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Abstract

This paper investigates the interrelation between adaptation and climate protection efforts of individuals in a cross-country comparison. The theoretical predictions based on a subjective utility framework demonstrate that, at the individual level, private adaptation and climate protection activities are determined by different factors and thus cannot be substitutes. Considering seven climate protection and four adaptation measures, these theoretical predictions are tested empirically using representative data from more than 3400 citizens in China, Germany, and the USA. The empirical findings are consistent with the theoretical predictions that the engagement in adaptation and climate protection activities tends to be positively related. While climate protection efforts seem to be mainly driven by their benefits (e.g., financial advantages or feelings of warm glow), adaptation activities are significantly influenced by a higher income and the individual evaluation of the risk that negative consequences from climate change occur. There is also some evidence that a perceived lack of public engagement in climate protection is compensated by increased private adaptation and climate protection efforts. Preferences for public adaptation and climate protection are significantly determined by individuals' beliefs about the efforts of others, social norms, feelings of warm glow, and confidence in the effectiveness.

Keywords: Adaptation, climate protection, climate change, policy preferences

JEL: H41, Q54, Q58

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1. Introduction

International climate policy has merely made little progress towards binding emission reduction targets involving the world's largest emitters such as China and the USA. Even if international climate negotiations are able to reach an agreement on the distribution of climate protection costs which all countries consider to be fair, the scientific society would doubt that such an agreement will lead to lasting climate stability (e.g., IPCC, 2013). Therefore, the respective actors cannot rely on climate protection activities only, but also need to turn towards adaptation measures to cope with the unpreventable impacts of global warming (e.g., Klein et al., 2005; Stern, 2008; Aakre and Rübbelke, 2010). The fourth assessment report (AR4) of the Intergovernmental Panel on Climate Change emphasizes that "reliance on adaptation alone is likely to lead to a magnitude of climate change in the long run to which effective adaptation is no longer possible or only at very high social, economic and environmental costs" (IPCC, 2007, p. 748).

In contrast to the public good climate protection, adaptation to climate change is regarded as a private or club good. Benefits from investments in adaptation can be of exclusive use to the investor or to particular regions. This makes adaptation an attractive alternative and additional option for policy, industries, companies, and individuals to reduce climate-related damages and losses (e.g., Tol, 2005; Onuma and Arino, 2011; Barrett, 2011). Such adaptation measures that reduce the severity of potential climate-related losses might, however, diminish the incentive to engage in activities that reduce the risk of climate change, i.e. climate protection activities.[1] To date there is barely any empirical evidence regarding decisions for adaptation and climate protection activities taking account of potential interrelations between these responses to climate change. This study empirically investigates these interrelations at the individual level by exploring the determinants and motives of adaptation and climate protection efforts of citizens in three countries.

At the policy level, theoretical predictions on the interrelation between adaptation and climate protection are ambiguous. While there is a broad consensus that efficient and cost-effective climate policy involves adaptation and climate protection strategies (e.g., Klein et al., 2005; Tol, 2005; Swart and Raes, 2007; IPCC, 2014), the option of adaptation may also aggravate the social dilemma of greenhouse gas reductions (e.g., Auerswald et al., 2011; Probst, 2013). Regarding adaptation and climate protection as imperfect substitutes, Barrett (2011) shows

[1] This is comparable to a very important problem in the contract literature, i.e. "moral hazard", which describes the propensity of individuals to take less care in preventing loss if they don't have to bear the risk of these losses (e.g., Hirshleifer and Riley, 1979).

that returns from adaptation and climate protection are interrelated and may lead to corner solutions where countries rely solely on adaptation in case of non-cooperation and solely on climate protection in case of cooperation. Differences in adaptive capacities may also reinforce welfare inequalities between rich and poor countries. Taking account of fairness considerations, Rübbelke (2011) shows that transfers to support adaptation in developing countries may reduce the perceived lack of fairness and increase the incentive to cooperate, while Ebert and Welsch (2012) demonstrate that improvements in the productivity of adaptation and adaptive capacity may lead to higher global emission levels.

Buob and Stephan (2011) develop a game theoretic framework and show that regions choose the strategy with lower marginal costs. Only relatively rich regions with poor environmental quality who account for the interdependence of adaptation and climate protection efforts use these measures as a common strategy. Kane and Shogren (2000) find that an exogenous increase in risk results in more adaptation efforts while the change in climate protection efforts depends on the marginal effectiveness of mitigation in reducing risk. The chance of receiving better information about climate change in the future may decrease climate protection efforts if adaptation is possible (e.g., Ingham et al., 2007).

The existing literature also provides some experimental evidence on the interrelation between adaptation and climate protection. Hasson et al. (2010) consider either-or decisions in an experimental setting and find no significant difference in choosing climate protection between low-vulnerability and high-vulnerability treatments. Probst (2013) finds that adaptation substitutes climate protection. Lower adaptation costs increase free-riding but to a lesser extent than theoretically predicted which may be attributed to risk preferences and inequity aversion.

This study is the first to provide survey-based empirical evidence on adaptation and climate protection efforts of individuals, preferences for the respective public activities, and their interrelation in a cross-country comparison. These analyses are based on theoretical predictions derived from a subjective utility framework that models climate change as a shock that potentially causes losses to a representative individual. The severity of these climate-related losses can be reduced by private adaptation measures, while risk reduction through private climate protection efforts is assumed to be marginal. The individual chooses adaptation and climate protection activities by maximizing her subjective expected utility. The comparative static results demonstrate that private adaptation and climate protection activities are determined by different factors. While climate protection efforts are predicted to be solely affected by their costs and benefits (e.g., financial advantages or feelings of warm glow), adaptation activities

tend to be driven by income and the individual evaluation of the risk that negative consequences from climate change occur. These theoretical predictions are tested empirically using survey data from citizens in China, Germany, and the USA. China, the European Union (EU)[2], and the USA are large emitters and supposed to play a key role in future international climate policy. The empirical results broadly confirm the theoretical prediction in the three countries and reveal a positive relationship between private adaptation and climate protection activities as well as private climate protection efforts and preferences for public climate protection activities.

The remainder of this paper is structured as follows: Section 2 derives theoretical prediction based on a subjective utility maximization problem of a representative individual under climate-related uncertainty. After the description of the surveys and the econometric approach in Section 3, Section 4 discusses the empirical findings. Section 5 summarizes the results and draws some conclusions.

2. Theoretical predictions

Assume that a representative individual faces two states of the world: a moderate state and a bad state with negative consequences from climate change causing loss $l(a)$ (e.g., an extreme weather event causing damages). The severity of potential losses can be reduced by investments in adaptation measures a, i.e. $l_a < 0$ and $l_{aa} < 0$.[3] The individual assigns a probability to each state of the world which is interpreted as the individual's subjective evaluation of the risk that negative consequences from climate change occur.[4] This subjective risk perception $\pi(G, \theta, z)$ depends on exogenous factors θ[5] (e.g., Hasson et al., 2010) and individual-specific characteristics z (e.g., gender, education, income)[6]. While the total amount of climate protection efforts G reduces the actual probability of negative consequences from climate change and thereby potentially the individual's subjective risk perception, the effect of private climate protection efforts g on the mitigation of climate risks remains marginal and will thus not be considered in the following, i.e. $\pi_G < 0$ and $\pi_g = 0$ (e.g., Hoel, 1991; Kane and Shogren,

[2] The survey was conducted in Germany since this country is the largest economy in the EU.
[3] Hereafter, subscripts denote first and second partial derivatives, i.e. $l_a \equiv \partial l/\partial a$ and $l_{aa} \equiv \partial^2 l/\partial a^2$.
[4] Using subjective risk perception takes into account that individuals may not be able comprehend information and parameters of actual loss probabilities properly (e.g., Kahneman and Tversky, 1979; Schoemaker and Kunreuther, 1979; Shogren, 1990; Botzen and v. d. Bergh, 2009).
[5] θ reflects natural processes that cause climatic changes, the uncertainty about the effects of climate protection, but also factors like media exposure of climate change and its consequences.
[6] These factors were found to determine risk aversion (e.g., Cicchetti and Dubin, 1994) as well as the decision for self-insurance and self-protection measures (e.g., Lewis and Nickerson, 1989).

2000; Ebert and Welsch, 2012). The individual's payoffs, x_0 and x_1,[7] in the moderate and the bad state of the world are:

$$x_0 = w - c(G,\tau)a - pg + b(g)$$

$$x_1 = w - l(a) - c(G,\tau)a - pg + b(g)$$

where w is the individual's initial wealth and p is the price for private climate protection activities. Costs of private adaptation $c(G,\tau)$ are influenced by the actual probability of negative consequences from climate change[8] which is reduced by total climate protection efforts,[9] i.e. $c_G < 0$ (e.g., Buob and Stephan, 2011; Ingham et al., 2013), as well as other factors τ like administrative expenses (e.g., Lakdawalla and Zanjani, 2005). The function $b(g)$ represents co-benefits associated with the individual's climate protection efforts including material (e.g., financial advantages) as well as immaterial (e.g., feelings of warm glow or social approval) gains. These benefits increase with private climate protection efforts at a decreasing rate, i.e. $b_g > 0$ and $b_{gg} < 0$.

