Protection Motivation Theory and Contingent Valuation: Perceived Realism, Threat and WTP Estimates for Biodiversity Protection

Susanne Menzel and Riccardo Scarpa

NOTA DI LAVORO 26.2005

FEBRUARY 2005

SIEV – Sustainability Indicators and Environmental Valuation

Susanne Menzel, *Institute of Agricultural Economics, University of Goettingen and Environment Department, University of York*
Riccardo Scarpa, *Environment Department, University of York*

Protection Motivation Theory and Contingent Valuation: Perceived Realism, Threat and WTP Estimates for Biodiversity Protection

Summary

We report on a discrete-choice CV study conducted in Germany to value the WTP for biodiversity protection in less developed countries. To systematically investigate survey realism and subjective threat assessment from the loss of biodiversity described in the scenario the study includes questions to uncover the constructs of Protection Motivation Theory, which is introduced to the CV literature. The patterns of responses to such questions are analysed using an Expectation-Maximization algorithm to derive class membership probabilities. These are found to match the predictions of Protection Motivation Theory and systematically improve the logistic analysis of the *WTP* responses.

Keywords: Biodiversity valuation, Protection motivation theory, Latent class analysis, Expectation-Maximization algorithm, Contingent valuation

JEL Classification: Q2, D6,C42, C25

Address for correspondence

Riccardo Scarpa
Environment Department
University of York
York YO10 5DD
UK
Phone: +44 01904 434 791
Fax: +44 01904 432 998
E-mail: rs24@york.ac.uk

1. Introduction

The convention on biological diversity considers the transfer of resources from developed countries, with relatively low-biodiversity and high opportunity cost of conservation, to developing countries with relatively high-biodiversity and low opportunity cost of conservation (CBD, 1992; Perrings, 1995). Such measure ensures, amongst other things, that money be allocated in conservation activities in locations where the marginal returns are high. However, its implementation poses at least two challenging questions. First, what is the appropriate amount of money to be transferred for the purpose of biodiversity conservation? Such issue is addressed in this study where we report the results of a contingent valuation (CV) survey asking a random sample of German residents to state their willingness to pay (WTP) for such conservation initiatives.

The second challenge derives from the unique nature of biodiversity as a good of global public value and is linked to the perception of the consequences of its loss by respondents. In this paper we approach this second challenge in the context of the CV study and by drawing from a broad research program in social psychology: Protection Motivation Theory (henceforth PMT). Empirically, we explore

1) the potential that PMT affords in informing economic analysis of CV responses, and ultimately WTP estimates. In particular, we exploit it in a finite-mixing context, contrasting it with conventional analysis that would not rely on this set of psychological constructs and;
2) the relationship between PMT constructs as they cluster in each of the different classes we empirically identify and their underlying WTP distributions.

Earlier studies have assessed and emphasized the role of *familiarity* with the purchase of the good under valuation (Carson, 1998) and of the *perceived realism* of contingent valuation surveys (Cummings and Taylor, 1998; Powe and Bateman, 2004). These are now consensually accepted as necessary ingredients for a valid measurement of WTP via CV. While it is safe to assume that respondents would not be familiar with the notion of *"purchasing"* biodiversity protection in developing countries, during the focus group discussions conducted for the development of our survey instrument some doubts were expressed about the "*practical deliverability"* of biodiversity protection.

In the absence of familiarity respondents are known to resort to heuristics (Schkade and Payne, 1994; DuBourg *et al*., 1997) and in our case this frequently leads to an *assessment of the threats* implied by biodiversity loss. Threat evaluation also emerged as a dominating concern in the focus group discussions of this study. Threat and risk assessment are not uncommon contexts of study for CV, as its use as a valuation tool for goods that are implicitly requiring respondents to assess some kind of threat is rapidly expanding (Buzby, Ready, and Skees 1995; Henson, 1996 amongst others). In a stated preference exercise on biodiversity protection, dominated by low familiarity of the public good under valuation, one would generally expect respondents' statements not to be perfectly consistent with rational choice theory (Payne and Bettman, 1993; Spash and Hanley, 1995), and hence show some anomalies which might be explained by including in the analysis a select number of psychological constructs. In short, the aim of this paper is to explore and champion the use of PMT in such an empirical context.

In PMT perceived realism and threat assessment are the constructs that together constitute the main sources of intention analysis. Psychologists, however, have developed their own terminology for these constructs, and part of the objective of the paper is that of

reconciling the terminology used in economics with that employed in social psychology. What is important to our purposes is that the PMT research programme developed tight protocols to empirically measure these constructs. A major feature of PMT in our context of study is that it predicts the existence of interactions between the two main dimensions of "realism" and "threat" perceptions, which result in well-identifiable payment intentions. The basic question we ask is whether this framework effectively helps the econometric analysis of referendum CV responses by providing better grounds to explain differences, and perhaps some anomalies, in estimates of WTP distributions. In short: we try and identify the primary sources of preferences that lead to stated WTP by applying PMT constructs to the analysis of the observed responses. Although we use as background conventional logit analysis, this theory enables us to answer some remaining questions in the modelling of response heterogeneity via latent class analysis, as it provides underlying reasons for finite heterogeneity in preferences. This is useful step forward, especially because economic theory alone does not provide many indicators to check if an answer to a WTP question results from rationally well-behaved preferences, as analysts often assume that this is a fact. In this context, we find that supplementing conventional economic theory with theories from other social sciences is a fruitful avenue of investigation.

1.1 Background and previous empirical work

Theories from social psychology were applied to the analysis of CV responses and they were found to be important in explaining the rationale behind patterns of WTP answers. For example, the *theory of reasoned action* (TRA) (Ajzen and Fishbein, 1980) and its subsequent development *theory of planned behaviour* (TPB) (Ajzen, 1991) from social psychology have been used to explain CV responses (Ajzen and Driver, 1992; Barro, Manfredo, Brown, and Peterson, 1996; Kerr and Cullen, 1995).

In the context of information bias the theory has been used to investigate links between quality of arguments, personal relevance of the proposed public good and stated WTP (Ajzen, Brown, and Rosenthal, 1996). Pouta and Rekola (2001) used it to investigate attitudes, subjective norms, and perceived behavioral control in predicting behavioral intention. Ajzen, Rosenthal, and Brown (2000) used it to explore perceived fairness and WTP for public goods. After Bishop and Heberlein (1986) had suggested that the norm activations model would be a useful framework to analyse WTP-answers, this was used in a qualitative evaluation of a CVM study to show the influence of social norms in stated WTP responses (Blamey, 1998). This body of literature significantly adds to the early evidence reported by the influential study by Kahneman and Knetsch (1992) that theories provided by Psychology can enhance the interpretation of values compared to pure micro-economic explanations.

However, none of these studies directly addresses the issues of realism and threat assessment, which are two mental dimensions that loom important in biodiversity conservation.

The role of perceived realisms in CV survey design for public goods has been studied under two prevalent aspects. One aspect of realism is motivated by the need to generate in the respondent the perception that the results of the survey will effectively influence policy decisions, thereby inducing a high subjective probability that the respondent's answer will affect policy outcomes. This is what Green *et al.* (1998) call a "decisive implementation frame". However, the importance of this aspect of realism can be traced to the early work of Hoehn and Randall (1987), where the link to incentive compatibility and truthful revelation was first established. Cummings and Taylor (1998) provide evidence that this aspect of "realness" is much more powerful when it is extended to include the likelihood of payment[1].

Another aspect of realism that has received recent attention within the context of scope effects is that concerning the perceived realism of the proposed scenario (or scheme).

For example, in such context Powe and Bateman (2004) find a dummy variable representing "perceived realism" to be significant in explaining the probability of a "yes" response and draw the conclusion that "… tests for perceived realism should become a standard element of CV study design and analysis…"(page 259). Following this prescription we believe that the measurement of "perceived realism" can be improved by using psychological constructs. We therefore turned our attention to psychological theories addressing the role of such constructs in the context of motivating intentions and actions for the purpose of protection from some kind of loss, as we are interested in WTP for biodiversity loss.

1.2 This study in brief

When using stated preference methods to value global biodiversity we are faced with a challenging task, which is to elicit valid WTP responses for the reduction of its loss (Bishop, 2003). When validity is an issue, we are not interested only in the result of economic choice (WTP), but also in the motivations or sources behind these choices.

We have designed the CV survey instrument so as to include the individual measurements of constructs from Protection Motivation Theory (PMT). This theory was originally developed to gain understanding on processes of response formulation and reasons for choices when scenarios require respondents to assess threats and, in particular, the possibilities to cope with a potential threatening event (Rogers and Prentice-Dunn, 1997). This is the terminology with which psychologists in this field would use to indicate what economists in the CV literature named "perceived realism". In what follows we will use the term "coping" and "efficacy" as synonyms to indicate such specific forms of survey realism.

Originally, PMT was introduced by Rogers in 1975 and it has since been widely applied in psychology, mostly for predicting health-related (Milne, Sheeran, and Orbell, 2000) and environmental-related behaviour (Gardener and Stern 1996; Hass, Bagley, and Rogers, 1975; Martens & Rost 1998; Martens 1999). We are not aware of applications of such theory in the context of stated-preference studies; hence this paper would be novel in this respect.

We argue that if the decision context under investigation requires individual judgement on both perceptions of threat (which is loosely linked to uncertainty) and realism of the proposed protective action (in our case the proposed species conservation initiative), then PMT may offer useful insights on the sources of preference behind stated WTP (Menzel 2004).

A consequence of PMT is that the respondent's perceptions of the threat of biodiversity loss *jointly* with that of efficacy of the proposed protective action are intuitive evaluation criteria to turn to when considering a payment for biodiversity conservation.

Psychologists have long maintained that PMT is an adequate framework for the investigation of intentions and behaviour with regard to environmental and health risk. We maintain that PMT deserves closer attention from stated preference practitioners because it provides a framework for the understanding of choices when scenarios require respondents to assess threats and their associated ability to cope with such threats. On the other hand, economic theory remains quite uninformative in this respect. Particularly so in view of the fact that a number of recent CV studies have investigated issues associated with private and public risks of various nature, such as global warming (Layton and Brown, 2000), potential benefits from the Kyoto Protocol agreement (Berrens *et al.* 2004), the value of statistical life (Johannesson, Johansson, and O'Conor, 1996; Krupnick *et al.* 2002), of road safety (Garrod *et al.* 2002; Scarpa *et al.* 2001), and of food-safety issues (Buzby, Ready, and Skees 1995; Henson, 1996; Canavari *et al.* 2004).

More specifically, PMT might be of interest to applied economists because it can provide a framework for identification of preference groups in the treatment of heterogeneity.

The structure of the constructs underlying each preference group and the relative dimension of the WTP values across groups can be used as an additional argument to validate this valuation method. Recent efforts in the treatment of heterogeneity have focussed on finite rather than continuous mixing. Validation of non-market estimates based on latent class approaches (finite mixing) have attracted the economists' attention (Provencher *et al*. 2002; Boxall and Adamowicz, 2002; Scarpa *et al.* 2003; Shonkwiler and Shaw, 2003). However, economic theory is silent about the number, sources and sizes of different preference groups, as these issues are not addressed by economics. Latent-class analyses are normally conducted *in the absence* of both a theoretical prediction on the number and structure of classes and of statistical tests capable of discriminating across competing hypotheses. Only statistical *criteria* have been employed so far to get some guidance on this issue (Clogg and Goodman 1984; Wedel and Kamakura 1999), which are often found to be inconclusive in practice (cfr. Scarpa and Thiene 2004).

The advantage of PMT in this context is that not only does it propose a theory for the source of preference, but it also makes predictions on the structure of preference classes and it can be used to develop theoretical validity relations for the WTP values of each group. We hence find it convenient to employ latent class analysis centred on responses to carefully formulated PMT-based questions. The fact that PMT produces clear predictions about how perceptions of respondents should segregate into motivational classes provides analysts with expectations on the outcome of latent class analysis. The empirical analysis in our case supports the claim that such segregation produces a better statistical fit than that achieved by endogenous segregation in the presence or absence of conventional socio-economic covariates.

2 The original structure of PMT

As already mentioned, the appraisal of a threat and that of coping with such a threat (approximately *realism* in an economist's terms) are the main constructs of PMT to predict an intention or behaviour. Both constructs are composed of sub-constructs as illustrated in figure 1 and in what follows.

Threat Appraisal

The appraisal of a *perceived threat* is the result of the evaluation of sub-constructs. These include severity, vulnerability, fear, and the subjective probability of occurrence of the threatening event. In earlier applications of PMT these sub-constructs were combined in a multiplicative fashion (Beck *et al*. 1981). This assumption was later empirically rejected, so it is now often assumed that the relations between these sub-constructs are additive (Wolf, Gregory and Stephan 1986). However, our approach breaks away from this restrictive functional relationship, as we will describe in what follows.

Coping Appraisal

The appraisal of *coping*, instead, is the combined result of evaluating other two sub-constructs, in addition to the cost of the coping action. The first sub-construct is *response efficacy*, that is, the "belief that a recommended action is able to avert an undesirable threat" (Rogers, 1983). The second is *self-efficacy*, or the "beliefs about ability and effort required to carry out a recommended (health) behaviour" (Rogers and Prentice-Dunn, 1997, cited by Houlding and Davidson, 2003). If one cannot conduct the recommended protective action by

oneself and must instead rely on a public agency, then what becomes important is the perception of whether the agency is perceived as trustworthy and able to conduct the recommended action (Shelton and Rogers, 1981).

