09)		
	Luxemburg			2.075***	(0.18)		
	Malta			2.362***	(0.26)		
	Netherlands			1.262***	(0.10)		
	Poland			0.923	(0.08)		
	Portugal			0.800**	(0.09)		
	Romania			2.683***	(0.34)		
	Slovak Republic			1.155	(0.11)		
	Slovenia			3.003***	(0.28)		
	Spain			1.298***	(0.12)		
	Sweden			1.350***	(0.13)		
	UK			1.079	(0.09)		
EST						0.640***	(0.11)
NO_REFORM						1.557**	(0.30)
CO2_PC						1.006***	(0.00)
TAX_GDP						0.999	(0.02)
REC_TOT						0.135*	(0.16)
Oss.		21264		21264		21264	
log likelihood		-25604.71		-24969.23		-25408.14	
Pseudo R2		0.03		0.05		0.04	
LR chi2		1620.93		2891.89		.	
PR>chi2		0.00		0.00		.	
BIC		51488.44		50476.56		51075.37	

Tab. 6: Ordered logit estimates. The dependent variable is ENVIRONMENT. Odds ratios and standard errors (in parentheses). *, **, *** mean significantly different from zero at the 0.10, 0.05, 0.01 significance level. a= clustered standard errors applied

		ENVIRONMENT=1		ENVIRONMENT=2		ENVIRONMENT=3	
FEMALE		1.119***	(0.05)	0.929**	(0.03)	0.838***	(0.03)
AGE		1.002	(0.01)	1.002	(0.01)	1.002	(0.01)
AGE2		1.000	(0.00)	1.000	(0.00)	1.000	(0.00)
CHILDREN		1.024	(0.05)	1.024	(0.05)	1.024	(0.05)
EDUCATION	Middle	1.174***	(0.07)	1.174***	(0.07)	1.174***	(0.07)
	Upper	1.767***	(0.20)	1.771***	(0.15)	1.416***	(0.11)
RIGHT	2	1.026	(0.11)	1.026	(0.11)	1.026	(0.11)
	3	0.940	(0.09)	0.940	(0.09)	0.940	(0.09)
	4	0.923	(0.11)	0.891	(0.10)	0.716**	(0.09)
	5	0.952	(0.10)	0.774***	(0.07)	0.779***	(0.07)
	6	1.047	(0.14)	0.796*	(0.10)	0.689***	(0.09)
	7	0.999	(0.15)	0.859	(0.10)	0.696***	(0.07)
	8	0.786**	(0.09)	0.786**	(0.09)	0.786**	(0.09)
	9	0.810	(0.14)	0.754*	(0.12)	0.972	(0.16)
	right	0.778	(0.13)	0.932	(0.13)	1.251	(0.18)
GEN_TRUST		1.461***	(0.09)	1.327***	(0.07)	1.220***	(0.07)
RELIGION	roman catholic	1.007	(0.08)	1.007	(0.08)	1.007	(0.08)
	protestant	1.305**	(0.17)	1.305**	(0.17)	1.305**	(0.17)
	ortodhox	2.146***	(0.26)	2.146***	(0.26)	2.146***	(0.26)
	other	1.270**	(0.15)	1.270**	(0.15)	1.270**	(0.15)
ENV_CAT		1.979***	(0.13)	1.979***	(0.13)	1.979***	(0.13)
GOVER_TRUST		1.436***	(0.13)	1.375***	(0.09)	1.066	(0.06)
WORLD_WHOLE		1.148**	(0.08)	1.587***	(0.13)	1.700***	(0.13)
INCOME		1.032	(0.33)	1.032	(0.33)	1.032	(0.33)
INCOME2		1.000	(0.02)	1.000	(0.02)	1.000	(0.02)
EST		0.643***	(0.11)	0.643***	(0.11)	0.643***	(0.11)
NO_REFORM		1.448	(0.37)	1.646**	(0.33)	1.477**	(0.29)
CO2_pc		1.006***	(0.00)	1.006***	(0.00)	1.006***	(0.00)
TAX_GDP		1.000	(0.02)	1.000	(0.02)	1.000	(0.02)
REC_TOT		0.135*	(0.16)	0.135*	(0.16)	0.135*	(0.16)
Oss.				21264			
log likelihood				-25299.69			
Pseudo R2				0.04			
LR chi2				1385.57			
PR>chi2				0.00			
BIC				50858.46			

Tab. 7: Generalized ordered logit (GOLOGIT) estimates with the parallel lines constraint relaxed only for those variables where it is violated (partial proportional odds model). The dependent variable is ENVIRONMENT. Odds ratio and standard errors corrected for clustering at country level in parentheses. *, **, * mean significantly different from zero at the 0.10, 0.05, 0.01 significance level.**

		ETR (NO)		ETR (YES)	
FEMALE		0.916**	(0.04)	0.976	(0.07)
AGE		1.006	(0.01)	0.985	(0.01)
AGE2		1.000	(0.00)	1.000	(0.00)
CHILDREN		1.001	(0.06)	1.053	(0.06)
EDUCATION	Middle	1.305***	(0.07)	0.851**	(0.06)
	Upper	1.794***	(0.16)	1.224	(0.18)
RIGHT	2	0.940	(0.11)	1.068	(0.26)
	3	0.922	(0.09)	0.809	(0.24)
	4	0.816	(0.11)	0.744	(0.19)
	5	0.806**	(0.08)	0.673	(0.20)
	6	0.810	(0.11)	0.639	(0.19)
	7	0.858	(0.10)	0.586*	(0.17)
	8	0.845	(0.11)	0.487***	(0.10)
	9	0.938	(0.15)	0.373***	(0.11)
	right	1.145	(0.17)	0.437***	(0.11)
GEN_TRUST		1.187***	(0.07)	1.490***	(0.14)
RELIGION	roman catholic	0.951	(0.08)	1.467**	(0.25)
	protestant	1.385**	(0.21)	1.078	(0.22)
	ortodhox	2.057***	(0.24)	0.476*	(0.19)
	other	1.231	(0.23)	1.375**	(0.20)
ENV_CAT		2.033***	(0.15)	1.835***	(0.26)
GOVER_TRUST		1.232***	(0.08)	1.399***	(0.16)
WORLD_WHOLE		1.604***	(0.10)	1.550***	(0.14)
INCOME		1.262	(0.45)	0.505**	(0.15)
INCOME2		0.983	(0.03)	1.059***	(0.02)
EST		0.595***	(0.11)	-	-
CO2_PC		1.004*	(0.00)	1.003	(0.00)
TAX_GDP		0.977	(0.02)	1.092***	(0.03)
REC_TOT		0.385	(0.67)	0.103**	(0.12)
Oss.		15732		5532	
log likelihood		-18747.89		-6510.50	
Pseudo R2		0.04		0.06	
LR chi2		.		.	
PR>chi2		.		.	
BIC		37689.05		13064.09	

Tab. 8: Ordered logit estimates. The dependent variable is ENVIRONMENT. Odds ratios and standard errors adjusted for clustering at country level (in parentheses). *, **, * mean significantly different from zero at the 0.10, 0.05, 0.01 significance level.**