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Abstract

This paper empirically examines whether environmental values are correlated with economic preferences from behavioral economics and considers possible consequences when independence is assumed. The data for this analysis stem from a large-scale computer-based survey among more than 3700 German citizens. Our indicators for environmental values are based on the New Ecological Paradigm (NEP), which is a standard instrument in social and behavioral sciences and increasingly common in economic studies. The econometric analysis with Generalized Poisson regression models reveals strong correlations between two NEP scales and several economic preferences, which are based on established experimental measures: While social preferences (measured in an incentivized dictator game) and positive reciprocity are significantly positively correlated, trust and (less robust) negative reciprocity are significantly negatively correlated with the NEP scales, respectively. Only risk and time preferences (also measured in an incentivized experiment) are not robustly significantly correlated with the NEP scales. These estimation results strongly recommend the additional inclusion of economic preferences in econometric analyses that use a NEP scale as explanatory factor of main interest for environmentally relevant behavior. In particular, not considering social preferences, trust, and positive and negative reciprocity can lead to strong distortions due to omitted variable biases. This conclusion is illustrated in an empirical example that reveals biased estimation results for the effect of a NEP scale on donation activities if not all relevant economic preferences are included as control variables.

JEL classification: Q50, D01, D91, Q57, A13

Keywords: Environmental values, New Ecological Paradigm (NEP), economic preferences, individual behavior, artefactual field experiments

1. Introduction

Previous economic studies show that environmentally relevant behavior is affected by a broad range of factors such as socio-demographics (e.g. Lange and Ziegler, 2017), but also social norms (e.g. Allcott, 2011, Videras et al., 2012) or attitudinal factors like warm glow (e.g. Schwirplies and Ziegler, 2016) or individual values (e.g. Kahn, 2007, considering political orientation). With respect to the latter factor, environmental values seem to be most relevant. For example, Kotchen and Moore (2008) analyze the effect of the membership in an environmental organization on electricity consumption and Dastrup et al. (2012) examine the effect of contributions to environmental organizations on the probability to live in solar homes. Recently, New Ecological Paradigm (NEP) scales according to Dunlap et al. (2000), which are a standard instrument in social and behavioral sciences, are increasingly common as indicator for environmental values, concern, awareness, or attitudes in economics. For example, NEP scales are considered to explain the participation in green electricity programs (e.g. Kotchen and Moore, 2007), electricity conservation (e.g. Delmas and Lessem, 2014), or other climate protection activities (e.g. Lange et al., 2017). The NEP scales incorporate ideas like limits to growth and the significance of the balance of nature. Furthermore, they measure general beliefs about the relationship between humankind and the natural environment (e.g. Dunlap, 2008).

This paper examines the relationship between two NEP scales and common economic preferences like risk and time preferences, trust, or reciprocity. In addition to social norms and individual values, economic studies reveal that such preferences from behavioral economics also play an important role for the explanation of individual behavior and life outcomes (e.g. Dohmen et al., 2011, Sutter et al., 2013). With respect to environmentally relevant behavior, Fischbacher et al. (2015) specifically identify correlations between risk and time preferences and investments in energy saving measures. However, Albanese et al. (2017) show that risk and time preferences, trust, and reciprocity are correlated with each other. On this basis, they argue that neglecting one of these indicators in explaining individual behavior can lead to strong distortions due to omitted variable biases. Similarly, Dohmen et al. (2008) reveal (negative) correlations between trust and negative reciprocity and Dohmen et al. (2010) reveal positive correlations between cognitive ability, risk taking preferences, and patience. The latter study thus argues that significant effects of cognitive ability on individual behavior can be due to its relationship with these two economic preferences.

Against this background, it can also be speculated that the estimated effects of environmental values and specifically of NEP scales on environmentally relevant behavior are biased if economic preferences are correlated with environmental values and not additionally included in econometric analyses, i.e. the estimated effects of environmental values might be distorted by possible effects of economic preferences. So far, almost no study considering the effects of environmental values includes such preferences. One exception is the study of Fischbacher et al. (2015), which shows significant effects of risk and time preferences on energy efficiency measures. However, Fischbacher et al. (2015) do not examine possible distortions for the estimated effect of the NEP indicator if some economic preferences are not considered in the econometric analysis. Previous empirical analyses instead typically assume at least implicitly that environmental values are uncorrelated with economic preferences. However, this assumption has received no attention in empirical economic studies so far. The main contribution of our systematic analysis of the relationship between NEP scales and common economic preferences is therefore to identify possible biased estimation results in this respect.

In addition to risk and time preferences, trust, and positive and negative reciprocity, our econometric analysis considers social preferences, for which several studies reveal direct effects on environmentally relevant behavior (e.g. Clark et al., 2003, Kotchen and Moore, 2007, Fischbacher et al., 2015). Since our identification of time and social preferences is based on artefactual field experiments (e.g. Levitt and List, 2009, List, 2011), our empirical analysis also contributes to previous studies (e.g. Dohmen et al., 2011, Fischbacher et al., 2015) that mimic laboratory experiments in the field by considering incentivized measures in a computer-based survey among more than 3700 German citizens. Our econometric analysis with Generalized Poisson regression models reveals that social preferences and positive reciprocity are significantly positively correlated, whereas trust and (less robust) negative reciprocity are significantly negatively correlated with environmental values, respectively. Only risk and time preferences are not robustly significantly correlated with the NEP scales. An additional econometric analysis also reveals distortedly estimated effects of a NEP scale on environmentally relevant behavior (i.e. donation activities) if economic preferences are insufficiently included as control variables. As a consequence, these estimation results strongly recommend the additional inclusion of economic preferences and especially of social preferences, trust, and positive and negative reciprocity in order to avoid omitted variable biases.

The remainder of the paper is organized as follows: Section 2 discusses the concept of the NEP, the relevance of economic preferences for individual behavior and life outcomes, and hypothesized relationships between NEP scales and economic preferences. Section 3 presents the data and the variables in our econometric analysis as well as some descriptive statistics. Section 4 discusses the main estimation results, several robustness checks, and possible omitted variable biases. Section 5 concludes.

2. New Ecological Paradigm and economic preferences

2.1. New Ecological Paradigm

For a long time, the anthropocentric Dominant Social Paradigm (e.g. Pirages and Ehrlich, 1974) was the prevailing worldview that served as a guideline for social and individual behavior as well as for social expectations. In the USA and most other industrialized societies, the Dominant Social Paradigm refers to a commitment to individualism and incorporates attitudes like beliefs in progress, material abundance, and the goodness of growth, faith in the efficacy of technology and science, as well as the superiority of humankind over nature (see also e.g. Dunlap, 2008). However, social psychologists in the USA hypothesized that this worldview changed during the 1970s due to increasing environmental concerns in the population, i.e. an ecological worldview diffused from scientific circles to the larger society (e.g. Dunlap, 2008) questioning the validity of the Dominant Social Paradigm (e.g. Dunlap and Van Liere, 1978, Dunlap, 2008). Therefore, the development of more environmentally oriented paradigms was considered necessary to better understand the changing attitudes. Against this background, Dunlap and Van Liere (1978) considered the total of several single ideas like the unavoidability of limits to growth or the necessity of realizing a steady-state economy as a new worldview, which they termed "New Environmental Paradigm".