PMT predicts the following course of reasoning: If one is confronted with a potentially threatening event, first one conducts an individual appraisal of the threat. Then, the coping appraisal follows, focussing on whether the individual or the public agency can cope with it, how so and to which expenses. The combination of threat and coping appraisals leads to the individual choice of a *coping strategy*, which determines *intention* – in our case expressed in the reporting of a WTP in the interview – and ultimately in *action* (the payment of the WTP amount). As a basic principle it is assumed that perceived threat as well as a perceived ability to cope with such threat influence the probability of a given intention or action (Rogers and Prentice-Dunn, 1997).

For the purpose of illustration we consider an extreme example: protection against a potential earthquake. According to PMT one would first consider the severity of an earthquake (e.g. the dimension of damage at one's property and of personal injuries) and its likelihood (e.g. the probability that an earthquake occurs within, say, the next 2, 5, or 10 years). After considering whether there is a possibility to prevent damages and/or injuries from such earthquake, one will assess one's abilities to conduct the possible prevention activity, taking into account the costs of these actions. As a result, one will conduct possible actions to reduce or prevent the potential damaging event or decide to do nothing.

Many empirical studies have been conducted to explore the implications of this theory and results have shown it useful in predicting both intention and action (Beck and Frankel, 1981; Houlding and Davidson, 2003; McClendon and Prentice-Dunn, 2001; Martens, 1999). Further, recent meta-analyses of empirical studies based on PMT show that variables concerning constructs relating to coping appraisal display a relatively superior performance in predicting intention or action than those measuring threat appraisal (Floyd, Prentice-Dunn and Rogers, 2000; Milne, Sheeran, and Orbell, 2000).

Note, however, that PMT does not imply that a highly perceived threat always leads to a higher intention to act upon it. There are also significant interaction effects between threat and coping appraisals that need to be accounted for. These can enhance or detract from the overall outcome due to the single effects. For example, one may perceive the threat to be high, yet associate this with a low coping appraisal. PMT predicts this combination to lead to no action, the so-called "maladaptive behaviour" (Gardner and Stern, 1996; Rogers and Prentice-Dunn, 1997). This despite a perception of high threat alone would induce the expectation of some degree of action.

2.2 PMT coping strategies and expression of WTP

In the light of the above, what we hypothesise in our study is that in formulating the response to the WTP question respondents assess the utility of investing money for preserving biodiversity in developing countries by considering mostly two features:

1) An assessment of the perceived threat to oneself and others in terms of the potential welfare-loss due to the absence of the proposed biodiversity protection policy and
2) perceived coping[2] of the proposed policy to produce the desired level of protection of biodiversity.

Although each of these two constructs is multidimensional in nature, and is treated as such in this empirical study, one can simplify the postulated relationship in a reduced form as follows. Indicate the perceived threat assessment as a factor ranging in the population from a

minimum of $\underline{\theta}$ to a maximum of $\overline{\theta}$ and the assessed efficacy (perceived realism) of the agency as a factor ranging from $\underline{\lambda}$ to $\overline{\lambda}$.

Then, the respondent's subjective assessments of θ and λ jointly determines the coping strategy and, as a consequence, the underlying valuation driving the response to the *WTP* elicitation question. PMT predicts that the joint density values for θ and λ display multi-modality and cluster around focal values consistent with the four prevailing coping strategies.

More explicitly, the theory predicts the existence of four prevailing coping strategies, each accompanied by an established terminology in the literature (table 1).

1) When both values of θ and λ are below certain levels θ^* and λ^* we expect that the individual formulates a low expectation for the utility of the proposed biodiversity conservation policy, so as to express a low or zero valuation. Such group in the PMT literature is called "*no action*", because the perceived utility of the proposed scheme is so low that no action is taken to protect oneself.

2) Conversely, for those individuals who have both threat and efficacy assessments higher than θ^* and λ^*, and are hence focussed on the reduction of the threat, we expect that they formulate a high expectation for the utility of the proposed biodiversity conservation policy. Such group in the PMT literature is called "*problem focussed*", because the perceived utility of the proposed protection policy is at a sufficiently high level to justify a strong valuation.

The remaining two groups are made-up by individuals whose assessments are mixed: they have either $\theta < \theta^*$ and $\lambda > \lambda^*$ or vice-versa. In either case we expect a *WTP* not as high as in the problem-focussed group.

3) If threat is low and coping is high the person has no much motivation to act, or does so with a reduced effort. This coping strategy is termed "*just to be sure*".

4) If threat is assessed as high and at the same time perception of coping is low the person reacts "*maladaptively*". So, the discomfort of a high threat is matched by a feeling of disempowerment. As a consequence, the reaction to the appraisal of the threat is not focussed on its reduction, as this is perceived as not achievable. But it can be – for example – characterised by apparently irrational behaviours, such as trying to endure the threat, or to develop fatalistic attitudes, or to live with fears, anxieties or a feeling of helplessness (Gardener and Stern 1996).

The theory predicts that the intensity of intention (in our case stated *WTP*) leading to the action reducing the threat is higher for respondents adopting the "just to be sure" coping strategy than for those adopting the "maladaptive".

Of course, empirically speaking θ and λ are unobserved multidimensional factors, but they can be derived on the basis of responses to adequately formulated questions. We now illustrate how we have modified PMT survey techniques to this purpose.

2.3 Modification to the CV survey and application of the theory

2.3.1 Modification

For the purpose of this study we departed from the conventional application of PMT, and modified it in some minor points. First, following Martens (1999), *responsibility* was included as an additional construct. This seemed necessary, because PMT was originally developed for health psychology, and as a result it needed adjusting to the purpose of valuing a global public good. While it is quite self-evident that one feels responsible for its own health, in the case of biodiversity conservation it can be argued that the respondent can feel

responsible also for other "entities" beyond oneself – a form of pure altruism. We assume that the degree of responsibility for these additional entities has an impact on both intention and action. Evidence of the effect of responsibility towards others on *WTP* responses in CV was found before under various guises (Blamey 1995, Nyborg 2000, Shiell and Rush 2003). We defined *responsibility* as the extent the respondent feels the duty to contribute to the protection of species in developing countries. (See Appendix for exact wording).

Secondly, we looked at a special form of self-efficacy. This, in conventional applications of PMT, is the ability to act to prevent a threat. In our case we had rather looked at the *perceived result* of paying for the prevention of loss of biodiversity. In other words, *self-efficacy* concerns the respondent's opinion that the required amount the respondents is asked to contribute could have an influence on the protection of biodiversity, and is similar to the *decisiveness* concept that Green *et al.* (1998) find of high relevance in CV survey design.

Finally, *vulnerability*, which is part of the threat construct in PMT, although it was included in the study, resulted in responses that we eventually decided not to employ in the empirical analysis. This because a preliminary investigation persuaded us that respondents were not able to deal with probabilities of threat linked to the loss of biodiversity.

2.3.2 Application

It became apparent in the focus group discussions that loss of biological diversity is not perceived as a direct and current threat for German residents. Thus, the component of threat assessment dealing with *severity* (figure 1) was broadly defined. Current threat was limited to population of developing countries, while threat to the German respondent was investigated in terms of future effects. *Fear* was operationalized in terms of *uneasiness* at the thought of loss of biological diversity and loss of species in developing countries.

Response efficacy was operationalized as the *belief* that 1) species can be protected at all or 2) can be protected in the way proposed in the scenario, respectively. Any single respondent cannot implement a program to conserve species in developing countries. So an important component of realism, *trust in the implementing organisation*, was surveyed as part of the perceived coping. The *costs* result from monetary costs (bid level). For the relation between operationalized PMT constructs and survey questions see figure 2).

3. Latent Class Model of WTP

If PMT is informative in latent class analysis of *WTP* response distributions, then:

1. one should find classes with patterns of responses that could be recognised or reconciled with the PMT classes;
2. the membership probabilities to PMT-defined classes should significantly improve the fit of finite mixing specification of *WTP* distributions in discrete-choice CV responses.

In what follows we outline an econometric approach developed to evaluate such implications in our sample.

3.1 Endogenous WTP classes

The theory underlying the estimation of positive response probability to a given bid amount is well known (Hanemann and Kanninen, 1999; James and Cameron, 1987). Here we focus on the estimation of a finite mixing model of response probability.

In the context of a sample of discrete choice responses to a *WTP* question one can rely on endogenous segmentation techniques to identify homogeneous response classes. Assume there are C classes of responses, each respondents has a probability of membership $\Pr_i(c)$. Then, from the law of total probability, the *marginal* probability of observing a "yes"

response from respondent i at a given bid level t^* can be written as Pr (" *yes* " | $t_i = t^*$) = $\sum_{c \in C} \Pr(c) \Pr_i("yes" | t_i = t^*)$. However, such a model is rarely employed in contingent valuation studies where it is more prevalent to assume that there is a unique, most often unimodal distribution of WTP values in the population, perhaps shifted by socio-economic factors or attitude scores. This is clearly quite restrictive, although justified by the low informational content of binary responses. However, discrete-choice studies that account for finite mixing distributions are increasing in other areas of non-market valuation. The consensus is that it may be an approach worth pursuing when – such as in this case – there are reasons to believe that preferences are clustered around focal values.

Probabilities of membership to groups can be specified either semi-parametrically (Hensher and Greene, 2003; Scarpa and Thiene, 2004), or conditionally on socio-economic covariates (Provencher *et al.* 2002; Scarpa *et al.* 2003; Scarpa *et al.* 2004) and simultaneously estimated with the underlying choice model using full information maximum likelihood. Although the above are the conventional ways to derive membership probabilities, in the approach we employed here they are estimated separately and based on our responses to questions designed to measure PMT constructs. In the empirical analysis we will then compare our approach with the above more conventional ones to validate the role of PMT in identifying *WTP* classes.

3.2 Deriving PMT-based class membership probabilities

In our application the constructs necessary to apply the PMT are probed by means of PMT questions, the answers to which are expressed in a Likert scale. We therefore use a latent-class modelling approach suitable to identify membership probabilities on the basis of such information. Although analyses of this type have a long history and wide scope of application in quantitative psychology (Henry, 1999), this approach is relatively uncommon in economics. Here we follow the approach used by Morey *et al.* (2004) and focus on preference heterogeneity linked to PMT constructs. The intent is first to endogenously identify classes with communalities in response patterns, and the individual membership probability of each respondent to each class. The assumption is that individuals belonging to the same PMT type are more likely to produce similar patterns of response than those belonging to different classes. Secondly, we aim to check whether the observed response patterns of each class are consistent with those predicted to be dominating by PMT. Finally, because class membership is probabilistic, we estimate a willingness to pay model for each of the identified classes, and examine the pattern of mean *WTP* estimates against the features that PMT emphasize being part of each class.

Define $\mathbf{y}_i$ as a $k \times 1$ vector with the observed pattern of responses to k attitudinal questions for individual i. Our objective is that of first estimating the *unconditional probability* of observing a given response to attitudinal question y_{ki}. For all questions we used a 1-5 Likert scale, ranging from expressions of "strong agreement" (score = 1) to "strong *dis*agreement" (score = 5), and a "do not know" response (score = 0), giving a total of six potential responses.

$$\Pr(y_{ki} = j),\ j = 0, 1, 2, 3, 4, 5 \qquad (1)$$

Then we are interested in the same type of probability, but *conditional* on the individual belonging to a given class c.

$$\Pr(y_{ki} = j|c),\ j = 0, 1, 2, 3, 4, 5;\ c = 1, 2, 3, \ldots, C \qquad (2)$$

Where the total number of classes C is to be established on the basis of the empirical outcomes, but it is suggested to have a structure that can be rationalised around four types by PMT. Given class membership the response sequence is assumed to be independent, so that the unconditional response pattern probability is:

$$\Pr(\mathbf{y}_i) = \sum_{c=1}^{C} \Pr(c) \Pr(\mathbf{y}_i \mid c) = \sum_{c=1}^{C} \Pr(c) \prod_{k=1}^{K} \prod_{j=1}^{J} \Pr(y_{ki} = j \mid c) \tag{3}$$

This approach can be extended to condition on socio-economic covariates (gender, education level, household size, etc.), so that the membership probability is also made conditional on socio-economic "types". However, when we used this approach our likelihood values did not substantially improve. So, for the sake of simplicity, and to maintain focus on the main research issue, which is the matching of PMT predicted and observed classes, we omit to discuss the treatment of covariates here.

The objective is to estimate the $(J \times K \times C) - K$ probability parameters that maximize the sample log-likelihood function:

$$\ln L = \sum_{i=1}^{N} \ln\left[\Pr(\mathbf{y}_i)\right] \tag{4}$$

constrained by the adding-up properties of response and class membership probabilities:

$\sum_{c=1}^{C} \Pr(c) \leq 1$ and $\sum_{j=1}^{J} \Pr(y_{ki} = j \mid c) \leq 1$.

The constrained-maximizers of the above log-likelihood are:

$$\Pr(y_{ki} = j \mid c) = \frac{\sum_{i=1}^{N} \Pr(c \mid \mathbf{y}_i) 1(y_{ki} = j)}{\sum_{i=1}^{N} \Pr(c \mid \mathbf{y}_i)} \tag{5}$$

Notice that this is just an estimate of the proportion of responses in class c which took a j Likert value in question k.

