

# **Do “environmental losers” pay the price? The role of individual and country vulnerabilities in the relationship between environmental concern and willingness to pay to protect the environment\***

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## **Abstract**

Previous research consistently finds a weak relationship between environmental concern and willingness to pay for the environment. Although individuals are concerned for the environment and believe climate change is a serious problem, a major part of concerned individuals fail to act pro-environmentally or to support climate policies. Existing research has not yet provided a complete understanding of the relationship between perception of environmental problem and pro-environmental behaviours. In this study, we add to previous research on the environmental attitude-behaviour gap by focusing on economic and climate-related vulnerabilities that might act as barriers in the translation of environmental concern into willingness to pay. Using multilevel analysis on data from the International Social Survey Programme (ISSP), we find that economic constraints and the perception of having experienced an extreme weather event affect people’s willingness to pay to protect the environment. We also find that concerned people are more likely to engage in pro-environmental behaviours in countries where national wealth is higher, whereas living in climate-vulnerable countries mostly affect the willingness to pay of non-concerned individuals.

**Keywords:** environment, willingness to pay, environmental concern, economic vulnerabilities, climate vulnerabilities, ISSP

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## **Introduction**

Climate change is one of the most urgent problems our society faces today. From year to year, we are assisting to higher adverse impacts and related losses and damages to nature and people caused by the effects of global warming. The last report of the International Panel of Climate Change (IPCC, 2023) emphasizes strongly that the pro-environmental efforts that we are making, as citizens, organizations, and countries, are undeniably insufficient.

In this context, understanding the mechanisms and factors that influence citizens' environmental attitudes and behaviours has a key role to ease the introduction of climate policies (Fairbrother, 2022). In this respect, the literature indicates that awareness of global warming and environmental issues is widespread in most countries: citizens believe in climate change existence, in its human cause and they are concerned for its consequences (Poortinga et al., 2019; Tendero, 2022). However, this high awareness does not correspond to equally high engagement in pro-environmental behaviours or willingness to accept costs to protect the environment (the so called "environmental attitude-behaviour gap"). Previous studies show that only a minority of the population engages in pro-environmental behaviours and supports climate action, even among those who are concerned for the environment and hold positive attitudes toward environmental problems (Fairbrother, 2022a; Mayerl & Best, 2019; Meyer et al., 2022). Furthermore, comparative studies emphasize that also countries differ in the extent to which citizens translate their environmental concern in climate action, suggesting that contextual characteristics affect the relationship between concern and behaviours.

Previous empirical research has extensively focused on the potential predictors of policy support and pro-environmental behaviours, both at the individual and at the contextual level, and two of these have been shown to be critical for environmental attitudes and behaviours. On the one hand, studies focused on economic capacities finds that affluent individuals, as well as citizens living in affluent countries, are more likely to engage in pro-environmental behaviours. On the other hand, the environmental degradation perspective argues that being exposed to poor environmental conditions and experiencing extreme weather events affect the awareness of environmental problems and in turn the willingness to engage in climate actions. Both approaches highlight how economic and climate vulnerability contribute to explain pro-environmental behaviours. However, fewer studies have considered how economic factors contribute to explain why individuals succeed or fail in translating their environmental concern into willingness to pay to protect the environment (Dienes, 2015; Mayerl & Best, 2019), and, to the best of our knowledge, there are not studies looking at the role of environmental conditions and vulnerabilities in the relationship between concern and willingness to pay.

This study contributes to the literature on the environmental attitude-behaviour gap by investigating whether economic and climate-related vulnerabilities affect, first, individuals' willingness to pay to protect the environment and, second, its relationship with environmental concern. Therefore, we argue that two opposite mechanisms can make individuals being, what we call, environmental losers. Economic vulnerabilities make individuals losers of potential regressive costs of climate policies, while environmental vulnerabilities make them more susceptible to climate change consequences. Furthermore, we argue that economic and climate vulnerabilities may act as "barriers" both at the individual and at the contextual level: on the one hand, economic constraints might impede individuals' willingness to pay for the environment even among those who are concerned for it; on the other hand, a lack of climate vulnerabilities may make environmental problems appear abstract and distant, hindering individuals' engagement in climate actions.

Using International Social Survey Programme (ISSP) data from 27 countries, we first analyse the relationship between environmental concern and willingness to pay to protect the environment. Second, we focus on the two "barriers" that, at the individual and contextual level, respondents might face in translating their concern into willingness to pay to protect the environment: economic vulnerabilities and climate vulnerabilities. Specifically, at the individual level, we test whether economic constraints on the one hand, and experience of extreme weather events on the other hand, affect the willingness to pay and, critically, whether being environmentally concerned trigger different reactions among individuals experiencing economic and climate-related vulnerabilities. At the country level, we use cross-levels interactions to test whether economic and climate vulnerabilities – national wealth and level of climate risk – moderate the process that leads individuals to translate their environmental concern into willingness to pay to protect the environment.

## **Theoretical Background**

### **Willingness to pay to protect the environment and environmental concern**

Willingness to pay to protect the environment has been defined as "the extent to which individuals' decisions will take into account the well-being of the environment, even at the expense of immediate self-interest, effort, or costs" (Davis et al., 2011). In the literature it is considered a type of intentional behaviour and its theoretical background can be found in Stern's definition (2000) of public sphere environmentally significant behaviours. Stern distinguishes between private and public-sphere behaviours. Private-sphere behaviours, such as recycling or travelling in sustainable modes, are private sphere individual actions that would have a direct impact on the environment if the majority

of the population were to engage in them. Public-sphere behaviours, instead, have an indirect effect on environmental protection, as they aim at modifying public policies that in turn modify the context in which individual and organizational choices are made (Stern, 2000). These include protesting, being member of an organization, support for climate policies or willingness to sacrifice for the environment.

Although both private and public-sphere behaviours are relevant for the individual and societal changes needed to handle climate change consequences, research shows that engaging in such behaviours is not common and that only a minority of the population is committed to support climate policies or actions to protect the environment (Hadler & Haller, 2011). Therefore, a crucial focus for studies aimed at understanding and incentivizing pro-environmental behaviours regards those factors that can influence these behaviours and climate policy support. In this regard, a widespread perspective in explaining citizens commitment to pro-environmental actions and behaviours, have focused on environmental concern and on the perceptions of environmental conditions. This approach is generally rooted in the Theory of Planned Behaviour, which argues that environmental intentions are outcomes of attitudes and beliefs (Ajzen, 1991). This theory links enduring values, beliefs regarding the human-nature relationship, specific environmental beliefs and intentional behaviours through a causal chain, ultimately leading to pro-environmental behaviours. Indeed, several studies that adopt this theoretical framework to explain the relationship between environmental concern and intentional behaviours find a positive association with willingness to protect the environment and climate policy support (Dienes, 2015; Liebe et al., 2011; Poortinga et al., 2004).

Overall, previous research suggests that environmental concern is a necessary precondition to engage in pro-environmental behaviours (Dietz et al., 2007; Drews & van den Bergh, 2016; Hornsey et al., 2016). Thus, in this article, we consider environmental concern as one of the last elements of the chain between values and pro-environmental intentions and we anticipate that the higher the concern for the environment, the higher the willingness to pay to protect it.

