Valuing Mediterranean seascape and land-use changes with explicit consideration of loss aversion and increasing price sensitivity

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Abstract

This disparity between WTP for a good and the WTA compensation to forgo the same good is one of the most widely documented phenomena in environmental economics. We find that tourists lodging along the French Mediterranean coast display a WTA/WTP ratio of 1.94 with respect to the installation of an offshore wind farm, reef-associated recreational activities and green tourism. In regard to wind farm installation, the ratio imply that the disutility of seeing an offshore wind farm in the near view shed is 94 % higher than the utility associated with removing the wind farm, once it is in place. We investigate the extent to which the income effect, in alignment with standard Hicksian theory may help explain observed discrepancies. Prospect theory offers an alternative explanation to observed WTP-WTA asymmetry. According to this theory the perception of the current endowment is a central aspect of the respondents' valuation (Khaneman and Tversky 1979). We show that nationality has a bearing on asymmetries, potentially rooted in differences in perceived endowments. Consistent with previous research we also show that experience with wind turbines, serve to lessen loss aversion. Lastly, we find evidence of increasing sensitivities both in regard to paying more and paying less for holiday accommodation.

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Key words: gain-loss asymmetry, price sensitivity, prospect theory, choice experiment, offshore wind farms, tourism.

1. Introduction

There is widespread evidence of a consistent discrepancy between a person's willingness to pay (WTP) for a good and his willingness to accept (WTA) compensation to forgo the same good. Particularly, Tversky and Kahneman (1991) find that when comparing losses with equal-sized gains, people tend to significantly over-estimate losses, setting the value of losses to the double of the value of equal-sized gains. This disparity between the two measures of value is one of the most widely documented phenomena in environmental economics (Bateman 2002) and has been observed for market and non-market goods in real, hypothetical and experimental settings (Horowitz and McConnell 2002). The practical implication for economic valuation surveys is that the perception of the current endowment is a central aspect of the respondents' valuation, providing a potentially important source of unobserved heterogeneity (Lanz et al. 2009). Standard Hicksian economic theory allows for two explanations of observed WTP – WTA discrepancies (Randall and Stoll, 1980). The first one assert that if there is lack of substitutes for the good that is being valued, then this will lead to extreme WTA values, because it will be very difficult to compensate an individual for the removal of the good (Hanemann 1991). The second avenue holds that an income effect of a price rise will constrain WTP, thus putting an upper bound on possible WTP. Demand for compensation, one the other hand, is not constrained by the income effect. An increasing consensus in the literature however, acknowledges that the degree of discrepancy observed in empirical studies would have to be generated by unreasonable levels of income and substitution effects (Sugden 1999)

A prominent alternative explanation, to observed WTP-WTA asymmetry, accepted by researchers in a variety of disciplines has its roots in prospect theory (Khaneman and Tversky 1979). In prospect theory, an individual's decision-making process involves the evaluation of gains and losses defined in relation to a reference point, with a higher evaluation for losses than gains and decreasing marginal values in both positive and negative domains. Thaler (1980) proposed an extension and generalisation of the prospect theory to choices not involving uncertainty, by postulating an endowment effect on individuals' valuation functions and a kink in this function at the status quo point. The endowment effect refers to the notion that goods are considered to be more valuable when they are part of a person's endowment than when not in the endowment, all else equal. Experimental findings of WTA-WTP disparity experiments led Tversky and Kahneman (1991:1041) to describe "an endowment effect which is produced apparently instantaneously, by giving an individual property right over a consumption good". Consequently, one of the basic phenomena of choice under both risk and uncertainty is that losses loom larger than gains (Tversky and Kahneman, 1991).

In contrast to classical theory, where the utility of an uncertain prospect is the sum of the utilities of the outcomes each weighted by its probability, prospect theory postulates that 1) the carriers of value are gain and losses, not final assets and 2) the value of each outcome is multiplied by a decision weight. As such, risk aversion and risk seeking are determined jointly by the value function and by a cumulative weighting function[1]. More particularly, in the evaluation of outcomes, the reference point is the boundary that distinguishes gains from losses. In the evaluation of uncertainty, there are two natural boundaries, certainty and impossibility (corresponding to endpoints of the certainty scale).

[1] In expected utility theory, risk aversion and risk seeking are determined solely by the utility function.