The unknown components of the above formula are the class membership probabilities conditional on the pattern of response. These can be promptly derived by Bayes' Law:

$$\Pr(c \mid \mathbf{y}_i) = \frac{\Pr(c) \prod_{k=1}^{K} \prod_{j=1}^{J} \Pr(y_{ki} = j \mid c)}{\Pr(\mathbf{y}_i)} \tag{6}$$

This can be made a function of observables by substituting equation (3) into (6). As illustrated in Morey *et al.* (2004) the estimation can be conveniently achieved by means of the E-M algorithm. Although a number of commercial software packages are available to implement E-M algorithms for the purpose of latent-class analysis, we obtained our results by purpose coding the algorithm in Gauss (available from authors upon request). The first iteration of the E-M algorithm starts with some guess for the individual $\Pr(c|\mathbf{y}_i)$, which are then fed into equation (5). This, in turn, is used to compute the log-likelihood in (3) and (4). The next iteration starts with new updated values obtained using equation (6) and repeats the process. Convergence is achieved when the difference between the difference in the log-likelihood values of iteration T and T-1 is lower than a predetermined threshold (we used 10^{-6}). The process is completed many times (250 in our case) using each time random starting values and only the results associated with the highest log-likelihood are kept. This because the maximization problem is ill-behaved and may achieve only a local maximum, which is a frequent occurrence when the number of latent classes C is high (larger than 3). In our search we allowed up to 7 preference classes.

When the above latent-class estimation is completed, each individual will have an estimated membership probability conditional on her own specific pattern of response $\Pr(c|\mathbf{y}_i)$. We call these PMT-based membership probabilities. The model estimating the probability of a positive discrete response to the proposed bid amount in the contingent

valuation question is formulated as a simple logit random utility model, in which the marginal probability is weighted by the estimated membership probability:

$$\sum_{i=1}^{N} \ln\left[\sum_{c=1}^{C} \Pr(c|\mathbf{y}_i)\pi_i^{\text{yes}}(1\text{-}\pi_i)^{(1\text{-yes})}\right], \text{ where } \pi_i = \frac{\exp(\alpha_c + \beta_c A_i)}{1-\exp(\alpha_c + \beta_c A_i)}, \qquad (7)$$

and A_i is the bid amount offered in the CV question to respondent *i* and "yes" is an indicator function of a positive response to the bid amount. The estimate for mean/median WTP for class *c* is therefore $-\alpha_c/\beta_c$. Notice that each class is associated with a different marginal utility of income $-\beta_c$.

3.3 Criteria for model fit and number of classes

Although the total number of classes *C* with different response patterns to PMT questions is unknown, PMT predicts the presence of four prevalent patterns of responses. From the estimation viewpoint *C* is outside the space of the estimable parameters. Because the parameter values under the null are at the boundary of the parameter space the conventional specification tests used for maximum likelihood estimates (likelihood ratio, Lagrange multipliers and Wald tests) are not valid in this context. The regularity conditions for a limiting chi-square distribution under the null are not satisfied.

Wedel and Kamakura (1999, p. 91) discuss how resampling from the empirical distribution is feasible but very impractical because of the computational complexity it involves. As guidance practitioners have used a variety of information criteria $C = -2\ln L + J\kappa$ where $\ln L$ is the log-likelihood of the model at convergence, *J* is the number of estimated parameters in the model, and κ is a penalty constant. However, these criteria also fail some of the regularity conditions under the null for a valid test under the null (Leroux, 1992). We mention here only a selection. For $\kappa = 2$ we obtain the Akaike Information Criteria (AIC); for $\kappa = \ln(N+1)$ we obtain the *consistent* AIC (cnAIC); for $\kappa = \ln(N)$ we obtain the Bayesian Information Criteria (BIC), which by construction is very similar to the cnAIC. Finally, for $\kappa = 2(J+1)(J+2)/(N-J-2)$ we have the *corrected* AIC (crAIC) (Hurvich and Tsai, 1989), which increases the penalty for the number of extra parameters estimated.

The AIC is reported to over-estimate the number of groups, while the BIC does not do this, asymptotically, although in small sample sizes it tends to favour too few groups (McLachlan and Peel, 2000).

Finally, a criterion that we favour in this context is an entropy index suggested by Wedel and Kamakura:

$$En = 1 - \frac{\sum_{i=1}^{N}\sum_{c=1}^{C} -\Pr(c|\mathbf{y}_i)\ln\left[\Pr(c|\mathbf{y}_i)\right]}{N\ln(C)} \qquad (8)$$

The choice of number of classes that maximizes this criterion is associated with the best separation in terms of individual membership probabilities.

4. Empirical Study

4.1 Survey and data

The population of the survey consists of German residents (native and foreign) aged 18 or older[3]. Because of the large population of German residents (66.4 million) a minimum sample of 1,000 completed questionnaires was set as a target to ensure a sufficiently representative result. A telephone survey was selected as the interview technique, primarily because of limited financial resources. Telephone numbers were generated using the "random

digit dialling method". When contact was established and more than one individual was available at the telephone unit, then the person who most recently had his/her birthday was asked to participate.

In April and May 2001 a total of 12,000 random numbers were dialled. These resulted in 3,675 contacts with persons to whom the screening text was read, 58% of whom refused to participate in an interview. Out of the fraction who did engage in the phone interview only 1.5% dropped out during the administration of the survey. Eventually, a total of 1,017 respondents completed the interview (see table 2) each providing a complete set of the required responses.

Of these 54.7% were women, 45.3% were men. The age group in the sample ranging from 25 to 45 was over-represented and people older than 65 were under-represented with respect to the national proportions (see table 3). Households with three or more than three people were overrepresented whereas one-person-households were highly underrepresented (see table A in Appendix). The average length of the telephone conversation was 16 minutes.

The sample is more or less evenly distributed over different income categories and this seems comparable to the statistics from the last population census, however, as it is always the case, the evaluation of the overall representativeness of the sample is problematic (see table B in Appendix).

The formal education of the sample is hard to compare to the basic population. Data concerning the education of the population are only available for special age groups. According to the PISA-survey[4] 19% between 25 and 64 years hold a university degree. In the sample almost 26% in this age group held a university degree. A university-entrance diploma or an advanced technical college certificate are held by 40% of the population living in Germany.[5] Whereas 46% of the respondents (all older than 18 years old) had reached at least this level of qualification. The sample is hence under-representative of German residents with lower education, perhaps due to a higher rate of drop-off in the screening process.

4.2 Results from latent class analysis

Our intent goes beyond simply addressing the issue of the number of classes, their relative proportions in the population and their individual preference structure. We also wish to identify the extent of the correspondence between the groups predicted by PMT and those empirically identified in the analysis. Further, we wish to learn more about these groups and the features of the implied WTP distribution of each class.

4.3 Choice of questions for response patterns

The survey instrument included a total of 12 questions designed to elicit responses suitable to characterise PMT types. However, interpreting the 6^{12} combinations produced by 12 sets of 6 Likert scale responses is quite a complicated endeavour, even when limited to a number of only 4-6 latent classes. We hence reduced the number of variables by dropping in turn each set of responses to a given question and using as a criterion the impact of such exclusion on the log-likelihood at convergence. If dropping a given set produced a relatively small reduction of the log-likelihood in equation 4, compared to the effects of dropping others, then this was taken as an indication that the set of responses was relatively uninformative. As a consequence the responses to these questions were eliminated. At the end of this lengthy procedure (each convergence required about 7 hours of computing time with 500 random starting points) – whose results are reported in table 4a – we were left with response to questions x2, x4, x8, x9, x11, and x12. (For the values of the goodness of fit criteria for the model including the select group of responses and the model with all responses see table 4b and 4c).

Using these variables we maximize equation 4 varying the number of classes from 2 to 7. Over this range, using the criteria described above, we fail to identify evidence in support of any particular number of classes. The criteria, in fact, did not allow a clear-cut identification of the optimal number of classes.

Because we were primarily interested in informing the number of a finite points in a mixture of WTP distributions another objective was to find the number of PMT-based classes that best explains the *WTP* response model in (7), rather than the patterns of Likert scale responses in equation 4. So, the individual probabilities of class membership that are obtained in the maximizations of the latter were then used in the maximization of equation 7, which explains the distribution of *WTP* in each class. For this equation the average contribution to the sample log-likelihood associated with 5 classes is the highest in the range between 1 to 7 classes (table 5, Model 1).

We report here the mean log-likelihood values at convergence for estimates based on semi-parametric estimation, where only *C*-1 constants are estimated in the logit membership probabilities functions (Model 2); and based on logit membership probabilities conditional on various selections of socio-economic covariates (Models 3 to 5). In particular, we used average household income and age (Model 3), and then we added to these two variables, one dummy for "having visited developing countries" (Model 4) and the "number of children in the respondent's household" (Model 5).

We observe that PMT-based membership probabilities produce better mean log-likelihood values than those produced by other conventional latent class models with logit membership probabilities for classes 2 to 5 (we fail to achieve convergence for any number of classes larger than 5), both when these were specified semi-parametrically in Model 2 (constant only), and conditionally on select co-variates in Model 3 to 5.

Because of the different sample sizes due to missing data on socio-economic covariates it is not possible to formally test specifications, using, for example, the approach by Vuong (1989). However, since "the maximum likelihood of a model is a natural estimator of the distance between the model and the true distribution as measured by the Kullback-Leibler Information Criterion" (Vuong 1989, page 326), we conclude that, with the information in hand, the specification based on 5 PMT classes are best at informing the segmentation of *WTP* distributions in the sample in hand.

4.4 Identified classes and class characteristics

We point the reader to tables 7 and 8 for the predicted probabilities of response to each question in members of each class as predicted by the 5 class model. We therefore focus our attention on the structure of these five and proceed to check that the four classes predicted by PMT are recognizable.

Class A. It is the largest class (39% of the sample), and has the highest mean WTP (€ 36). This class shows a pattern of probability of response consistent with what PMT defines as *problem focused* coping strategy. The probabilities of observing responses in agreement with the perception of threat (X2 and X4), responsibility (X12) and efficacy of the policy (X8, X9, X11) are all high.

Class B. This class is the smallest (3% of the sample) and shows a pattern of response clearly consistent with what PMT defines as *no action* coping strategy, and an attendant estimate of mean WTP of € 3. Probabilities of low scores are high along all dimensions.

Class C. This is an intermediate size class (14% of the sample). The pattern of response probabilities to PMT questions is consistent with what PMT defines as *maladaptive* coping strategy, as members of this class have a very high probability of low scores in all variables, with the exclusion for the severity of threat, which shows a moderate score. The

estimated mean WTP for the class is negative (€ -16), a value consistent with the features of this class, as we will discuss below in more detail.

Class D. This class shows the second highest mean WTP (€ 28) and is the second largest class with (= 22% of the sample). The probabilities of low scores for perceived threat are high especially own-threat. Instead the probabilities of *high* scores on response with high efficacy are high, but those for trust in the implementing organisations and feeling of responsibility are low. The combination of low threat and high perceived coping is consistent with what PMT defines as *just to be sure*.

Class E. Like class D, this class represents 22% of the sample and has an estimated mean WTP of €22. But the pattern of probabilities is dominated by moderate probabilities in high scores of threat perception. Probabilities for high scores with perceived efficacy of the policy are high apart from those on trust on the implementing organisations. High to very high score probabilities are found for responses of high feeling of responsibility for the protection of species in developing countries. As coping and perceived threat are high the class can be labelled as *problem focussed*. However, since the values are not as high as in class A we label it as *moderate problem focussed*.

Table 6 gives an overview of the probabilities of response patterns for the five identified classes.

5. Discussion

5.1 Psychological versus economic rationality

Given the results obtained, what can we conclude with regards to the *behaviour* of the *WTP* distributions associated with each class? Do they reflect anomalous preferences? Let us examine each in turn.

Problem-focussed case

Respondents who behave "problem-focussed" and report high *WTP* values behave rationally from both PMT and economic viewpoints. They perceive a high threat from the loss of biodiversity, they believe that in general the loss of biodiversity can be reduced, and they believe their monetary contribution has a positive impact on the preservation of species. Thus, they are willing to pay a comparable high amount for biodiversity conservation in developing countries. Our data are consistent with such pattern in two of the separate classes we identified empirically: the "problem-focussed" and the one we termed *moderate* "problem-focussed".

No action case

Similarly, the distribution of reported WTP for "no action" respondents' can be considered to be rational in terms of both PMT and economic theory. These respondents do not feel strongly threatened by biodiversity loss and believe that not much can be done in practice to protect biodiversity. Accordingly, they report an average willing to pay amount that is comparatively low.

Just to be sure case

We find that the mean WTP for the distribution of respondents in the class "just to be sure" is lower than that for those in class "problem-focussed", yet higher than that in the "no action" class. This, again, is rational in both PMT and economic theory terms. People who act "just to be sure" although they feel the threat from the loss of biodiversity in developing countries to be low, they do not extend this perception or belief to the possibility of protecting it. They believe species protection in developing countries to be generally viable, especially in terms of effectiveness of their own contribution.

Maladaptive case

Perhaps the most interesting class in terms of interpretation of the associated WTP distribution is the maladaptive class. People of this class express a high perception of threat and a low perception of coping, and are associated with a negative mean WTP. The obvious contradiction of a moderate-to-high threat perception and a negative WTP could be interpreted as an anomaly. However, in our case we can explain it by the low perceived realism, which becomes apparent only because of using the PMT constructs. The surveyed information that these respondents do not believe in the implementation of biodiversity protection or in the power of their own payment provides us the opportunity to interpret the associated *WTP* as the outcome of a rational calculation.

With the identification of the maladaptive class we found evidence for alternative explanations of negative *WTP*. Those negative *WTP* for a public good such as biodiversity conservation would more likely be associated with strategic behaviour or protest responses. Identification and elimination of inconsistencies from the sample has been advocated in the past (e.g. Foster and Mourato, 2002), and would presumably be the conventional course of action. However, the additional articulated information PMT affords on perception of realism provides a plausible reason for such occurrence. Members of the class manifest high levels of scenario rejection due to perceived unrealism, or as psychologist would put it have a low to very low perceived "coping". Furthermore, the latent class approach does not require the always-undesirable elimination of any group of respondents, but it elegantly accommodated all groups in an overarching statistical model.