Denoting $u_0 \equiv u(x_0)$ and $u_1 \equiv u(x_1)$, the individual's expected utility can be written as

$$EU = \pi u_1 + (1-\pi)u_0 \tag{1}$$

with $u' > 0$ and $u'' < 0$.[10] The individual chooses adaptation and climate protection efforts that maximize this subjective expected utility. The first order condition with respect to a is

$$\frac{\partial EU}{\partial a} = \pi u_1'(-l_a - c) + (1-\pi)u_0'(-c) = 0. \tag{2}$$

That is, the individual balances marginal costs and benefits from adaptation across the two states of the world, such that the optimality condition for the choice of adaptation efforts can be written as

$$\frac{c}{-l_a} = \frac{\pi u_1'}{\pi u_1' + (1-\pi)u_0'}.$$

The first order condition with respect to g is

$$\frac{\partial EU}{\partial g} = \big(b_g - p\big)[\pi u_1' + (1-\pi)u_0'] = 0. \tag{3}$$

[7] It is assumed that the individual is not fully insured, i.e. $l(a) > 0$, which implies that $x_0 > x_1$.
[8] Insurance companies, for instance, possess very good knowledge about actual risk probabilities and adjust insurance costs according to these probabilities.
[9] As discussed above, the effect of private climate protection efforts g is assumed to be marginal and is thus not considered.
[10] u' denotes the first order derivative $\partial u/\partial x$ and u'' the second order derivative $\partial^2 u/\partial x^2$. This also implies that $u_0' < u_1'$.

Since the term in squared brackets is strictly greater than zero, this condition can only hold if the price for climate protection activities equals marginal benefits, i.e. $p = b_g$. In the optimum, the decision to engage in climate protection is independent of the subjective risk perception. Denote the optimal solutions to the utility maximization problem $a^*(\cdot)$ and $g^*(\cdot)$.

Appendix A presents the comparative statics in order to explore how changes in the exogenous parameters c, p, π, G, and w affect the demand for private adaptation and climate protection. Assuming the second order condition $|H| = \partial^2 EU/\partial a^2 \, \partial^2 EU/\partial g^2 - (\partial^2 EU/\partial a \partial g)^2$ to hold whenever (2) and (3) hold, i.e. $|H| > 0$, the effects of changes in prices c for adaptation and p for climate protection are

$$\frac{\partial g^*}{\partial c} = 0, \qquad \frac{\partial a^*}{\partial c} < 0, \qquad \frac{\partial g^*}{\partial p} < 0, \text{ and } \frac{\partial a^*}{\partial p} < 0.$$

The latter expression $\partial a^*/\partial p$ is negative if $-u_0''/u_0' < -u_1''/u_1'$. Making adaptation less costly may solely increase adaptation efforts, while lower costs for climate protection may increase both adaptation and climate protection efforts if the individual's absolute risk aversion (e.g., Pratt, 1964) regarding the bad state exceeds her absolute risk aversion regarding the good state of the world. Thus, private adaptation and climate protection efforts are not predicted to be substitutes,[11] but there might be a positive relationship between the engagements in both activities.

> *Prediction 1: Private adaptation activities are either positively or not related to private climate protection efforts.*

The effects of a change in the subjective risk perception on private adaptation and climate protection activities are

$$\frac{\partial a^*}{\partial \pi} > 0 \text{ and } \frac{\partial g^*}{\partial \pi} = 0.$$

That is, an increase in the subjective risk perception is associated with an increase in adaptation efforts, while an increase in the subjective risk perception does not change the individual's climate protection activities.

> *Prediction 2: Individuals with a higher subjective risk perception show a higher propensity to engage in private adaptation activities, while subjective risk perception has no effect on the propensity to take climate protection activities.*

[11] In economic terms, private adaptation and climate protection would be substitutes if higher cost for adaptation reduced adaptation and increased climate protection efforts and vice versa (e.g., Ingham et al., 2013).

Now consider a change in the total climate protection efforts:

$$\frac{\partial a^*}{\partial G} = ? \text{ and } \frac{\partial g^*}{\partial G} = 0.$$

The effect of G on adaptation activities is ambiguous. On the one hand, an increase in the total amount of climate protection increases π which reduces the need to invest in adaptation. On the other hand, an increase in the total amount of climate protection decreases the costs of adaptation which makes this alternative more attractive. Hence, it is left to the empirical analyzes in the next two sections to determine this effect. Again, an increase in the total amount of climate protection does not change private climate protection efforts.

Assuming that the total amount of climate protection provides some additional benefits for the individual, i.e. $b(g, G)$ with $b_G > 0$ and $b_{gG} < 0$, this result changes to

$$\frac{\partial g^*}{\partial G} < 0.$$

An increase in G may reduce private climate protection efforts if the individual draws additional benefits from G, for example, through an increase in environmental quality or due to preferences for reciprocity.[12] Conversely, this implies that private climate protection activities may also compensate a perceived lack in public climate protection efforts if the individual profits from public activities. The effect of G on adaptation activities remains ambiguous.

> *Prediction 3: Individuals who perceive the amount of total climate protection to be lower show a higher propensity to take climate protection activities if the total amount of climate protection provides additional benefits for them.*

The effect of an exogenous change in initial wealth on private adaptation activities is

$$\frac{\partial a^*}{\partial w} > 0 \text{ which is positive if } -u_0''/u_0' < -u_1''/u_1', \text{ and } \frac{\partial g^*}{\partial w} = 0.$$

This implies that the individual increases her adaptation efforts with increasing wealth if her absolute risk aversion (e.g., Pratt, 1964) regarding the bad state exceeds her absolute risk aversion regarding the good state of the world. In contrast, an exogenous change in initial wealth does not affect private climate protection efforts.

> *Prediction 4: Individuals with higher income show a higher propensity to engage in private adaptation, while income has no effect on private climate protection activities.*

[12] This finding is the same if the individual had to pay a tax $t(G)$ which finances the increase in G.

Climate protection efforts of individuals are predicted to be unaffected by subjective risk perception and changes in wealth, but determined by additional co-benefits and costs of these efforts. Individuals' incentive to invest in adaptation is predicted to be higher the higher the subjective risk perception and initial wealth.[13] These findings suggest that quite different factors influence the individual's responses to climate change and that climate protection efforts are, at the individual level, not crowded out by the option to invest in adaptation measures.

From a policy perspective it may also be important to gain insights into the relationship between private and public responses to climate change since implementing and achieving climate policy objectives broadly depends on the acceptance and participation of citizens. The next two sections empirically investigate the interrelation between private adaptation activities and climate protection efforts of individuals and their preferences for public adaptation and climate protection. The microeconometric analyses comprise two parts in order to draw meaningful conclusions: (i) analysis of the determinants and motives of private adaptation and climate protection activities as well as the impact of adaptation activities on voluntary climate protection efforts and (ii) identification of the determinants of individual preferences for public adaptation and climate protection including the impact of private activities on these preferences.

3. Data and variables

The data for these analyses were collected in May and June 2013 by the market research company GfK SE (Gesellschaft für Konsumforschung). In Germany and the USA, the sample was drawn from representative GfK Online Panels. Respondents were invited via email to attend a self-administered interview in a web-based online environment. In China, participants were recruited by employees of GfK China in eleven core regions and were invited to centrally located test studios.[14] In the test studios respondents answered the survey questions without any interference by the interviewers who were thoroughly briefed. Survey questions were carefully pretested and the completion of the survey required about 30 minutes on average in all three countries. In total, 1430 Chinese, 1005 German, and 1010 U.S. citizens aged 18 and older completed the questionnaire.

[13] The presented model is also suitable to analyze preferences for public adaptation if $c(a)$ is interpreted as a tax to finance these public adaptation activities. Thus, public adaptation may be positively related to private activities (e.g., air conditioning in public buildings and at home) while both may also be substitutes (e.g., public financial compensation and insurance against damage by natural forces).

[14] Due to lacking internet access in rural areas, an online survey is likely to lead to a systematic bias in China.

Among others, the questionnaire covered a wide range of climate protection activities which respondents had already engaged in: buying energy-efficient appliances, saving energy at home, reducing the consumption of meat or dairy products, using or purchasing energy from renewable sources, buying a car with lower fuel consumption, reducing car use, and reducing the number of flights. In the first part of the microeconometric analysis, the dependent variables g_{ij} are dummies indicating that respondent i ($i = 1, \dots, n$) has already engaged in one of the climate protection activities j ($j = 1, \dots, 7$) which serves as a proxy for respondents' private climate protection efforts. The underlying unobservable latent variable is

$$g_{ij}^* = \beta_j \pi_i + \gamma_j a_i + \delta_j' b_{ij} + \lambda_j' z_i + \varepsilon_{ij} \text{ with } g_{ij} = 1 \text{ if } g_{ij}^* > 0 \quad (4)$$

where π_i and a_i are dummy variables indicating the respondent's subjective risk assessment and adaptation activities, b_{ij} is a vector of explanatory variables capturing potential co-benefits from the climate protection activities, and z_i is a vector of explanatory variables including beliefs, preferences, and characteristics of the respondent. By treating the responses to each climate protection activity as a separate sample and arranging (i.e. stacking) these samples as a panel dataset over the seven activities for each country, binary random effects probit models can be applied to analyze the general probability of engaging in one of the climate protection activities. This approach is suitable to control for individual-specific random effects in the error term ε_{ij} which are constant over the climate protection activities and are assumed to be uncorrelated with the explanatory variables.[15]

The unobservable latent variable of the propensity that respondent i ($i = 1, \dots, n$) has already engaged in one of the adaptation activities is

$$a_i^* = \beta_j \pi_i + \lambda_j' z_i + \nu_{ij} \text{ with } a_i = 1 \text{ if } a_i^* > 0. \quad (5)$$

This equation is estimated using common binary probit models. Since decisions for private adaptation and climate protection activities might be made simultaneously, the variable a_i indicating private adaptation activities might be endogenous in equation (4). This can be confirmed with the Smith-Blundell test of exogeneity[16] for the Chinese sample at the 5 percent significance level and for the German sample at the 1 percent significance level, but not for the U.S. sample. To derive consistent parameter estimates the exogenous variables π_i and in

[15] As a robustness check, the estimation of single binary probit models for each climate protection activity confirm the findings from the random effects probit models. The results are not reported for reasons of brevity but are available upon request.