However, several studies identify a gap between individual's positive attitudes toward the environment and pro-environmental behaviours or support for climate policies (Fairbrother, 2022b). Although the relationship is generally found to be positive, it is surprisingly weak (Farjam et al., 2019; Hornsey et al., 2016; Mayerl & Best, 2019; F. Meyer et al., 2022). In particular, the gap tends to increase the more the measure of pro-environmental behaviours involves personal costs. For example, Hornsey and colleagues in their 2016 review found that the association between policy support and climate change's beliefs weakens as the measure of policy support becomes more specific and related to personal cost. Hence, individuals do not seem to completely translate their concern for environmental problems in willingness to act to protect it.

Therefore, a crucial focus in environmental studies involves comprehending the factors that drive individuals to be concerned enough to pay and sacrifice for environmental protection. As Johansson Sevä and Kulin (2018) underline, the existing literature on pro-environmental behaviours can be divided into two main approaches: one focused on the individual level determinants and another one focused on the contextual level ones. Both approaches have identified relevant predictors of pro-environmental behaviours, but fewer studies have considered how both these factors interact in the relationship between environmental concern and pro-environmental behaviours.

In the following sections, we introduced two factors that might influence the willingness to sacrifice to protect the environment and its relationship with environmental concern both at the individual and the country level might. We begin with individual-level explanations and then proceed to contextual-level explanations.

### **Individual explanations**

Several individual predictors of environmental behaviours have been investigated in the literature to understand people's position toward environmental behaviours and climate policy support. These can be partitioned into four main categories: (i) socio-economic factors, such as age, income and education; (ii) social-psychological factors, e.g. worldviews, values, political orientation; (iii) climate change perception, which includes, among others, climate change knowledge and beliefs, risk perception, environmental concern; (iv) the perception of pro-environmental behaviours and its characteristics, such as the personal costs involved, the perceived effectiveness of the behaviour (or the policy), and its potential revenues (Drews & van den Bergh, 2016; Hornsey et al., 2016).

In this article, we contribute to the study of the first and third of the aforementioned categories by focusing our attention on socio-economic vulnerabilities, on the one side, and climate-related vulnerabilities, on the other side. To do so, we rely on two theoretical approaches used in previous studies that are useful to better frame these potential barriers to climate actions.

First, the *compensation hypothesis* identifies individual income as the main predictor of people's willingness to pay for environmental goods. Environmental protection is a good whose demand rises as economic capacities increases, as any other good. Thus, given identical preferences – that is, identical level of environmental concern – higher income individuals will be able to spend more for environmental goods in comparison to low-income individuals (Diekmann & Franzen, 1999; Barry and Field, 2009 in Meyer & Liebe, 2010). Other studies adopt the *post-materialist thesis* (Inglehart, 1995, 1998) to explain higher willingness to pay to protect the environment among wealthier individuals. According to Inglehart (1995, 1997), environmental attitudes and values are part of a

general shift in values observed in affluent societies because of their development. The more individuals live in affluent societies, the less they are concerned for material needs - such as economic struggles - and the more they engage in post-materialist values - such as quality of life, self-fulfilment, and environmental protection. Hence, following this approach, wealthier individuals are more likely to focus on non-material concerns such as environmental protection in comparison to less affluent individuals. Studies relying either on the post-materialist or the affluent hypothesis to analyse the impact of individual wealth on environmental attitudes and behaviours mostly find a positive association (Fairbrother, 2013; Franzen & Meyer, 2010; Meyer & Liebe, 2010). Moreover, empirical evidence seems to support the hypothesis of individual wealth as moderating factor in the relationship between environmental concern and private-sphere behaviours, for instance recycling and sustainable travelling (see Dienes, 2015). However, fewer studies investigate the role of income in affecting the extent to which citizens translate environmental concern in public-sphere pro-environmental behaviours, such as willingness to protect the environment. Dienes (2015), using data from the Life in Transition Survey II, found that having strongly experienced a financial crisis reduced the effect of climate change concern on willingness to pay for climate change mitigation. In this article, instead, we test both the direct effect of household income on willingness to pay and its moderating effect on the attitude-behaviour gap by formulating the following hypotheses:

*H1a: Low-income individuals are less willing to pay to protect the environment in comparison to high-income individuals.*

*H1b: The positive association between environmental concern and willingness to pay to protect the environment is weaker among low-income individuals in comparison to higher-income individuals.*

Economic insecurities, however, are not the only vulnerabilities that might affect individuals' behavioural intentions. In fact, one of the barriers that the literature has identified in hindering environmental behaviours consists in the perceived distance of climate change risk and consequences (Lorenzoni et al., 2007). Most people do not perceive climate change as an urgent personal threat: they instead locate its consequences remotely in space and time (Lorenzoni & Pidgeon, 2006). Nonetheless, with the raise of climate disasters and visible consequences of climate change, the circumstances in which visible climate consequences are experienced have increased. This led recent research to focus on the extent to which experiencing the consequences of climate change affects people's attitudes and commitment to protect the environment. In fact, experiencing a climate-

related event may induce people to perceive climate change as more concrete and closer, with positive effects on climate attitudes and behaviours (Weber, 2006, 2010).

The theoretical mechanisms by which extreme weather events (EWE from here on) may affect climate change attitudes and behaviours have been well illustrated by Demski et al. (2017), who emphasize the theoretical mechanisms derived by the psychological literature in relation to the role of availability heuristic and affect heuristic (Weber, 2010). First, EWE experiences might heighten the cognitive accessibility and salience of climate risks in individuals' perceptions, and in turn might affect individuals' ability to imagine future risks and environmental problems. Second, the emotional response that easily accompany the experiences of such events also affect the 'learning experiences' with consequences on climate risk perception and environmental action to mitigate the event. Emotional responses are a typical characteristic of extreme weather events in contrast to other climate change consequences, such as temperature increase or the North Pole's glacier melting (Demski et al., 2017). Empirical evidence shows that the effect of climate-related experiences on environmental commitment is generally positive (Demski et al., 2017; Spence et al., 2011), but it also depends on the event experienced (Soni & Mistur, 2022) and on the extent to which it has been perceived as climate-caused (Ogunbode et al., 2019).

Building upon this emerging evidence, we investigate the influence of perceiving to have experienced an extreme weather event in the neighbourhood on the willingness to pay to protect the environment as well as on the relationship between environmental concern and willingness to pay.

We assume that individuals that perceive to have experienced such an event may feel more vulnerable to climate change risks and thus may perceive climate change consequences as closer and more concrete in comparison to those who did not experience an extreme weather event. This perception might influence their environmental intentions and subsequently alter the mental processes through which environmental concern translates into willingness to pay for environmental preservation. We thus hypothesize that:

*H2a: Individuals who perceive to have experienced extreme weather events are more willing to pay to protect the environment.*

*H2b: The positive association between environmental concern and willingness to pay to protect the environment is stronger among individuals who perceived to have experienced extreme weather events in comparison to those who did not.*

## **Contextual explanations**

Previous studies showed that, while countries exhibit similar levels of environmental concern, substantial variation exists in terms of engagement in environmental behaviours (Fairbrother, 2022b; Hadler & Haller, 2011; Mayerl & Best, 2019) as well as in the gap between concern and behaviours (Davidovic et al., 2020a; Johansson Sevä & Kulin, 2018; Kulin & Johansson Sevä, 2021). These results suggest that contextual factors, in addition to individual ones, influence citizens' environmental attitudes, behaviours and the ease with which concern is translated into behaviours.