5.2 Realism

Although during the interview great care was taken to emphasize that money will only be used to fund biodiversity protection, a noticeable proportion of the members of the sample expressed their low realism: they could not be convinced of the possibilities to put the protection of biodiversity in developing countries into practice, did not believe in the credibility of the implementing organisations and/or did not believe their payment would make a contribution to the protection of species. By decomposing realism based on PMT in sub-constructs response-efficacy, trust in implementing organisations and belief in the power of the own payment we get deeper insights in the characteristics of realism. We could identify the *multidimensionality* of realism and the different important of aspects of realism for *WTP*. Surprisingly lack of trust in the implementing organisations did not result in low mean *WTP* in the "problem-focussed" or "just to be sure" classes.

The emphasis in realism research in CVM so far was placed on the respondents' belief in the possibilities to implement the proposed scenario. With our operationalisation of realism we could show the importance in the belief of the power of the own payment for expressed *WTP*, which seems to be kind of ignored in CVM research so far.

6. Conclusions

In this study we emphasised the importance of perceived realism *in combination with* perceived threat as sources of systematic differences across classes of respondents and their mean *WTP* estimates for biodiversity conservation. We were inspired in our investigation by protection motivation theory, a well-established and successful psychological theory. We believe that researchers interested in characterizing the sources of heterogeneity in respondent behaviour should make an effort to bring to bear psychological findings in their economic analysis. In particular, we feel that with so much of the CV literature currently exploring the value of private and public health issues, PMT could represent a promising avenue for insightful findings in rationalising some common CV anomalies.

The empirical evidence produced in our analysis is consistent with the predictions of PMT. The patterns of observed probability of responses associated with each class matches the expectations built on such theory, and so do the relative magnitudes of mean WTP for the value distribution in each class. There is much appeal in a theory that can predict the structure of a finite number of classes, especially in view of the poor guidance available from statistical criteria suitable to discriminate between competing hypotheses on class compositions in discrete choice models.

Looking at the characteristics of the identified classes and according to the PMT helped to understand reported WTP of class members. We can summarise that a very low perceived threat as well as low self-efficacy and responsibility resulted in a very low mean WTP – as predicted by PMT. Additionally, high scores for responsibility and self-efficacy are associated with high mean WTP.

Furthermore, the theory predicts that high threat in combination with low coping results in maladaptive behaviour. We could identify this effect very clearly with negative WTP for the class identified as "maladaptive".

Similarly, to other PMT applications (Milne *et al*. 2000) we have evidence that perceived coping (response efficacy & self-efficacy) is more influential than perceived threat (severity & fears). In fact, the level of reported WTP is lower when perceived coping is low than when our measure of perceived threat is low. The suggestion is that self-efficacy has a higher influence on WTP than fear.

In the case of payments for biodiversity protection the application of PMT made different forms of perceived realism apparent for stated *WTP*. Whether the respondents perceive the production of the good in question as plausible or not and whether the own payment is perceived as important for the production of the good in question plays a key role for stated *WTP*. In our case a class of people could be identified which did not believe in species protection in the described way or biodiversity protection in general as possible, or they did not believe in the power of their own payment. However, we can conclude that even the members of this group expressed well-behaved preferences in terms of their rationality.

Powe and Bateman (2004) have already emphasised perceived realism in the construction of CV surveys. We present further empirical evidence for the importance of realism and highlight its multidimensionality. Self-efficacy and response-efficacy, as components of realism, should be examined in the design phase of CV studies and the main survey. Using PMT enables researcher to find an appropriate wording for questions to measure the different aspects of realism. A good wording is found when respondents do not realise that it is intended to test whether they believe in the scenario or not. If reasons for low realism are detected in the design phase of CV studies, then this needs to be amended. Additionally, in the main survey respondents could be allowed to ask for extra information after the standard scenario presentation (see Fischer, 2004). Furthermore, respondents' belief in the effects of their payment contribution ought to be measured in early stages of the interview to possibly strengthen the trust of respondents in the power of their own actions.

7. References

Ajzen, I. 1999. "The Theory of Planned Behavior." *Organizational Behavior And Human Decision Processes* 50: 179-211.

Ajzen, I., & Fishbein, M. 1980. *Understanding Attitudes and Predicting Social Behavior*. Englewood Cliffs, NJ: Prentice-Hall.

Ajzen, I., and B. L. Driver. 1992. "Contingent Value Measurement: On the Nature and Meaning of Willingness-to-pay." *Journal of Consumer Psychology* 1: 297-316.

Ajzen, I., T. C. Brown, and L. H. Rosenthal. 1996. "Information Bias in Contingent Valuation: Effects of Personal Relevance, Quality of Information, and Motivational Orientation." *Journal of Environmental Economic and Management* 30: 43-57.

Barro, S.C., M.J. Manfredo, T.C. Brown, and G.L. Peterson. 1996. "Examination of the Predictive Validity of CVM Using an Attitude-behavior Framework." *Society and Natural Resources* 9 (2): 111-124.

Beck, K.H., and A. Frankel. 1981. "A Conceptualization of Threat Communications and Protective Health Behavior." *Social Psychology Quarterly* 44 (3): 204-217.

Berrens, R., A. Bohara, H. Jenkins-Smith, C. Silva, and D. Weimer. 2004." Information and Effort in Contingent Valuation Surveys: Application to Global Climate Change using National Internet Samples". *Journal of Environmental Economics and Management* 47: 331-363.

Bishop, R. C. 2003. "Where to from here?" Chapter 14 in *A Primer in Nonmarket Valuation*, ed P. A. Champ, K. J. Boyle and T. C. Brown, Kluwer Academic Publisher.

Bishop, R. C., and T. A. Heberlein. 1986. "Does Contingent Valuation Work?" In *Valuing Environmental Goods: A State of the Art Assessment of the Contingent Valuation Method*, ed. R. G. Cummings, D.S. Brookshire, and W. D. Schultze, Rowman and Allanheld: Totowa.

Blamey, R. 1998. "Contingent Valuation and the Activation of Environmental Norms." *Ecological Economics* 24 (1):47-72.

Boxall, P., and W. Adamowicz. 2002." Understanding Heterogeneous Preferences in Random Utility Models: a Latent Class Approach." *Environmental and Resource Economics* 23 (4): 421-446.

Buzby, J.C., Ready, R.C., and J.R. Skees 1995. "Contingent Valuation in Food Policy Analysis: A Case Study of a Pesticide-Residue Risk Reduction." *Journal of Agricultural and Applied Economics* 27(2): 613-25.

Canavari, M., Nocella P., and R. Scarpa 2004. Stated Willingness-to-pay for Organic Fruit and Pesticide Ban: an Evaluation Using both Web-based and Face-to-face Interviewing. Forthcoming in *Journal of Food Products Marketing*.

Carson R. I., and R.C. Mitchell 1989. *Using Surveys to Value Public Goods: The Contingent Valuation Method*. Resources for the Future: Washington DC.

Carson, R. T. 1998. "Valuation of Tropical Rainforests: Philosophical and Practical Issues in the Use of Contingent Valuation." *Ecological Economics* 24 (1): 15-29.

Clogg, C., and L. Goodman 1984. "Latent Structure Analysis of a Set of Multidimensional Contingency Tables." *Journal of the American Statistical Association* 79 (388), 762-771.

Cummings, R. G., and L.O. Taylor. 1998." Does Realism Matter in Contingent Valuation Surveys?" *Land Economics* 74, 2: 203-215.

DuBourg, W. R., M. W. Jones-Lee, and G. Loomes. 1997. “Imprecise Preferences and Survey Design in Contingent Valuation.” *Economica* 64 (256): 681-702.

Fischer, A. (2004). *Decision Behaviour and Information Processing in Contingent Valuation Surveys - an Economic Psychological Analysis of Impacts on Environmental Valuation*. Berlin: dissertation.de.

Floyd, D. L., S. Prentice-Dunn, and R. W. Rogers. 2000. “A Meta-Analysis of Research on Protection Motivation Theory.” *Journal of Applied Social Psychology* 20 (2): 407-429.

Foster, V., and S. Mourato. 2002. ”Elicitation Format and Sensivity of Scope.” *Environmental and Resource Economics* 24: 141-160.

Gardner, G.T., and P. C. Stern. 1996. *Environmental Problems and Human Behavior*. Boston: Allyn and Bacon.

Garrod, G. D., Scarpa, R., and K. G. Willis. 2002. “Estimating The Benefits of Traffic Calming on Through Routes: A Choice Experiment Approach.” *Journal of Transport Economics and Policy* 36(2): 211-231.

Green, D., K. E. Jacowitz, D. Kahneman, and D. McFadden. 1998. “Referendum Contingent Valuation, Anchoring, and Willingness to Pay for Public Goods.” *Resource and Energy Economics* 20: 85-116.

Hanemann, M. W., and B. Kanninen. 1999. “The Statistical Analysis of Discrete-Response CV Data.” In *Valuing Environmental Preferences ed.* Bateman I. and G. K. Willis. Oxford University Press, p.302-441.

Hass, J.W., G. S. Bagley, and R. W. Rogers. 1975. “Coping with the Energy Crisis: Effects of Fear Appeals upon Attitudes toward Energy Consumption.” *Journal of Applied Psychology* 60 (6): 754-756.

Hensher, D., and W. Greene. 2003. *A Latent Class Model for Discrete Choice Analysis:Contrasts with Mixed Logit.* In Transportation Research Part B 37, 681–698.

Henson, S. 1996. “Consumer Willingness to Pay for Reductions in the Risk of Food Poisoning in the UK.” *Journal of Agricultural Economics* 47 (3): 403-20.

Henry, N. W. “Latent Structure Analysis at Fifty.” Available on-line at: http://www.people.vcu.edu/~nhenry/LSA50.htm.

Hoehn, J. P., and A. Randall. 1987. "A Satisfactory Benefit Cost Indicator from Contingent Valuation." *Journal of Environmental Economics and Management* 14(June): 226-47.

Houlding, C., and R. Davidson. 2003. “Beliefs as Predictors of Condom Use by Injecting Drug Users in Treatment.” *Health Education Research* 18: 145-155.

Hurvich, C.M., and Tsai, C.-L. 1989. “Regression and Time Series Model Selection in Small Samples.” *Biometrika* 76: 297-307.

Johannesson, M., P.-O. Johansson, and R. M. O'Conor. 1996. "The Value of Private Safety Versus the Value of Public Safety." *Journal of Risk and Uncertainty* 12: 263-275.

Kahneman, D., and J. L. Knetsch . 1992. “Valuing Public Goods: The Purchase of Moral Satisfaction.” *Journal of Environmental Economics and Management* **22**: 57-70.

Kerr, G. N., and R. Cullen. 1995. “Public Preferences and Efficient Allocation of a Possum-control Budget.” *Journal of Environmental Management* 43: 1-5.

Krupnick, A., Alberini, A., Cropper, M., Simon, N., O’Brien, B., Goeree, R., and M. Heintzelman. 2002. “Age, Health, and the Willingness to Pay for Mortality Risk Reductions: A Contingent Valuation Survey of Ontario Residents.” *Journal of Risk and Uncertainty* 24 (2): 161-186.

Layton, D. F., and G. Brown. 2000. “Heterogeneous Preferences Regarding Global Climate Change.” *The Review of Economics and Statistics* 82 (4): 616–624.

Martens, T. 1999. *Kognitive und affektive Bedingungen von Umwelthandeln*. Berlin: dissertation.de.

Martens, T., and J. Rost. 1998: „Der Zusammenhang von wahrgenommener Bedrohung durch Umweltgefahren und der Ausbildung von Handlungsintentionen.“ *Zeitschrift für Experimentelle Psychologie* 45 (4): 345-364.

McClendon, B.T., and S. Prentice-Dunn. 2001: “Reducing Skin Cancer Risk: an Intervention Based on Protection Motivation Theory.” *Journal of Health Psychology* 6 (3): 321-328.

McLachlan, G., and Peel D. 2000. *Finite Mixture Models*. New York: Jon Wiley and Sons.

Menzel, S. 2004. *Der ökonomische Wert der Erhaltung von Biodiversität - Die Herausforderung seiner empirischen Erfassung zur Abschätzung internationaler Transferzahlungen*. Berlin: dissertation.de.

Milne, S., P. Sheeran, and S. Orbell. 2000. “Prediction and Intervention in Health-Related Behavior: A Meta-Analytic Review of Protection Motivation Theory.” *Journal of Applied Social Psychology* 30 (2): 106-143.

Morey, E., Thacher J., and Breffle W. 2004. “Using Angler Characteristics and Attitudinal Data to Identify Environmental Preference Classes: A Latent-Class Model.” Forthcoming in *Environmental and Resource Economics*.

Nyborg, K. 2000. “Homo Economicus and Homo Politicus: Interpretation and Aggregation of Environmental Values.” *Journal of Economic Behavior and Organization* 42: 305-322.

Payne, J. W., and J. R. Bettman. 1993. *The Adaptive Decision Maker*. New York: Cambridge University Press.

Perrings, C. 1995. “Economic Values of Biodiversity.” In *Global Biodiversity Assessment* ed. Heywood, V. H., and R.T. Watson, published for the United Nations Environmental Programme. p. 823-914.