In order to analyze the degree of support of this worldview, they developed an instrument by creating several sets of Likert items (see also Dunlap, 2008) that refer to beliefs about the relationship between humankind and the natural environment. The original scale from the New Environmental Paradigm comprised 12 items that can be summarized by three facets, i.e. the existence of ecological limits to growth, the importance of maintaining the balance of nature, and the rejection of the anthropocentric notion that nature exists primarily for human use. Scales on the basis of the New Environmental Paradigm idea were mostly used as a one-dimensional measure for the support of an eco-

logical and ecocentric worldview and thus for environmental concerns. While several alternative measures of environmental concerns like the Ecology scale according to Maloney and Ward (1973) and Maloney et al. (1975) or the Environmental Concern scale according to Weigel and Weigel (1978) were very popular in the 1980s, New Environmental Paradigm scales and advanced environmentally oriented scales as discussed in the following have become the most common measures of environmental values in social and behavioral science over time (e.g. Stern et al., 1995, Fransson and Gärling, 1999, Dunlap et al., 2000, Dunlap, 2008).

In order to improve their New Environmental Paradigm scale, Dunlap et al. (2000) developed a modified 15-item scale on the basis of a revised worldview that is based on socio-psychological theory (e.g. Stern et al., 1995), which they termed "New Ecological Paradigm" (NEP). The NEP includes a wider range of an ecological or ecocentric worldview, whereby two further facets, i.e. the degree to which modern industrial society is exempt from ecological constraints and the likelihood of eco-crises, are additionally considered. Furthermore, the 15 underlying statements avoid outdated terminology (e.g. mankind) and are more balanced with respect to positively and negatively defined items. They are based on five ordered response categories (i.e. five-point Likert scales). However, Dunlap et al. (2000) do not further specify the specific construction of the scale and the range of their values. While some studies also interpret NEP scales as a measure of environmental concern (e.g. Kotchen and Moore, 2007), other studies consider it as a measure of different constructs, i.e. NEP scales are also considered as a measure of environmental values (e.g. Whitmarsh, 2008, 2011, Ziegler, 2017), environmental awareness (e.g. Schwirplies and Ziegler, 2016), or environmental attitudes (e.g. Attari et al., 2009, Hawcroft and Milfont, 2010, Delmas and Lessem, 2014), which leads to an ambiguity of the measure (e.g. Dunlap et al., 2000).[2]

Similarly, the measurement of NEP scales is very different in previous studies. While some studies refer to all 15 items (e.g. Kotchen and Reiling, 2000), other studies refer to ten items (e.g. Clark et al., 2003), six items (e.g. Whitmarsh, 2011), five items (e.g. Kotchen and Moore, 2007), or even only three items (e.g. Fischbacher et al., 2015). According to Hawcroft and Milfont (2010), most of the analyzed studies (i.e. about 42%) use all 15 items, but also six items are often considered. In contrast, the number of or-

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[2] In his overview article, Dunlap (2008) suggests the interpretation of NEP scales as measures of environmental beliefs and especially as measures of the degree to which citizens view the world ecologically.

dered response categories in the underlying statements is more consistent since the strong majority, i.e. over 83% of the examined studies, consider a five-point scale (e.g. Kotchen and Moore, 2007, Lange et al., 2017), whereas less studies consider a four-point scale (e.g. Brody et al., 2012) or a seven-point scale (e.g. Attari et al., 2009). In addition, some studies modify the wording of single items for a better fit (e.g. Fischbacher et al., 2015). For example, the wording of all NEP items is changed negatively to measure ecological disregard instead of ecological values or beliefs (e.g. Brody et al., 2012). In this paper, our NEP scales are based on six items (see Table 1) according to Dunlap et al. (2000). The consideration of only six items is in line with Whitmarsh (2008, 2011), who shows that many respondents have difficulties to interpret the remaining nine NEP items.

2.2. Economic preferences

Economic preferences play an important role for individual behavior and life outcomes. In particular, risk and time preferences, trust, social preferences, as well as positive and negative reciprocity are often considered in behavioral economics (e.g. Falk et al., 2016, 2018). For example, it is shown that risk preferences are relevant for individual behavior such as occupational choice, housing ownership, or stock purchases (see e.g. the overview in Dohmen et al., 2012). Other studies reveal the importance of risk and time preferences for cognitive ability (e.g. Dohmen et al., 2010). It is also shown that time preferences are relevant for long-term life outcomes such as income or employment (e.g. Golsteyn et al., 2014). Furthermore, previous studies identify the relevance of aggregated trust measures for several macroeconomic variables like GDP growth, inflation, or the volume of trade between countries (see e.g. the overview in Fehr, 2009). At the individual level, it is also shown that trust plays an important role for buying stocks (e.g. Guiso et al., 2008). With respect to reciprocal preferences, their importance for, for example, labor market behavior and outcomes like work effort and unemployment or for life satisfaction is revealed (e.g. Dohmen et al., 2009). In addition, previous studies examine the relationship between several economic preferences such as risk and time preferences, trust, and reciprocity (e.g. Albanese et al., 2017).

Furthermore, economic preferences are also specifically examined in the field of environmentally relevant behavior. For example, Sirin and Gonul (2016) consider the relationship between several economic preferences and the choice of an electricity tariff. Fischbacher et al. (2015) show that risk taking preferences are positively correlated with

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energy saving renovation decisions, while patience is positively correlated with the probability to live in energy efficient homes. Other studies examine the importance of risk preferences on the adoption of energy efficient technologies (e.g. Qiu et al., 2014), the effect of time preferences on energy efficiency decisions (e.g. Newell and Siikamäki, 2015), or the effect of risk and time preferences on energy saving measures (e.g. Epper et al., 2011) and on the willingness to participate in time-of-use electricity tariffs (e.g. Qiu et al., 2017). Furthermore, Clark et al. (2003) and Kotchen and Moore (2007) show a strong relevance of social preferences for the individual participation in a green electricity tariff and Fischbacher et al. (2015) reveal a strong relevance for energy efficiency measures. On the basis of these studies, it is plausible to think that economic preferences are not only correlated with environmentally relevant behavior, but also with environmental values or attitudes due to the strong correlations between environmental values and behavior. However, to the best of our knowledge, the relationship between several economic preferences and NEP scales has not been examined so far.

2.3. Hypothesized relationships

It is well-known that several economic preferences are strongly correlated with each other. For example, Dohmen et al. (2008) reveal a significantly negative correlation between trust and negative reciprocity, although their result with German individual data is only based on univariate correlation coefficients. Furthermore, they state that trust and positive and negative reciprocity are crucial components of social preferences, making them strongly correlated. The positive correlation between social preferences and trust is confirmed in the econometric analysis of Albanese et al. (2017) for Germany. On the basis of Italian and German individual data, they also reveal that trust is significantly positively correlated with patience and significantly negatively correlated with risk aversion. Based on large-scale world-wide individual data from 76 countries, Falk et al. (2018) report partial correlation coefficients (conditional on country fixed effects) between patience, risk taking, trust, social preferences, as well as positive and negative reciprocity and show that all these economic preferences are significantly positively correlated with each other.

In order to avoid omitted variable biases, Albanese et al. (2017) therefore argue that risk and time preferences should be included as explanatory variables in econometric analyses that examine the effect of trust. Similarly, Falk et al. (2018) explain that considering

all economic preferences allows the analysis of possible distorted estimation results when the relationship between single preferences and life outcomes or individual behavior is examined. This problem of omitted variable bias is explicitly discussed in Dohmen et al. (2010, 2018) for the case of cognitive ability, for which they reveal a strong correlation with risk and time preferences. Therefore, they argue that estimated effects of cognitive ability on individual behavior without controlling for these two economic preferences can be spurious. While Dohmen et al. (2010, 2018) discuss several theoretical arguments for the relationship between cognitive ability and risk and time preferences, they explain that the detection of the causality of their relationship is very difficult and not completely clarified so far. In addition, they argue that the empirical identification of these causality problems is conceptually difficult. However, they especially argue that this empirical identification is not crucial for the detection of possible omitted variable biases, i.e. the identification of correlations is completely sufficient in this respect.

