Article

To Pay or Not to Pay: Competing Theories to Explain Individuals' Willingness to Pay for Public Environmental Goods

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Abstract

Several theories have been proposed in an attempt to explain individuals' willingness to pay (WTP) for public environmental goods. While most studies only take into account a single theory, this article discusses competing theories. These include, in addition to a basic economic model, the theory of public goods, Ajzen's theory of planned behavior, and Schwartz's norm-activation model. Empirical results are based on a contingent valuation study of biodiversity in German forests. Multivariate analyses demonstrate that studies using single theories omit crucial explanatory variables and, hence, might be misleading. Economic models of WTP have proven to be incomplete, that is, they have restricted explanatory power and need to be supplemented by psychological and sociological models. Furthermore, a general finding is that factors influencing WTP are different for "in-principle WTP" on the one hand and "amount of WTP (given in-principle WTP)" on the other. Income,

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for example, does not affect whether individuals are willing to pay at all, but significantly influences how much they are willing to pay.

Introduction

If values of public environmental goods such as clean air, unpolluted water, or biodiversity cannot be derived from observation of individual behavior in the context of markets (revealed preferences), they are commonly determined by responses to questions in surveys (stated preferences). Contingent valuation (CV) is still the most prominent technique of the stated preference methods in nonmarket valuation (Carson & Hanemann, 2005 for an overview). Roughly speaking, in a CV survey, respondents are directly asked for their monetary values of (changes of) environmental goods, predominantly by asking them for the maximum amount they would be willing to pay (WTP).

Using CV to value public environmental goods is an important and controversial field of research.[1] It is important because CV provides information about "the (monetary) value of nature" and this can help political decision makers. Nevertheless, issues intensively discussed in the literature refer to the question of how CV surveys should be designed and administered, how CV data are best analyzed, whether CV results correspond to economic theory, and whether WTP responses in surveys capture more than purely hypothetical values (Carson & Hanemann, 2005).

The present article is related to this discussion insofar as it asks what determines individuals' WTP for public environmental goods. There are several studies aiming at an explanation of WTP responses in CV studies. These studies consider, besides economic variables, aspects of collective action (e.g., Blamey, 1998a), the effect of environmental concern (e.g., Kotchen & Reiling, 2000), Ajzen's theory of planned behavior (e.g., Pouta & Rekola, 2001), altruistic motives or warm glow motivation (e.g., Kahneman & Knetsch, 1992), and Schwartz's norm-activation model (e.g., Guagnano, 2001).

One drawback of studies of these types is that they normally focus on a single theory and, hence, their results may be misleading (see Wall, Devine-Wright, & Mill, 2007, who recently argued in favor of comparing and combining theories to explain proenvironmental intentions). The interpretation of study results depends on which explanatory determinants, models or

theories have been considered. For example, a confirmation of the theory of planned behavior in CV studies is often interpreted in favor of economic valuation (i.e., in favor of construct or predictive validity, Meyerhoff, 2006), whereas a confirmation of the norm-activation model would doubt CV surveys (e.g., Blamey, 1998a). But which of these models is more successful in predicting WTP responses when examined in a direct and comparable manner? The present article addresses this question by discussing competing theories and by testing them empirically in a CV study concerning biodiversity in German forests.

Competing Theories

Basic Economic Model

Economic models focus on two determinants of WTP, *income* and the *use of the good in question*. When individuals consider paying for improved environmental quality, their choices and responses to valuation questions are constrained by their (disposable) income. Accordingly, income should correlate to the amount of money respondents are willing to spend in order to obtain environmental goods, to have better environmental quality or to avert environmental deterioration. Therefore, income is regularly included in stated preference surveys and is expected to have a positive effect on WTP (Carson, Flores, & Meade, 2001).

Whether people actually use the public good in question is another determinant closely related to the economic concept of value. If, for instance, a landscape is visited by an individual, it is expected to have instrumental value. People use the good because it is increasing their well-being. In this case, there is a direct behavioral link between the good and the individual's well-being. This link is expressed by the concept of "use values." If an individual does not use the good in question, the only link between the good and the individual's well-being is the "knowledge" the individual has about the good. This link is expressed in "non-use values" (e.g., existence value). As this latter link is expected to be weaker than a link based on direct use, it is assumed that users are willing to pay more than nonusers (Carson et al., 2001).