[16] Test results are not reported for reasons of brevity but are available upon request.

z_i serve as instruments for private adaptation activities in a two-stage approach,[17] where equations (4) and (5) are estimated simultaneously.[18] To check the robustness of the results and detect further differences between individuals, random effects probit models are also estimated separately using the maximum likelihood method for the whole sample, for respondents who have already engaged in adaptation activities, and for respondents who have not yet engaged in adaptation activities.[19]

For the analysis of the preferences for public activities, respondents were asked how strongly the following two responses should be pursued by public authorities in their home country: mitigation of climate change (e.g. advancement of renewable energy or energy-efficient technologies) and adaptation measures regarding the consequences of climate change (e.g. provide protection against natural events like the building of dams, safeguarding of traffic routes). The dependent variables y_i are measured on a symmetric scale with five ordered response levels (i.e. "very weakly", "rather weakly", "neither weakly nor strongly", "rather strongly", and "very strongly") and are analyzed by applying ordered probit models. The underlying latent variable y_i^* can be written as

$$y_i^* = \beta\pi_i + \gamma a_i + \theta g_i + \delta' b_i + \lambda' z_i + \varepsilon_i \text{ with } y_i = m \text{ if } \kappa_{m-1} < y_i^* < \kappa_m \qquad (6)$$

with κ_m $(m = 1, \dots, 5)$ as the upper bound threshold for the discrete level y_i. Equation (6) is estimated in a bivariate ordered probit model to allow for correlations in the respective error terms between the preferences for public adaptation and climate protection measures.

The survey included four questions on private adaptation activities which respondents had already taken: climate control in their home (e.g. air-conditioning, sunblind, green roof), flood prevention measures in their home (e.g. backflow trap, waterproof external plaster), purchasing insurances to protect themselves against weather factors (e.g. storms, heavy rain events), and changing their travel habits due to weather impacts (e.g. choosing different travel periods or destinations due to high temperatures or missing snow reliability). The main explanatory variable *adaptation* (a_i) indicates that a respondent has already taken one of the four adapta-

[17] Parameter estimates are consistent even if the variable indicating respondents' adaptation activities is exogenous.

[18] The simultaneous estimation incorporates higher-dimensional cumulative normal distributions and requires the application of simulated maximum likelihood (SML) using Geweke, Hajivassiliou, and Keane (GHK) algorithm. The simultaneous estimation of the two probabilities allows for potential dependencies between the preferences for adaptation and climate protection and accounts for possible correlations between the dependent variables in the error terms.

[19] All estimations relied on robust estimations of the standard deviation of the parameter estimates.

tion activities.[20] For the analyses of policy preferences, the binary variable *climate protection* denotes that a respondent has already engaged in one of the seven climate protection activities and the variables *number of adaptation activities* and *number of climate protection activities* count the number of measures a respondent has already taken.[21]

As a proxy for the subjective risk perception (π), the binary variable *negative consequences* reflects the respondent's belief that climate change has roughly equally positive and negative, rather negative, or very negative consequences for her personal living conditions. Perceptions of the climate protection efforts of others are captured by the binary variables *little effort of home country* and *little effort of most countries* and thereby by the belief that the respondent's home country does too little for climate protection or that most countries do too little for climate protection (i.e. G is believed to be small). For China, these two variables are not included since the underlying questions were not asked there.

Four additional binary variables cover respondent's financial, social, and psychological benefits from the climate protection activities (b). *Financial advantage from activity* reflects the respondent's belief that a certain climate protection activity provides rather financial advantages for her personally, *expectation of social environment* and *no contribution of social environment* cover the respondent's rewards from norm compliant behavior, and *warm glow* indicates that contributing to climate protection makes her feel good. The dummy *high contribution of activity* indicates that a certain climate protection activity is perceived to contribute rather a lot or a lot to climate protection and thereby serves as a proxy for a lower price of the climate protection activity (p).[22]

Lacking confidence in the effectiveness of climate protection activities may discourage individuals from engaging in climate protection activities. The index variable *lack of confidence* reflects the respondent's belief that climate change can still be effectively limited by climate protection measures, that one person on their own will not change anything anyway (reflecting the awareness that $\pi_g = 0$), or both. In Germany and the USA, the binary variables *liberal*, *conservative*, and *green* reflect the respondent's political attitudes. The binary variable

[20] I also used the single adaptation activities as explanatory variables in equation (4) and dependent variables a_{ik} $(k = 1, \dots, 4)$ in equation (5). Estimation results are very similar to those reported in the next section and are not reported for reasons of brevity but are available upon request.

[21] The variable *number of climate protection activities* only includes the five activities which were reported by all respondents. The questions *for reduce car use* and *reduce the number of flights* were filtered, i.e. only citizens who reported a positive number of kilometers or a positive number of flights could answer these questions so that the number of observations is considerably lower in this case. Hence, the variable *number of climate protection activities* only includes the five activities which were reported by all respondents (i.e. buy energy-efficient appliances, save energy at home, reduce the consumption of meat or dairy products, use or purchase energy from renewable sources, and buy a fuel-efficient car).

[22] An increase in the effectiveness of offsets is equivalent to a reduction in their price.

communist indicates that a Chinese respondent is a member of the communist party. Table 1 in Appendix B provides a full list of explanatory variables (including several socio-economic and regional control variables) and their definitions. The binary random effects probit models include seven additional binary variables to identify and control for each climate protection activity.

4. Estimation results

Table 2 reports some descriptive statistics of the dependent and explanatory variables for the samples of 1430 Chinese, 1005 German, and 1010 U.S. respondents. On average, the probabilities of buying energy efficient appliances, saving energy at home, and using renewable energy are highest in Germany. Chinese respondents report the highest average propensity to reduce meat or dairy products, to buy a fuel-efficient car, and to reduce car use and the number of flights. The average numbers of adaptation (2.30 for Chinese, 0.79 for German, and 1.44 for U.S. respondents) and climate protection activities (3.29 for Chinese, 2.88 for German, and 2.38 for U.S. respondents) which respondents have already engaged in are highest in China. In all three countries, a very large proportion of individuals has already taken climate protection activities (96 percent in China, 94 percent in Germany, and 88 percent in the USA), while the average engagement in at least one of the four adaptation measures is considerably lower (89 percent in China, 51 percent in Germany, and 69 percent in the USA).[23]

Average preferences for adaptation and climate protection efforts by public authorities are very similar in the three countries. Respondents rated climate protection slightly higher than adaptation, whereas German respondents rated both responses slightly higher compared to the other two countries. This is surprising since not even half of the respondents in China and only one third of the respondents in Germany and the USA believe that climate change has rather or very negative consequences for their personal living conditions and more than three quarters of the respondents in each country lack confidence in the effectiveness of climate protection activities.

[23] The Global Climate Risk Index (CRI) published by Germanwatch measures to what extent countries have been affected by the impacts of weather-related loss events (see https://germanwatch.org/de/download/8551.pdf). In the period from 1993 to 2012, the lowest risk is measured for Germany followed by the USA and China. These differences in risk might be the reason for the varying average engagements in adaptation in the three countries.

4.1 Private adaptation and climate protection

Tables 3 to 5 report the estimation results for the general probability of engaging in one of the seven climate protection and in one of the four adaptation activities in the three countries. The first two columns in each table refer to the instrument variable approach where the binary random effects probit models for the climate protection activities and binary probit models for *adaptation* are estimated simultaneously. The latter three columns contain the results from the binary random effects probit models without instrumentation, first for the whole sample, followed by respondents who have not yet engaged in adaptation activities, and then for respondents who have already engaged in adaptation activities. Evidently, estimation results for the whole samples are very similar in the models with and without the instrumentation of *adaptation*.

In all three countries, adaptation is significantly positively related to the probability of engaging in one of the seven climate protection activities. But there are some groups of individuals who significantly reduce their climate protection efforts if they engage in adaptation: older people living in China as well as Chinese and U.S. respondents who perceive negative consequences from climate change. Even though there is no indication that adaptation and climate protection efforts are negatively related, which is in line with prediction 1, the engagement in adaptation may reduce the incentive to take climate protection activities for certain subgroups of individuals.

In line with prediction 2, expecting negative consequences from climate change significantly raises the probability of adaptation activities in China and the USA, while this variable has no significant effect on the probability of engaging in climate protection. Only Chinese and U.S. respondents who have not yet engaged in adaptation are significantly more likely to take one of the climate protection activities. In Germany, the belief that climate change has negative consequences for the personal living conditions has no significant effect on adaptation or climate protection efforts in any of the models.

The belief that the home country does too little for climate protection is associated with a significantly higher probability of taking adaptation measures in Germany and of engaging in climate protection for U.S. respondents who have not yet taken adaptation measures. The belief that most states do too little for climate protection significantly increases German respondents' climate protection efforts if they have not yet engaged in adaptation and U.S. re-

spondents' likelihood to take adaptation measures.[24] In line with prediction 3, this finding implies that individuals compensate for a perceived lack of other's engagement in climate protection with higher efforts in either adaptation or climate protection activities.

In all three countries, financial advantages associated with the climate protection activity seem to be the most important driver for climate protection activities. Peer behavior represents an additional considerable factor for climate protection efforts. The perception that the social environment does not contribute to climate protection significantly discourages Chinese and German respondents except for those who have already engaged in adaptation. The belief that the social environment expects a contribution to climate protection significantly motivates respondents in China and the USA, especially if they have already engaged in adaptation activities.[25] Feelings of warm glow are a highly significant motive to take climate protection activities for German respondents, but also for Chinese respondents who have not yet engaged in adaptation activities. The effectiveness of a climate protection activity in providing climate protection, as indicated by the dummy variable *high contribution of activity*, further significantly increases the likelihood that respondents in all three countries engage in climate protection activities. Consistent with the theoretical modeling, climate protection efforts are strongly motivated by benefits from these activities and lower costs.