Against this background, we empirically examine the relationship between NEP scales and the six economic preferences. While (in line with Dohmen et al., 2010, 2018) an extensive theoretical analysis of these relationships, especially with respect to their causality, is outside the scope of the paper, we now briefly discuss several hypotheses about their direction. With respect to risk preferences, several studies as discussed above show a positive effect of risk taking preferences on long-term pro-environmental activities like investments in energy saving measures that generate uncertain benefits in the future (e.g. Epper et al., 2011, Qiu et al., 2014, Fischbacher et al., 2015). Other studies show that specific risk perceptions are relevant for pro-environmental attitudes or activities, for example, in the case of climate protection (e.g. Brody et al., 2012). However, the results of these studies have no clear implications on the relationship between risk preferences and environmental values so that it is useful to consider some single items of the NEP scales according to Table 1, which refer to the possibility of ecological crises (especially the statements "humans are severely abusing the planet" and "nature is strong enough to cope with the impacts of modern industrial nations"). These items suggest that an agreement with the first statement and a disagreement with the second statement and thus rather higher values of the NEP scales as explained below are negatively correlated with risk taking preferences.

Similarly, with respect to time preferences, several studies, as discussed above, show that patience has a positive effect on long-term pro-environmental activities (e.g. Epper et al.,

2011, Fischbacher et al., 2015, Newell and Siikamäki, 2015). However, such an effect gives no direct indication of the relationship with environmental values. In general, it can be argued that patience is connected with a long-time perspective and future well-being (e.g. Meyer and Liebe, 2010), which leads to a higher concern about the livelihoods of future generations. Therefore, it can be argued that more patient individuals are more aware of possible ecological crises and their impacts. In line with this argumentation, for example, Milfont and Gouveia (2006) show a positive correlation between future orientation and environmental values (i.e. environmental preservation) and Dietz et al. (2007) even reveal a positive correlation between future orientation and a NEP scale. However, it might also be argued that impatient individuals challenge environmental issues sooner and thus prefer to avoid possible ecological crises earlier. Therefore, the direction of the relationship between time preferences and environmental values is ambiguous.

With respect to trust[3], it should be noted that environmental values are generally directed to protect the natural basis of life and environmental protection is clearly a public good. Against this background, Meyer and Liebe (2010), for example, show that trust is positively correlated with the contribution to (environmental) public goods. They argue that trust positively influences the belief that other citizens also contribute to public goods. Franzen and Vogl (2013) additionally reveal that trust has a positive effect on environmental "concern" so that it could be argued that trust and the NEP scales are also positively correlated. However, the indicator for environmental concern in Franzen and Vogel (2013) is based on very heterogeneous items such as the willingness to pay for environmental protection. Furthermore, it can also be argued that strong trust in people can lead to a higher propensity to free-ride on the contribution to public goods. In addition, it is again useful to consider some single items of the NEP scales. It can be speculated that the agreement to the statement "humans are severely abusing the planet" and the disagreement to the statements "humans have the right to modify the natural environment to suit their needs" and "humans were meant to rule over the rest of nature" are connected with low trust in people. Therefore, the direction of the relationship between trust and the NEP scales is ambiguous.

With respect to social preferences (or altruism, e.g. Kotchen and Moore, 2007, Falk et al., 2016, 2018, Albanese et al., 2017), several previous studies, as discussed above,

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[3] In this study, we only consider trust in people rather than other directions of trust like trust in governments (e.g. Franzen and Vogl, 2013).

show a positive correlation with the contribution to (environmental) public goods, for example, in the case of the participation in green electricity programs (e.g. Clark et al., 2003, Kotchen and Moore, 2007) or specific energy efficiency measures (e.g. Fischbacher et al., 2015). Again, these results give no direct indication of the relationship between social preferences and environmental values. However, the NEP is clearly characterized by an anti-anthropocentrism and thus an anti-egoism, which is in line with social values and preferences. Therefore, it is not surprising that Stern et al. (1995) reveal a negative correlation between egoistic values (which are in contrast to social preferences) and NEP scales. In addition, social preferences are generally measured by stated or revealed private contributions to public goods, for example, in dictator experiments (e.g. Fischbacher et al., 2015). Therefore, it can be hypothesized that social preferences are positively correlated with the NEP scales, as it is already implicitly shown in Dietz et al. (2007).

Reciprocity describes how individuals respond to perceived kindness and unkindness (e.g. Falk and Fischbacher, 2006). While positive reciprocity expresses the willingness to return favors, negative reciprocity refers to the willingness to harm those who previously harmed the individual (e.g. Caliendo et al., 2012). As aforementioned, positive reciprocity is strongly positively correlated with social preferences and social interactions such as helping people in need, possibly in the sense that positive reciprocans who have been helped before are also willing to help others (e.g. Falk et al., 2018). Similar to the case of social preferences, it can thus be argued that also positive reciprocity is in line with a propensity to anti-anthropocentrism and anti-egoism according to the NEP. Specifically, positive reciprocity in relation to people might be transferred to animals and nature, i.e. it might be argued that classical positive reciprocans also positively respond to perceived pleasant experiences with nature and animals, which would lead to a positive correlation with the NEP scales. In contrast, negative reciprocans in relation to people might also negatively respond to perceived unpleasant or threatening experiences with nature and animals. Therefore, it can be hypothesized that negative reciprocity is negatively correlated with the NEP scales.

3. Data and variables

Our empirical analysis is based on data collected from a large-scale computer-based survey among 3705 citizens in Germany, which was carried out in June and July 2016 in

cooperation with the German market research company Psyma. Due to the focus of the survey on energy-specific questions, only adults who are solely responsible for the choice of electricity tariffs and providers or responsible together with a partner are included. In order to consider relevant population groups after this filtering, the sample (which was drawn from a Psyma panel) was stratified in terms of age, gender, place of residence, and religious affiliation so that it is representative for these criteria.[4] The first part of the questionnaire consisted of screening questions to identify the previously described target group. The second part of the questionnaire referred to personal values and attitudes, especially including economic preferences, comprising two artefactual field experiments to identify time and social preferences. Furthermore, the second part especially comprised the six statements as reported in Table 1 for the construction of our NEP scales. The next three parts, which are, however, not considered in this paper, referred to energy-specific details including a stated choice experiment with respect to different electricity tariffs. The final part of the survey comprised further socio-economic and socio-demographic variables. Among all participants, the median time to complete the questionnaire was about 28 minutes.

3.1. Dependent variables

As discussed above, our NEP scales are not based on all 15 items, but only on six items. This procedure is in line with Whitmarsh (2008, 2011), who showed by means of pilot studies that many respondents had difficulties to interpret the remaining nine NEP items. As a consequence, the following six statements are considered (see also Table 1): "Humans have the right to modify the natural environment to suit their needs", "humans are severely abusing the planet", "plants and animals have the same right to exist as humans", "nature is strong enough to cope with the impacts of modern industrial nations", "humans were meant to rule over the rest of nature", and "the balance of nature is very delicate and easily upset". The respondents were asked how strongly they agree with these statements including five ordered response categories, i.e. "totally disagree", "rather disagree", "undecided", "rather agree", and "totally agree". On the basis of these six items, we construct two different NEP scales.