A widely used social explanation to account for cross-countries differences in citizens' environmental behaviours is Inglehart's post-materialist thesis. According to Inglehart, wealthier countries show positive attitudes toward environmental issues and high engagement in pro-environmental behaviours because of the diffusion of post-materialist values. However, empirical evidence revealed the insufficiency of this hypothesis in explaining environmental attitudes in less developed and less affluent countries (Inglehart, 1995; 1997). Therefore, in addition to the post-materialist thesis, Inglehart proposed the "Objective problems and subjective predispositions" hypothesis according to which the environmental attitudes and concerns reported in less-developed countries are consequences of the poor environmental conditions experienced, which make environmental issues a material need and not a post-materialist value as in wealthier societies.

In contrast to Inglehart's thesis, Dunlap and Mertig (1994, 1995) claim that environmental attitudes are globally spread regardless of the wealth of a country. They argue that environmental concern, as well as demand for environmental protection (Dunlap & York, 2008), are not limited to the wealthy nations and are not the result of the raising of post-materialist values. According to these scholars, environmental concern has become a global phenomenon resulting from several factors and mechanisms. Among those, they particularly emphasized the role of direct experience of environmental degradation that can stimulate environmental attitudes and behaviours in both poor and rich countries (Dunlap & York, 2008). Hence, differently from the "Objective problems and subjective predispositions" thesis, Dunlap and colleagues underline that environmental degradation can affect individuals' attitudes regardless of the country's wealth and they reject the hypothesis that postmaterialist values determine country differences in environmental concern and the demand for environmental protection.

Several further empirical studies analysed the role of national wealth and environmental degradation. On the one hand, Dunlap and Mertig's hypothesis has been contradicted by empirical research showing a positive impact of national wealth both on environmental concern and especially



on costly pro-environmental behaviours (Diekmann & Franzen, 1999; Franzen & Meyer, 2010). At the same time, other empirical studies found the opposite, that is, higher environmental concern and pro-environmental intentions in poorer countries in comparison to richer ones (Dunlap & York, 2008; Fairbrother, 2013). Hence, the evidence regarding national wealth is mixed in the literature and it seems to be highly dependent on the measurements and on the data used. Related to this, Lo and Chow (2015) observe variations in the impact of national wealth depending on whether importance or risk perception is considered. They note that in affluent countries the importance of climate change and environmental problems is higher than in poorer countries where instead the risk perception is higher.

On the other hand, the hypothesis related to environmental degradation has shown mixed results depending both on the measure of environmental concern adopted and on the environmental characteristic analysed as proxy of poor environmental conditions. For example, studies considering the perception of water quality or air pollution generally find a positive effect on environmental attitudes but not on environmental behaviours (see for example Pisano & Lubell, 2017). In contrast, one study assessing the exposure to climate disasters found a positive effect on public opinion toward environmental problems and support for environmental spending (Soni & Mistur, 2022).

With the aim of further contributing to this debate, in this article we investigate what role is played by country level economic and environmental vulnerabilities in the individual-level relationship between environmental concern and willingness to pay to protect the environment.

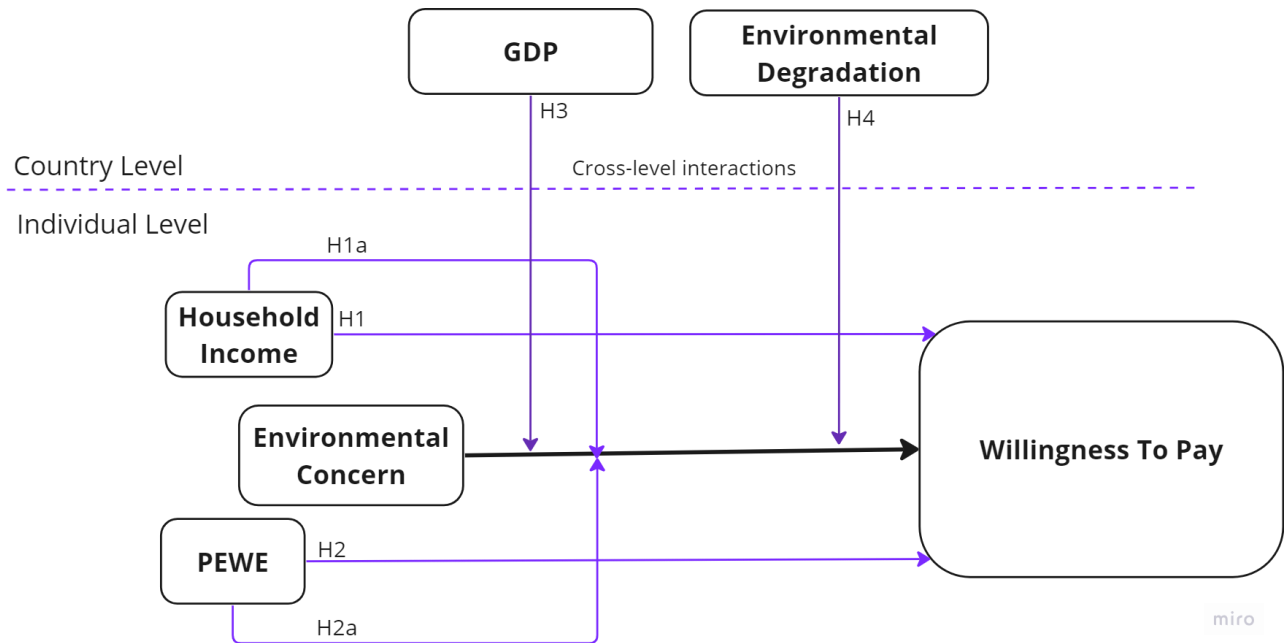
First, we assume that individuals living in less affluent countries will struggle more in translating their environmental concern in willingness to pay because of the economic constraints that make them more resistant to costly environmental behaviours, even if they are concerned for the environment. Hence, we hypothesize that:

*H3: The positive association between environmental concern and willingness to pay to protect the environment is weaker in less affluent countries than in more affluent ones.*

Second, we assume that in high climate risk countries, environmental problems are more concrete and tangible: they are material needs that must be addressed for the survival of the citizens. Therefore, we hypothesize that:

H4: *The positive association between environmental concern and willingness to pay to protect the environment is stronger in countries where climate vulnerability is higher than in countries where climate vulnerability is lower.*

Figure 1. Conceptual Model



## Methodology

### Data and sample

The analysis relies both on individual-level and country-level data. With regard to individual level data, we rely on the IV Environmental module collected between 2020 and 2023 by the International Social Survey Programme (ISSP). We use the nationally-representative samples of 27 countries that participated in the module and include all the variables necessary for the analysis<sup>3</sup>: Australia (AU), Austria (AT), China (CN), Croatia (HR), Denmark (DK), Finland (FI), France (FR), Germany (DE), Hungary (HU), Iceland (IS), India (IN), Italy (IT), Japan (JP), Korea (KR), Lithuania (LT), New Zealand (NZ), Norway (NO), Philippines (PH), Russia (RU), Slovakia (SK), Slovenia (SI), South Africa (ZA), Spain (ES), Sweden (SE), Switzerland (CH), Thailand (TH), United States (US). After applying list-wise deletion of the missing values (5316 observations) and selecting respondents between 15 and 85 years old, our sample comprehends 36962 individuals.

### Dependent variable

<sup>3</sup> Although Taiwan participated to the ISSP module, it has been excluded from the analysis because the index used to measure climate vulnerability at the country level does not have information for Taiwan.