Pouta, E., and M. Rekola. 2001. “The Theory of Planned Behavior in Predicting Willingness to Pay for Abatement of Forest Regeneration.” *Society and Natural Resources* 14: 93–106.

Powe, N. A., and I. J. Bateman. 2004. “Investigating Insensitivity to Scope: A Split-Sample Test of Perceived Scheme Realism.” *Land Economics* 80 (2): 258-271.

Provencher, B., K. A. Baerenklau, and R. C. Bishop. 2002. “A Finite Mixture Logit Model of Recreational Angling with Serially Correlated Random Utility.” *American Journal of Agricultural Economics* 84 (4): 1066-1075.

Rogers, R.W. 1983. “Cognitive and Physiological Processes in Fear Appeals and Attitude Change: A Revised Theory of Protection Motivation” In *Social Psychophysiology: a Source Book* ed. J.T. Cacioppo, and R.E. Petty. New York: Guilford.

Rogers, R.W., and S. Prentice-Dunn. 1997. “Protection Motivation Theory” In *Handbook of Health Behavior Research* ed. D.S. Gochman. New York: Plenum Press.

Scarpa, R., and M. Thiene. 2004. *Destination choice models for rock-climbing in the North-Eastern Alps: a latent-class approach based on intensity of participation.* EAERE conference Budapest, June 25th-28th, 2004.

Scarpa, R., Kenneth G. W., and M. Acutt. (forthcoming) 2004. “Individual-specific welfare measures for public goods: a latent class approach to residential customers of Yorkshire Water.” Chapter 14 in: *Econometrics Informing Natural Resource Management*, Chapter 14. ed. P. Koundouri. Edward Elgar Publisher

Scarpa, R., Willis, K. G., and G. D. Garrod. 2001. “Estimating WTP for Speed Reduction from Dichotomous-Choice CV Responses with Follow-up: The Case of Rural

Trunk Roads." *Environmental and Resource Economics*. December, 20(4): 281-304.

Schkade, D. A., and J. W. Payne. 1994. "How People Respond to Contingent Valuation Questions: a Verbal Protocol Analysis of Willingness to Pay for an Environmental Regulation." *Journal of Environmental Economics and Management* 26: 88-109.

Shelton, M. L., and R. W. Rogers. 1981. "Fear-Arousing and Empathy-Arousing Appeals to Help." *Journal of Applied Social Psychology* 11: 366-378.

Shiell, A., and Rush, B. 2003. "Can Willingness to Pay Capture the Value of Altruism? An Exploration of Sen's Notion of Commitment." *Journal of Socio-Economics* 32: 647-660.

Shonkwiler, J. S., and Shaw W. D. 2003. "A Finite Mixture Approach to Analyzing Income Effects in Random Utility Models: Reservoir Recreation along the Columbia River, Chapter 13 In *The New Economics of Outdoor Recreation.* ed. N. Hanley, D. Shaw, and R. Wright. Edward Elgar publisher, p. 242-268.

Spash, C. L., and N. Hanley. 1995. "Preferences, Information and Biodiversity Preservation." *Ecological Economics*, 12: 191-208.

Wedel, M., and W. A. Kamakura. 1999. *Market Segmentation - Conceptual and Methodological Foundations.* vol 2. Boston et al.: Kluwer.

Wolf, S., W. L. Gregory, and W. G. Stephan. 1986. "Protection Motivation Theory: Predictions of Intentions to Engage in Anti-Nuclear War Behaviors." *Journal of Applied Social Psychology* 16: 310-321.

8. Appendix:

x1 = “The loss of biodiversity in developing countries will in the long run affect the living conditions of **people living in developing countries”**
x2 = inverted “The loss of biodiversity in developing countries will – if at all – derogate a few **people on earth.”**
x3 = “The loss of biodiversity in developing countries will negatively affect the living conditions of **future generations.”**
x4 = “The loss of biodiversity in developing countries will not derogate **me personally. ”**
x5 = “The extinction of 50.000 animal and plant species does contribute to the danger/endangerment of the ecological equilibrium of the earth.”
x6 = “I have a bad feeling, when I hear that animal and plant species are going to be extinct.”
x7 = „It is a pity when 50.000 animal and plant species become extinct in developing countries.“
x8 = “With advices and financial support from developed countries half of endangered plant and animal species can be protected. “
x9 = “The governmental and non-governmental organisations, who are trying to protect animal and plant species are confidential/trustable. “
x10 = “It is possible to reduce the extinction of species in developing countries. “
x11 = “Payer” (1) „Even my payment matters for the protection of species in developing countries “
”not payer” (2) „A payment from me would not matter for the protection of species in developing countries. “
x12 = “I am as well responsible for the protection of 50,000 endangered species in developing countries.”

Appendix : Tables

Table A: Household size in sample und basic population

	Valid Percent (sample)	Percent (basic population)
1-personhouseholds	19.4	36.7
2-personshouseholds	31.2	33.7
3-personshouseholds	17.1	14.2
4-personshouseholds	20.3	11.1
5 and more personshouseholds	12	4.2

Sources: own survey and Federal Statistical Office Germany (available at http://www.destatis.de/basis/d/bevoe/bevoetab11.php)

Table B: Household income in sample und basic population

	Sample			**Basic population**	
Income categories (in €)	Frequency	Percent	Valid percent	Income categories (in €)	Percent
< 900 Euro	127	12	**16**	< 920	**16.7**
900 - 1.250 Euro	107	11	**13**	920-1534	**27.7**
1.251- 1.600 Euro	138	14	**17**		
1.601 – 2.000 Euro	124	12	**16**	1534-2556	**32.5**
2.001 – 2.500 Euro	107	11	**14**		
> 2.500 Euro	197	19	**25**	>2556	**22.9**
total	**800**	**77**	**100**		
Do not know/ no statement	217	21			

(*Sources: own survey and Federal Statistical Office Germany, Datenreport 2002, S. 212)*

Table 1: Coping strategies of PMT (source: Rogers and Prentice-Dunn 1997)

		Threat	
		high	low
Coping	high	Problem focused	Just to be sure
	low	Maladaptive	No action

Table 2: Sample report

	Cases	Percentages
Telephone-Number Total	12000	100.0%
neutral outfalls	5177	43.1%
No connection	4537	37.8%
wrong connection / number has changed	83	0.7%
business telephone number	557	4.6%
Revised Gross I	6823	100.0%
other outfalls	3148	46.1%
no connection tone, no contact	1701	24.9%
busy	86	1.3%
answering machine / mailbox	601	8.8%
fax machine/ modem (whistle)	541	7.9%
strong communication problems	219	3.2%
Revised Gross II	3675	100.0%
not neutral outfalls	2658	72.3%
cancelled appointments	41	1.1%
person not available in given time period (10 contact attempts)	427	11.6%
refusals	2135	58.1%
drop outs	55	1.5%
Realised Interviews	1017	27.7%

Source: own research and own calculations

Table 3: Percentages of people in age groups in sample and basic population

	Percent of sample	Percent of basic population
15(18)-25	15	13
25-45	45	36
45-65	29	31
65+	12	20

Source: own research and own calculations

Data for basic population: Federal Statistical Office (Germany), 2002.

Table 4a: log likelihood with and without dropping of each variable for the different class cases (variables in bold were kept in the final analysis)

	4 classes	**5 classes**	**6 classes**	**7 classes**
Complete set	*-13976.49*	*13890.72*	*13810.82*	*13747.32*
Omitting X1	-12997.30	-12917.50	-12848.51	-12795.75
Omitting X2	**-12614.87**	**-12543.84**	**-12482.92**	**-12422.75**
Omitting X3	-13132.33	-13041.83	-12983.47	-12983.47
Omitting X4	**-12455.97**	**-12378.39**	**-12303.14**	**-12303.14**
Omitting X5	-12779.93	-12709.15	-12643.22	-12643.22
Omitting X6	-13266.43	-13181.35	-13108.89	-13108.89
Omitting X7	-13493.21	-13412.92	-13339.38	-13339.38
Omitting X8	**-12634.70**	**-12562.50**	**-12499.20**	**-12499.20**
Omitting X9	**-12496.50**	**-12421.20**	**-12362.10**	**-12362.10**
Omitting X10	-12879.30	-12800.90	-12741.60	-12741.60
Omitting X11	**-12579.00**	**-12499.30**	**-12435.40**	**-12435.40**
Omitting X12	**-12750.20**	**-12673.50**	**-12602.30**	**-12602.30**

Table 4b: Goodness of fit criteria for model including the select group of Likert responses (x2, x4, x8, x9, x11, x12) for cases of 2-7 classes

Classes	log-lik.	AIC	CAIC_J	AIC_C	Entropy
2	-8764.63	17525.26	17543.11	17519.26	0.5597
3	-8644.10	17282.20	**17308.98**	**17274.20**	0.5959
4	-8595.06	17182.12	18713.75	17305.55	0.6526
5	-8552.59	17095.19	19009.73	17301.81	0.6738
6	-8517.47	17022.93	19320.38	17343.79	0.7214
7	**-8484.93**	**16955.85**	19636.21	17430.08	**0.7312**

Table 4c: Goodness of fit criteria for model with all variables

Classes	log-lik.	AIC	BIC	AIC_C	Entropy
2	-14306.28	28608.57	29443.52	28641.56	0.751
3	-14090.47	28174.94	**29427.37**	28253.84	0.7512
4	-13976.49	27944.99	29476.4	28068.41	0.7690
5	-13890.73	27771.45	29685.72	27978.08	0.7638
6	-13810.82	27609.63	29906.75	**27930.48**	0.7919
7	**-13747.32**	**27480.65**	30160.62	27954.87	**0.8037**

Table 5: Comparisons of mean log-likelihood values across latent class *WTP* logit models

		Model1	Model 2	Model 3	Model 4	Model 5
classes	PJ	PMT-based	Constant-only	HH_INC+AGE	+knowdev	+kids
2	5	-0.5844	-0.6216	-0.5896	-0.5872	-0.5767
3	8	-0.5224	-0.6215	-0.5838	-0.5773	-0.5742
4	11	-0.5451	-0.6213	-0.5812	-0.5741	-0.5622
5	14	-0.5183	-0.6207	-0.5799	-0.5537	-0.5279
6	17	-0.5293	n.a.	n.a.	n.a.	n.a.
7	20	-0.5345	n.a.	n.a.	n.a.	n.a.

Table 6: Table: Probabilities of “I completely agree” plus “I fairly agree” answers to PMT questions for members of the five classes

	A	**B**	**C**	**D**	**E**
N	392	35	142	221	227
%	39	3	14	22	22
WTP	36	3	-16	28	21
Threat					
Severity – others	0.8	0.54	0.54	0.51	0.77
Severity – self	0.76	0.22	0.38	0.27	0.6
Coping					
response efficacy	0.81	0.47	0.26	0.7	0.73
Trust in organisations	0.45	0.2	0.2	0.3	0.36
Self efficacy	0.83	0.23	0.22	0.73	0.65
Responsability	0.91	0.48	0.33	0.59	0.8
PMT group	Problem focussed	No action	Maladaptive	Just to be sure	Moderate problem focussed

Legend:

> 0.75	0.6 – 0.76	0.45-0,59	0.3-0.44	< 0.29

Figure 1: Structure of PMT including choice of coping strategy (adapted from Gardener and Stern, 1996)