In line with, for example, Kotchen and More (2007), the first NEP scale includes all categories of the ordered response categories for each statement. Specifically, we assign

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[4] However, this sampling strategy can lead to deviations for other criteria, for example, due to an overrepresentation of high education.

increasing integers from zero to four for the three environmentally positively worded statements and decreasing integers from four to zero for the three environmentally negatively worded statements. The variable "NEP based on ordinal variables" is then constructed by adding up the six values so that it can vary between zero and 24. In line with, for example, Schwirplies and Ziegler (2016), the second NEP scale is constructed on the basis of six dummy variables. For a positively worded statement, the corresponding dummy variables take the value one if a respondent rather or totally agrees with the statement. In the case of negatively worded statement, the dummy variables take the value one if a respondent rather or strongly disagrees. The variable "NEP based on dummy variables" is designed by adding up the single values of the six dummy variables and thus can vary between zero and six. For both NEP scales, higher values imply a higher environmental awareness. Table 1 reports the frequencies of the agreement with the six statements, respectively, which reveal relatively strong environmental values and attitudes for all six items.

3.2. Economic preferences

Our main explanatory variables refer to economic preferences, i.e. risk and time preferences, trust, social preferences, as well as positive and negative reciprocity. Our variable for risk preferences is based on a survey question from the German Socio-Economic Panel (SOEP). The respondents were thus asked how willing they generally are to take risks with five ordered response categories "not at all willing to take risks", "rather not willing to take risks", "undecided", "rather willing to take risks", and "very willing to take risks". The reliability of this general risk preference measure was validated by Dohmen et al. (2011) in a field experiment which confirms that this general risk assessment is an appropriate measure. Furthermore, several previous empirical studies apply such measures of risk preferences (e.g. Jaeger et al., 2010, Dohmen et al., 2012, Fischbacher et al., 2015). On the basis of this ordinal variable, we construct the dummy variable "risk taking preferences" that takes the value one if the respondent indicated one of the latter two categories. Table 2 reports the frequencies of the willingness to take risks across all respondents and reveals that 28.5% of the participants self-assess as rather willing or very willing to take risks.

The identification of time preferences is based on an incentivized artefactual field experiment. The respondents had to decide to receive 80 Euro in one month after the survey or

to receive higher amounts in seven months after the survey. The choice table for the experiment can be found in Table 3 and reveals that the respondents had to make 12 different decisions. Furthermore, the participants were informed that 36 individuals of the sample are randomly selected at the end of the survey, for each selected participant one of the 12 decisions is randomly chosen, and the indicated payment is realized in one or seven months. Furthermore, we informed the respondents that the winners are immediately notified after the survey and that the Euro amount is credited in bonus points on their account as member of the Psyma panel. In line with, for example, Dohmen et al. (2010) or Fischbacher et al. (2015), the variable "patience" represents the minimum discount factor and is constructed as ratio between 80 Euro and the value at which the participant chooses the amount in seven months for the first time. Therefore, "patience" varies between 0.74 and one. Table 4 reports the distribution of the discount rates across all 3705 respondents and reveals similar results as in Fischbacher et al. (2015), although our sample comprises more strongly impatient respondents (i.e. more than 28%) who always prefer 80 Euro in one month.

In line with, for example, Dohmen et al. (2012) and similar to common trust measures in surveys such as the General Social Survey (GSS) or the World Value Survey (WVS) (e.g. Fehr, 2009), our variable for trust is also based on experimentally validated survey questions from the SOEP, which refer to the following three statements: "In general, one can trust people", "these days you cannot rely on anybody else", and "when dealing with strangers, it is better to be careful before you trust them". The respondents were asked how strongly they agree with these statements on a symmetric scale with five ordered response categories, i.e. "totally disagree", "rather disagree", "undecided", "rather agree", and "totally agree". Our trust variable is designed on the basis of three dummy variables. With respect to the first positively worded statements, the dummy variable takes the value one if a respondent rather or totally agrees, whereas for the latter two negatively worded statements the dummy variable takes the value one if a respondent rather or totally disagrees. The variable "trust" is then constructed by adding up the single values of the three dummy variables and thus can vary between zero and three, whereby higher values indicate a higher trust. Table 5 reports the frequencies of the agreement with the three statements of trust attitudes across all 3705 respondents.

In line with Fischbacher et al. (2015), the identification of social preferences is also based on an incentivized artefactual field experiment. The experiment is specifically

based on a standard dictator game, where generosity is costly. Each participant was presented a table and asked to divide the amount of 100 Euro with another randomly selected respondent in case that the respondent turns out to be the winner in the lottery. The corresponding choice table in the survey can be found in Table 6. The participants were informed that (independent of the first lottery) 36 individuals of the sample are randomly selected at the end of the survey and have the opportunity to receive 100 Euro. Furthermore, we again informed the respondents that the winners are immediately notified after the survey and that the Euro amount is credited in bonus points on their account as member of the Psyma panel. Table 7 reports the distribution of the payment amounts for other participants across the 3705 respondents. In accordance with Fischbacher et al. (2015), it shows that the majority chooses an equal distribution of the 100 Euro. In the econometric analysis, we consider the variable "social preferences" as the amount that is allocated to another participant, divided by 100. Therefore, this variable can take values between zero and one, whereby higher values imply stronger social preferences.

Our variables for positive and negative reciprocity are in line with several previous studies (e.g. Dohmen et al., 2009, Caliendo et al., 2012) and thus in line with survey questions from the SOEP. The variable for positive reciprocity is based on the following three statements: "If someone does me a favor I am ready to return it", "I am particularly trying to help someone who has helped me before", and "I am willing to pay costs to help someone who has helped me before". The variable for negative reciprocity is based on the following three statements: "If I am faced with a great injustice, I will avenge myself at the next opportunity", "if someone puts me in a difficult position, I'll do the same with him", and "if someone insults me, I will also be offensive to him". The respondents were again asked how strongly they agree with these statements on a symmetric scale with five ordered response categories, i.e. "totally disagree", "rather disagree", "undecided", "rather agree", and "totally agree". Again, we consider dummy variables, which take the value one if a respondent rather or totally agrees to a statement. The variables "positive reciprocity" and "negative reciprocity" are then constructed by adding up the single values of the three dummy variables, respectively, so that both variables can vary between zero and three, whereby higher values indicate higher positive or negative reciprocal preferences. Table 8 reports the frequencies of the agreement with the corresponding statements and reveals a relatively high positive reciprocity and a relatively low negative reciprocity on average.

3.3. Further explanatory variables

As discussed before, NEP scales are often interpreted as environmental values and can thus be expected to be correlated with other individual values. In fact, several studies show that especially political values, which reflect another component of worldviews, are strongly correlated with NEP scales (e.g. Dunlap et al., 2000, Dietz et al., 2007, Attari et al., 2009, Whitmarsh, 2011). This is the reason why it is useful to include both NEP scales and political orientation as explanatory variables for environmentally relevant behavior and attitudes in econometric analyses (e.g. Ziegler, 2017) in order to disentangle their individual effects and thus to avoid omitted variable biases. However, we do not consider a simple one-dimensional indicator for a right-wing or a left-wing policy identification since it is possible that political orientations are interrelated. In Germany, for example, a conservative policy identification is often combined with a liberal policy identification. We therefore asked the participants how strongly they agree with the statements "I identify myself with conservatively oriented politics", "I identify myself with liberally oriented politics", "I identify myself with socially oriented politics", and "I identify myself with ecologically oriented politics", again on a symmetric scale with the five ordered response categories "totally disagree", "rather disagree", "undecided", "rather agree", and "totally agree". On the basis of these ordinal variables, we construct the four dummy variables "conservative policy identification", "liberal policy identification", "social policy identification", and "ecological policy identification" that take the value one if the respondent indicated one of the latter two categories, respectively.