To measure our dependent variable, we used two indicators assessing the citizens' willingness to pay to protect the environment: willingness to pay much higher prices (i) and taxes (ii) to protect the environment. The items responses are 'very willing', 'fairly willing', 'neither willing nor unwilling', 'fairly unwilling' and 'very unwilling'. To ensure that higher values correspond to higher willingness to pay to protect the environment, we inverted the coding of the two variables so that 1 corresponds to very unwilling and 5 to very willing. Although the two items are not measures of specific environmental policies, they are good proxies for climate policy support. In fact, according to climate policy experts (Fairbrother, 2022a), willingness to pay is the minimum requirement to any public support for environmental taxes, one of the most effective and least costly measures to address climate change. Thus, following the work of previous studies (Davidovic et al., 2020b), we here consider willingness to pay higher taxes and prices as proxy of policy support for one of the climate policies we would primarily need: environmental taxes. The first item captures tax support indirectly – since environmental taxes often end up in price increases - while the second one explicitly measures attitudes on environmental taxes. Together they are considered as a general measure of environmental tax support. Therefore, for the analysis, we built an index, which we will call WTP (Willingness to Pay), composed by the average of the two items. The index ranges from 0 – unwilling to pay - to 5 – very willing to pay. Factor analysis confirms they reflect a unique factor in each country and Alpha of Cronbach ranges between 0.7 and 0.9 across countries.

### *Independent variables*

Our independent variables are divided in two types of vulnerability and two levels of analysis. On the one hand, we consider both climate and economic vulnerabilities; on the other hand, we look at these vulnerabilities both at the country and at the individual level. This translated into having four main independent variables measuring climate and economic vulnerabilities at the individual and country level.

To measure *individual-level climate vulnerabilities* (1), we used the extent to which the respondents indicate that their neighbourhood was affected by an extreme weather event (such as severe storms, droughts, floods, heat waves, cold snaps, etc.) over the last 12 months. The response options are: 'not at all', 'to a little extent', 'to some extent', 'to a great extent' and 'to a very great extent'. We recoded together 'to a great extent' and 'to a very great extent' because of the low numerosity of these two categories. We will call this variable PEWE (Perceived Experience of Extreme Weather Event). The use of the perception of such experience is in line with the heuristic literature since it enables the researcher to consider the extent to which such an event has emotionally been perceived by the respondents. In fact, as Ogunbode et al. (2019) show, the attribution of the

EWE to climate change is a necessary condition to transform such experience in climate behavioural responses. *Individual-level economic vulnerability* (2) is measured through household income quintiles, calculated from the income distribution in each country. The variable, therefore, is a measure of respondent's household income relative to other households in her/his society.

Moving to the country level variables, to measure the *country-level economic vulnerability* (3) we use the GDP per capita as Purchasing Power Parity (PPP) calculated by the World Bank in 2022<sup>4</sup>. The *country-level climate vulnerability* (4) is assessed through an index measuring the climate risk level of every country, the World Risk Index. The World Risk Index enables us to pursue a comprehensive analysis of environmental degradation, considering the multiple factors that make a country environmentally vulnerable, rather than concentrating on a single indicator. The 2023 World Risk Index has been edited by the Institute for International Law of Peace and Armed Conflict (IFHV) of Ruhr-University Bochum that revises the index methodology since 2018. The index assesses the level of environmental risk of a country interacting two dimensions that compose it: the exposure to natural hazards and the societal capacities to respond to these events. The exposure dimension consists in the frequency and intensity of extreme weather events to which the population is exposed. The second dimension consists in the range of capacities necessary to cope with such environmental risks. It is composed by three subdimension: (i) susceptibility, indicating the structural characteristics and the general condition of the population that influence the reaction to climate risk; (ii) the coping capacities to mitigate the effect of climate disasters as well as the capacities to recover after it; and (iii), the adaptive capacities that consist in the long-term strategies to mitigate and prevent negative impacts of climate hazards. The index varies from 0 to 100, where 0 corresponds to no climate risk and 100 maximum climate risk. Among the countries considered in the present analysis, the World Risk Index varies from 0.9 in Denmark, Hungary and Slovakia, to 40 in Philippines and India. On average it scores 12, but with high variability across countries (standard deviation of 12).

The analyses also control for three individual-level variables: gender of the respondent (men as reference vs women), age (15-29 as reference, 30-59, 60-85) and level of education (up to lower secondary education as reference, upper secondary education to short-cycle tertiary education, tertiary and post tertiary education).

### *Modelling strategy*

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<sup>4</sup> Data download in September 2023.

To test our hypotheses, we rely on multilevel random intercept and random slopes linear regression models<sup>5</sup>. Multilevel analysis enables the researcher to account for both the hierarchical structural of data (in this case individuals clustered in countries) as well as to include macro-level variables measuring contextual characteristics. In Model 1 we look at the effect of environmental concern by itself. Then, in Models 2 and 3, we include the direct effects of PEWE and household income on WTP, as well as the control variables (Model 3). Successively, we add the interaction between environmental concern and household income (Model 4) and PEWE (Model 5). We then move to the country-level factors. In Models 6 and 7 we, respectively, include GDP and World Risk. Lastly, we include the two contextual variables in two cross-level interaction effects between environmental concern and, respectively, GDP (Model 8) and World Risk Index (Model 9). To facilitate the interpretation of the cross-level interaction effects, we graphically report their predicted values with 95% confidence intervals derived from Models 8 and 9.

## Results

### *Environmental Concern on Willingness to pay to protect the environment.*

Figure 2 shows the mean level of willingness to pay to protect the environment by the mean level of environmental concern in the 27 countries. The countries range from 3.2 to 4.3 in the average level of environmental concern, confirming the presence of high levels of concern for environmental issues in several western and non-western countries. The coefficient of variation across the countries means is 0.06, indicating little variation in the environmental concern across different contexts. On the other hand, the willingness to pay to protect the environment is generally lower, as it varies from 1.8 (in Slovakia) to 3.7 (in India) with most countries scoring between 2.5 and 3.2. Thus, on average, individuals have high levels of environmental concern but low willingness to pay to protect the environment. The country-level coefficient of variation is 0.14, indicating that there is high variability in the extent to which individuals are willing to pay to protect the environment in different countries. Moreover, the figure shows that willingness to pay is not strongly related to environmental concern at the country level. Indeed, the correlation between the country mean level of environmental concern and willingness to pay is 0.2. Thus, environmental concern does not appear to be a convincing explanation of why willingness to pay for the environment is much higher in some countries than in others. In the following section, we empirically assess the direct relationship between environmental concern and WTP at the individual level using multilevel models.

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<sup>5</sup> Before performing the multilevel models, we proceeded with a country-by-country analysis to test the direct relationship between environmental concern and WTP looking at differences across countries. Results are reported in Figure 1 in the Appendix.