A lack of confidence significantly discourages U.S. respondents to engage in climate protection especially if they have already taken adaptation measures, while this variable has no significant effect in China and Germany. In line with prediction 4, a higher income significantly increases the probability to have already engaged in adaptation for Chinese and German respondents, while income has no effect on climate protection efforts. The estimation results further reveal that female (with the exception of the significantly negative effect in China), older, and highly educated (except in Germany) respondents are significantly more likely to engage in adaptation measures, but also some regional heterogeneity. Socio-demographic and regional factors seem to be of minor importance for private climate protection efforts.

[24] As mentioned before, these two variables are not included for China since the underlying questions were not asked in the Chinese survey.

[25] The significantly negative sign of the parameter estimate of the variable *expectation of the social environment* for U.S. respondents who have not yet engaged in adaptation activities seems to be counterintuitive. Some unobserved characteristics of these respondents might prevent them from doing anything in response to climate change.

4.2 Preferences for public adaptation and climate protection

Tables 6 to 8 report the estimation results for policy preferences in the bivariate ordered probit models. The estimated correlation in the error terms between preferences for adaptation and climate protection efforts by public authorities is significantly positive in all three countries and highest in the USA (0.50 in China, 0.38 in Germany, and 0.58 in the USA) suggesting a positive interrelation between the preferences for public adaptation and climate protection activities.

The relationship between private and public activities is quite heterogeneous in the three countries. Respondents in all three countries who engage in private climate protection are significantly more likely to have higher preferences for public climate protection activities. This finding implies a positive interrelation between private climate protection efforts and preferences for public activities. In Germany, the private engagement in climate protection additionally significantly increases the preferences for public adaptation, while a higher number of adaptation activities has an additional significantly negative effect on Chinese respondents' preferences for public climate protection. The belief that climate change has negative consequences for the own living conditions decreases preferences for public adaptation in China, but increases the preferences for public climate protection in Germany. In China, these findings may be attributed to the high average number of private adaptation activities of Chinese individuals, but also to the perception that public authorities already engage intensively in adaptation.[26] In Germany, the negative consequences from climate change are much more moderate. German individuals, therefore, exhibit the lowest average number of private adaptation activities among the three countries and seem to rely much more on public activities to cope with future negative consequences resulting from climate change.

In Germany, the perceptions that the home country and most states do too little for climate protection have significantly positive effects on the preferences for public climate protection. The belief that most states do too little for climate protection significantly increases U.S. respondents' preferences for both measures. In both countries, the perceived lack of climate protection efforts of others tends to be compensated with private activities (as discussed in Section 4.1) but also with higher preferences for public engagement in climate protection (in both countries) and in adaptation (only in Germany).

Peer behavior seems to influence not only private activities but also preferences for public efforts. In all three countries, the perception that the social environment does not contribute to

[26] China spent more than 200 billion yuan on public adaptation during the past two decades (see http://en.ndrc.gov.cn/newsrelease/201311/P020131108611533042884.pdf).

climate protection is associated with significantly lower preferences for public climate protection. Chinese respondents who state that their social environment expects them to make a contribution to climate protection are significantly more likely to have higher preferences for both public activities. In China and the USA, feelings of warm glow significantly increase preferences for both public activities, but in Germany only for public climate protection. As expected, a lack of confidence regarding the effectiveness of climate protection is associated with lower preferences for public climate protection in all three countries, and in Germany also with lower preferences for adaptation.

Being a member of the communist party in China is associated with significantly higher preferences for adaptation, identifying with green politics in Germany significantly increases preferences for climate protection, and U.S. liberals have significantly higher preferences for both. The estimation results also reveal considerable differences between the three countries concerning the socio-economic and regional characteristics. While a higher income, being female, older, and highly educated are significant determinants of private adaptation activities, these factors only partly influence preferences for public adaptation efforts. Preferences for public climate protection activities, however, are hardly determined by socio-demographic characteristics.

5. Summary and conclusions

This study is the first to provide survey-based evidence on the preferences for adaptation to climate change and climate protection and their interrelation at the individual level. The empirical analyzes are based on theoretical predictions derived from a subjective utility framework which demonstrates that, at the individual level, private adaptation and climate protection activities cannot be substitutes and are determined by different factors. These predictions are tested using unique data from three key players in international climate policy, i.e. China, Germany (as the largest economy in the EU), and the USA.

The empirical findings strongly support the theoretical predictions that the private engagements in adaptation and climate protection are positively related. While the expectation of negative consequences from climate change (as a proxy for the subjective risk perception) and individual characteristics (like income, education, gender, and age) significantly influence adaptation activities, these factors have no significant effects on climate protection efforts. Financial advantages and a high effectiveness in providing climate protection seem to be the most important drivers for climate protection activities in all three countries. Feelings of

warm glow and benefits from norm compliant behavior seem to further motivate these activities in China and Germany. There is also some evidence that a perceived lack of public engagement in climate protection is compensated by increased private adaptation and climate protection efforts.

These results also confirm findings from the existing literature, for example, the predictions from the model provided by Kane and Shogren (2000) that an exogenous increase in risk leads to higher adaptation efforts, while a change in climate protection efforts depends on the marginal effectiveness of mitigation in reducing risk, but also the experimental evidence in Hasson et al. (2010) who find no significant difference in choosing climate protection between low-vulnerability and high-vulnerability treatments.

Regarding policy preferences, the empirical findings indicate a positive relationship between private and public climate protection efforts. In the three countries, preferences for public adaptation and climate protection seem to be mainly driven by individual beliefs about the climate protection efforts of others, social norms, feelings of warm glow, and the confidence in the effectiveness (in the case of climate protection). Individual characteristics that significantly determine these preferences differ significantly between Chinese, German, and U.S. respondents.

Future research could investigate whether the findings in this study are robust in other countries. Future studies may also use panel data to gain deeper insights into the interrelation between adaptation and climate protection efforts. Future research could also allow for other private adaptation and climate protection activities as well as for a richer set of items capturing the factors that determine these activities. New experimental settings may also account for potential trade-offs between private adaptation and climate protection efforts.

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Appendix A: Comparative statics

Totally differentiating the first order conditions (2) and (3) yields

$$\frac{\partial^2 EU}{\partial a^2}da + \frac{\partial^2 EU}{\partial a \partial g}dg = -\frac{\partial^2 EU}{\partial a \partial c}dc - \frac{\partial^2 EU}{\partial a \partial p}dp - \frac{\partial^2 EU}{\partial a \partial \pi}d\pi - \frac{\partial^2 EU}{\partial a \partial G}dG - \frac{\partial^2 EU}{\partial a \partial w}dw$$

$$\frac{\partial^2 EU}{\partial a \partial g}da + \frac{\partial^2 EU}{\partial g^2}dg = -\frac{\partial^2 EU}{\partial g \partial c}dc - \frac{\partial^2 EU}{\partial g \partial p}dp - \frac{\partial^2 EU}{\partial g \partial \pi}d\pi - \frac{\partial^2 EU}{\partial g \partial G}dG - \frac{\partial^2 EU}{\partial g \partial w}dw.$$

with

$$\frac{\partial^2 EU}{\partial a^2} = (-l_{aa})\pi u_1' + \pi u_1''(-l_a - c)^2 + (1-\pi)u_0''(-c)^2 < 0,$$

which is negative by the second order sufficiency condition which is assumed to hold whenever (2) and (3) hold,

$$\frac{\partial^2 EU}{\partial a \partial g} = \big(b_g - p\big)(-c[\pi u_1'' + (1-\pi)u_0''] - l_a \pi u_1'') = 0$$

which is equal to zero by the first order condition in (3), and

$$\frac{\partial^2 EU}{\partial g^2} = \big(b_g - p\big)^2[\pi u_1'' + (1-\pi)u_0''] + b_{gg}[\pi u_1' + (1-\pi)u_0'] < 0.$$

Cross partial derivatives with respect to p are

$$\frac{\partial^2 EU}{\partial g \partial p} = \big(b_g - p\big)(-g)[\pi u_1'' + (1-\pi)u_0''] - [\pi u_1' + (1-\pi)u_0'] < 0,$$

$$\frac{\partial^2 EU}{\partial a \partial p} = \pi u_1''(-l_a - c)(-g) + (1-\pi)u_0''(-c)(-g) = l_a \pi g u_1'' + cg[\pi u_1'' + (1-\pi)u_0''] < 0$$

if $\frac{c}{-l_a} > \frac{\pi u_1''}{[\pi u_1'' + (1-\pi)u_0'']}$.

Substituting the first order condition (2) and rearranging yields $\pi < 1$ if $-u_0''/u_0' < -u_1''/u_1'$.

Cross partial derivatives with respect to c are

$$\frac{\partial^2 EU}{\partial g \partial c} = \big(b_g - p\big)(-a)[\pi u_1' + (1-\pi)u_0'] = 0,$$

$$\frac{\partial^2 EU}{\partial a \partial c} = \pi u_1''(-l_a - c)(-a) + (1-\pi)u_0''(-c)(-a) = l_a \pi a u_1'' + ca[\pi u_1'' + (1-\pi)u_0''] < 0$$

(see $\partial^2 EU/\partial a \partial p$).