Another direction of important values or also norms refers to religiosity or religious affiliation. Therefore, the respondents were asked whether they belong to the Roman Catholic Church, to Protestant Churches, to Islam, to other religious communities, or whether they have no religious affiliation. On this basis, we construct the dummy variables "Catholic affiliation" for Catholics, "Protestant affiliation" for Protestants, "other religious affiliation" for the membership to other religious communities including Islam, and "no religious affiliation" for respondents who do not belong to any religious group. Finally, some additional socio-demographic factors are included as control variables. The variable "age" is the age of a respondent in years and the dummy variable "female" takes the value one for a female participant. The dummy variable "higher educational degree" takes the value one if a respondent has at least a college or university degree and the dummy variable "Eastern Germany" controls for geographical differences and takes

the value one if a respondent lives in one of the new Eastern federal states of Germany including Berlin. Table 9 reports some descriptive statistics for our dependent and explanatory variables.

3.4. Variables in the omitted variable bias analysis

In order to analyze possible distortions in the estimated effects of NEP indicators on environmentally relevant behavior if economic preferences are insufficiently included, we conduct an additional econometric analysis. As an example for individual behavior, we consider donations. The corresponding dependent dummy variable "donation activities" takes the value one if the respondent has donated in 2015 for social, clerical, cultural, or charitable purposes. The explanatory variables of main interest refer to the (first) NEP scale, for which we may expect positive correlations since donations often refer to environmental protection, and the economic preferences as considered in the previous econometric analysis. As control variables, we again include the variables for political identification and religious affiliations as discussed above as well as the identical age and education variables, whereas the dummy variables for gender and and geographical differences are excluded since preliminary estimations have shown that they are never significantly correlated with donation activities. Instead, we additionally include the control variables "household size", i.e. the number of persons in the household of the respondent, and "higher household income", i.e. a dummy variable that takes the value if the household income of the respondent is higher than the median. For both variables we expect positive correlations with donation activities. The last three lines of Table 9 report some descriptive statistics for the new dependent and explanatory variables.

4. Econometric analysis

4.1. Main estimation results

Our two dependent variables "NEP based on ordinal variables" and "NEP based on dummy variables" are quantitative discrete variables and restricted to non-negative integers. Due to the quantitative character of the dependent variables, the analysis of linear regression models would generally be possible. However, if the data generation process does not follow the assumptions of linear regression models, but, for example, a Poisson regression model, the OLS estimations would be inconsistent. As a consequence, we focus on the application of count data models for the econometric analysis, although we

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check the robustness of the estimation results by additionally applying linear regression models. While the Poisson regression model is the most commonly used count data model, its implicit assumption of equidispersion is often restrictive in empirical practice. As a consequence, it is not very surprising that our underlying data do not support equidispersion and thus the use of Poisson regression models. Instead, we can identify a strong underdispersion.[5] Against this background, we focus on the application of Generalized Poisson regression models, which can be used for the analysis of both over- and underdispersion (e.g. Winkelmann, 2008).

Table 10 reports Maximum Likelihood (ML) estimations of two different model specifications.[6] While the first column refers to the first NEP scale, the second column refers to the dependent variable "NEP based on dummy variables". In both models, all six economic preferences, i.e. "risk taking preferences", "patience", "trust", "social preferences", "positive reciprocity", and "negative reciprocity" are included as explanatory variables. Furthermore, our variables for political identification and religious affiliation as well as the four socio-demographic control variables are always incorporated. The estimation results in both models reveal a strong relevance of political identification and religious affiliation. In line with previous studies (e.g. Ziegler, 2017), a liberal-conservative political identification is significantly negatively correlated, whereas an ecological and (less robustly) a social policy identification is significantly positively correlated with the mean values of both NEP scales. Furthermore, religious affiliations and especially Catholic and other religious affiliations are significantly negatively correlated with the average NEP scales. This result suggests that the NEP, which in contrast to the anthropocentric Dominant Social Paradigm does not comprise the superiority of humankind over nature, is a worldview less widespread among religiously affiliated respondents. Finally, older respondents, females, respondents with a lower education, and respondents from Western Germany indicate significantly higher mean NEP scales.

However, our main estimation results refer to the relationships with the six economic preferences. While risk and time preferences are not significantly correlated with the average values of any NEP scale, Table 10 reveals a significantly positive correlation between social preferences or positive reciprocity and the mean of both NEP scales. In contrast, trust and negative reciprocity are significantly negatively correlated with the

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[5] The corresponding test results are not reported due to brevity, but are available upon request.

[6] All estimations (and also all descriptive statistics as discussed above) were conducted with the statistical software package Stata.

mean values of both "NEP based on ordinal variables" and "NEP based on dummy variables". These estimation results clearly suggest strong relationships between several economic preferences, especially trust, social preferences, and positive and negative reciprocity, and the NEP scales and thus environmental values and attitudes. As discussed below, these estimation results furthermore suggest the inclusion of economic preferences in econometric analyses that use specific NEP scales as explanatory factor of main interest for environmentally relevant behavior since their non-consideration might lead to strong distortions due to omitted variable biases.

In order to test the robustness of our estimation results, we examine alternative model specifications in several directions. As discussed above, we first consider the OLS estimation of linear regression models by including the same dependent and explanatory variables.[7] Furthermore, we still consider the ML estimations of two Generalized Poisson regression models, but include alternative indicators for risk and time preferences, trust, and reciprocal preferences. Instead of constructing a dummy variable for risk taking preferences, the underlying ordinal variable is included as explanatory variable, which is in line with, for example, Dohmen et al. (2012) and Fischbacher et al. (2015). In accordance with the construction of the second NEP scale "NEP based on ordinal variables", the alternative variables of trust, positive reciprocity, and negative reciprocity are not based on the sum of values of dummy variables, but on the sum of the underlying values of the ordinal variables. Finally, with respect to time preferences, the number of patient choices is included instead of the minimum discount factor, which is, for example, in line with Fischbacher et al. (2015). Table 11 reports the corresponding estimation results and reveals qualitatively extremely similar estimation results, validating the main conclusions from the estimation results in Table 10.[8]

4.2. Analysis of possible omitted variable biases

In order to test possible omitted variable biases if economic preferences are not included as control variables for an analysis of the effects of NEP scales on environmentally relevant behavior, we now econometrically examine the determinants of donation activities, as discussed above. Due to the binary character of the dependent variable, we apply

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[7] In addition, we have also considered ML estimations of conventional Poisson regression models, which lead to qualitatively nearly identical results as in Generalized Poisson regression models according to Table 10. These results are not reported due to brevity, but are available upon request

[8] The only exception is the insignificant correlation between the alternative indicator of negative reciprocity and "NEP based on ordinal variables"

common binary probit models for this econometric analysis. Table 12 reports the ML estimations for average marginal and discrete probability effects in five binary probit models that always include the NEP scale as main explanatory variable as well as the indicators for political identification and religious affiliation and the four socio-economic and socio-demographic factors as control variables. The first model specification includes all six economic preferences, whereas the other four model specifications successively exclude some of them. While the second binary probit model excludes only the two indicators for risk and time preferences, the third model excludes only the two reciprocity variables and the fourth model additionally excludes the indicator for social preferences. Finally, the fifth model specification does not include an economic preference at all as it is quite common in empirical applications of the effect of NEP scales so far.