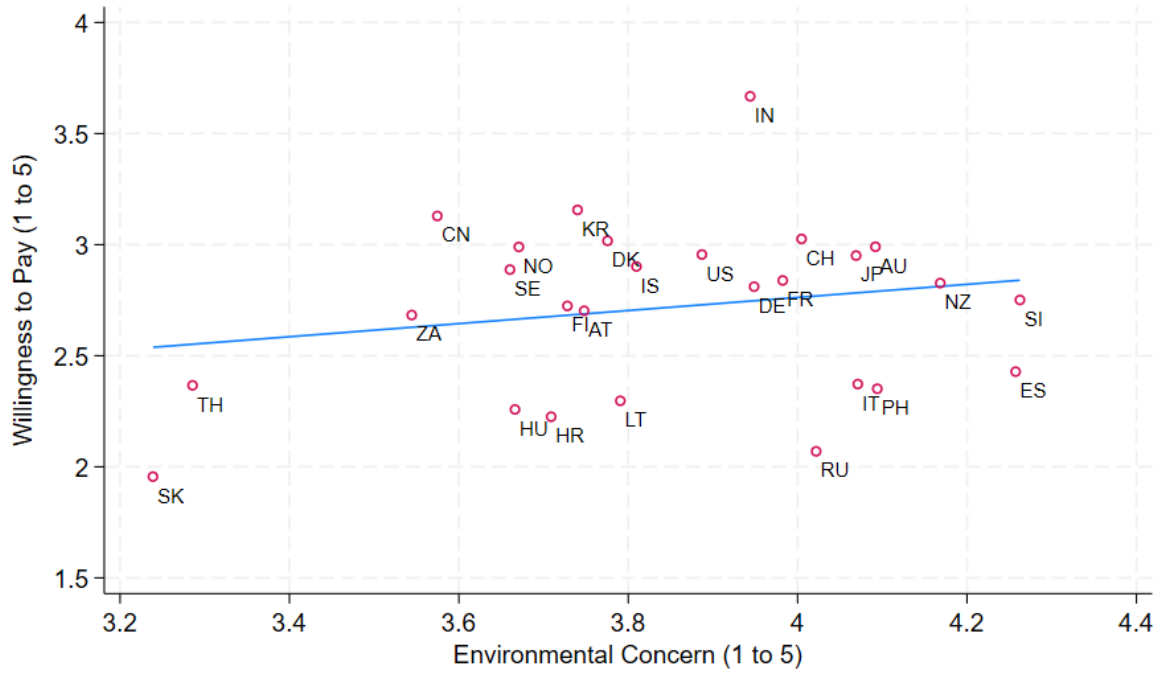


Fig. 2. Mean national willingness to pay to protect the environment by mean national concern for the environment. Country abbreviations are: AU Australia, AT Austria, CN China, HR Croatia, DK Denmark, FI Finland, FR France, DE Germany, HU Hungary, IS Iceland, IN India, IT Italy, JP Japan, KR Korea, LT Lithuania, NZ New Zealand, NO Norway, PH Philippines, RU Russia, SK Slovakia, SI Slovenia, ZA South Africa, ES Spain, SE Sweden, CH Switzerland, TH Thailand, US USA.

### *Multilevel Analysis*

Table 1 shows the results of the multilevel models. Model 0 is a null model with no covariates, used to compare the following models with. The Intra-class correlation, calculated from the country and individual variance is equal to 0.11, indicating that 11% of the variance of willingness to pay to protect the environment is explained by country differences and the rest by differences within countries.

As expected, environmental concern is positively associated with willingness to pay to protect the environment (beta coefficient equal to 0.31, Model 1). Model 2 adds household income and PEWE. The results show that both the variables have a positive and significant effect on the willingness to pay to protect the environment. The effects remain equal even under the control of sociodemographic variables (Model 3). As regards economic vulnerabilities, the results suggest that individuals in higher quintiles of household income are more willing to pay for the environment in comparison to individuals in lower quintiles. Looking at the coefficients of model 3, the difference in the willingness to pay between individuals in the highest and in the lowest quintile is 0.25 on average. As regards climate vulnerabilities, the more individuals perceive having experienced extreme weather events in the last 12 months, the higher is their willingness to pay for the environment in comparison to those

who have not experienced such poor environmental conditions. However, the effect of PEWE is particularly small and does not enable us to find support for our hypothesis 2a.

The results for the sociodemographic variables (Model 3) confirm the findings of previous research suggesting that education and being young have positive effects on the support of climate policies, even when personal costs are included (Jacques, 2023; Parth & Vlandas, 2022). In contrast, gender does not have any significant effect on willingness to pay to protect the environment. See the appendix for the complete table showing the effects of control variables.

Models 4 and 5 add the interaction effect between concern and household income, and concern and PEWE, respectively. Model 4 shows a significant interaction effect only between the most vulnerable individuals (1<sup>st</sup> quintile) and the least vulnerable ones (5<sup>th</sup> quintile), i.e., the association between environmental concern and willingness to pay for the environment is stronger among individuals in highest household-income quintiles in comparison to those in the lowest one. Therefore, among citizens with the greatest economic vulnerabilities we observe a weaker association between environmental concern and willingness to pay (supporting H1b). In contrast, we find no statistically significant interaction between PEWE and environmental concern on willingness to pay (Model 5). Although having experienced poor environmental conditions moderately affects the willingness to pay, the effect is not multiplicative and such experience does not moderate the effect of environmental concern. Therefore, we did not find support for our hypothesis 2b.

Table 1. Multilevel Linear Regression Models of Willingness to pay to protect the environment.

	Model 0	Model 1	Model 2	Model 3	Model 4	Model 5
Environmental Concern		0.307*** (0.00)	0.299*** (0.01)	0.292*** (0.01)	0.302*** (0.01)	0.278*** (0.01)
Income (rf: 1 <sup>^</sup> quintile)						
Quintile 2 <sup>^</sup>			0.047** (0.02)	0.037* (0.02)	0.230*** (0.07)	0.037* (0.02)
Quintile 3 <sup>^</sup>			0.092*** (0.02)	0.063*** (0.02)	0.093 (0.06)	0.062*** (0.02)
Quintile 4 <sup>^</sup>			0.192*** (0.02)	0.143*** (0.02)	0.066 (0.07)	0.143*** (0.02)
Quintile 5 <sup>^</sup>			0.337*** (0.02)	0.250*** (0.02)	-0.060 (0.07)	0.250*** (0.02)
PEWE (rf: not at all)						
small extent			0.041** (0.01)	0.036* (0.01)	0.037** (0.01)	-0.039 (0.05)
some extent			0.103*** (0.01)	0.095*** (0.01)	0.094*** (0.01)	-0.049 (0.05)
large extent			0.047** (0.02)	0.042* (0.02)	0.042* (0.02)	0.091 (0.06)
Income*Environmental concern						
Quintile 2 <sup>^</sup>					-0.050** (0.02)	
Quintile 3 <sup>^</sup>					-0.008 (0.02)	
Quintile 4 <sup>^</sup>					0.020 (0.02)	
Quintile 5 <sup>^</sup>					(0.02)	
PEWE*Environmental concern						
small extent						0.021 (0.01)
some extent						0.038** (0.01)
large extent						-0.010 (0.02)
Constant	2.716*** (0.07)	1.537*** (0.07)	1.427*** (0.08)	1.472*** (0.08)	1.436*** (0.09)	1.523*** (0.08)
Random Effects						
Country intercepts	0.143*** (0.04)	0.138*** (0.04)	0.139*** (0.04)	0.138*** (0.04)	0.139*** (0.04)	0.137*** (0.04)
Individual variance	1.110*** (0.01)	1.008 (0.01)	0.993 (0.01)	0.980** (0.01)	0.978** (0.01)	0.980** (0.01)
Log Likelihood (-2LL)	108896.44	105309.29	104758.37	104298.55	104223.71	104285.84

Models control for: gender, age, and level of education. rf = Reference category. N=36962

Sig. level: p ≤ 0.10\*; p ≤ 0.05\*\*; p ≤ 0.01\*\*\*



Moving to the effects of country level vulnerabilities, Table 2 shows the randoms slope models in which GDP and the World Risk index have been included. Model 6 and 7 shows that national wealth is negatively associated with willingness to pay ( $\beta=-0.454$ ,  $p=0.000$ ), while the level of climate risk is positively associated ( $\beta=0.349$ ,  $p=0.000$ ). With regard to the effect of GDP, these results confirm what previous studies have found (Dunlap & York, 2008; Fairbrother, 2013) and are counter to the affluent and post-materialist hypothesis: in more affluent countries individuals have lower levels of willingness to pay to protect the environment. As regards climate risk, instead, the results suggest a positive direct relationship: living in countries at higher climate risk leads individuals to be more willing to accept costs to protect the environment.