Theory of Public Goods

Individuals might perceive and define their WTP as a contribution to the provision of a public good. This refers to theories of public goods and collective action (e.g., Olson, 1965; Sandler, 1992). One essential of a public

good is that no one can be excluded from using it once it is provided. Non-excludability also holds for individuals who do not contribute to the provision of the good. Accordingly, this gives an incentive to rely on the contributions of others and to use the good as a free rider. Such situations are characterized as social dilemmas:

> Social dilemmas are situations in which individual rationality leads to collective irrationality. […] As individuals we are each better off when we make use of a public resource, such as public television, without making any contribution, but if everyone acted on this conclusion, the public resource would not be provided and we would all be hurt. (Kollock, 1998, p. 183)

Following mainstream economics, a rational actor would never contribute to the provision of a public good. However, this "zero contribution thesis" seems to be too pessimistic (Udéhn, 1993, p. 253; in addition to the strong version of the free rider hypothesis, there is also a weaker version: some will contribute, but the outcome is still suboptimal). Experimental evidence shows that people cooperate in public good games. They do not use every opportunity to free ride (see Camerer, 2003; Ledyard, 1995). People contribute to improving environmental quality although their contribution has only a minimal effect. This deviance from economic assumptions may be explained by theoretical approaches focusing, among other things, on fairness, inequity aversion, and reciprocity (e.g., Bolton & Ockenfels, 2000; Falk & Fischbacher, 2006; Fehr & Schmidt, 1999; Tutic & Liebe, 2009) and on different types of actors including "conditional cooperators" (Ostrom, 2000). Conditional cooperators make their behavior dependent on (their beliefs about) how others behave, that is, whether and how much others contribute.

In the framework of the theory of public goods, *dilemma concern* and *trust in other people's cooperation* can be considered as determinants of WTP. Dilemma concern is seen as a concept to measure the degree to which people perceive environmental protection as a social dilemma and follow strategies of conditional cooperation (Franzen, 1995). It is expected that the more people perceive environmental protection as a social dilemma, the less likely they are willing to pay for the provision of a specific public good.

The concept "trust in other people's cooperation" refers to a person's belief that others are willing to pay or "do their share." The assumption is that individuals who believe in other people's "payments" regarding a specific public good are more likely to be willing to pay as compared to individuals

who do not believe in other people's payments. This originates from the idea of conditional cooperation. Ostrom (2000, p. 142) stated that "conditional cooperators will tend to trust others." Those who trust that others will cooperate are less likely to think that they are the only ones who would contribute to the good. Several authors have discussed the relevance of collective action in economic valuation (Blamey, 1998a; Sugden, 1999), but no systematic empirical (quantitative) studies have been carried out to date.

Attitude-Behavior Paradigm and Theory of Planned Behavior

While economists rely on the concept of preferences in order to determine what people value, psychologists and sociologists have a strong affinity to the attitude concept. The main difference between the two concepts is that preferences pertain to choices between alternatives whereas attitudes focus on "the desirability of a single action or object" (Green & Tunstall, 1999, p. 222; Kahneman, Ritov, & Schkade, 1999). A "classical" attitude-behavior paradigm would assume that behavior can be predicted by attitudes. This would mean that general attitudes such as *environmental concern* have a direct and positive effect on WTP. Indeed, several CV studies have shown such effects (Cooper, Poe, & Bateman, 2004; Kotchen & Reiling, 2000).[2]

The basic attitude-behavior model is still part of thinking in social psychology although there are approaches going beyond this simple paradigm. Ajzen's (1991) theory of planned behavior which has been successfully applied to a variety of behavioral domains (see Armitage & Conner, 2001) is one of these approaches. According to Ajzen, the intention to perform a behavior is the immediate determinant of the behavior in question including "the behavior of paying money for a good" (Ajzen, Brown, & Rosenthal, 1996, p. 45). Three determinants of the behavioral intention are proposed: *attitude toward the behavior*, *subjective norm*, and *perceived behavioral control*. The attitude toward the behavior refers to an individual's positive or negative evaluation of performing the behavior. An individual's perception of social pressure from reference group members to enact the behavior is captured by the subjective norm. Perceived behavioral control includes the perceived ease or difficulty of performing the behavior.

With regard to public environmental goods, WTP is expected to increase with a more favorable attitude toward paying for such goods, with increasing social pressure toward paying, and with an increasing perceived behavioral control regarding paying for such goods. The theory of planned behavior is confirmed in several CV studies (Ajzen et al., 1996; Meyerhoff, 2006; Moisseinen, 1999; Pouta & Rekola, 2001).

Models of Altruistic/Moral Behavior

Theories of altruistic behavior are discussed in the valuation literature in the framework of a contribution model which is a counterpart to the purchase model typically assumed in CV (Guagnano, Dietz, & Stern, 1994; Kahneman & Knetsch, 1992; Kahneman, Ritov, Jacowitz, & Grant, 1993). Models of altruism are based on a broader motivational structure than standard economic models. One possibility to "enable" altruistic behavior in economic terms is to use a utility function that incorporates a "taste for having other people better off" (e.g., Margolis, 1982, p. 21) where "others" does not necessarily refer to human beings but also to environmental amenities (e.g., Stern, Dietz, & Kalof, 1993). Altruistic motivation can lead to perceived obligations to contribute to the preservation of environmental goods. For example, people might feel that they are obliged to do something about deforestation of rain forests. It follows that a financial contribution to a specific environmental good may give personal satisfaction and thus yields individual utility when there are feelings of moral obligation. It is also known that some people like "to do good," irrespective of specific environmental goods. People might perceive a general obligation to support good causes and benefit from contributions for "whatever reason." In this respect, contributions to environmental goods are just one way of obtaining satisfaction among many others.