Table 12 reveals that with the exception of a conservative political orientation (which never has a significant effect) and a liberal political orientation (which only has significant effects in some model specifications), all other control variables have a strong significantly positive effect on donation activities. With respect to the NEP scale, its estimated effect is negative in the preferred first model that includes all six economic preferences (see column 1 in Table 12) and positive in the restricted fifth model specifications (see column 5 in Table 12), although both effects are insignificant. By only comparing these two estimation results, it thus seems that the omission of all economic preferences does not lead to strong distortions in the most restricted binary probit model (even when several effects such as of liberal, social, and ecological policy identification are overestimated in this case). However, the estimation results in the third and fourth models (see columns 3 and 4 in Table 12) clearly point to strong biases since the NEP scale has a positive effect at the 10% significance level in the third and even at the 5% significance level in the fourth model specification.[9] Therefore, these binary probit models would incorrectly imply that environmental values and attitudes, measured by a NEP scale, positively affect donation activities.

In fact, this result would not be very surprising since many donations refer to the environmental sector, for which environmental values can be expected to be relevant. However, these estimated effects are obviously distorted, i.e. upward biased, due to the insignificant effect of the NEP scale in the first model that includes all six economic prefer-

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[9] Furthermore, the difference in the estimated effects is about 0.0008, which cannot be directly recognized in Table 12 due to the decimal places.

ences as control variables. In fact, the upward biases can be easily explained. The first column in Table 12 shows that positive reciprocity has a significantly positive and negative reciprocity has a significantly negative effect on donation activities. Together with the results in Tables 10 and 11, which reveal a strong significantly positive correlation between positive reciprocity and the NEP scales as well as a strong significantly negative correlation between (this indicator of) negative reciprocity and the NEP scales, this means that the omission of both reciprocity variables in the explanation of donation activities obviously leads to upward biases in the estimated effect of the NEP scale (see column 3 in Table 12). This upward bias is even strengthened if the indicator for social preferences is omitted (see column 4 in Table 12) due to its estimated correlations with the NEP scales and the donation activities in the same direction, i.e. social preferences are significantly positively correlated with the donation activities (see column 1 in Table 12) and with the NEP scales (see Tables 10 and 11).

Further estimations[10] confirm these interpretations. If the indicator for time preferences is additionally excluded from the fourth binary probit model (which leads to a model specification that only includes risk preferences and trust as economic preferences), the estimation result for the NEP scale is almost identical to that in column 4 in Table 12 due to the insignificant correlation between patience and both the NEP scales and donation activities (at least in the model specification that includes all six economic preferences). In contrast, if trust is additionally excluded (which leads to a model specification that only includes the indicators for risk and time preferences), the estimated effect of the NEP scale becomes insignificant due to the significantly positive correlation between trust and donation activities and the significantly negative correlation between trust and the NEP scales. These opposing estimated correlations obviously lead to downward biases for the estimated effect of the NEP scale.[11] Finally, the estimation results for the second binary probit model confirm this mechanism (see column 2 in Table 12). Due to the insignificant correlations between both risk preferences and patience and the NEP scales, the estimated effect of the NEP scale remains insignificant.[12] These results suggest that at least the four economic preferences (i.e. trust, social preferences, and the two variables

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[10] The following results are not reported due to brevity, but are available upon request.

[11] As a consequence, a model specification that only excludes trust, but includes the other five economic preferences leads to a stronger estimated negative effect of the NEP scale on donation activities compared to the first model specification, even when this effect remains insignificant.

[12] Furthermore, the difference in the estimated effects is only about 0.0004, which cannot be directly recognized in Table 12 due to the decimal places.

of reciprocity) that are significantly correlated with the NEP scales should be included in econometric analyses that examine the effect of NEP scales on environmentally relevant behavior.

5. Conclusions

Many previous studies show that environmental values, for example, measured by NEP scales, play an important role for environmentally relevant behavior. In order to test whether the estimated effects might be distorted, this paper examines the relationship between two NEP scales and common economic preferences. According to numerous previous empirical economic studies, such preferences from behavioral economics are highly relevant for the explanation of diverse individual behavior and life outcomes. On the basis of data from a large-scale computer-based survey among more than 3700 German citizens, our econometric analysis with Generalized Poisson regression models shows that social preferences (measured in an incentivized dictator game) and positive reciprocity are significantly positively correlated, whereas trust and (less robust) negative reciprocity are significantly negatively correlated with the NEP scales. Only risk and time preferences (also measured in an incentivized experiment) are not robustly significantly correlated with the NEP scales. An additional econometric analysis then reveals distortedly estimated effects of a NEP scale on environmentally relevant behavior (i.e. donation activities) if economic preferences are insufficiently included as control variables.

While these results do not suggest that the omission of some economic preferences is generally problematic if NEP scales are not the main variables in the econometric analysis, it should be noted that the estimated effects of NEP scales can be spurious since they can comprise distorting effects of some economic preferences. In other words, not considering economic preferences can lead to strong distortions in the estimated NEP scale effects due to omitted variable biases. For the case that NEP scales are the explanatory variables of main interest, our estimation results therefore strongly recommend the additional inclusion of a full set of economic preferences, but at least social preferences, trust, and positive and negative reciprocity. The inclusion of such control variables can disentangle the effects of NEP scales and economic preferences and thus avoid omitted variable biases. Therefore, our pure estimation results would raise the question on the reliability and robustness of the estimated effects of NEP scales and possibly also other

indicators for environmental values on environmentally relevant behavior in previous empirical studies that do not control for economic preferences.

However, our estimation results should not lead to overinterpretation and exaggerated conclusions since they refer to the specific case of Germany in 2016. Therefore, it is an open question whether these results are valid for other time periods and countries. Similar empirical analyses in other Western industrialized countries, but also in Asian countries such as China or Japan as well as in developing countries are thus an interesting direction for future research. In order to test the generalizability of our estimation results, it is certainly also interesting to examine the relationship between economic preferences and alternative indicators for environmental values, awareness, or attitudes that are considered in empirical economic analyses to explain environmentally relevant behavior. Examples are single indicators such as the membership in or the contribution to an environmental organization (e.g. Kotchen and Moore, 2008, Dastrup et al., 2012, Gutsche et al., 2019) or the self-description as environmentalist (e.g. Videras et al., 2012). Other examples are indicators that are based (like the NEP scales) on different items such as the General Ecological Behavior (GEB) scale from social psychology (e.g. Kaiser and Wilson, 2000, Kaiser et al., 2010), which is, for example, used in Daziano et al. (2017).