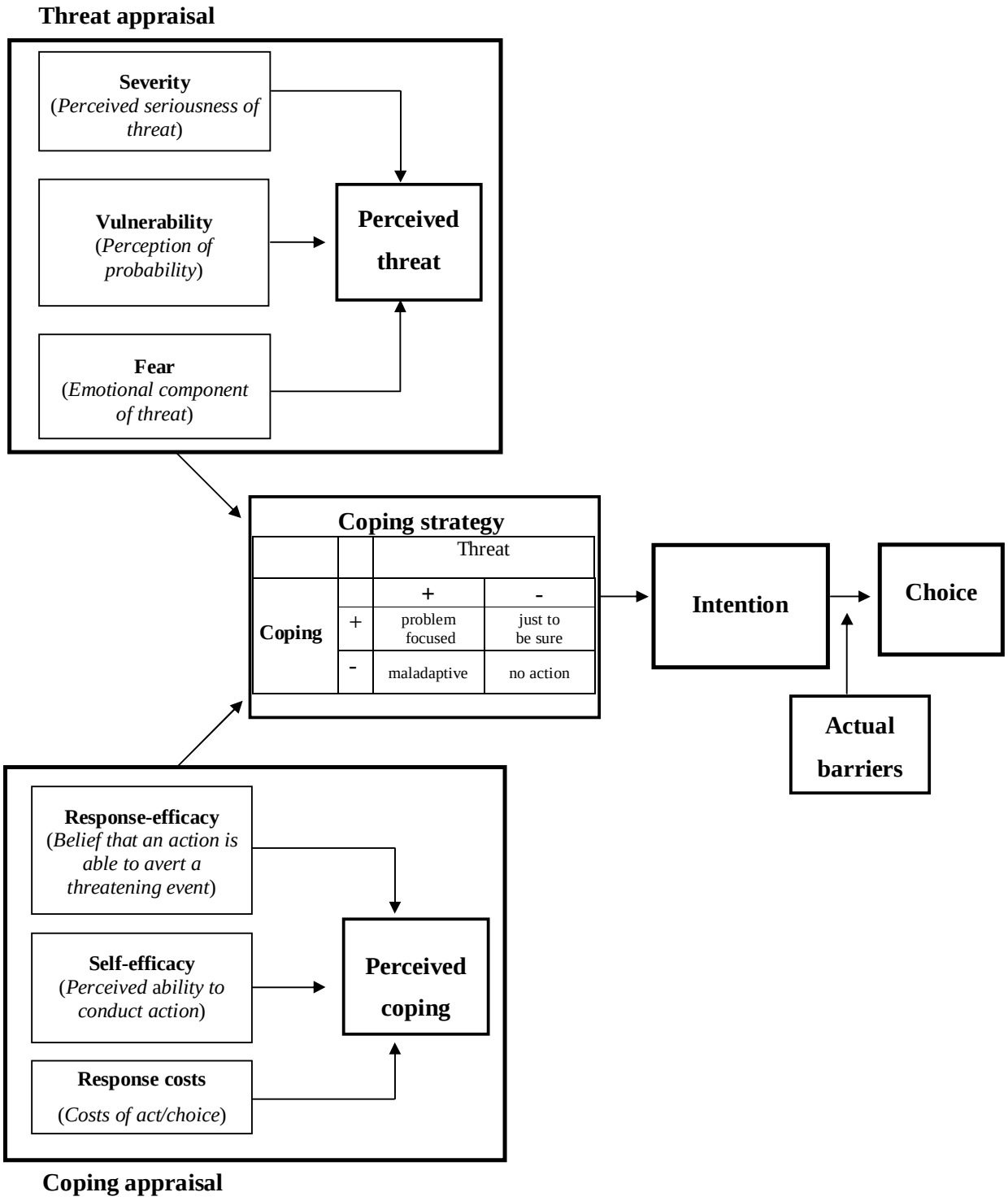
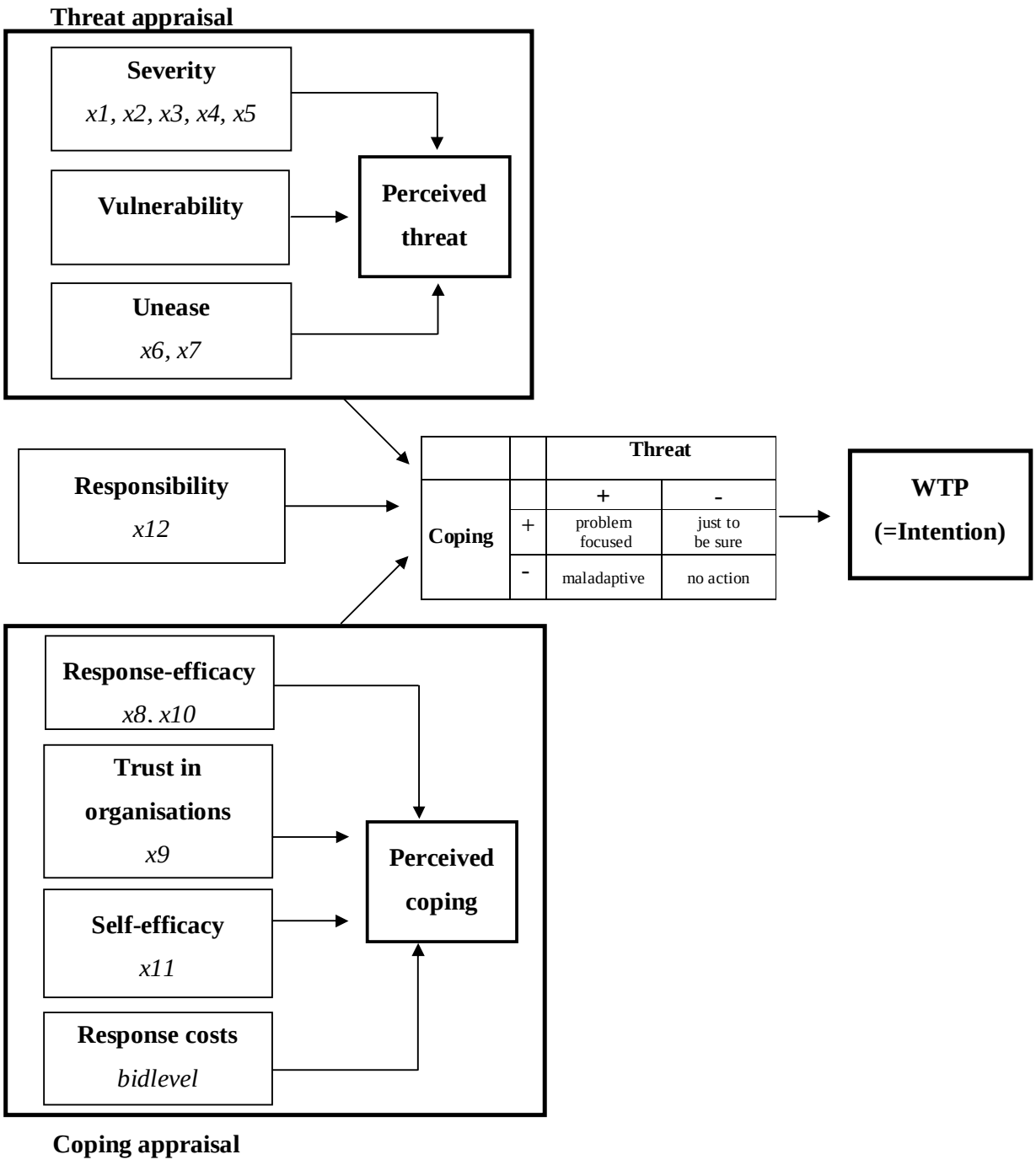


Figure 2: Theory's constructs and variables of survey



[1] Although for incentive-compatibility Green et al. (1998) note that the payment vehicle must be decoupled, that is, "if a good is provided, then its cost will be distributed across all consumers by a formula (such as an income tax) surcharge that does not depend on the subject's CV response." (page 88).

[2] Short of cost considerations this maps into "perceived realism" in an economist's terms.

[3] One part of the basic population is its eligible voters. In Germany people are eligible to vote when they turn 18. 1998: 60.8 million (1998). (Federal Statistical Office, Bundeswahlleiter). The other part of the basic population are the foreigners, who are 5.775 million (2001), 5.561million (1998) people aged 18 and older (Federal Statistical Office)

[4] OECD: http://www.oecd.org/pdf/M00036000/M00036064.pdf

[5] Federal Statistical Office http://www.destatis.de/basis/d/biwiku/bildab1.htm

NOTE DI LAVORO DELLA FONDAZIONE ENI ENRICO MATTEI

Fondazione Eni Enrico Mattei Working Paper Series

Our Note di Lavoro are available on the Internet at the following addresses:

http://www.feem.it/Feem/Pub/Publications/WPapers/default.html
http://www.ssrn.com/link/feem.html

NOTE DI LAVORO PUBLISHED IN 2004

IEM	1.2004	*Anil MARKANDYA, Suzette PEDROSO and Alexander GOLUB*: Empirical Analysis of National Income and So2 Emissions in Selected European Countries
ETA	2.2004	*Masahisa FUJITA and Shlomo WEBER:* Strategic Immigration Policies and Welfare in Heterogeneous Countries
PRA	3.2004	*Adolfo DI CARLUCCIO, Giovanni FERRI, Cecilia FRALE and Ottavio RICCHI:* Do Privatizations Boost Household Shareholding? Evidence from Italy
ETA	4.2004	*Victor GINSBURGH and Shlomo WEBER:* Languages Disenfranchisement in the European Union
ETA	5.2004	*Romano PIRAS:* Growth, Congestion of Public Goods, and Second-Best Optimal Policy
CCMP	6.2004	*Herman R.J. VOLLEBERGH:* Lessons from the Polder: Is Dutch CO2-Taxation Optimal
PRA	7.2004	*Sandro BRUSCO, Giuseppe LOPOMO and S. VISWANATHAN* (lxv): Merger Mechanisms
PRA	8.2004	*Wolfgang AUSSENEGG, Pegaret PICHLER and Alex STOMPER* (lxv): IPO Pricing with Bookbuilding, and a When-Issued Market
PRA	9.2004	*Pegaret PICHLER and Alex STOMPER* (lxv): Primary Market Design: Direct Mechanisms and Markets
PRA	10.2004	*Florian ENGLMAIER, Pablo GUILLEN, Loreto LLORENTE, Sander ONDERSTAL and Rupert SAUSGRUBER* (lxv): The Chopstick Auction: A Study of the Exposure Problem in Multi-Unit Auctions
PRA	11.2004	*Bjarne BRENDSTRUP and Harry J. PAARSCH* (lxv): Nonparametric Identification and Estimation of Multi-Unit, Sequential, Oral, Ascending-Price Auctions With Asymmetric Bidders
PRA	12.2004	*Ohad KADAN* (lxv): Equilibrium in the Two Player, k-Double Auction with Affiliated Private Values
PRA	13.2004	*Maarten C.W. JANSSEN* (lxv): Auctions as Coordination Devices
PRA	14.2004	*Gadi FIBICH, Arieh GAVIOUS and Aner SELA* (lxv): All-Pay Auctions with Weakly Risk-Averse Buyers
PRA	15.2004	*Orly SADE, Charles SCHNITZLEIN and Jaime F. ZENDER* (lxv): Competition and Cooperation in Divisible Good Auctions: An Experimental Examination
PRA	16.2004	*Marta STRYSZOWSKA* (lxv): Late and Multiple Bidding in Competing Second Price Internet Auctions
CCMP	17.2004	*Slim Ben YOUSSEF:* R&D in Cleaner Technology and International Trade
NRM	18.2004	*Angelo ANTOCI, Simone BORGHESI and Paolo RUSSU* (lxvi): Biodiversity and Economic Growth: Stabilization Versus Preservation of the Ecological Dynamics
SIEV	19.2004	*Anna ALBERINI, Paolo ROSATO, Alberto LONGO and Valentina ZANATTA:* Information and Willingness to Pay in a Contingent Valuation Study: The Value of S. Erasmo in the Lagoon of Venice
NRM	20.2004	*Guido CANDELA and Roberto CELLINI* (lxvii): Investment in Tourism Market: A Dynamic Model of Differentiated Oligopoly
NRM	21.2004	*Jacqueline M. HAMILTON* (lxvii): Climate and the Destination Choice of German Tourists
NRM	22.2004	*Javier Rey-MAQUIEIRA PALMER, Javier LOZANO IBÁÑEZ and Carlos Mario GÓMEZ GÓMEZ* (lxvii): Land, Environmental Externalities and Tourism Development
NRM	23.2004	*Pius ODUNGA and Henk FOLMER* (lxvii): Profiling Tourists for Balanced Utilization of Tourism-Based Resources in Kenya
NRM	24.2004	*Jean-Jacques NOWAK, Mondher SAHLI and Pasquale M. SGRO* (lxvii):Tourism, Trade and Domestic Welfare
NRM	25.2004	*Riaz SHAREEF* (lxvii): Country Risk Ratings of Small Island Tourism Economies
NRM	26.2004	*Juan Luis EUGENIO-MARTÍN, Noelia MARTÍN MORALES and Riccardo SCARPA* (lxvii): Tourism and Economic Growth in Latin American Countries: A Panel Data Approach
NRM	27.2004	*Raúl Hernández MARTÍN* (lxvii): Impact of Tourism Consumption on GDP. The Role of Imports
CSRM	28.2004	*Nicoletta FERRO:* Cross-Country Ethical Dilemmas in Business: A Descriptive Framework
NRM	29.2004	*Marian WEBER* (lxvi): Assessing the Effectiveness of Tradable Landuse Rights for Biodiversity Conservation: an Application to Canada's Boreal Mixedwood Forest
NRM	30.2004	*Trond BJORNDAL, Phoebe KOUNDOURI and Sean PASCOE* (lxvi): Output Substitution in Multi-Species Trawl Fisheries: Implications for Quota Setting
CCMP	31.2004	*Marzio GALEOTTI, Alessandra GORIA, Paolo MOMBRINI and Evi SPANTIDAKI:* Weather Impacts on Natural, Social and Economic Systems (WISE) Part I: Sectoral Analysis of Climate Impacts in Italy
CCMP	32.2004	*Marzio GALEOTTI, Alessandra GORIA ,Paolo MOMBRINI and Evi SPANTIDAKI:* Weather Impacts on Natural, Social and Economic Systems (WISE) Part II: Individual Perception of Climate Extremes in Italy
CTN	33.2004	*Wilson PEREZ:* Divide and Conquer: Noisy Communication in Networks, Power, and Wealth Distribution
KTHC	34.2004	*Gianmarco I.P. OTTAVIANO and Giovanni PERI* (lxviii): The Economic Value of Cultural Diversity: Evidence from US Cities
KTHC	35.2004	*Linda CHAIB* (lxviii): Immigration and Local Urban Participatory Democracy: A Boston-Paris Comparison