In economic valuation, such general feelings of obligation are discussed in terms of "a warm glow of giving" or "purchase of moral satisfaction" (see e.g., Kahneman & Knetsch, 1992 and Andreoni, 1990 for a baseline model). People may derive utility from altruistic behavior per se, independent of the fact that others will be better off. This leads, for example, to "impure altruism" in the model of Andreoni (1990) and is termed "participation altruism" in the model of Margolis (1982). Kahneman and Knetsch (1992) use these concepts to explain what is known as the embedding effect, that is, the observation that sometimes WTP does not vary with the quantity of the good in question. If people only derive utility from the act of giving, then it does not matter what quantity of the good is provided. However, Kahneman and Knetsch (1992) pointed out that the moral satisfaction may vary with the good: some goods give more satisfaction than others. They also provide empirical evidence for the purchase of moral satisfaction (with respect to a good-specific moral obligation). Taken together, it can be expected that WTP is positively affected by both a *subjective obligation to pay* for the specific good and a *general warm glow* which is independent of the specific good in question.

Norm-Activation Model

Schwartz's norm-activation model (Schwartz, 1977; Schwartz & Howard, 1982) has been developed to explain (altruistically motivated) helping behavior. It has also been applied in the context of environmental issues such as individuals' WTP (Blamey, 1998a, 1998b; Guagnano, 2001; Guagnano et al., 1994). The norm-activation model assumes that a personal norm leading to moral obligations regarding a specific action (such as paying for an environmental good) is only activated and transformed into behavior if certain conditions are fulfilled. Schwartz's theory is a cognitive and sequential decision model that covers the entire process from norm-activation to action. The model is quite complex and difficult to test empirically.

Although different specifications of the model can be found in the literature, also with regard to WTP for environmental goods (Blamey, 1998a, 1998b; Guagnano, 2001; Guagnano et al., 1994), most specifications include the awareness of need and the awareness of responsibility as determinants of norm-activation. Awareness of need refers to the precondition that individuals must recognize that something has to be done concerning the object in question. Awareness of responsibility means that individuals must recognize that they are responsible for doing something. Given awareness of need and awareness of responsibility, a perceived moral obligation can result in specific behavior. Both determinants mediate the effect of a perceived moral obligation on behavior.

In the context of WTP analyses, the *personal norm* to pay for the good, the *awareness of need* with respect to providing the good, and the *awareness of responsibility* for paying are considered as behavioral determinants. The personal norm equals more or less the subjective obligation to pay which was discussed in the preceding models of altruistic behavior. It is expected that the awareness of need and the awareness of responsibility positively affect WTP when considered as interaction terms with the subjective obligation to pay.

Table 1 gives a summary of the six theoretical models and the related determinants of WTP that have been discussed in this section. These determinants will be the independent variables in the empirical analyses presented in the following sections. Note that with respect to the theory of planned behavior and the norm-activation model, not all determinants proposed by the models are considered. This means that these models are not fully tested. Table 1 does not include the subjective obligation to pay (i.e., the personal norm) regarding the norm-activation model and the interaction effects based on the norm-activation model. The subjective obligation to pay is already considered under the headline "altruistic/moral behavior."

Table 1. Summary of Theoretical Approaches

Theoretical Approach	Determinants of Willingness to Pay
Basic economic model	Income
	Use of public good (i.e., forests)
Theory of public goods	Dilemma concern
	Trust in other people's cooperation
Attitude-behavior paradigm	Environmental concern
Theory of planned behavior	Attitude toward paying
	Subjective norm
	Perceived behavioral control
Altruistic/moral behavior	General warm glow
	Subjective obligation to pay
Norm-activation model	Awareness of need for paying
	Awareness of responsibility for paying

Empirical Data

The data result from a survey that was conducted in 2004 as part of the research project "Forest conversion." The aim of this valuation study was to estimate the benefits people would derive from different levels of forest biodiversity in the "Lüneburger Heide" region in Lower Saxony, Germany.[3]

The Lüneburger Heide (LH) is located in the relatively humid north-western part of Germany. Due to historic land uses, large parts of the landscape are covered with heath and pine monocultures. Therefore, the government of Lower Saxony has created a long-term ecological forest development program (LÖWE). According to this program, forest conversion takes place in different regions of Lower Saxony and will cause, among other things, changes in forest biodiversity. For example, a higher portion of broad-leaved forests will affect both the kinds of plant and animal species present as well as the number of species. In order to determine whether improvements of biodiversity would increase the welfare of people living in the study region, a CV study was initiated.

Starting with a broader list of attributes describing different aspects of forest biodiversity, four attributes were selected on the basis of focus groups carried out in the study region: habitats of protected and endangered plant and animal species, species diversity, forest stand structure, and landscape diversity.[4] The first and the second attribute were differentiated at two levels (medium and high), the third and the fourth at three levels (low, medium, and high). Furthermore, each level of an attribute was portrayed by a specific symbol. The attribute levels were chosen in accordance with the LÖWE program.