A final interesting direction for further research is the analysis of the relationship between NEP scales and personality traits (e.g. measured by the Big Five factors). While personality traits were developed in (personality) psychology (e.g. Borghans et al., 2008, Almlund et al., 2011), they are increasingly also used in economic studies, for example, to explain different individual behavior and life outcomes such as cooperation (e.g. Kagel and McGee, 2014, Proto et al., 2019), employment and wages (e.g. Fletcher, 2013), or educational success (e.g. Humphries and Kosse, 2017), but also with respect to their relationship with economic preferences (e.g. Dohmen et al., 2008, Becker et al., 2012). First recent studies additionally reveal the relevance of personality traits for environmental preferences and behavior (e.g. Boyce et al., 2019). Since NEP scales and other indicators for environmental values also play an important role for environmentally relevant behavior, future studies about their relationship to personality traits are very useful so that not only the effects of NEP scales and economic preferences as considered in this paper, but also of NEP scales and personality traits can be disentangled.

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Tables

Table 1: Frequencies of the agreement with six statements of the NEP scales, 3705 observations

	Totally agree	Rather agree	Undecided	Rather disagree	Totally disagree
"Humans have the right to modify the natural environment to suit their needs"	64 (1.73%)	379 (10.23%)	769 (20.76%)	1440 (38.87%)	1053 (28.42%)
"Humans are severely abusing the planet"	1519 (41.00%)	1605 (43.32%)	369 (9.96%)	136 (3.67%)	76 (2.05%)
"Plants and animals have the same right to exist as humans"	1738 (46.91%)	1295 (34.95%)	398 (10.74%)	212 (5.72%)	62 (1.67%)
"Nature is strong enough to cope with the impacts of modern industrial nations"	82 (2.21%)	357 (9.64%)	647 (17.46%)	1662 (70.69%)	957 (25.83%)
"Humans were meant to rule over the rest of nature"	70 (1.89%)	297 (8.02%)	581 (15.68%)	1248 (33.68%)	1509 (40.73%)
"The balance of nature is very delicate and easily upset"	1389 (37.49%)	1683 (45.43%)	401 (10.82%)	193 (5.21%)	39 (1.05%)

Table 2: Frequencies of the willingness to take risks, 3705 observations

Very willing to take risks	Rather willing to take risks	Undecided	Rather not willing to take risks	Not at all willing to take risks
67 (1.81%)	989 (26.69%)	965 (26.05%)	1406 (37.95%)	278 (7.50%)

Table 3: Choice table in the time preferences experiment

Choice situation	Option A (payment amount in one month)	Option B (payment amount in seven months)
1	80 Euro □	80 Euro □
2	80 Euro □	80.50 Euro □
3	80 Euro □	81 Euro □
4	80 Euro □	82 Euro □
5	80 Euro □	83.50 Euro □
6	80 Euro □	85.50 Euro □
7	80 Euro □	88 Euro □
8	80 Euro □	91 Euro □
9	80 Euro □	94.50 Euro □
10	80 Euro □	98.50 Euro □
11	80 Euro □	103 Euro □
12	80 Euro □	108 Euro □

Table 4: Frequencies of minimum discount factors, 3705 observations

Discount factors	0.741	0.777	0.812	0.847	0.879	0.909
Frequencies	1046 (28.23%)	209 (5.64%)	177 (4.78%)	203 (5.48%)	412 (11.12%)	436 (11.77%)
Discount factors	0.936	0.958	0.976	0.988	0.994	1
Frequencies	296 (7.99%)	164 (4.43%)	102 (2.75%)	80 (2.16%)	275 (7.42%)	305 (8.23%)

Table 5: Frequencies of the agreement with the three statements of the trust variable, 3705 observations

	Totally agree	Rather agree	Unde-cided	Rather disagree	Totally disagree
"In general, one can trust people"	65 (1.75%)	1096 (29.58%)	1477 (39.87%)	854 (23.05%)	213 (5.75%)
"Nowadays one cannot rely on any-one"	233 (6.29%)	973 (26.26%)	1191 (32.15%)	1051 (28.37%)	257 (6.94%)
"When dealing with strangers, it is better to be careful before you trust them"	953 (25.72%)	1698 (45.83%)	690 (18.62%)	313 (8.45%)	51 (1.38%)

Table 6: Choice table in the social preferences experiment (i.e. dictator game)

Amount for you	0 Euro	10 Euro	20 Euro	30 Euro	40 Euro	50 Euro	60 Euro	70 Euro	80 Euro	90 Euro	100 Euro
Amount for another randomly selected person	100 Euro	90 Euro	80 Euro	70 Euro	60 Euro	50 Euro	40 Euro	30 Euro	20 Euro	10 Euro	0 Euro
Decision	□	□	□	□	□	□	□	□	□	□	□

Table 7: Frequencies of payment amounts (in Euro) for other participants in the social preferences experiment (i.e. dictator game), 3705 observations

Payments	0	10	20	30	40	50
Frequencies	626 (16.90%)	208 (5.61%)	336 (9.07%)	396 (10.69%)	378 (10.20%)	1670 (45.07%)
Payments	60	70	80	90	100	
Frequencies	24 (0.65%)	16 (0.43%)	21 (0.57%)	15 (0.40%)	15 (0.40%)	

Table 8: Frequencies of the agreement with the three statements of positive reciprocity and with the three statements of negative reciprocity, 3705 observations

	Totally agree	Rather agree	Unde-cided	Rather disagree	Totally disagree
"When someone does me a favor I am willing to return it"	1882 (50.80%)	1672 (45.13%)	123 (3.32%)	15 (0.40%)	13 (0.35%)
"I make a special effort to help someone who has helped me before"	1285 (34.68%)	2021 (54.44%)	330 (8.91%)	54 (1.46%)	15 (0.40%)
"I am willing to pay costs to help someone who has helped me before"	973 (26.26%)	2062 (55.65%)	690 (18.62%)	313 (8.45%)	51 (1.38%)
"If I am treated very unjustly, I will take revenge at the first occasion, no matter what the cost"	141 (3.81%)	499 (13.47%)	1108 (29.91%)	1270 (34.28%)	687 (18.54%)
If someone puts me in a difficult position, I will do the same to him/her"	94 (2.54%)	368 (9.93%)	1042 (28.12%)	1529 (41.27%)	672 (18.14%)
If someone offends me, I will also offend him/her	143 (3.86%)	634 (17.11%)	1099 (29.66%)	1334 (36.01%)	495 (13.36%)

Table 9: Descriptive statistics of dependent and explanatory variables, 3705 observations

Variables	Mean	Standard deviation	Minimum	Maximum
NEP based on ordinal variables	18.182	3.77	0	24
NEP based on dummy variables	4.615	1.50	0	6
Risk taking preferences	0.285	0.45	0	1
Patience	0.864	0.10	0.741	1
Trust	8.159	2.23	3	15
Social preferences	0.341	0.20	0	1
Positive reciprocity	12.721	1.67	3	15
Negative reciprocity	7.493	2.67	3	15
Conservative policy identification	0.224	0.42	0	1
Liberal policy identification	0.338	0.47	0	1
Social policy identification	0.637	0.48	0	1
Ecological policy identification	0.489	0.50	0	1
Catholic affiliation	0.288	0.45	0	1
Protestant affiliation	0.320	0.47	0	1
Other religious affiliation	0.043	0.20	0	1
No religious affiliation	0.349	0.48	0	1
Age	48.720	15.10	18	87
Female	0.505	0.50	0	1
Higher education	0.282	0.45	0	1
Eastern Germany	0.209	0.41	0	1
Donation activities	0.539	0.50	0	1
Household size	2.199	1.10	1	10
Higher household income	0.461	0.50	0	1

Table 10: Maximum Likelihood estimates (robust z-statistics) in Generalized Poisson regression models, 3705 observations