Beyond the direct effect of national wealth or country climate risk on willingness to pay, what can be said about their moderating role in affecting the extent to which environmental concern is translated in willingness to pay? The significant interaction effects – 0.14 for GDP and -0.08 for World Risk in Models 8 and 9 respectively – indicate that both variables play a cross-level moderating role. To provide a clearer representation of the magnitude of the interactions effects we plot predicted mean values with 95% confidence intervals of willingness to pay to protect the environment by environmental concern and the two macro-level variables in Figure 3, panels (a) and (b) respectively.

Table 2. Multilevel Linear Regression Models of Willingness to pay to protect the environment.

	Model 6	Model 7	Model 8	Model 9
Environmental Concern	0.316*** (0.03)	0.316*** (0.03)	0.310*** (0.02)	0.313*** (0.03)
Income (rf: 1 <sup>^</sup> quintile)				
Quintile 2 <sup>^</sup>	0.037* (0.02)	0.037* (0.02)	0.038* (0.02)	0.037* (0.02)
Quintile 3 <sup>^</sup>	0.068*** (0.02)	0.067*** (0.02)	0.068*** (0.02)	0.067*** (0.02)
Quintile 4 <sup>^</sup>	0.149*** (0.02)	0.149*** (0.02)	0.149*** (0.02)	0.149*** (0.02)
Quintile 5 <sup>^</sup>	0.257*** (0.02)	0.257*** (0.02)	0.257*** (0.02)	0.257*** (0.02)
GDP	-0.454*** (0.09)		-0.470*** (0.08)	
World Risk		0.349*** (0.10)		0.356*** (0.10)
GDP*EnvConcern			0.138*** (0.02)	
World Risk*EnvConcern				-0.075** (0.03)
Constant	1.434*** (0.09)	1.427*** (0.10)	1.432*** (0.08)	1.426*** (0.10)
Random Effects				
Environmental Concern (slope)	0.026*** (0.01)	0.026*** (0.01)	0.009*** (0.00)	0.020*** (0.01)
Country intercepts	0.182*** (0.05)	0.255*** (0.07)	0.167*** (0.05)	0.251*** (0.07)
Individual variance	0.949*** (0.01)	0.949*** (0.01)	0.949*** (0.01)	0.949*** (0.01)
Log Likelihood (-2LL)	103215.34	103223.78	103187.13	103217.45

Models control for: gender, age, and level of education. rf = Reference category. N=36962  
 Sig. level:  $p \leq 0.10^*$ ;  $p \leq 0.05^{**}$ ;  $p \leq 0.01^{***}$

Figure 3, panel a, provides some support for H3 regarding the role of GDP: as national wealth increases, so does the willingness to pay but only among respondents who are very concerned for the environment. In contrast, the predicted values of WTP among non-concerned individuals decrease substantially from lower to higher GDP countries: the predicted values of WTP are equal to 2.4 for non-concerned individuals in the lowest GDP country and equal to 0.9 among those in the highest GDP country. In other words, non-concerned individuals are much more willing to pay to protect the environment in poorer countries than in wealthier ones and, as a result, the gap between concerned

and non-concerned respondents in the degree to which they are willing to pay to protect the environment is much larger in wealthier countries than in less affluent ones.

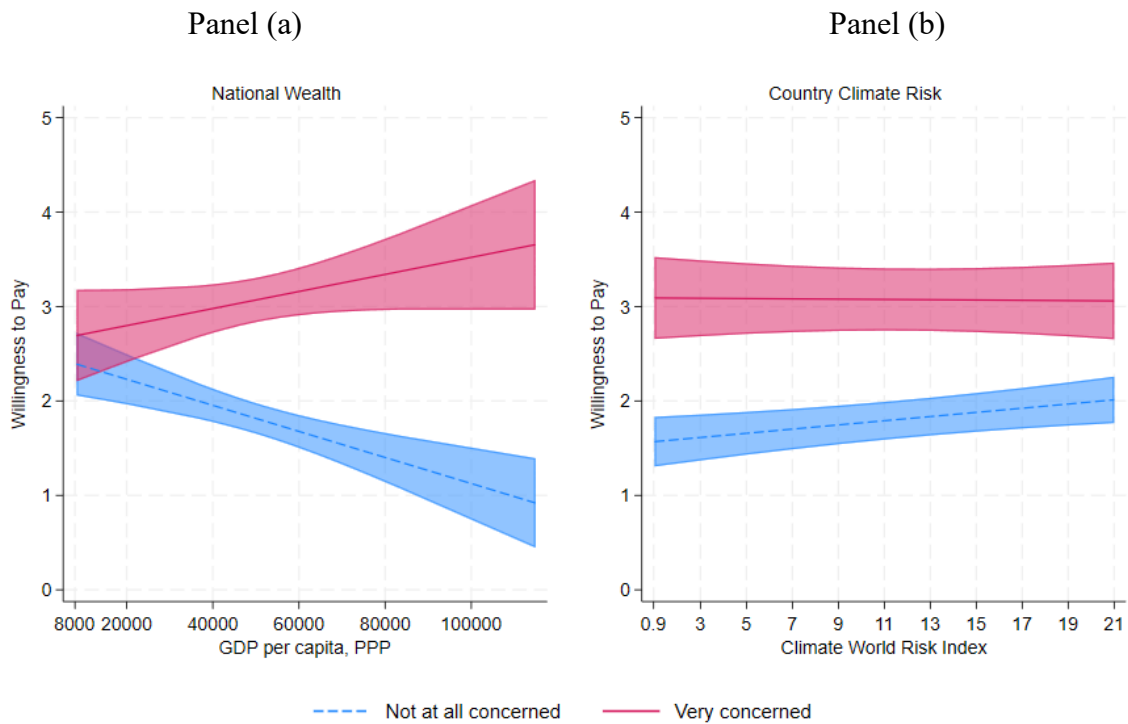


Figure 3. Predicted values with 95% confidence intervals of willingness to pay to protect the environment by environmental concern and countries' GDP per capita (panel a) and by environmental concern and levels of Climate World Risk (panel b). The predicted values are derived from Models 8 and 9 in Table 2.

Panel b in Figure 3, instead, shows the predicted values of willingness to pay by levels of country climate risk for individuals that are very concerned vs not at all concerned for the environment. In contrast with H4, the results suggest that individuals who are concerned for the environment have the same willingness to pay for its protection independently of the level of climate risk of their country. To the contrary, for those who are not environmental concerned, living in high climate risk countries increases the willingness to pay for environmental protection. The predicted values of WTP for non-concerned respondents living in high climate risk countries are equal to 2.02, while for those living in low climate risk countries the predicted WTP is equal to 1.57. Therefore, living in countries with a high climate risk appears to prompt non-concerned individuals to increase their willingness to pay, whereas it does not affect those who already perceive concerns for the issue.