	Without forest conversion	Program A	Amount per year	WTP yes ✓ unsure/no ×
Broad-leaved trees	30 percent	60 percent	€0.50 €1.00 €2.00 €3.00	_____ _____ _____ _____
Habitats for endangered/ protected species	medium	high	€5.00 €7.00 €10.00 €15.00	_____ _____ _____ _____
Species diversity	medium	medium	€20.00 €25.00 €30.00 €35.00	_____ _____ _____ _____
Forest stand structure	low	high	€50.00 €60.00 €75.00 €90.00	_____ _____ _____ _____
Landscape diversity	low	medium	€100.00 €130.00 other amount	_____ _____ _____

Figure 1. Description of environmental good and payment ladder
Note: €1.00 is about US$1.30.

The general structure of the questionnaire was as follows: (a) Respondents were asked about their frequency of forest visits in the LH and their knowledge about general conditions of forests in Lower Saxony. (b) Basic information was provided on a map showing the areas where ecological forest conversion would be possible, and on a card explaining potential impacts on forest biodiversity. The card also depicted the symbols designed to represent the attributes. Then, respondents were introduced to the logic of the hypothetical market. They were informed that conversion of the forests could not be fully financed by public money. Therefore, the idea of a special "forest conversion fund" was presented. Based on this, respondents were finally asked whether they were in-principle willing to contribute to this fund. Those answering this question positively were offered a specific forest conversion program (Program A = LÖWE) together with a payment ladder to measure WTP (see Figure 1). (c) In addition to this valuation scenario, the questionnaire also included questions with regard to the theoretical approaches discussed in the previous section.

In autumn 2004, a professional survey organization collected data pertaining to a random sample of 305 people aged 18 and over living in the study region (face-to-face interviews). The average interview time was about 30 minutes. The data were weighted for descriptive analyses because due to the sampling procedure they were only representative of households and not of people. People living in a one-person household had a higher probability of being selected than those living in households with more than one person. For

multivariate analyses, presented in the next section, the nonweighted data were used since it is controversial whether weighting in multiple regression models will give more valid results (Winship & Radbill, 1994).

Variables and Descriptive Results

Dependent Variables and Descriptive Results

"In-principle WTP" and "amount of WTP (given that the respondent is willing to pay)" will be the dependent variables of the multivariate analyses presented in the next section. As mentioned above, respondents were first asked whether they were willing to pay at all in order to increase forest biodiversity in their region. If they responded positively, they were confronted with biodiversity attributes according to the LÖWE program, together with a payment ladder (Figure 1). In principle, 28% of respondents were willing to pay. For calculating the amount of WTP, the midpoints of the payment ladder intervals were used. The mean amount of WTP over all respondents was €6.86 (US$8.92) per person and year [with a minimum of €0, a maximum of €115 (US$149.50), and a standard deviation of 17.75], and in the subgroup of payers €24.29 (US$31.58) [with a minimum of €0.75 (US$0.98), a maximum of €115 (US$149.50), and a standard deviation of 26.41].

Independent Variables and Descriptive Results

The construction of the independent variables followed the theoretical discussion. Exact measurement instruments (question wordings) are given in the appendix.

Basic economic model. The monthly household net *income* was surveyed in two steps. First, an open question was asked and if the respondent refused to answer, she or he was requested to choose between stipulated income categories. Missing open values were replaced by the means of these categories. The remaining missing values were imputed by applying an income regression. For subsequent analyses, the equivalized disposable income was used. This was calculated by dividing the household net income by the square root of the number of all household members. The mean value of income was €1,347 ($1,751). *Use of the forests* was measured by asking how often respondents had visited the local forests in the last 12 months prior to the interview. On average, respondents had visited the forests three to five times. A binary variable was coded (1 = *person had visited the forests*), which gave 71% forest users.

Theory of public goods. *Dilemma concern* was measured using four statements following Diekmann and Preisendörfer (1991). They were answered on a 5-digit scale (from 1 = *strongly disagree* to 5 = *strongly agree*) and focused on dilemma aspects of environmental protection such as the effect of individual behavior on environmental protection, conditional cooperation, and free riding. An additive index was constructed and its range was standardized from 0 to 10. Higher values indicated a higher dilemma concern. The mean of the index was 3.6. *Trust in other people's cooperation* was obtained using the following statement answered on a 7-point scale: "What do you believe: Are other people willing to pay something for forest conversion?" A value of 1 indicated that respondents believed that other people were definitely not willing to pay, a value of 7 that other people were definitely willing to pay. The scale was recoded to 0-6. The mean value was 2.0. Thus, the majority did not believe in payments by other people (low trust in cooperation).

Environmental concern. The measurement of general *environmental concern* was based on nine items from a scale proposed by Diekmann and Preisendörfer (2003). These items focused on cognitive aspects (insight into endangerment) and emotional aspects (feelings of fear, anger, etc.). Following the results of a factor analysis, six of the nine items were selected to construct an index with a standardized range from 0 to 10 and a mean of 6.77.