The effects of changes in prices c for adaptation and p for climate protection are then

$$\frac{\partial g^*}{\partial c} = \frac{\frac{\partial^2 EU}{\partial g \partial a} \cdot \frac{\partial^2 EU}{\partial a \partial c} - \frac{\partial^2 EU}{\partial a^2} \cdot \frac{\partial^2 EU}{\partial g \partial c}}{|H|} = 0,$$

$$\frac{\partial a^*}{\partial c} = \frac{\frac{\partial^2 EU}{\partial a \partial g} \cdot \frac{\partial^2 EU}{\partial g \partial c} - \frac{\partial^2 EU}{\partial g^2} \cdot \frac{\partial^2 EU}{\partial a \partial c}}{|H|} = \frac{-b_{gg}[\pi u_1' + (1-\pi)u_0'] \cdot \left[l_a \pi a u_1'' + ca[\pi u_1'' + (1-\pi)u_0'']\right]}{|H|} < 0$$

$$\frac{\partial g^*}{\partial p} = \frac{\frac{\partial^2 EU}{\partial g \partial a} \cdot \frac{\partial^2 EU}{\partial a \partial p} - \frac{\partial^2 EU}{\partial a^2} \cdot \frac{\partial^2 EU}{\partial g \partial p}}{|H|}$$

$$= \frac{[(-l_{aa})\pi u_1' + \pi u_1''(-l_a - c)^2 + (1-\pi)u_0''(-c)^2][\pi u_1' + (1-\pi)u_0']}{|H|} < 0,$$

$$\frac{\partial a^*}{\partial p} = \frac{\frac{\partial^2 EU}{\partial a \partial g} \cdot \frac{\partial^2 EU}{\partial g \partial p} - \frac{\partial^2 EU}{\partial g^2} \cdot \frac{\partial^2 EU}{\partial a \partial p}}{|H|} = \frac{-\left[b_{gg}[\pi u_1' + (1-\pi)u_0']\right]\left[l_a \pi g u_1'' + cg[\pi u_1'' + (1-\pi)u_0'']\right]}{|H|} < 0$$

if $-u_0''/u_0' < -u_1''/u_1'$.

Cross partial derivatives with respect to π are

$$\frac{\partial^2 EU}{\partial g \partial \pi} = \left(b_g - p\right)[u_1' - u_0'] = 0,$$

$$\frac{\partial^2 EU}{\partial a \partial \pi} = u_1'(-l_a - c) + cu_0' = -l_a u_1' + c(u_0' - u_1') > 0$$

if $-\frac{c}{l_a} < \frac{u_1'}{u_1' - u_0'}$.

Substituting the first order condition (2) and rearranging yields $u_0' > 0$ which is assumed.

The effects of an increase in the subjective risk perception are then

$$\frac{\partial a^*}{\partial \pi} = \frac{\frac{\partial^2 EU}{\partial a \partial g} \cdot \frac{\partial^2 EU}{\partial g \partial \pi} - \frac{\partial^2 EU}{\partial g^2} \cdot \frac{\partial^2 EU}{\partial a \partial \pi}}{|H|} = \frac{-b_{gg}[\pi u_1' + (1-\pi)u_0'] \cdot [u_1'(-l_a - c) + cu_0']}{|H|} > 0,$$

$$\frac{\partial g^*}{\partial \pi} = \frac{\frac{\partial^2 EU}{\partial g \partial a} \cdot \frac{\partial^2 EU}{\partial a \partial \pi} - \frac{\partial^2 EU}{\partial a^2} \cdot \frac{\partial^2 EU}{\partial g \partial \pi}}{|H|} = 0.$$

Cross partial derivatives with respect to G are

$$\frac{\partial^2 EU}{\partial g \partial G} = \left(b_g - p\right)[\pi_G u_1' - c_G \pi u_1'' - \pi_G u_0' - c_G(1-\pi)u_0''] = 0,$$

$$\frac{\partial^2 EU}{\partial a \partial G} = \pi_G u_1'(-l_a - c) - c_G \pi u_1''(-l_a - c) - c_G \pi u_1' - c_G(1-\pi)u_0' + c\pi_G u_0' + c_G c(1-\pi)u_0''$$

$$= -l_a(\pi_G u_1' - c_G \pi u_1'') + cc_G[\pi u_1'' + (1-\pi)u_0''] - c_G[\pi u_1' + (1-\pi)u_0'] + c\pi_G(u_0' - u_1') = ?.$$

The effects of a change in the total climate protection efforts are then

$$\frac{\partial a^*}{\partial G} = \frac{\frac{\partial^2 EU}{\partial a \partial g} \cdot \frac{\partial^2 EU}{\partial g \partial G} - \frac{\partial^2 EU}{\partial g^2} \cdot \frac{\partial EU}{\partial a \partial G}}{|H|}$$

$$= \frac{-\left[b_{gg}[\pi u_1' + (1-\pi)u_0']\right][-l_a(\pi_G u_1' - c_G \pi u_1'') + cc_G[\pi u_1'' + (1-\pi)u_0''] - c_G[\pi u_1' + (1-\pi)u_0'] + c\pi_G(u_0' - u_1')]}{|H|},$$

the sign of this expression is ambiguous, and

$$\frac{\partial g^*}{\partial G} = \frac{\frac{\partial^2 EU}{\partial a \partial g} \cdot \frac{\partial^2 EU}{\partial a \partial G} - \frac{\partial^2 EU}{\partial a^2} \cdot \frac{\partial^2 EU}{\partial g \partial G}}{|H|} = 0.$$

Assuming that the individual derives additional benefits from G, i.e. $b(g, G)$, this cross partial derivative $\partial^2 EU / \partial g \partial G$ becomes

$$\frac{\partial^2 EU}{\partial g \partial G} = (b_g - p)[\pi_G u_1' + (b_G - c_G)\pi u_1'' - \pi_G u_0' + (b_G - c_G)(1-\pi)u_0''] + b_{gG}[\pi u_1' + (1-\pi)u_0']$$

$$= b_{gG}[\pi u_1' + (1-\pi)u_0'] < 0, \text{ and}$$

$$\frac{\partial^2 EU}{\partial g \partial G} = (b_g - p)[\pi_G u_1' + (b_G - c_G)\pi u_1'' - \pi_G u_0' + (b_G - c_G)(1-\pi)u_0''] + b_{gG}[\pi u_1' + (1-\pi)u_0'] < 0$$

Cross partial derivatives with respect to w are

$$\frac{\partial^2 EU}{\partial g \partial w} = (b_g - p)[\pi u_1'' + (1-\pi)u_0''] = 0,$$

$$\frac{\partial^2 EU}{\partial a \partial w} = (-l_a - c)\pi u_1'' + (1-\pi)u_0''(-c) = -l_a \pi u_1'' - c[\pi u_1'' + (1-\pi)u_0''] > 0$$

if $\frac{c}{-l_a} > \frac{\pi u_1''}{[\pi u_1'' + (1-\pi)u_0'']}$.

Substituting the first order condition (2) and rearranging yields $\pi < 1$ if $-u_0''/u_0' < -u_1''/u_1'$.

The effects of an exogenous change in initial wealth are

$$\frac{\partial a^*}{\partial w} = \frac{\frac{\partial^2 EU}{\partial a \partial g} \cdot \frac{\partial^2 EU}{\partial g \partial w} - \frac{\partial^2 EU}{\partial g^2} \cdot \frac{\partial^2 EU}{\partial a \partial w}}{|H|} = \frac{-b_{gg}[\pi u_1' + (1-\pi)u_0'](-l_a \pi u_1'' - c[\pi u_1'' + (1-\pi)u_0''])}{|H|} > 0$$

if $-u_0''/u_0' < -u_1''/u_1'$,

$$\frac{\partial g^*}{\partial w} = \frac{\frac{\partial^2 EU}{\partial g \partial a} \cdot \frac{\partial^2 EU}{\partial a \partial w} - \frac{\partial^2 EU}{\partial a^2} \cdot \frac{\partial^2 EU}{\partial g \partial w}}{|H|} = 0.$$

Appendix B: Tables

Table 1: Description of explanatory variables

Variables	Description
Adaptation	1 if respondent has already taken at least one of the four adaptation activities (i.e. climate control in their home, flood prevention measures in their home, purchase of insurances to protect themselves against weather factors, and change travel habits due to weather impacts), 0 otherwise.
Climate protection	1 if respondent has already engaged in at least one of the seven climate protection activities (i.e. buying energy-efficient appliances, saving energy at home, reducing the consumption of meat or dairy products, using or purchasing energy from renewable sources, buying a car with lower fuel consumption, reducing car use, and reducing the number of flights), 0 otherwise.
Number of climate protection activities	Takes values from zero to five by counting the climate protection activities which a respondent has already engaged in and which were reported by all respondents (i.e. buy energy-efficient appliances, save energy at home, reduce the consumption of meat or dairy products, use or purchase energy from renewable sources, and buy a fuel-efficient car).
Number of adaptation activities	Takes values from zero to four by counting the adaptation activities which a respondent has already engaged in (i.e. climate control in their home, flood prevention measures in their home, purchase of insurances to protect themselves against weather factors, and change travel habits due to weather impacts).
Negative consequences	1 if respondent believes that climate change has equally positive and negative, rather negative, or very negative consequences for his or her personal living conditions, 0 otherwise. The underlying question is "in your opinion, what consequences does climate change have for your personal living conditions" with the five ordered response categories: "very negative consequences", "rather negative consequences", "roughly equally positive and negative consequences", "rather positive consequences", and "very positive consequences".
Little effort of home country	1 if the respondent agreed rather strongly or very strongly to the statement "my home country does too little for climate protection", 0 otherwise.[27]
Little effort of most countries	1 if the respondent agreed rather strongly or very strongly to the statement "most countries do too little for climate protection", 0 otherwise.[27]
Financial advantage from activity	1 if the respondent believes that a certain climate protection activity provides rather financial advantages for her personally, 0 otherwise. The underlying question is "in your opinion, do the following measures provide rather financial advantages (e.g., saving money, financial gains) or rather financial disadvantages (e.g., costs) for you personally" with the three ordered response categories: "Rather financial disadvantages", "neither financial advantages nor disadvantages", and "rather financial advantages".
High contribution of activity	1 if the respondent believes that a certain climate protection activity contributes rather a lot or a lot to climate protection, 0 otherwise. The underlying question is "how much do you believe the following measures contribute to climate protection" with the five ordered response categories: "Very little", "rather little", "neither a little nor a lot", "rather a lot", and a lot".
No contribution of social environment	1 if the respondent agreed rather strongly or very strongly to the statement "my family, friends or colleagues do not contribute to climate protection", 0 otherwise.[27]
Expectations of social environment	1 if the respondent agreed rather strongly or very strongly to the statement "my family, friends or colleagues expect me to contribute to climate protection", 0 otherwise.[27]