## Discussion and conclusion

The limited commitment to pro-environmental behaviours and climate policy support is a relevant obstacle to the success of climate action on a larger scale. Therefore, understanding the mechanisms by which citizens engage in pro-environmental behaviours is essential to climate change mitigation. Empirical evidence on the topic is mixed: on the one hand, some previous studies have shown that environmental concern acts as a key determinant for pro-environmental behaviours (Dietz et al., 2007; Drews & van den Bergh, 2016); on the other hand, others have emphasized that the relationship is weaker than expected (Hornsey et al., 2016; Mayerl & Best, 2019). Therefore, it is plausible that other mechanisms, beyond environmental concern, influence the extent to which citizens are committed to environmental action. Moreover, in addition to individual differences, comparative studies have found that the strength of the relationship between concern and behaviours varies across countries (Hadler & Haller, 2011; Mayerl & Best, 2019), indicating that contextual characteristics might influence the extent to which individuals succeed or fail in translating their concern in behaviours.

This study contributes to the literature by distinguishing two different factors - both at the individual and at the contextual level – that may interfere in the relationship between individuals' concern for climate change and willingness to pay to mitigate it: economic and climate-related vulnerabilities.

At the individual level, we theoretically rely on the affluent/post-materialist hypothesis and on the idea of perceived distance of environmental problems to argue that economic constraints and climate vulnerabilities influence individuals' willingness to pay to protect the environment in opposing ways. The results support our hypotheses (1a and 1b), showing that a) the more individuals have economic constraints, the less they are willing to pay for the environment (H1a), and b) that economic constraints negatively modify the effect of environmental concern on willingness to pay (H2b). Therefore, in contrast to previous research that mainly analysed how individual wealth directly affects pro-environmental behaviours, our research adds to previous knowledge by showing that economic vulnerabilities also affect the extent to which individuals translate their environmental concern in willingness to pay to protect the environment.

As regard climate vulnerabilities, at the individual level our results do not support our hypotheses (2a nor 2b). We found a very small effect of the perception of the experience of an extreme weather event on willingness to pay, and we did not find a multiplicative effect of such perceived experience on willingness to pay (no support for hypothesis 2b). Therefore, environmental concern does not seem to trigger different mental processes in individuals that perceived to have experienced extreme weather events in comparison to those who did not. In contrast to previous studies showing a positive effect of experiencing an extreme weather event on environmental attitudes and behaviours, our

research shows that the perception of EWE does not modify pro-environmental behaviours if environmental concern is included in the analysis.

At the contextual level, we hypothesised that economic and climate-related vulnerabilities would have affected the individual-level relationship between environmental concern and willingness to pay (H3 and H4). As regard economic factors, our results show that non-concerned individuals are less willing to pay for the environment in wealthier countries, where there is a gap between concerned and non-concerned in the willingness to pay, than in poorer countries, where instead there is no difference in the willingness to pay according to the level of environmental concern. These results seem to align with the post-materialist thesis, since they suggest that in poorer countries, where the willingness to pay to protect the environment is less dependent on concern, environmental action may be more related to material needs and capacities. Conversely, in wealthier countries, characterized by a greater divide between those concerned and those non-concerned, environmental problems may be more polarized along different values and worldviews rather than material concerns.

As regard environmental conditions, we rely on the environmental degradation thesis, arguing that the climate vulnerability of the country strengthens the extent to which individuals translate their environmental concern in willingness to pay. In contrast to previous studies showing that contextual measures of environmental degradation, such as water and air pollution levels, do not affect pro-environmental behaviours (Franzen & Meyer, 2010; Gelissen, 2007), our study empirically shows that a country's climate vulnerability, assessed through a comprehensive measure of climate risk, impacts the citizens' willingness to protect the environment. Despite this positive direct effect, we do not find support for our last hypothesis according to which the effect of environmental concern would be stronger in more climate vulnerable countries. However, the analysis of the interaction effect indicates that non-concerned individuals are more willing to pay to protect the environment in countries facing greater climate vulnerabilities, in comparison to those living in contexts with lower climate risk. Therefore, the results suggest that, similar to economically vulnerable countries, in countries facing high climate risk the willingness to pay for environmental protection may be more connected to concrete needs than to general concern for the environment.

A potential limitation of this study regards the bidirectional relationship of environmental concern and perceived experience of an extreme weather event. Environmental concern affects the extent to which individuals perceive to have experienced an extreme weather event, and, vice versa, having experience such an event affects the concern for the environment. This reciprocal relationship may have weakened our results about the effect of individual-level climate vulnerabilities. Further research should disentangle these relationships investigating the impact of experiencing extreme weather events on the translation of environmental concern into willingness to pay.

Another potential limitation relates to the operationalization of pro-environmental behaviours. As previous research highlighted (Mayerl & Best, 2019), although willingness to pay to protect the environment is an intentional behaviour to act for the environment, we cannot be sure that it necessarily indicates a behaviour in practice.

In conclusion, this study shows that pro-environmental behaviours can be promoted through increasing environmental concern, but the effectiveness of this intervention may be limited, especially for economically vulnerable individuals and in economic and climate vulnerable countries where environmental concern does not seem to be the strongest predictor of willingness to pay for the environment. Hence, further research should explore other factors that might affect pro-environmental behaviours in climate and economically vulnerable countries as well as among economically vulnerable individuals. More specifically, future studies may focus on more concrete factors that lead individuals to be more willing to pay for environmental protection regardless of their general environmental concern. Moreover, future studies may focus on different measures of pro-environmental behaviours in order to analyse whether climate and economic vulnerabilities affect them in a similar way as to the willingness to pay.

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### **Disclosure statement**

The authors report there are no competing interests to declare.

## Appendix

Table 1. Summary of Statistics: Means and proportions of variables.

WTP	2.75 (SD=1.12)
Environmental Concern	3.84 (SD=1.07)
PEWE	
Not at all	0.25
To a small extent	0.31
To some extent	0.29
To a great extent	0.15
Income	
Quintile 1^	0,1876
Quintile 2^	0,1522
Quintile 3^	0,1719
Quintile 4^	0,1543
Quintile 5^	0,1325
Missing values	0,2016
Gender	
Female	0.47
Male	0.53
Age	
18-29	0.15
30-59	0.53
60-85	0.32
Education	
Low	0.24
Medium	0.47
High	0.29
GDP	49369.3 (SD=24096.94)
WorldRisk	123236 (SD=12.70)

Figure 1. Predicted values of willingness to pay to protect the environment by levels of environmental concern. Results are based on linear regression Models controlling for age, sex, education and income.