KTHC	36.2004	*Franca ECKERT COEN and Claudio ROSSI* (lxviii): Foreigners, Immigrants, Host Cities: The Policies of Multi-Ethnicity in Rome. Reading Governance in a Local Context
KTHC	37.2004	*Kristine CRANE* (lxviii): Governing Migration: Immigrant Groups' Strategies in Three Italian Cities – Rome, Naples and Bari
KTHC	38.2004	*Kiflemariam HAMDE* (lxviii): Mind in Africa, Body in Europe: The Struggle for Maintaining and Transforming Cultural Identity - A Note from the Experience of Eritrean Immigrants in Stockholm
ETA	39.2004	*Alberto CAVALIERE:* Price Competition with Information Disparities in a Vertically Differentiated Duopoly
PRA	40.2004	*Andrea BIGANO and Stef PROOST:* The Opening of the European Electricity Market and Environmental Policy: Does the Degree of Competition Matter?
CCMP	41.2004	*Micheal FINUS* (lxix): International Cooperation to Resolve International Pollution Problems
KTHC	42.2004	*Francesco CRESPI:* Notes on the Determinants of Innovation: A Multi-Perspective Analysis
CTN	43.2004	*Sergio CURRARINI and Marco MARINI:* Coalition Formation in Games without Synergies
CTN	44.2004	*Marc ESCRIHUELA-VILLAR:* Cartel Sustainability and Cartel Stability
NRM	45.2004	*Sebastian BERVOETS and Nicolas GRAVEL* (lxvi): Appraising Diversity with an Ordinal Notion of Similarity: An Axiomatic Approach
NRM	46.2004	*Signe ANTHON and Bo JELLESMARK THORSEN* (lxvi): Optimal Afforestation Contracts with Asymmetric Information on Private Environmental Benefits
NRM	47.2004	*John MBURU* (lxvi)*:* Wildlife Conservation and Management in Kenya: Towards a Co-management Approach
NRM	48.2004	*Ekin BIROL, Ágnes GYOVAI and Melinda SMALE* (lxvi)*:* Using a Choice Experiment to Value Agricultural Biodiversity on Hungarian Small Farms: Agri-Environmental Policies in a Transition al Economy
CCMP	49.2004	*Gernot KLEPPER and Sonja PETERSON:* The EU Emissions Trading Scheme. Allowance Prices, Trade Flows, Competitiveness Effects
GG	50.2004	*Scott BARRETT and Michael HOEL:* Optimal Disease Eradication
CTN	51.2004	*Dinko DIMITROV, Peter BORM, Ruud HENDRICKX and Shao CHIN SUNG:* Simple Priorities and Core Stability in Hedonic Games
SIEV	52.2004	*Francesco RICCI*: Channels of Transmission of Environmental Policy to Economic Growth: A Survey of the Theory
SIEV	53.2004	*Anna ALBERINI, Maureen CROPPER, Alan KRUPNICK and Nathalie B. SIMON:* Willingness to Pay for Mortality Risk Reductions: Does Latency Matter?
NRM	54.2004	*Ingo BRÄUER and Rainer MARGGRAF* (lxvi): Valuation of Ecosystem Services Provided by Biodiversity Conservation: An Integrated Hydrological and Economic Model to Value the Enhanced Nitrogen Retention in Renaturated Streams
NRM	55.2004	*Timo GOESCHL and Tun LIN* (lxvi): Biodiversity Conservation on Private Lands: Information Problems and Regulatory Choices
NRM	56.2004	*Tom DEDEURWAERDERE* (lxvi): Bioprospection: From the Economics of Contracts to Reflexive Governance
CCMP	57.2004	*Katrin REHDANZ and David MADDISON:* The Amenity Value of Climate to German Households
CCMP	58.2004	*Koen SMEKENS and Bob VAN DER ZWAAN:* Environmental Externalities of Geological Carbon Sequestration Effects on Energy Scenarios
NRM	59.2004	*Valentina BOSETTI, Mariaester CASSINELLI and Alessandro LANZA* (lxvii): Using Data Envelopment Analysis to Evaluate Environmentally Conscious Tourism Management
NRM	60.2004	*Timo GOESCHL and Danilo CAMARGO IGLIORI* (lxvi):Property Rights Conservation and Development: An Analysis of Extractive Reserves in the Brazilian Amazon
CCMP	61.2004	*Barbara BUCHNER and Carlo CARRARO*: Economic and Environmental Effectiveness of a Technology-based Climate Protocol
NRM	62.2004	*Elissaios PAPYRAKIS and Reyer GERLAGH*: Resource-Abundance and Economic Growth in the U.S.
NRM	63.2004	*Györgyi BELA, György PATAKI, Melinda SMALE and Mariann HAJDÚ* (lxvi): Conserving Crop Genetic Resources on Smallholder Farms in Hungary: Institutional Analysis
NRM	64.2004	*E.C.M. RUIJGROK and E.E.M. NILLESEN* (lxvi): The Socio-Economic Value of Natural Riverbanks in the Netherlands
NRM	65.2004	*E.C.M. RUIJGROK* (lxvi): Reducing Acidification: The Benefits of Increased Nature Quality. Investigating the Possibilities of the Contingent Valuation Method
ETA	66.2004	*Giannis VARDAS and Anastasios XEPAPADEAS*: Uncertainty Aversion, Robust Control and Asset Holdings
GG	67.2004	*Anastasios XEPAPADEAS and Constadina PASSA*: Participation in and Compliance with Public Voluntary Environmental Programs: An Evolutionary Approach
GG	68.2004	*Michael FINUS*: Modesty Pays: Sometimes!
NRM	69.2004	*Trond BJØRNDAL and Ana BRASÃO*: The Northern Atlantic Bluefin Tuna Fisheries: Management and Policy Implications
CTN	70.2004	*Alejandro CAPARRÓS, Abdelhakim HAMMOUDI and Tarik TAZDAÏT*: On Coalition Formation with Heterogeneous Agents
IEM	71.2004	*Massimo GIOVANNINI, Margherita GRASSO, Alessandro LANZA and Matteo MANERA*: Conditional Correlations in the Returns on Oil Companies Stock Prices and Their Determinants
IEM	72.2004	*Alessandro LANZA, Matteo MANERA and Michael MCALEER*: Modelling Dynamic Conditional Correlations in WTI Oil Forward and Futures Returns
SIEV	73.2004	*Margarita GENIUS and Elisabetta STRAZZERA*: The Copula Approach to Sample Selection Modelling: An Application to the Recreational Value of Forests

CCMP	74.2004	*Rob DELLINK and Ekko van IERLAND*: Pollution Abatement in the Netherlands: A Dynamic Applied General Equilibrium Assessment
ETA	75.2004	*Rosella LEVAGGI and Michele MORETTO*: Investment in Hospital Care Technology under Different Purchasing Rules: A Real Option Approach
CTN	76.2004	*Salvador BARBERÀ and Matthew O. JACKSON* (lxx): On the Weights of Nations: Assigning Voting Weights in a Heterogeneous Union
CTN	77.2004	*Àlex ARENAS, Antonio CABRALES, Albert DÍAZ-GUILERA, Roger GUIMERÀ and Fernando VEGA-REDONDO* (lxx): Optimal Information Transmission in Organizations: Search and Congestion
CTN	78.2004	*Francis BLOCH and Armando GOMES* (lxx): Contracting with Externalities and Outside Options
CTN	79.2004	*Rabah AMIR, Effrosyni DIAMANTOUDI and Licun XUE* (lxx): Merger Performance under Uncertain Efficiency Gains
CTN	80.2004	*Francis BLOCH and Matthew O. JACKSON* (lxx): The Formation of Networks with Transfers among Players
CTN	81.2004	*Daniel DIERMEIER, Hülya ERASLAN and Antonio MERLO* (lxx): Bicameralism and Government Formation
CTN	82.2004	*Rod GARRATT, James E. PARCO, Cheng-ZHONG QIN and Amnon RAPOPORT* (lxx): Potential Maximization and Coalition Government Formation
CTN	83.2004	*Kfir ELIAZ, Debraj RAY and Ronny RAZIN* (lxx): Group Decision-Making in the Shadow of Disagreement
CTN	84.2004	*Sanjeev GOYAL, Marco van der LEIJ and José Luis MORAGA-GONZÁLEZ* (lxx): Economics: An Emerging Small World?
CTN	85.2004	*Edward CARTWRIGHT* (lxx): Learning to Play Approximate Nash Equilibria in Games with Many Players
IEM	86.2004	*Finn R. FØRSUND and Michael HOEL*: Properties of a Non-Competitive Electricity Market Dominated by Hydroelectric Power
KTHC	87.2004	*Elissaios PAPYRAKIS and Reyer GERLAGH*: Natural Resources, Investment and Long-Term Income
CCMP	88.2004	*Marzio GALEOTTI and Claudia KEMFERT*: Interactions between Climate and Trade Policies: A Survey
IEM	89.2004	*A. MARKANDYA, S. PEDROSO and D. STREIMIKIENE*: Energy Efficiency in Transition Economies: Is There Convergence Towards the EU Average?
GG	90.2004	*Rolf GOLOMBEK and Michael HOEL* : Climate Agreements and Technology Policy
PRA	91.2004	*Sergei IZMALKOV* (lxv): Multi-Unit Open Ascending Price Efficient Auction
KTHC	92.2004	*Gianmarco I.P. OTTAVIANO and Giovanni PERI*: Cities and Cultures
KTHC	93.2004	*Massimo DEL GATTO*: Agglomeration, Integration, and Territorial Authority Scale in a System of Trading Cities. Centralisation versus devolution
CCMP	94.2004	*Pierre-André JOUVET, Philippe MICHEL and Gilles ROTILLON*: Equilibrium with a Market of Permits
CCMP	95.2004	*Bob van der ZWAAN and Reyer GERLAGH*: Climate Uncertainty and the Necessity to Transform Global Energy Supply
CCMP	96.2004	*Francesco BOSELLO, Marco LAZZARIN, Roberto ROSON and Richard S.J. TOL*: Economy-Wide Estimates of the Implications of Climate Change: Sea Level Rise
CTN	97.2004	*Gustavo BERGANTIÑOS and Juan J. VIDAL-PUGA*: Defining Rules in Cost Spanning Tree Problems Through the Canonical Form
CTN	98.2004	*Siddhartha BANDYOPADHYAY and Mandar OAK*: Party Formation and Coalitional Bargaining in a Model of Proportional Representation
GG	99.2004	*Hans-Peter WEIKARD, Michael FINUS and Juan-Carlos ALTAMIRANO-CABRERA*: The Impact of Surplus Sharing on the Stability of International Climate Agreements
SIEV	100.2004	*Chiara M. TRAVISI and Peter NIJKAMP*: Willingness to Pay for Agricultural Environmental Safety: Evidence from a Survey of Milan, Italy, Residents
SIEV	101.2004	*Chiara M. TRAVISI, Raymond J. G. M. FLORAX and Peter NIJKAMP*: A Meta-Analysis of the Willingness to Pay for Reductions in Pesticide Risk Exposure
NRM	102.2004	*Valentina BOSETTI and David TOMBERLIN:* Real Options Analysis of Fishing Fleet Dynamics: A Test
CCMP	103.2004	*Alessandra GORIA e Gretel GAMBARELLI:* Economic Evaluation of Climate Change Impacts and Adaptability in Italy
PRA	104.2004	*Massimo FLORIO and Mara GRASSENI*: The Missing Shock: The Macroeconomic Impact of British Privatisation
PRA	105.2004	*John BENNETT, Saul ESTRIN, James MAW and Giovanni URGA*: Privatisation Methods and Economic Growth in Transition Economies
PRA	106.2004	*Kira BÖRNER*: The Political Economy of Privatization: Why Do Governments Want Reforms?
PRA	107.2004	*Pehr-Johan NORBÄCK and Lars PERSSON*: Privatization and Restructuring in Concentrated Markets
SIEV	108.2004	*Angela GRANZOTTO, Fabio PRANOVI, Simone LIBRALATO, Patrizia TORRICELLI and Danilo MAINARDI*: Comparison between Artisanal Fishery and Manila Clam Harvesting in the Venice Lagoon by Using Ecosystem Indicators: An Ecological Economics Perspective
CTN	109.2004	*Somdeb LAHIRI*: The Cooperative Theory of Two Sided Matching Problems: A Re-examination of Some Results
NRM	110.2004	*Giuseppe DI VITA*: Natural Resources Dynamics: Another Look
SIEV	111.2004	*Anna ALBERINI, Alistair HUNT and Anil MARKANDYA*: Willingness to Pay to Reduce Mortality Risks: Evidence from a Three-Country Contingent Valuation Study
KTHC	112.2004	*Valeria PAPPONETTI and Dino PINELLI*: Scientific Advice to Public Policy-Making
SIEV	113.2004	*Paulo A.L.D. NUNES and Laura ONOFRI*: The Economics of Warm Glow: A Note on Consumer's Behavior and Public Policy Implications
IEM	114.2004	*Patrick CAYRADE*: Investments in Gas Pipelines and Liquefied Natural Gas Infrastructure What is the Impact on the Security of Supply?
IEM	115.2004	*Valeria COSTANTINI and Francesco GRACCEVA:* Oil Security. Short- and Long-Term Policies