Table 1: Description of explanatory variables (continued)

Variables	Description
Warm glow	1 if the respondent agreed rather strongly or very strongly to the statement "it makes me feel good to contribute to climate protection", 0 otherwise.[27]
Communist	1 if a Chinese respondent stated to belong to the communist party.
Conservative	1 if a German or U.S. respondent agreed rather strongly or very strongly to the statement "I am conservative", 0 otherwise.[27]
Green	1 if a German or U.S. respondent agreed rather strongly or very strongly to the statement "I identify myself closest with green politics", 0 otherwise.[27]
Liberal	1 if a German or U.S. respondent agreed rather strongly or very strongly to the statement "I am liberal", 0 otherwise.[27]
Lack of confidence	Additive indicator using the following two items: – "do you think that we can still effectively limit climate change by climate protection measures?" – "regarding climate protection one person on their own will not change anything anyway".[27] The variable is designed by constructing dummy variables that take the value one if the respondent answered the first question with "yes" and agreed to the second statement rather or very strongly. The two dummy variables were then added up. Accordingly, the variable takes values from 0 to 2.
High individual income	1 if the individual net income of the respondent is above median category of the sample (i.e. at least ¥ 5,000 in China, € 2,000 in Germany and $ 2,500 in the USA), 0 otherwise.
Highly educated	1 if the respondent's highest level of education is at least secondary (Senior Middle School in China, Abitur in Germany, College degree in the U.S.), 0 otherwise.
Age	Age of the respondent in years.
Female	1 if the respondent is a woman, 0 otherwise.
Number of own children	Number of own children of the respondent.
Living together with a partner	1 if the respondent lives together with his or her partner, 0 otherwise.
Regional dummies for China	Beijing, Shanghai, Guangzhou, Shenyang, Wuhan, Chengdu, Shijiazhuang, Hefei, Lanzhou, Yinchuan, and Quanzhou take the value 1 if respondent lives in the corresponding region in China, 0 otherwise.
Regional dummies for Germany	North, East, South, and West take the value 1 if the respondent lives in a northern (eastern, southern, western) state of Germany, 0 otherwise.
Regional dummies for the USA	Northeast, Midwest, South, and West take the value 1 if the respondent lives in the corresponding region in the USA, 0 otherwise.

[27] The underlying question is "how strongly do you agree to the following statement" with the five ordered response categories "very weakly", "rather weakly", "neither weakly nor strongly", "rather strongly", and "very strongly".

Table 2: Number of respondents and mean for all variables

Explanatory variables	China		Germany		USA	
	Respondents	Mean	Respondents	Mean	Respondents	Mean
Climate protection	1,418	0.96	982	0.94	975	0.88
Buying energy-efficient appliances	1,413	0.80	969	0.84	952	0.78
Saving energy at home	1,413	0.80	973	0.87	965	0.81
Reducing meat or dairy products	1,400	0.63	964	0.50	939	0.42
Using renewable energy	1,395	0.44	942	0.62	890	0.50
Buying a fuel-efficient car	1,374	0.75	929	0.71	915	0.67
Reducing car use	916	0.77	805	0.62	739	0.62
Reducing flights	1,049	0.66	547	0.36	371	0.47
Adaptation by public authorities	1,390	3.98	889	4.01	747	3.81
Mitigation by public authorities	1,390	4.15	890	4.23	754	3.99
Adaptation	1,416	0.89	977	0.51	965	0.69
Number of adaptation activities	1,315	2.30	820	0.79	807	1.44
Number of climate protection activities	1,347	3.29	890	2.88	829	2.38
Negative consequences	1,387	0.44	879	0.34	725	0.32
Little effort of home country			955	0.38	913	0.45
Little effort of most states			961	0.78	909	0.60
Financial advantages from activity						
Buy energy-efficient appliances	1,419	0.79	966	0.61	926	0.63
Save energy at home	1,404	0.73	956	0.81	919	0.76
Reduce meat or dairy products	1,340	0.43	897	0.37	833	0.39
Use energy from renewable sources	1,340	0.63	879	0.29	813	0.50
Buy a fuel-efficient car	1,348	0.70	912	0.61	877	0.66
Reduce car use	1,340	0.43	897	0.37	833	0.39
Reduce flights	1,331	0.55	834	0.56	805	0.56
High contribution of activity						
Buy energy-efficient appliances	1,402	0.70	956	0.62	914	0.73
Save energy at home	1,418	0.77	964	0.61	924	0.61
Reduce meat or dairy products	1,393	0.42	948	0.35	847	0.25
Use energy from renewable sources	1,406	0.83	949	0.67	875	0.60
Buy a fuel-efficient car	1,406	0.81	956	0.63	918	0.61
Reduce car use	1,393	0.42	948	0.35	847	0.25
Reduce flights	1,394	0.63	944	0.62	854	0.50
No contribution of social environment	1,384	0.24	912	0.19	872	0.29
Expectation of social environment	1,381	0.69	935	0.19	896	0.26
Warm glow	1,398	0.91	957	0.66	934	0.60
Member of communist party	1,430	0.30				
Being conservative			954	0.24	940	0.41
Identifying with green politics			938	0.30	907	0.21
Being liberal			937	0.43	939	0.29
Lack of confidence	1,319	0.49	839	0.78	743	0.83
High individual income	1,369	0.62	827	0.51	872	0.60
Age	1,430	39.26	1,005	41.13	1,010	48.51
Female	1,430	0.50	1,005	0.49	1,010	0.53
Number of own children	1,430	0.86	1,005	0.95	1,010	1.32
Living with a partner	1,420	0.78	1,002	0.63	1,006	0.62
Bejing	1,430	0.15				
Shanghai	1,430	0.16				
Guangzhou	1,430	0.13				
Shenyang	1,430	0.08				
Wuhan	1,430	0.08				
Chengdu	1,430	0.06				
Shijiazhuang	1,430	0.06				
Hefei	1,430	0.06				
Lanzhou	1,430	0.10				
Yinchuan	1,430	0.06				
North			1,005	0.17		
East			1,005	0.20		
South			1,005	0.30	1,010	0.35
West			1,005	0.33	1,010	0.22
Northeast					1,010	0.20
Midwest					1,010	0.23

Table 3: Estimation results for private activities in China

Explanatory variables	Binary random effects model and binary probit model		Climate protection activities in binary random effects probit models		
	Climate protection activities	Adaptation	Whole sample	If adaptation = 0	If adaptation = 1
Adaptation	2.05***		1.10***		
	(16.04)		(11.87)		
Negative consequences	-0.09	0.09**	-0.08	0.78***	-0.14**
	(-0.99)	(2.18)	(-1.26)	(2.97)	(-2.14)
Financial advantages from activity	0.25***		0.26***	0.02	0.29***
	(3.06)		(6.15)	(0.10)	(6.56)
No contribution of social environment	-0.15		-0.15**	-0.92***	-0.06
	(-1.59)		(-2.35)	(-3.93)	(-0.90)
Expectation of social environment	0.18**		0.19***	-0.08	0.22***
	(2.02)		(2.94)	(-0.37)	(3.36)
Warm glow	0.08		0.09	0.80***	0.04
	(0.68)		(1.09)	(2.85)	(0.45)
High contribution of activity	0.39***		0.40***	0.39**	0.41***
	(4.26)		(8.59)	(2.30)	(8.41)
Lack of confidence	-0.01		-0.01	0.18	-0.00
	(-0.16)		(-0.22)	(1.00)	(-0.06)
Member of communist party	0.13*	0.25***	0.18***	0.16	0.17***
	(1.70)	(6.26)	(3.12)	(0.71)	(2.95)
High individual income	0.02	0.09**	0.04	0.04	0.05
	(0.28)	(2.34)	(0.69)	(0.17)	(0.76)
Highly educated	-0.04	0.18***	-0.01	0.01	0.01
	(-0.41)	(4.25)	(-0.07)	(0.03)	(0.09)
Age	-0.00	0.00***	-0.00	0.01	-0.01**
	(-1.22)	(2.65)	(-1.33)	(0.75)	(-2.06)
Female	0.04	-0.06*	0.03	-0.12	0.04
	(0.57)	(-1.81)	(0.65)	(-0.64)	(0.79)
Number of own children	0.12*	0.17***	0.14***	0.74***	0.11**
	(1.69)	(4.21)	(3.04)	(3.76)	(2.35)
Living with a partner	0.03	-0.05	0.03	-1.08***	0.13
	(0.24)	(-0.82)	(0.42)	(-3.88)	(1.62)
Shanghai	-0.15	0.09	-0.14	0.08	-0.17*
	(-1.15)	(1.43)	(-1.47)	(0.27)	(-1.74)
Guangzhou	-0.19	0.13**	-0.18*	0.32	-0.20**
	(-1.39)	(2.03)	(-1.78)	(0.89)	(-2.02)
Shenyang	-0.17	0.13*	-0.16	-0.06	-0.16
	(-1.07)	(1.78)	(-1.41)	(-0.15)	(-1.40)
Wuhan	-0.08	0.01	-0.09	-0.14	-0.10
	(-0.47)	(0.10)	(-0.71)	(-0.30)	(-0.78)
Chengdu	0.12	0.13	0.14	0.96**	0.02
	(0.69)	(1.62)	(1.11)	(2.21)	(0.14)
Shijiazhuang	-0.11	0.34***	-0.07	-0.17	-0.12
	(-0.66)	(3.75)	(-0.54)	(-0.39)	(-0.97)
Hefei	-0.20	0.26***	-0.17	0.03	-0.24*
	(-1.14)	(2.98)	(-1.37)	(0.06)	(-1.90)
Lanzhou	-0.09	0.01	-0.09	0.23	-0.16
	(-0.61)	(0.11)	(-0.83)	(0.71)	(-1.41)
Yinchuan	-0.09	0.50***	-0.03	0.19	-0.04
	(-0.53)	(5.13)	(-0.24)	(0.37)	(-0.37)
Quanzhou	-0.17	0.27***	-0.13	-0.63	-0.09
	(-0.95)	(3.14)	(-0.99)	(-1.15)	(-0.72)
Constant	-2.11***	0.54***	-1.41***	-2.41***	-0.23
	(-8.47)	(5.88)	(-7.91)	(-4.08)	(-1.41)
Number of observations	9,373	9,373	7,735	671	7,064
Number of respondents			1,224	115	1,109