Explanatory variables	Dependent variable: NEP based on ordinal variables	Dependent variable: NEP based on dummy variables
Risk taking preferences	-0.006 (-0.93)	-0.014 (-1.57)
Patience	-0.007 (-0.22)	0.010 (0.25)
Trust	-0.015*** (-9.91)	-0.014*** (-7.57)
Social preferences	0.038** (2.39)	0.042** (2.01)
Positive reciprocity	0.025*** (11.87)	0.024*** (8.88)
Negative reciprocity	-0.008*** (-5.79)	-0.009*** (-5.37)
Conservative policy identification	-0.060*** (-7.15)	-0.057*** (-5.10)
Liberal policy identification	-0.032*** (-4.74)	-0.039*** (-4.36)
Social policy identification	0.013* (1.74)	0.027*** (2.72)
Ecological policy identification	0.094*** (13.59)	0.106*** (10.98)
Catholic affiliation	-0.041*** (-5.04)	-0.046*** (-4.20)
Protestant affiliation	-0.022*** (-2.88)	-0.015 (-1.50)
Other religious affiliation	-0.065*** (-4.30)	-0.094*** (-4.27)
Age	0.001*** (3.46)	0.001*** (2.73)
Female	0.056*** (9.10)	0.068*** (8.02)
Higher education	-0.038*** (-3.92)	-0.033*** (-3.43)
Eastern Germany	-0.032*** (-4.57)	-0.032*** (-2.95)
Constant	2.696*** (60.94)	1.297*** (22.13)

Note: * (**, ***) means that the appropriate estimated parameter is different from zero at the 10% (5%, 1%) significance level, respectively.

Table 11: OLS estimates (robust z-statistics) in linear regression models and Maximum Likelihood estimates (robust z-statistics) in Generalized Poisson regression models, 3705 observations

Explanatory variables	OLS estimation in linear regression models		ML estimation in Generalized Poisson regression models with alternative indicators for the economic preferences	
	Dependent variable: NEP based on ordinal variables	Dependent variable: NEP based on dummy variables	Dependent variable: NEP based on ordinal variables	Dependent variable: NEP based on dummy variables
Risk taking preferences	-0.146 (-1.13)	-0.063 (-1.26)	0.000 (0.02)	-0.008 (-0.88)
Patience	-0.028 (-0.05)	0.210 (0.88)	0.001 (0.86)	0.001 (1.03)
Trust	-0.265*** (-9.34)	-0.077*** (-7.29)	-0.024*** (-6.59)	-0.027*** (-5.84)
Social preferences	0.752** (2.53)	0.281** (2.34)	0.044*** (2.68)	0.045** (2.10)
Positive reciprocity	0.450*** (11.91)	0.144*** (9.92)	0.035*** (6.50)	0.049*** (6.37)
Negative reciprocity	-0.142*** (-5.59)	-0.049*** (-5.25)	-0.006 (-1.36)	-0.012** (-2.32)
Conservative policy identification	-1.125*** (-7.43)	-0.352*** (-5.80)	-0.057*** (-6.62)	-0.056*** (-4.98)
Liberal policy identification	-0.604*** (-4.78)	-0.231*** (-4.59)	-0.034*** (-4.81)	-0.040*** (-4.40)
Social policy identification	0.241* (1.79)	0.160*** (2.87)	0.016** (2.16)	0.029* (2.92)
Ecological policy identification	1.784*** (13.92)	0.638*** (12.40)	0.100*** (14.06)	0.111*** (11.47)
Catholic affiliation	-0.735*** (-4.78)	-0.245*** (-3.92)	-0.042*** (-5.08)	-0.047*** (-4.27)
Protestant affiliation	-0.399*** (-2.75)	-0.070 (-1.22)	-0.025*** (-3.16)	-0.018* (-1.77)
Other religious affiliation	-1.154*** (-4.25)	-0.477*** (-4.08)	-0.058*** (-3.70)	-0.087*** (-3.94)
Age	0.013*** (3.31)	0.004*** (2.66)	0.001*** (3.42)	0.001*** (2.75)
Female	1.066*** (9.25)	0.402*** (8.49)	0.067*** (10.52)	0.078*** (9.07)
Higher education	-0.604*** (-4.62)	-0.195*** (-3.65)	-0.038*** (-5.23)	-0.038*** (-3.91)
Eastern Germany	-0.401*** (-2.63)	-0.197*** (-3.16)	-0.023*** (-2.70)	-0.033*** (-3.01)
Constant	14.425*** (17.43)	3.070*** (9.30)	2.742*** (133.77)	1.32*** (43.30)

Note: * (**, ***) means that the appropriate estimated parameter is different from zero at the 10% (5%, 1%) significance level, respectively.

Table 12: Maximum Likelihood estimates of average marginal and discrete probability effects (robust z-statistics) in binary probit models, dependent variable: donation activities, 3705 observations

Explanatory variables	(1)	(2)	(3)	(4)	(5)
NEP based on ordinal variables	-0.000 (-0.10)	-0.001 (-0.28)	0.004* (1.65)	0.004** (2.01)	0.002 (0.83)
Risk taking preferences	0.066*** (3.91)	--	0.070*** (4.17)	0.073*** (4.33)	--
Patience	0.103 (1.31)	--	0.128 (1.61)	0.158** (1.98)	--
Trust	0.021*** (5.75)	0.021*** (5.71)	0.027*** (7.54)	0.029*** (8.25)	--
Social preferences	0.209*** (5.62)	0.216*** (5.80)	0.235*** (6.33)	--	--
Positive reciprocity	0.021*** (4.35)	0.023*** (4.85)	--	--	--
Negative reciprocity	-0.012*** (-5.58)	-0.016*** (-5.46)	--	--	--
Conservative policy identification	0.028 (1.49)	0.028 (1.50)	0.030 (1.58)	0.027 (1.41)	0.013 (0.69)
Liberal policy identification	0.026 (1.56)	0.027 (1.63)	0.027 (1.60)	0.028* (1.66)	0.042** (2.45)
Social policy identification	0.078*** (4.31)	0.078*** (4.33)	0.087*** (4.81)	0.094*** (5.05)	0.107*** (5.84)
Ecological policy identification	0.088*** (4.96)	0.092*** (5.17)	0.093*** (5.15)	0.094*** (5.20)	0.113*** (6.16)
Catholic affiliation	0.146*** (8.05)	0.145*** (8.00)	0.148*** (8.16)	0.152*** (8.39)	0.158*** (8.62)
Protestant affiliation	0.132*** (7.41)	0.134*** (7.51)	0.135*** (7.57)	0.142*** (7.92)	0.155*** (8.68)
Other religious affiliation	0.246*** (7.60)	0.246*** (7.59)	0.259*** (8.10)	0.272*** (8.82)	0.276*** (8.97)
Age	0.003*** (6.51)	0.003*** (6.19)	0.003*** (6.53)	0.004*** (7.08)	0.003*** (6.72)
Higher education	0.073*** (4.14)	0.079*** (4.49)	0.074*** (4.14)	0.069*** (3.84)	0.093*** (5.24)
Household size	0.026*** (3.44)	0.026*** (3.41)	0.028*** (3.60)	0.030*** (3.88)	0.027*** (3.47)
Higher household income	0.083*** (4.79)	0.086*** (4.95)	0.082*** (4.74)	0.079*** (4.54)	0.095*** (5.40)

Note: * (**, ***) means that the appropriate estimated probability effect is different from zero at the 10% (5%, 1%) significance level, respectively.