More generally, the literature has shown that the WTP / WTA gap is bigger for non-market goods than for marketed goods, and increasing in size the further the good is from an ordinary private good (Horowitz and McConnell (2002). A further and related explanation of the disparity is limited experience and knowledge of the good being valued (Shogren, 1994; Plott and Zeiler 2003, List 2004). When respondents are uncertain about their true value for goods which are complex and unfamiliar, natural caution suggest that when asked a WTP question they may be inclined towards values at the lower end of the interval, while WTA questions may draw more responses from the higher end (Bateman et al 2002). Moreover, psychological insights suggest that, individuals construct preferences using a variety of decision heuristics or rules of thumb (Slovic 1995; Tversky and Khaneman 1992:p317). In non-market valuation studies, this is likely to results in stated preferences exhibiting a range of anomalies of which the asymmetry of gains and losses is one of the best documented (Bateman 2009:p116). In this regard, Bateman et al., 2009 has also shown that visual 3D representations of data as opposed to numeric information significantly reduce gain-loss asymmetry, by helping to convey accurate meaning of information. In accordance with these findings, it may be expected that 'experience' with the good that this being valued, can help respondents tap into underlying preferences and reduce their propensity to use of simple gain-loss heuristics (according to which respondents are able distinguish an increase from a decrease, but can not comprehend the magnitude of that change) when eliciting their preferences.

In this paper we investigate whether reference dependence is prevalent in the context of a study on tourist preferences for the siting of offshore wind farms; eco-tourism activities and eco-efficiency at the tourist resort in the French Mediterranean. This is a logical extension to Westerberg et al (2013), who show how resorts may be affected by these changes, assuming that the WTA/WTP ratio is equal to one. When the WTA / WTP ratio is different from one, the welfare economic consequences of the invigoration of any policy attribute will vary depending on the tourist's perceived 'reference point'. This also implies that the actual welfare impacts from any policy, will depend on whether it has been invigorated or not, and whether we consider that the target population have a property right to the present situation (ex-ante) or the future (ex-post) situation. We show the extent to which welfare estimates vary in the two cases, and discuss when and whether it is imperative to correct for WTP-WTA discrepancies. A second contribution of this paper consists of investigating whether there are particular respondent specific characteristics that have an effect on reference dependence and implied gain-loss asymmetry. To the authors' awareness, the influence of socio-demographic characteristics on WTP-WTA discrepancies in valuation surveys has been little studied. This is inevitably a result of the relatively few studies that simultaneously use utility increasing and utility decreasing attributes and WTP and WTA elicitation formats (Hess et al. 2008, Hess 2008, Masiero and Hensher 2010, Lanz et al., 2009; Bateman 2009 ; Strathopoulos and Hess 2011). Needless to say, multi-attribute choice experiments invite themselves to the use of WTP and WTA elicitation formats, whenever there are both utility increasing and utility decreasing attributes present in the choice tasks. In this study, we sought to investigate the influence of higher income, nationality and experience on WTP – WTA assymetries. Our interest is the extent to which the income effect (in alignment with standard Hicksian theory) contributes to explaining observed discrepancies. Secondly, departing from the basis that the theory of loss-aversion help explain WTP-WTA asymmetries; we investigate whether experience is a

factor that can help improve respondent's comprehension or 'evaluability' of what they are being asked to value (Bateman et al 2009). Lastly, we investigate whether the WTA-WTP discrepancy is larger for French nationals than foreign tourists on the hypothesized basis that foreign tourists, are less inclined to consider the policy attributes of relevance as part of their endowment.

2. Study Design

2.1 Study Background

Under the EU Climate and Energy package, the French Government has committed to more than double its share of renewable energies by 2020 (GWEC, 2011). To fulfil this objective, the French Med region of the LR, has been under scrutiny, holding a significant offshore wind power wind power potential, due to regular and strong winds and a large, shallow continental plateau (BRL 2003).. Till present however, wind power projects in the Mediterranean have been stalled due to fear of the potential negative impact on tourism (Cabanis and Lourie 2011). Coastal municipalities argue that wind turbines would disfigure the landscape and hereby destroy the attractiveness of their tourist resorts (Guipponi, 2011). To investigate this hypothesis, we conducted a choice experiment valuation survey with tourists on the coast of Languedoc Roussillon and elicited willingness to pay / willingness to accept compensation for wind turbines at different distances from the shore. The results, with direct implications for the tourist industry, are discussed in Westerberg et al. (2013).