Notes: Simulated maximum likelihood and maximum likelihood estimates (z-statistics) of the parameters for China. Parameter estimates of dummy variables for single activities are not reported. * (**, ***) means that the parameter is different from zero at the 10% (5%, 1%) significance level.

Table 4: Estimation results for private activities in Germany

Explanatory variables	Binary random effects model and binary probit model		Climate protection activities in binary random effects probit models		
	Climate protection activities	Adaptation	Whole sample	If adaptation = 0	If adaptation = 1
Adaptation	1.04***		0.45***		
	(13.40)		(6.86)		
Negative consequences	0.08	0.02	0.09	-0.04	0.15
	(0.62)	(0.35)	(0.89)	(-0.27)	(1.15)
Little effort of home country	0.06	0.12***	0.09	0.09	0.09
	(0.75)	(3.00)	(1.33)	(0.78)	(1.05)
Little effort of most states	0.06	0.06	0.08	0.27**	-0.09
	(0.58)	(1.28)	(0.91)	(1.99)	(-0.86)
Financial advantages from activity	0.40***		0.42***	0.59***	0.32***
	(5.04)		(7.41)	(6.66)	(4.27)
No contribution of social environment	-0.19*		-0.20**	-0.45***	-0.02
	(-1.89)		(-2.39)	(-3.49)	(-0.15)
Expectation of social environment	-0.03		-0.03	0.12	-0.07
	(-0.29)		(-0.35)	(0.90)	(-0.73)
Warm glow	0.27***		0.28***	0.31***	0.25***
	(2.97)		(3.70)	(2.59)	(2.63)
High contribution of activity	0.38***		0.40***	0.27***	0.48***
	(4.56)		(6.71)	(2.92)	(6.10)
Lack of confidence	-0.03		-0.03	-0.03	-0.03
	(-0.52)		(-0.67)	(-0.42)	(-0.57)
Being conservative	-0.14	-0.02	-0.15**	-0.02	-0.26***
	(-1.54)	(-0.45)	(-1.99)	(-0.18)	(-2.72)
Identifying with green politics	0.17*	-0.05	0.16**	0.13	0.15
	(1.88)	(-1.33)	(2.21)	(1.16)	(1.64)
Being liberal	0.08	0.02	0.09	0.17*	0.02
	(1.06)	(0.67)	(1.40)	(1.72)	(0.20)
High individual income	-0.02	0.39***	0.07	-0.01	0.10
	(-0.28)	(9.63)	(1.03)	(-0.06)	(1.09)
Highly educated	0.07	-0.00	0.07	0.05	0.06
	(0.84)	(-0.01)	(1.06)	(0.50)	(0.65)
Age	0.01	0.01***	0.01**	0.01	0.01**
	(1.44)	(5.52)	(2.51)	(1.40)	(2.22)
Female	-0.01	0.24***	0.05	0.05	0.09
	(-0.08)	(6.21)	(0.78)	(0.48)	(1.00)
Number of own children	0.01	-0.02	0.01	-0.02	0.03
	(0.34)	(-1.29)	(0.25)	(-0.44)	(0.77)
Living with a partner	0.11	0.23***	0.18**	0.12	0.27***
	(1.33)	(5.79)	(2.50)	(1.08)	(2.86)
North	0.01	0.27***	0.08	-0.05	0.17
	(0.12)	(4.95)	(0.85)	(-0.31)	(1.43)
East	0.09	0.12**	0.12	0.20	0.06
	(0.86)	(2.44)	(1.40)	(1.53)	(0.51)
South	0.03	0.20***	0.08	-0.04	0.19*
	(0.28)	(4.46)	(0.96)	(-0.33)	(1.79)
Constant	-1.72***	-0.95***	-1.71***	-1.52***	-1.39***
	(-6.80)	(-9.40)	(-8.61)	(-4.81)	(-5.47)
Number of observations	5,047		3,644	1,654	1,990
Number of respondents			592	270	322

Notes: Simulated maximum likelihood and maximum likelihood estimates (z-statistics) of the parameters for Germany. Parameter estimates of dummy variables for single activities are not reported. * (**, ***) means that the parameter is different from zero at the 10% (5%, 1%) significance level.

Table 5: Estimation results for private activities in the USA

Explanatory variables	Binary random effects model and binary probit model		Climate protection activities in binary random effects probit models		
	Climate protection activities	Adaptation	Whole sample	If adaptation = 0	If adaptation = 1
Adaptation	1.87***		1.32***		
	(10.87)		(11.35)		
Negative consequences	-0.19	0.42***	-0.10	0.22	-0.23*
	(-1.15)	(9.88)	(-0.91)	(0.91)	(-1.86)
Little effort of home country	0.17	-0.04	0.17	0.61**	0.04
	(0.94)	(-0.91)	(1.45)	(2.06)	(0.36)
Little effort of most states	0.04	0.08*	0.06	0.18	-0.05
	(0.23)	(1.80)	(0.52)	(0.68)	(-0.41)
Financial advantages from activity	0.75***		0.78***	0.66***	0.79***
	(4.88)		(9.94)	(4.11)	(8.78)
No contribution of social environment	-0.06		-0.06	-0.22	0.07
	(-0.38)		(-0.55)	(-0.86)	(0.59)
Expectation of social environment	0.03		0.04	-0.94***	0.26**
	(0.20)		(0.32)	(-3.10)	(2.06)
Warm glow	-0.11		-0.11	0.12	-0.22
	(-0.55)		(-0.89)	(0.42)	(-1.58)
High contribution of activity	0.20		0.21**	0.25	0.19**
	(1.17)		(2.50)	(1.35)	(1.97)
Lack of confidence	-0.12		-0.13*	-0.07	-0.19**
	(-1.15)		(-1.79)	(-0.50)	(-2.26)
Being conservative	-0.16	0.22***	-0.12	-0.10	-0.16
	(-1.10)	(5.17)	(-1.21)	(-0.42)	(-1.36)
Identifying with green politics	0.31	0.57***	0.42***	0.43	0.33**
	(1.56)	(9.75)	(3.26)	(1.24)	(2.39)
Being liberal	-0.23	-0.02	-0.23**	-0.11	-0.28**
	(-1.32)	(-0.51)	(-2.04)	(-0.42)	(-2.20)
High individual income	-0.09	-0.00	-0.10	-0.29	-0.08
	(-0.64)	(-0.06)	(-0.97)	(-1.31)	(-0.71)
Highly educated	-0.12	0.38***	-0.05	-0.00	-0.01
	(-0.74)	(8.78)	(-0.41)	(-0.02)	(-0.11)
Age	-0.00	0.01***	0.00	0.02**	-0.00
	(-0.12)	(8.88)	(0.52)	(2.17)	(-0.14)
Female	-0.02	0.11***	-0.00	-0.19	-0.00
	(-0.16)	(2.58)	(-0.01)	(-0.86)	(-0.02)
Number of own children	0.03	-0.03*	0.02	0.03	0.01
	(0.53)	(-1.95)	(0.63)	(0.41)	(0.28)
Living with a partner	0.20	0.04	0.21**	0.31	0.17
	(1.32)	(0.98)	(2.01)	(1.36)	(1.46)
West	0.50***	-0.41***	0.44***	0.12	0.54***
	(2.64)	(-7.64)	(3.26)	(0.42)	(3.50)
Midwest	0.03	-0.05	0.02	0.03	-0.01
	(0.15)	(-1.01)	(0.14)	(0.10)	(-0.07)
Northeast	0.17	-0.08	0.16	0.13	0.16
	(0.89)	(-1.47)	(1.20)	(0.47)	(1.10)
Constant	-2.21***	-0.77***	-2.13***	-2.83***	-0.51*
	(-5.56)	(-8.00)	(-8.24)	(-5.35)	(-1.78)
Number of observations	4,837		3,063	874	2,189
Number of respondents			517	150	367

Notes: Simulated maximum likelihood and maximum likelihood estimates (z-statistics) of the parameters for the USA. Parameter estimates of dummy variables for single activities are not reported. * (**, ***) means that the parameter is different from zero at the 10% (5%, 1%) significance level.