Theory of planned behavior. The three main components of the theory were measured using statements answered on 7-point scales. The variable *attitude toward paying* consisted of an index based on two items and had a standardized range from 0 to 6. The items measured to what extent respondents perceived a monetary contribution to forest conversion as pleasant and beneficial. This applied to about one third of respondents. The index had a mean of 2.98. The question aiming at the *subjective norm* revealed to what extent friends and relatives were in favor of the respondent voluntarily contributing money to forest conversion. The responses to this question showed negative sanctioning for 18%, indifference for 49%, and positive sanctioning for 33%. Using a scale from 0 to 6, the mean value was 3.18. The *perceived behavioral control* was also an index based on two items measuring to what extent respondents perceived a monetary contribution as easy and feasible. A contribution would have been easy for 30% and feasible for 38%. On a standardized range from 0 to 6, the index had a mean of 2.71.

Altruistic/moral behavior. The variable *general warm glow* was an additive index consisting of three statements answered on a 5-point scale. The answers to the statements indicated to what extent respondents liked to support environmental projects, whether donations were associated with a good feeling, and whether there was a perceived obligation to help other people and to

support environmental projects. The index had a standardized range from 0 to 10 and a mean of 4.48. The *subjective obligation to pay* was measured with a single statement on a 7-point scale: "To what extent do you perceive paying something for forest conversion as a moral obligation?" The scale was coded 0 to 6. A rather strong moral obligation (values 4, 5, or 6) was perceived by 27%. The scale had a mean of 2.17.

Norm-activation model. In addition to subjective obligation to pay, the other main variables of the model are awareness of need and awareness of responsibility for paying. The variable *awareness of need for paying* was obtained using two statements that aimed to determine the perceived importance of forest conversion. The statements were answered on 5-point scales, an index was constructed with a standardized range from 0 to 4, the mean of this index was 2.04. A single statement, again answered on a 5-point scale, was used to measure *awareness of responsibility for paying*. This statement referred to a "defense strategy," that is, to what extent respondents were convinced that they already paid enough for other things and, therefore, did not have to pay for forest conversion. Recoding the variable so that higher values indicated a higher awareness of responsibility, 21% of the respondents perceived a responsibility (values 3 or 4). On a value range of 0 to 4, the variable had a mean of 1.37.

Control variables. The multivariate analyses were controlled for the sociodemographic variables of *gender*, *age* in years and *education* in years. With regard to gender, 60% of the respondents were female. The average respondent was 48 years old and had 10 years of education.[5]

Multivariate Results

To test the hypotheses derived from the competing theories, two separate decisions were considered: first, whether a respondent was willing to pay at all, and second, how much she or he was willing to pay given a WTP "in principle." Probit models were applied for the first decision, OLS regressions for the second one.[6]

In-Principle Willingness to Pay

The multivariate analyses regarding Pr(WTP >0) were conducted following the discussion of the explanatory approaches. The results are given in Table 2. The first six Models (A to F) consider each explanatory approach separately, whereas Model G includes all explanatory determinants. The full Model G excludes the proposed interaction effects and the variable "perceived behavioral control." The latter was not included because income and behavioral control (as a proxy

for the budget restriction) were highly correlated, which resulted in problems of multicollinearity. Since income can be seen as the common measure for budget restrictions, it has been decided to omit the behavioral control variable. All models take into account gender, age, and education as control variables. With the exception of gender and use of forests, all independent variables were centered to a mean of zero.

Model A in Table 2 includes the basic economic determinants of WTP. In the present study, income does not have a significant effect on the probability of being willing to pay. Use of the forests, however, does affect this probability. Forest users are more likely to be willing to pay compared to nonusers. The overall fit of the economic model is rather weak (Pseudo-R^2 = .07).[7]

The variables of the theory of public goods in Model B have more explanatory power. The higher an individual's dilemma concern, the less likely she or he is willing to pay. Conversely, a higher level of trust in other people's cooperation increases the probability. Thus, respondents who perceive the effect of their contribution to environmental protection as minimal and who make their behavior dependent on the behavior of others are less likely to be willing to pay. This is in line with the trust effect. If respondents are convinced that other people are also paying for forest conversion, then they do not believe that they are the only ones contributing (being a "sucker"). The two determinants of collective action have a considerably higher explanatory power (Pseudo-R^2 = .23) than the economic determinants.

Model C indicates that environmental concern has a positive and significant influence on the probability of being willing to pay. This direct effect supports the simple attitude-behavior paradigm. Greater environmental concern increases the in-principle WTP. Compared to the basic economic model, the attitude-behavior paradigm has a slightly higher model fit (Pseudo-R^2 = .09).

The fit of the model is much better with regard to the theory of planned behavior in Model D. All three determinants have the expected positive and significant effects. The likelihood of being willing to pay is greater with an increasing positive attitude toward forest conversion, with increasing positive sanctioning of friends and relatives, and with increasing perceived behavioral control. Model D has high explanatory power (Pseudo-R^2 = .32).