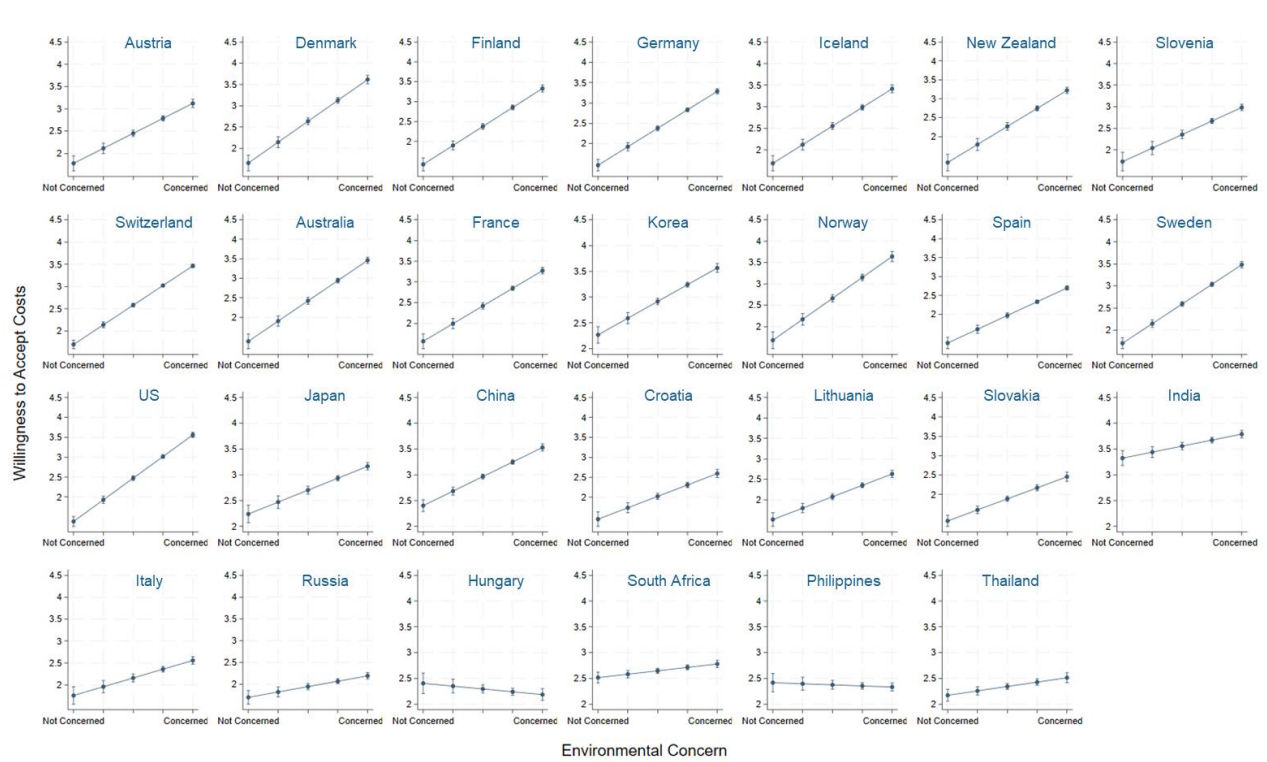


Table 2. Multilevel Linear Regression Models of Willingness to pay to protect the environment.

	Model 0	Model 1	Model 2	Model 3	Model 4	Model 5
Environmental Concern		0.307*** (0.00)	0.299*** (0.01)	0.292*** (0.01)	0.302*** (0.01)	0.278*** (0.01)
Income (rf: 1 <sup>^</sup> quintile)						
Quintile 2 <sup>^</sup>			0.047** (0.02)	0.037* (0.02)	0.230*** (0.07)	0.037* (0.02)
Quintile 3 <sup>^</sup>			0.092*** (0.02)	0.063*** (0.02)	0.093 (0.06)	0.062*** (0.02)
Quintile 4 <sup>^</sup>			0.192*** (0.02)	0.143*** (0.02)	0.066 (0.07)	0.143*** (0.02)
Quintile 5 <sup>^</sup>			0.337*** (0.02)	0.250*** (0.02)	-0.060 (0.07)	0.250*** (0.02)
PEWE (rf: not at all)						
small extent			0.041** (0.01)	0.036* (0.01)	0.037** (0.01)	-0.039 (0.05)
some extent			0.103*** (0.01)	0.095*** (0.01)	0.094*** (0.01)	-0.049 (0.05)
large extent			0.047** (0.01)	0.042* (0.01)	0.042* (0.01)	0.091 (0.05)

			(0.02)	(0.02)	(0.02)	(0.06)
Female (rf: male)				-0.008	-0.008	-0.008
				(0.01)	(0.01)	(0.01)
Age (rf: 18-29)						
30-59				-0.123***	-0.123***	-0.123***
				(0.02)	(0.02)	(0.02)
60-85				-0.075***	-0.077***	-0.076***
				(0.02)	(0.02)	(0.02)
Education (rf: low)						
Medium				0.056***	0.056***	0.056***
				(0.01)	(0.01)	(0.01)
High				0.280***	0.279***	0.280***
				(0.02)	(0.02)	(0.02)
Income*Environmental concern						
Quintile 2^					-0.050**	
					(0.02)	
Quintile 3^					-0.008	
					(0.02)	
Quintile 4^					0.020	
					(0.02)	
Quintile 5^					0.079***	
					(0.02)	
PEWE*Environmental concern						
small extent						0.021
						(0.01)
some extent						0.038**
						(0.01)
large extent						-0.010
						(0.02)
Constant	2.716***	1.537***	1.427***	1.472***	1.436***	1.523***
	(0.07)	(0.07)	(0.08)	(0.08)	(0.09)	(0.08)
Random Effects						
Country intercepts	0.143***	0.138***	0.139***	0.138***	0.139***	0.137***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Individual variance	1.110***	1.008	0.993	0.980**	0.978**	0.980**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Log Likelihood (-2LL)	108896.44	105309.29	104758.37	104298.55	104223.71	104285.84

rf = Reference category. N=36962

Sig. level:  $p \leq 0.10^*$ ;  $p \leq 0.05^{**}$ ;  $p \leq 0.01^{***}$

Table 3. Multilevel Linear Regression Models of Willingness to pay to protect the environment.

	Model 6	Model 7	Model 8	Model 9
Environmental Concern	0.316*** (0.03)	0.316*** (0.03)	0.310*** (0.02)	0.313*** (0.03)
Female (rf: male)	-0.021* (0.01)	-0.021* (0.01)	-0.021* (0.01)	-0.021* (0.01)
Age (rf: 18-29)				
30-59	-0.114*** (0.01)	-0.114*** (0.01)	-0.113*** (0.01)	-0.114*** (0.01)
60-85	-0.071*** (0.02)	-0.072*** (0.02)	-0.071*** (0.02)	-0.072*** (0.02)
Education (rf: low)				
Medium	0.070*** (0.01)	0.070*** (0.01)	0.070*** (0.01)	0.070*** (0.01)
High	0.275*** (0.02)	0.275*** (0.02)	0.275*** (0.02)	0.275*** (0.02)
Income (rf: 1^ quintile)				
Quintile 2^	0.037* (0.02)	0.037* (0.02)	0.038* (0.02)	0.037* (0.02)
Quintile 3^	0.068*** (0.02)	0.067*** (0.02)	0.068*** (0.02)	0.067*** (0.02)
Quintile 4^	0.149*** (0.02)	0.149*** (0.02)	0.149*** (0.02)	0.149*** (0.02)
Quintile 5^	0.257*** (0.02)	0.257*** (0.02)	0.257*** (0.02)	0.257*** (0.02)
GDP	-0.454*** (0.09)		-0.470*** (0.08)	
WorldRisk		0.349*** (0.10)		0.356*** (0.10)
GDP*EnvConcern			0.138*** (0.02)	
WorldRisk*EnvConcern				-0.075** (0.03)
Constant	1.434*** (0.09)	1.427*** (0.10)	1.432*** (0.08)	1.426*** (0.10)
Random Effects				
Environmental Concern (slope)	0.026*** (0.01)	0.026*** (0.01)	0.009*** (0.00)	0.020*** (0.01)
Country intercepts	0.182*** (0.05)	0.255*** (0.07)	0.167*** (0.05)	0.251*** (0.07)
Individual variance	0.949*** (0.01)	0.949*** (0.01)	0.949*** (0.01)	0.949*** (0.01)
Log Likelihood (-2LL)	103215.34	103223.78	103187.13	103217.45

rf = Reference category. N=36962

Sig. level:  $p \leq 0.10^*$ ;  $p \leq 0.05^{**}$ ;  $p \leq 0.01^{***}$