Table 6: Estimation results for preferences for public activities in China

Explanatory variables	Adaptation		Climate protection	
Adaptation	0.11		-0.10	
	(0.99)		(-0.89)	
Climate protection	0.03		0.44**	
	(0.19)		(2.55)	
Number of adaptation activities		0.04		-0.08**
		(1.37)		(-2.35)
Number of pro-environmental activities		0.00		0.10***
		(0.09)		(3.25)
Negative consequences from climate change	-0.40***	-0.43***	-0.08	-0.13
	(-4.74)	(-4.99)	(-0.98)	(-1.56)
No contribution of social environment	0.04	0.02	-0.13*	-0.17**
	(0.55)	(0.19)	(-1.71)	(-2.13)
Expectation of social environment	0.33***	0.30***	0.24***	0.21**
	(4.24)	(3.74)	(3.05)	(2.48)
Warm glow	0.36***	0.33***	0.42***	0.39***
	(3.75)	(3.20)	(4.32)	(3.78)
Lack of confidence	-0.08	-0.09	-0.10*	-0.11*
	(-1.48)	(-1.59)	(-1.78)	(-1.84)
Member of communist party	0.17**	0.20***	0.11	0.10
	(2.56)	(2.99)	(1.52)	(1.34)
High individual income	0.14*	0.16**	-0.02	0.01
	(1.87)	(2.09)	(-0.31)	(0.11)
Highly educated	-0.23**	-0.21**	0.03	0.05
	(-2.47)	(-2.15)	(0.27)	(0.49)
Age	0.00	0.00	-0.00	-0.00
	(0.52)	(0.48)	(-0.16)	(-0.26)
Female	0.03	0.02	0.02	0.03
	(0.50)	(0.37)	(0.35)	(0.38)
Number of own children	0.15**	0.15**	0.06	0.05
	(2.49)	(2.35)	(1.00)	(0.77)
Living with a partner	-0.12	-0.16	-0.08	-0.12
	(-1.22)	(-1.56)	(-0.87)	(-1.17)
Shanghai	-0.27**	-0.35***	-0.10	-0.13
	(-2.28)	(-2.87)	(-0.81)	(-0.98)
Guangzhou	-0.10	-0.13	-0.17	-0.20*
	(-0.79)	(-0.97)	(-1.44)	(-1.68)
Shenyang	-0.13	-0.15	-0.29**	-0.32**
	(-0.89)	(-0.96)	(-2.07)	(-2.17)
Wuhan	-0.24*	-0.27*	-0.38**	-0.37**
	(-1.69)	(-1.77)	(-2.43)	(-2.21)
Chengdu	-0.21	-0.27*	-0.05	-0.05
	(-1.38)	(-1.74)	(-0.33)	(-0.34)
Shijiazhuang	-0.13	-0.14	-0.07	-0.06
	(-0.86)	(-0.90)	(-0.42)	(-0.34)
Hefei	-0.23	-0.25	-0.16	-0.19
	(-1.51)	(-1.60)	(-1.16)	(-1.31)
Lanzhou	0.05	0.05	0.08	0.05
	(0.40)	(0.40)	(0.58)	(0.39)
Yinchuan	-0.12	-0.11	0.13	0.15
	(-0.86)	(-0.76)	(0.88)	(1.01)
Quanzhou	-0.39**	-0.39**	-0.12	-0.09
	(-2.48)	(-2.33)	(-0.70)	(-0.50)
Number of respondents	1,206	1,134	1,206	1,134

Notes: Maximum likelihood estimates (z-statistics) of the parameters in bivariate ordered probit models for China. The dependent variable is the respondents' assessment of how strongly adaptation and climate protection should be pursued by public authorities. * (**, ***) means that the parameter is different from zero at the 10% (5%, 1%) significance level.

Table 7: Estimation results for preferences for public activities in Germany

Explanatory variables	Adaptation		Climate protection	
Adaptation	0.01		0.16	
	(0.06)		(1.48)	
Climate protection	0.55**		0.67***	
	(2.55)		(3.00)	
Number of adaptation activities		-0.05		-0.03
		(-0.90)		(-0.47)
Number of pro-environmental activities		0.09*		0.14***
		(1.78)		(2.84)
Negative consequences from climate change	-0.25	-0.31	0.82***	0.49**
	(-1.02)	(-1.26)	(3.85)	(2.30)
Little effort of home country	-0.11	-0.11	0.28**	0.22*
	(-1.08)	(-0.99)	(2.54)	(1.85)
Little effort of most states	0.23*	0.18	0.54***	0.55***
	(1.73)	(1.23)	(3.93)	(3.76)
No contribution of social environment	-0.23*	-0.08	-0.27*	-0.29*
	(-1.88)	(-0.64)	(-1.93)	(-1.94)
Expectation of social environment	0.06	0.03	0.09	0.03
	(0.43)	(0.23)	(0.66)	(0.23)
Warm glow	0.00	-0.04	0.40***	0.33***
	(0.03)	(-0.29)	(3.59)	(2.68)
Lack of confidence	-0.20***	-0.24***	-0.23***	-0.26***
	(-2.84)	(-3.27)	(-3.19)	(-3.38)
Being conservative	0.09	0.08	-0.10	-0.04
	(0.84)	(0.69)	(-0.89)	(-0.30)
Identifying with green politics	-0.07	-0.16	0.30**	0.27**
	(-0.62)	(-1.34)	(2.50)	(2.14)
Being liberal	0.05	0.02	0.11	0.08
	(0.54)	(0.20)	(1.08)	(0.66)
High individual income	-0.16	-0.21*	-0.30**	-0.28**
	(-1.57)	(-1.86)	(-2.54)	(-2.23)
Highly educated	-0.12	-0.11	-0.06	-0.06
	(-1.13)	(-0.93)	(-0.54)	(-0.53)
Age	0.01**	0.01**	-0.00	-0.00
	(1.98)	(1.99)	(-0.27)	(-0.13)
Female	0.29***	0.23**	-0.08	-0.12
	(2.87)	(2.10)	(-0.74)	(-1.01)
Number of own children	-0.03	-0.03	0.03	0.01
	(-0.52)	(-0.63)	(0.48)	(0.23)
Living with a partner	-0.01	-0.12	0.12	0.13
	(-0.07)	(-0.99)	(1.11)	(1.11)
North	0.13	0.17	-0.03	0.00
	(0.96)	(1.12)	(-0.20)	(0.01)
East	0.15	0.26*	0.11	0.16
	(1.20)	(1.86)	(0.82)	(1.14)
South	0.05	0.18	0.17	0.17
	(0.38)	(1.39)	(1.26)	(1.17)
Number of observations	544	458	544	458

Notes: Maximum likelihood estimates (z-statistics) of the parameters in bivariate ordered probit models for Germany. The dependent variable is the respondents' assessment of how strongly adaptation and climate protection should be pursued by public authorities. * (**, ***) means that the parameter is different from zero at the 10% (5%, 1%) significance level.

Table 8: Estimation results for preferences for public activities in the USA

Explanatory variables	Adaptation		Climate protection	
Adaptation	-0.01		-0.00	
	(-0.04)		(-0.01)	
Climate protection	0.09		0.39*	
	(0.48)		(1.95)	
Number of adaptation activities		0.09		0.04
		(1.61)		(0.73)
Number of pro-environmental activities		-0.05		0.06
		(-0.92)		(1.10)
Negative consequences from climate change	-0.26*	-0.22	-0.06	-0.05
	(-1.86)	(-1.52)	(-0.39)	(-0.30)
Little effort of home country	-0.00	0.06	0.14	0.20
	(-0.00)	(0.42)	(1.01)	(1.32)
Little effort of most states	0.39***	0.36**	0.51***	0.43***
	(2.91)	(2.48)	(3.62)	(2.87)
No contribution of social environment	-0.10	-0.05	-0.28**	-0.26*
	(-0.69)	(-0.32)	(-2.06)	(-1.75)
Expectation of social environment	0.10	0.04	-0.07	-0.04
	(0.70)	(0.29)	(-0.50)	(-0.26)
Warm glow	0.41***	0.35**	0.69***	0.77***
	(3.15)	(2.53)	(4.99)	(5.36)
Lack of confidence	0.07	0.06	-0.20**	-0.19**
	(0.84)	(0.60)	(-2.42)	(-2.20)
Being conservative	0.03	0.06	-0.05	-0.03
	(0.26)	(0.48)	(-0.37)	(-0.22)
Identifying with green politics	0.12	0.13	0.34**	0.18
	(0.77)	(0.72)	(2.09)	(0.94)
Being liberal	0.28**	0.32**	0.24*	0.25*
	(2.20)	(2.31)	(1.78)	(1.70)
High individual income	0.08	0.03	0.17	0.20
	(0.65)	(0.19)	(1.37)	(1.58)
Highly educated	0.13	0.23*	-0.06	-0.01
	(1.01)	(1.66)	(-0.43)	(-0.05)
Age	0.01	0.01	0.01	0.01
	(1.41)	(1.56)	(1.29)	(1.21)
Female	0.20*	0.19	0.15	0.19
	(1.72)	(1.53)	(1.35)	(1.55)
Number of own children	-0.10**	-0.11***	-0.02	-0.05
	(-2.43)	(-2.73)	(-0.48)	(-1.10)
Living with a partner	-0.00	-0.05	-0.16	-0.24*
	(-0.00)	(-0.40)	(-1.30)	(-1.77)
West	-0.04	-0.05	-0.17	-0.18
	(-0.24)	(-0.30)	(-1.11)	(-1.07)
Midwest	-0.16	-0.23	-0.14	-0.19
	(-1.11)	(-1.47)	(-0.91)	(-1.13)
Northeast	0.08	0.07	0.18	0.16
	(0.51)	(0.45)	(1.14)	(0.95)
Number of observations	412	353	412	353

Notes: Maximum likelihood estimates (z-statistics) of the parameters in bivariate ordered probit models for the USA. The dependent variable is the respondents' assessment of how strongly adaptation and climate protection should be pursued by public authorities. * (**, ***) means that the parameter is different from zero at the 10% (5%, 1%) significance level.