The two variables with respect to altruistic/moral behavior in Model E also have high explanatory power (Pseudo-R^2 = .33). A general warm glow, that is, the good feeling and perceived obligation to engage in environmental and social issues, and also the subjective obligation to pay for forest conversion in particular increase the probability of being willing to pay.

The subjective obligation to pay in terms of a personal norm is also a main determinant of the norm-activation model. In fact, the activation of this norm

Table 2. Multivariate Results—In-Principle Willingness to Pay

Theoretical Approach	Probit Models (1 = Willing to Pay)						
	A	B	C	D	E	F	G
Basic economic model							
Income	0.09 (0.42)						−0.44 (−1.49) [−0.06]
Use of forests (1 = yes)	0.52a (2.58)						0.53a (2.27) [0.14]
Theory of public goods							
Dilemma concern		−0.16a (−4.41)					0.02 (0.52) [0.01]
Trust in other people's cooperation		0.31a (5.93)					0.08 (1.15) [0.02]
Attitude-behavior paradigm							
Environmental concern			0.19a (4.15)				0.07 (1.15) [0.01]
Theory of planned behavior							
Attitude toward paying				0.36a (3.84)			0.20 (1.87) [0.04]
Subjective norm				0.24a (2.65)			0.07 (0.76) [0.01]
Perceived behavioral control				0.23a (3.13)			
Altruistic/moral behavior							
General warm glow					0.20a (4.54)		0.10 (1.64) [0.02]

Table 2. (continued)

(continued)

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Probit Models (1 = *Willing to Pay*)

Theoretical Approach	A	B	C	D	E	F	G	
Subjective obligation to pay					0.35ª (4.98)	0.32ª (4.02)	0.23ª (2.54)	[0.05]
Norm-activation model								
Awareness of need for paying (AN)						0.11 (1.05)	0.02 (0.17)	[0.01]
Awareness of responsibility for paying (AR)						0.40ª (4.54)	0.41ª (4.56)	[0.10]
AN × Subjective obligation to pay						−0.05 (−0.77)		
AR × Subjective obligation to pay						0.16ª (3.26)		
Pseudo-R^2 (McFadden)	0.07	0.23	0.09	0.32	0.33	0.41	0.46	
N	288	288	288	288	288	288	288	

Note: Estimates with robust standard errors (Huber-White sandwich estimator); z values in parentheses. Models include gender, age, and education as control variables. All independent variables, except gender and use of forests, are centered to a mean of zero. Included in […], Model G also gives the effects of a one-unit change of the independent variables on the probability to be willing to pay given a reference individual who is male, a forest user and has mean values for all other variables. The probability that this person is willing to pay would be 11%.
a. Significant at 5%-level.

will be explained by the model. The test procedure in Model F shows a partial confirmation of the norm-activation model. The awareness of need has no significant effect, whereas both the subjective obligation to pay and the awareness of responsibility have positive and significant main effects. Furthermore, the higher the awareness of responsibility, the stronger the effect of the subjective obligation to pay. In a strict sense, the effect of the personal norm should be completely moderated by the other variables. However, it has to be kept in mind that not all determinants proposed by the norm-activation model were considered and that in general it is reasonable to assume an independent effect of the personal norm. Most studies do not reveal such effects because they do not consider the personal norm as a covariate in their models (e.g., Guagnano, Dietz, & Stern, 1994). The norm-activation model has the highest explanatory power (Pseudo-R^2 = .41).

Finally, Model G presents the results of a full model including all proposed determinants of the probability of being willing to pay. It also gives effects of a one-unit change of the independent variables on the probability to be willing to pay given a reference individual who is male, a forest user and has mean values for all other variables. The in-principle WTP of such a person would be 11%. Model G solves the puzzle of which determinants are most influential. It can be seen that three determinants significantly affect the likelihood of being willing to pay and eliminate significant effects of other variables. These three most important determinants are *use of forests*, *subjective obligation to pay*, and *awareness of responsibility*. According to the effects of a one-unit change of the independent variables on the probability of being willing to pay in Model G, forest users have a probability that is 14 percentage points higher than for nonusers. A one-unit increase in the subjective obligation to pay and in the awareness of responsibility increases the likelihood by 5 and 10 percentage points. Overall, aspects of the theory of public goods and attitude-related models lose explanatory power. The explanation of in-principle WTP is dominated by the economic user aspect and by aspects of norm-related behavior.

Amount of Willingness to Pay

The following results pertain to the amount of WTP, given that an individual is willing to pay. The results shown in Table 3 are based on OLS regressions. Due to a right-skewed distribution, the natural logarithm of WTP amounts was used as dependent variable. Analogous to the previous section, first, models for each theory are given (Models A to F), and, second, a full model was estimated (Model G). However, interaction effects proposed in the norm-activation model are not incorporated. The main reason for this is that the estimations are based on a relatively small number of cases ($N = 81$).