IEM	116.2004	*Valeria COSTANTINI and Francesco GRACCEVA:* Social Costs of Energy Disruptions
IEM	117.2004	*Christian EGENHOFER, Kyriakos GIALOGLOU, Giacomo LUCIANI, Maroeska BOOTS, Martin SCHEEPERS, Valeria COSTANTINI, Francesco GRACCEVA, Anil MARKANDYA and Giorgio VICINI*: Market-Based Options for Security of Energy Supply
IEM	118.2004	*David FISK*: Transport Energy Security. The Unseen Risk?
IEM	119.2004	*Giacomo LUCIANI*: Security of Supply for Natural Gas Markets. What is it and What is it not?
IEM	120.2004	*L.J. de VRIES and R.A. HAKVOORT*: The Question of Generation Adequacy in Liberalised Electricity Markets
KTHC	121.2004	*Alberto PETRUCCI*: Asset Accumulation, Fertility Choice and Nondegenerate Dynamics in a Small Open Economy
NRM	122.2004	*Carlo GIUPPONI, Jaroslaw MYSIAK and Anita FASSIO*: An Integrated Assessment Framework for Water Resources Management: A DSS Tool and a Pilot Study Application
NRM	123.2004	*Margaretha BREIL, Anita FASSIO, Carlo GIUPPONI and Paolo ROSATO*: Evaluation of Urban Improvement on the Islands of the Venice Lagoon: A Spatially-Distributed Hedonic-Hierarchical Approach
ETA	124.2004	*Paul MENSINK*: Instant Efficient Pollution Abatement Under Non-Linear Taxation and Asymmetric Information: The Differential Tax Revisited
NRM	125.2004	*Mauro FABIANO, Gabriella CAMARSA, Rosanna DURSI, Roberta IVALDI, Valentina MARIN and Francesca PALMISANI*: Integrated Environmental Study for Beach Management:A Methodological Approach
PRA	126.2004	*Irena GROSFELD and Iraj HASHI*: The Emergence of Large Shareholders in Mass Privatized Firms: Evidence from Poland and the Czech Republic
CCMP	127.2004	*Maria BERRITTELLA, Andrea BIGANO, Roberto ROSON and Richard S.J. TOL*: A General Equilibrium Analysis of Climate Change Impacts on Tourism
CCMP	128.2004	*Reyer GERLAGH*: A Climate-Change Policy Induced Shift from Innovations in Energy Production to Energy Savings
NRM	129.2004	*Elissaios PAPYRAKIS and Reyer GERLAGH*: Natural Resources, Innovation, and Growth
PRA	130.2004	*Bernardo BORTOLOTTI and Mara FACCIO*: Reluctant Privatization
SIEV	131.2004	*Riccardo SCARPA and Mara THIENE*: Destination Choice Models for Rock Climbing in the Northeast Alps: A Latent-Class Approach Based on Intensity of Participation
SIEV	132.2004	*Riccardo SCARPA Kenneth G. WILLIS and Melinda ACUTT*: Comparing Individual-Specific Benefit Estimates for Public Goods: Finite Versus Continuous Mixing in Logit Models
IEM	133.2004	*Santiago J. RUBIO*: On Capturing Oil Rents with a National Excise Tax Revisited
ETA	134.2004	*Ascensión ANDINA DÍAZ*: Political Competition when Media Create Candidates' Charisma
SIEV	135.2004	*Anna ALBERINI*: Robustness of VSL Values from Contingent Valuation Surveys
CCMP	136.2004	*Gernot KLEPPER and Sonja PETERSON*: Marginal Abatement Cost Curves in General Equilibrium: The Influence of World Energy Prices
ETA	137.2004	*Herbert DAWID, Christophe DEISSENBERG and Pavel ŠEVČIK*: Cheap Talk, Gullibility, and Welfare in an Environmental Taxation Game
CCMP	138.2004	*ZhongXiang ZHANG*: The World Bank's Prototype Carbon Fund and China
CCMP	139.2004	*Reyer GERLAGH and Marjan W. HOFKES*: Time Profile of Climate Change Stabilization Policy
NRM	140.2004	*Chiara D'ALPAOS and Michele MORETTO*: The Value of Flexibility in the Italian Water Service Sector: A Real Option Analysis
PRA	141.2004	*Patrick BAJARI, Stephanie HOUGHTON and Steven TADELIS* (lxxi): Bidding for Incompete Contracts
PRA	142.2004	*Susan ATHEY, Jonathan LEVIN and Enrique SEIRA* (lxxi): Comparing Open and Sealed Bid Auctions: Theory and Evidence from Timber Auctions
PRA	143.2004	*David GOLDREICH* (lxxi): Behavioral Biases of Dealers in U.S. Treasury Auctions
PRA	144.2004	*Roberto BURGUET* (lxxi): Optimal Procurement Auction for a Buyer with Downward Sloping Demand: More Simple Economics
PRA	145.2004	*Ali HORTACSU and Samita SAREEN* (lxxi): Order Flow and the Formation of Dealer Bids: An Analysis of Information and Strategic Behavior in the Government of Canada Securities Auctions
PRA	146.2004	*Victor GINSBURGH, Patrick LEGROS and Nicolas SAHUGUET* (lxxi): How to Win Twice at an Auction. On the Incidence of Commissions in Auction Markets
PRA	147.2004	*Claudio MEZZETTI, Aleksandar PEKEČ and Ilia TSETLIN* (lxxi): Sequential vs. Single-Round Uniform-Price Auctions
PRA	148.2004	*John ASKER and Estelle CANTILLON* (lxxi): Equilibrium of Scoring Auctions
PRA	149.2004	*Philip A. HAILE, Han HONG and Matthew SHUM* (lxxi): Nonparametric Tests for Common Values in First-Price Sealed-Bid Auctions
PRA	150.2004	*François DEGEORGE, François DERRIEN and Kent L. WOMACK* (lxxi): Quid Pro Quo in IPOs: Why Bookbuilding is Dominating Auctions
CCMP	151.2004	*Barbara BUCHNER and Silvia DALL'OLIO*: Russia: The Long Road to Ratification. Internal Institution and Pressure Groups in the Kyoto Protocol's Adoption Process
CCMP	152.2004	*Carlo CARRARO and Marzio GALEOTTI*: Does Endogenous Technical Change Make a Difference in Climate Policy Analysis? A Robustness Exercise with the FEEM-RICE Model
PRA	153.2004	*Alejandro M. MANELLI and Daniel R. VINCENT* (lxxi): Multidimensional Mechanism Design: Revenue Maximization and the Multiple-Good Monopoly
ETA	154.2004	*Nicola ACOCELLA, Giovanni Di BARTOLOMEO and Wilfried PAUWELS*: Is there any Scope for Corporatism in Stabilization Policies?
CTN	155.2004	*Johan EYCKMANS and Michael FINUS*: An Almost Ideal Sharing Scheme for Coalition Games with Externalities
CCMP	156.2004	*Cesare DOSI and Michele MORETTO*: Environmental Innovation, War of Attrition and Investment Grants

CCMP	157.2004	*Valentina BOSETTI, Marzio GALEOTTI and Alessandro LANZA*: How Consistent are Alternative Short-Term Climate Policies with Long-Term Goals?
ETA	158.2004	*Y. Hossein FARZIN and Ken-Ichi AKAO*: Non-pecuniary Value of Employment and Individual Labor Supply
ETA	159.2004	*William BROCK and Anastasios XEPAPADEAS*: Spatial Analysis: Development of Descriptive and Normative Methods with Applications to Economic-Ecological Modelling
KTHC	160.2004	*Alberto PETRUCCI*: On the Incidence of a Tax on PureRent with Infinite Horizons
IEM	161.2004	*Xavier LABANDEIRA, José M. LABEAGA and Miguel RODRÍGUEZ*: Microsimulating the Effects of Household Energy Price Changes in Spain

NOTE DI LAVORO PUBLISHED IN 2005

CCMP	1.2005	*Stéphane HALLEGATTE*: Accounting for Extreme Events in the Economic Assessment of Climate Change
CCMP	2.2005	*Qiang WU and Paulo Augusto NUNES*: Application of Technological Control Measures on Vehicle Pollution: A Cost-Benefit Analysis in China
CCMP	3.2005	*Andrea BIGANO, Jacqueline M. HAMILTON, Maren LAU, Richard S.J. TOL and Yuan ZHOU*: A Global Database of Domestic and International Tourist Numbers at National and Subnational Level
CCMP	4.2005	*Andrea BIGANO, Jacqueline M. HAMILTON and Richard S.J. TOL*: The Impact of Climate on Holiday Destination Choice
ETA	5.2005	*Hubert KEMPF*: Is Inequality Harmful for the Environment in a Growing Economy?
CCMP	6.2005	*Valentina BOSETTI, Carlo CARRARO and Marzio GALEOTTI*: The Dynamics of Carbon and Energy Intensity in a Model of Endogenous Technical Change
IEM	7.2005	*David CALEF and Robert GOBLE*: The Allure of Technology: How France and California Promoted Electric Vehicles to Reduce Urban Air Pollution
ETA	8.2005	*Lorenzo PELLEGRINI and Reyer GERLAGH*: An Empirical Contribution to the Debate on Corruption Democracy and Environmental Policy
CCMP	9.2005	*Angelo ANTOCI*: Environmental Resources Depletion and Interplay Between Negative and Positive Externalities in a Growth Model
CTN	10.2005	*Frédéric DEROIAN*: Cost-Reducing Alliances and Local Spillovers
NRM	11.2005	*Francesco SINDICO*: The GMO Dispute before the WTO: Legal Implications for the Trade and Environment Debate
KTHC	12.2005	*Carla MASSIDDA*: Estimating the New Keynesian Phillips Curve for Italian Manufacturing Sectors
KTHC	13.2005	*Michele MORETTO and Gianpaolo ROSSINI*: Start-up Entry Strategies: Employer vs. Nonemployer firms
PRCG	14.2005	*Clara GRAZIANO and Annalisa LUPORINI*: Ownership Concentration, Monitoring and Optimal Board Structure
CSRM	15.2005	*Parashar KULKARNI*: Use of Ecolabels in Promoting Exports from Developing Countries to Developed Countries: Lessons from the Indian LeatherFootwear Industry
KTHC	16.2005	*Adriana DI LIBERTO, Roberto MURA and Francesco PIGLIARU*: How to Measure the Unobservable: A Panel Technique for the Analysis of TFP Convergence
KTHC	17.2005	*Alireza NAGHAVI*: Asymmetric Labor Markets, Southern Wages, and the Location of Firms
KTHC	18.2005	*Alireza NAGHAVI*: Strategic Intellectual Property Rights Policy and North-South Technology Transfer
KTHC	19.2005	*Mombert HOPPE*: Technology Transfer Through Trade
PRCG	20.2005	*Roberto ROSON*: Platform Competition with Endogenous Multihoming
CCMP	21.2005	*Barbara BUCHNER and Carlo CARRARO*: Regional and Sub-Global Climate Blocs. A Game Theoretic Perspective on Bottom-up Climate Regimes
IEM	22.2005	*Fausto CAVALLARO*: An Integrated Multi-Criteria System to Assess Sustainable Energy Options: An Application of the Promethee Method
CTN	23.2005	*Michael FINUS, Pierre v. MOUCHE and Bianca RUNDSHAGEN*: Uniqueness of Coalitional Equilibria
IEM	24.2005	*Wietze LISE*: Decomposition of CO2 Emissions over 1980–2003 in Turkey
CTN	25.2005	*Somdeb LAHIRI*: The Core of Directed Network Problems with Quotas
SIEV	26.2005	*Susanne MENZEL and Riccardo SCARPA*: Protection Motivation Theory and Contingent Valuation: Perceived Realism, Threat and WTP Estimates for Biodiversity Protection

(lxv) This paper was presented at the EuroConference on “Auctions and Market Design: Theory, Evidence and Applications” organised by Fondazione Eni Enrico Mattei and sponsored by the EU, Milan, September 25-27, 2003

(lxvi) This paper has been presented at the 4th BioEcon Workshop on “Economic Analysis of Policies for Biodiversity Conservation” organised on behalf of the BIOECON Network by Fondazione Eni Enrico Mattei, Venice International University (VIU) and University College London (UCL) , Venice, August 28-29, 2003

(lxvii) This paper has been presented at the international conference on “Tourism and Sustainable Economic Development – Macro and Micro Economic Issues” jointly organised by CRENoS (Università di Cagliari e Sassari, Italy) and Fondazione Eni Enrico Mattei, and supported by the World Bank, Sardinia, September 19-20, 2003

(lxviii) This paper was presented at the ENGIME Workshop on “Governance and Policies in Multicultural Cities”, Rome, June 5-6, 2003

(lxix) This paper was presented at the Fourth EEP Plenary Workshop and EEP Conference “The Future of Climate Policy”, Cagliari, Italy, 27-28 March 2003

(lxx) This paper was presented at the 9th Coalition Theory Workshop on "Collective Decisions and Institutional Design" organised by the Universitat Autònoma de Barcelona and held in Barcelona, Spain, January 30-31, 2004

(lxxi) This paper was presented at the EuroConference on “Auctions and Market Design: Theory, Evidence and Applications”, organised by Fondazione Eni Enrico Mattei and Consip and sponsored by the EU, Rome, September 23-25, 2004

2004 SERIES	
CCMP	*Climate Change Modelling and Policy* (Editor: Marzio Galeotti)
GG	*Global Governance* (Editor: Carlo Carraro*)*
SIEV	*Sustainability Indicators and Environmental Valuation* (Editor: Anna Alberini)
NRM	*Natural Resources Management* (Editor: Carlo Giupponi)
KTHC	*Knowledge, Technology, Human Capital* (Editor: Gianmarco Ottaviano)
IEM	*International Energy Markets* (Editor: Anil Markandya)
CSRM	*Corporate Social Responsibility and Sustainable Management* (Editor: Sabina Ratti)
PRA	*Privatisation, Regulation, Antitrust* (Editor: Bernardo Bortolotti)
ETA	*Economic Theory and Applications* (Editor: Carlo Carraro)
CTN	*Coalition Theory Network*

2005 SERIES	
CCMP	*Climate Change Modelling and Policy* (Editor: Marzio Galeotti)
SIEV	*Sustainability Indicators and Environmental Valuation* (Editor: Anna Alberini)
NRM	*Natural Resources Management* (Editor: Carlo Giupponi)
KTHC	*Knowledge, Technology, Human Capital* (Editor: Gianmarco Ottaviano)
IEM	*International Energy Markets* (Editor: Anil Markandya)
CSRM	*Corporate Social Responsibility and Sustainable Management* (Editor: Sabina Ratti)
PRCG	*Privatisation Regulation Corporate Governance* (Editor: Bernardo Bortolotti)
ETA	*Economic Theory and Applications* (Editor: Carlo Carraro)
CTN	*Coalition Theory Network*