Table 3. Multivariate Results—Amount of Willingness to Pay

Theoretical Approach	OLS, Where WTP > 0						
	A	B	C	D	E	F	G
Basic economic model							
Income	0.90[a] (3.72)						0.78[a] (3.11)
Use of forests (1 = yes)	0.23 (0.98)						0.06 (0.27)
Theory of public goods							
Dilemma concern		−0.06 (−1.39)					0.02 (0.29)
Trust in other people's cooperation		−0.01 (−0.02)					0.01 (0.01)
Attitude-behavior paradigms							
Environmental concern			0.21[a] (3.79)				0.19[a] (3.12)
Theory of planned behavior							
Attitude toward paying				0.03 (0.33)			−0.05 (−0.39)
Subjective norm				0.03 (0.22)			0.05 (0.42)
Perceived behavioral control				0.07 (0.75)			
Altruistic/moral behavior							
General warm glow					0.04 (0.76)		−0.01 (−0.01)
Subjective obligation to pay					0.04 (0.67)	−0.01 (−0.03)	−0.06 (−0.77)
Norm-activation model							
Awareness of need for paying						−0.05 (−0.40)	−0.07 (−0.61)
Awareness of responsibility for paying						0.22[a] (2.26)	0.22[a] (2.54)
Adj. R²	0.14	0.02	0.12	0.01	0.02	0.05	0.16
N	81	81	81	81	81	81	81

Note: Ln(WTP + 1) given WTP >0 is used as dependent variable. Estimates with robust standard errors (Huber-White sandwich estimator); *t* values in parentheses. Models include gender, age, and education as control variables. All independent variables, except gender and use of forests, are centered to a mean of zero.
a. Significant at 5%-level.

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It can be seen from Table 3 that only the three determinants *income*, *environmental concern*, and *awareness of responsibility* significantly affect the amount of WTP. These determinants have positive effects which are stable across model variants, that is, also stable when controlling for all proposed determinants in Model G. They are part of the basic economic model, the attitude-behavior paradigm, and the norm-activation model. Thus, variables of the theory of public goods, the theory of planned behavior and altruistic/moral behavior have no noteworthy influence.

Interestingly, a comparison between Tables 2 and 3 supports the assumption that in the present study the two decisions "in-principle WTP" and "amount of WTP" can and must be separated. Both decisions are determined by different variables. This is particularly obvious with respect to the effect of income which does not significantly affect in-principle WTP, but is a strong predictor of amount of WTP given WTP > 0. Since both income and WTP amount are logarithmized variables, the effect of income in Table 3 can be interpreted in terms of income elasticity. In Models A and G, a one-percentage increase in income gives an increase in WTP of .90 and .78 percentage points.

The missing effect of income with regard to in-principle WTP indicates that income does not affect the purchase decision (whether to purchase the good at all) but the decision how much to pay, given a purchase decision. Similar examples showing that variables may have different effects on each of the two decisions can be found for the purchase of other durable goods not related to the field of environmental protection (e.g., Cragg, 1971).

Concluding Remarks

Many studies that attempt to explain individuals' WTP for public environmental goods take into account a single theory. The present results demonstrate that such studies may be misleading. For example, when considered independently, the findings support the theory of planned behavior in predicting whether individuals are willing to pay for ecological forest conversion. However, a full model including determinants from competing theories shows that the economic variable use of the forests, the personal norm and awareness of responsibility derived from the norm-activation model have higher explanatory power than variables derived from the theory of planned behavior (as well as the theory of public goods and the simple attitude-behavior paradigm). This is especially remarkable because processes of norm activation are often interpreted as being in conflict with the foundations of economic valuation, whereas attitude-behavior models are interpreted as being in favor of it. Thus, only studies that include competing theories can contribute toward answering the question of what determines individuals' WTP for environmental goods.

Of course, it may not be possible to generalize on the basis of the findings of the present study. A generalization would need further empirical evidence. More comparative studies with regard to competing explanatory models should be conducted. Such studies should also investigate different environmental goods. It has to be noted that some of the theoretical models were not fully tested and that some measurement instruments may not entirely fit the theoretical models. Nevertheless, the empirical results confirm the importance of incorporating different approaches.

The findings revealed two separated WTP decisions where the first decision pertains to whether an individual is willing to pay at all, and the second refers to the amount of WTP given that the individual is willing to pay in principle. In the present study, these decisions are affected by different behavioral determinants. For example, income does not significantly affect in-principle WTP but is a main predictor of WTP amount. Future studies should use different hypothetical market settings (for example, with different payment procedures and vehicles) to test the validity of this discrepancy between behavioral determinants regarding in-principle WTP on the one hand and amount of WTP on the other.

Moreover, additional studies concerning private environmental consumer goods (as opposed to public environmental goods) are needed. This is particularly important with respect to theoretical construct validity of economic valuation. If purchase and consumption of private environmental goods (such as recycling products or organic food products) is in line with theories of moral/altruistic behavior or with theories of norm-activation (as suggested by Guagnano 2001), then norm-orientation would not be a worrying finding for economic valuation, but a "common" determinant of consumer decisions. This in turn would motivate new directions in theory building.

Authors' Note

Declaration of Conflicting Interests

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Appendix

Statements to Measure Independent Variables

Dilemma concern[a]
If I individually do something for environmental protection, it changes nothing at all in the aggregate.
If others do not take part, I also will not engage in environmental protection.
If I protect the environment, I am a "sucker" because I still suffer as a consequence of the environmentally damaging behavior of others.
Since others do enough for environmental protection, I do not have to contribute.

Trust in other people's cooperation[b]
What do you believe: Are other people willing to pay something for forest conversion? (1 = *definitely not willing to pay*, 7 = *definitely willing to pay*).

Attitude toward paying[b]
For me, a payment for forest conversion in the Lüneburger Heide is or would be … (1 = *not beneficial to* 7 = *beneficial, and* 1 = *unpleasant to* 7 = *pleasant*).

Subjective norm[b]
What do you think: Would your friends and relatives be in favor if you voluntarily contribute money to forest conversion? (1 = *would not be in favor*, 4 = *would not care*, 7 = *would be strongly in favor*).

Perceived behavioral control[b]
For me, a payment for forest conversion in the Lüneburger Heide is or would be … (1 = *very difficult to* 7 = *very easy, and* 1 = *not at all feasible to* 7 = *feasible without any problems*).

Awareness of need for paying[a]
Compared to other policy measures, forest conversion is not a high priority.
The current percentage of broad-leaved forests in the Lüneburger Heide is completely sufficient. From my point of view, there is no need to increase it.

Awareness of responsibility for paying[a]
I already pay enough for other things. I do not have to also pay for forest conversion.

Environmental concern[a]
I am afraid when I think about environmental conditions for future generations.
If we continue our current style of living, we are approaching an environmental catastrophe.
When watching TV or reading about environmental problems in the newspapers, I am often embarrassed and angry.
There are limits of economic growth that the industrialized world has already reached or will reach very soon.
In my opinion, environmental problems are greatly exaggerated by proponents of the environmental movement.
It is still true that politicians do far too little to protect the environment.

General warm glow[a]
I like to contribute money to projects that protect the environment. I will rarely deny a request to contribute to such projects.
I get a good feeling from donations to good causes such as environmental projects.
Spending money for a good cause is nothing special. I have an obligation to do something for others or the environment.

Subjective obligation to pay[b]
To what extent do you perceive paying something for forest conversion as a moral obligation? (1 = *no moral obligation at all* to 7 = *a very strong moral obligation*).

a. Measured on a 5-point scale (from 1 = *strongly disagree* to 5 = *strongly agree*).
b. Measured on a 7-point scale.

Notes

1. Public environmental goods belong to the general class of public goods which, opposed to private goods, can be characterized by nonexcludability and/or non-rivalry in consumption. Such public goods have externality effects not priced through markets. They can be called nonmarket goods and services, because they are not traded in markets and do not have a market price. In fact, public environmental goods often have features of both private and public goods. A unique landscape, for example, is connected with use values (e.g., benefits from recreational opportunities) and nonuse values (e.g., benefits derived from knowing that such a landscape exists). The present article focuses on stated preferences methods that can be applied to measure both use and nonuse values.

2. However, it is well known that there are only moderate correlations between environmental attitudes and behavior (Hines, Hungerford, & Tomera, 1986/1987). Several models have been developed that incorporate an indirect effect of attitudes on behavior as well as possible direct effects. Examples are the A-B-C model proposed by Guagnano, Stern, and Dietz (1995), and the low-cost hypothesis proposed by Diekmann and Preisendörfer (2003).

3. The project was funded by the German Federal Ministry of Education and Research. It included two regions, the Lüneburger Heide and Solling/Harz, both located in Lower Saxony. We focus only on the Lüneburger Heide, but the main results concerning determinants of WTP proved to be very similar.

4. Habitats for endangered and protected plant and animal species means the number of habitats that exist in order to protect endangered and protected plant and animal species. Species diversity considers mainly the number of plant and animal species. Forest stand structure refers to the diversity of vegetation layers based on different-aged tree rejuvenation. Landscape diversity means the number of different stand types and forest communities based on main tree species and the occurrence of pure and mixed stands.

5. For more details about the construction, justification, reliability, and validity of the various indices in this section, see Liebe (2007).

6. A two-part model of this type is only appropriate if the two decisions are relatively independent of each other. Formulated in statistical terms, this means that the assumption of "complete dominance" must hold (e.g., Jones, 1989 for a short overview on relevant statistical models). Supplementary analyses presented in Liebe (2007) show that complete dominance can in fact be assumed for the data.

7. With regard to the control variables, only education shows an effect. More highly educated people are more likely to be willing to pay. The effect of income (in the Models A and G) is also not significant when education as a control variable is excluded.

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