Attribute	Level	Acronym
Wind farm and no artificial reef	Yes 5, 8, 12 km →	WF5, WF8, WF12
Associated recreational activities (If windfarm is present)	Yes, no	Recreation
Coherent environmental policy (if windfarm is present)	Yes No	Eco-efficiency
Change in weekly accommodation price	[- 200, -50, -20, -5, +5, +20, +50, +200] EUR	

Table 1: CE Attributes and levels

2.2 Data

The CE survey design commenced early 2010 with a series of meetings with chambers of commerce and industry, regional and departmental committees for tourism and with professionals in the wind power and tourist industry. This background helped in sketching a series of pertinent attributes, consisting of wind farm placement at different distances from the shore, with or without wind farm associated recreational activities,[1] the presence or absence of a coherent environmental policy at the

[1] Offshore wind farms act as no-take zones for fish (Punt et al. 2009), the eco-design of wind turbine foundations or the installation of artificial reefs around turbine foundations, serve to create fish habitat and hereby permit to boost tourism and leisure activities, such as diving, angling and observational boating (LaCroix and Pioch 2011).

coastal tourist community, and an increase in the weekly overnight expense (table 2). The full-scale survey was undertaken in the summer of 2010 on the beaches of 9 different coastal resort communities in Languedoc Roussillon. We used personal interviews in which the interviewer guided the respondent through the Survey, in French or English. The final sample comprises a total of 337 individuals and 2712 choice set observations. The descriptive statistics of the sample are provided in table 2. Further description of the attributes and the data collection process, are provided in Westerberg et al. (2013).

Background socio-demographic characteristics and trip characteristics	Description	Present in analysis	Mean % (st. dev)	Weekly accommodation price: per person (st.dev) / per household (st dev)
High income	With net monthly income above EYR 5000 / month	X	31 %	€199 (209) / €729 (971)
Lower income	With net monthly income below EUR 5000 / month	(X)	20 %	€139 (124) / €443 (435)
Northern European	Of Scandinavian, English, Belgian, German, Swiss, Luxembourgian or Dutch origin.	X	26%	
Experience	See wind turbines daily (for example during a commute to work).	X		
Net household income	In intervals of €500 per month (min €0, max €>7000)		€ 2500 - € 3500	
Higher Education	Has done at least 2 years of university studies		51%	
International tourists See wind turbines daily	Of any origin other than French The tourist sees wind turbines daily, for during his trip to work.		27% 32 %	
Age Female	Age (min 17 yrs, max 81 yrs)		37 years (14.6 years) 59%	
Average accommodation price in EUR per adult per week			€ 158 (€157)	

Table 2: Socio-demographic characteristics

3. Methodology and Model description

3.1 Expected utility theory and random utility theory

To describe discrete choices in a utility maximizing framework, the CE employs the behavioral framework of random utility theory (RUT). When the relationship between utility and characteristics is linear in the parameters, the individual i's utility U from alternative j is specified as:

$$U_{ij} = V_{ij} + e_{ij} \quad (1)$$

where V_{ij} is the systematic and observable component of the latent utility and e_{ij} is a random or "unexplained" component assumed IID and extreme value distributed (Louviere et al., 2000). The choice of one alternative (*j*) over another alternative is a function of the probability that the utility associated with *j* is higher than that associated with other alternatives. In this case, the probability of any particular alternative *j* being chosen can be expressed in terms of a logistic distribution and Equation 1 can be estimated with a conditional logit model (CLM) (Greene, 2003), which takes the general form:

$$P_{ij} = \frac{e^{V_{ij}}}{\sum_{h \in C} e^{V_{ih}}} \qquad (2)$$

To uncover potential latent preference heterogeneity across respondents we also specify a random parameter logit model (RPL) with error component (RPLEC). In this model, each attribute is associated with a mean β_j and an individual specific deviation (η_i) from that mean:

$$\beta_{ij} = \beta_j + \eta_i + \gamma_{ij} v_{ij} \qquad (3)$$

v_{ij} is a random variable with mean 0 and variance a_j^2 (see Greene and Hensher 2007) for further description). The normal distribution was chosen as statistical distribution for all attributes, because it delivered the best model fit. For a more thorough and in-depth treatment of the RPLEC, the interested reader is referred to Train (2009), Hensher and Greene (2003) or Hensher et al. (2005), Greene and Hensher (2007).

Under standard welfare economic expected theory, the symmetric deterministic part of the utility function, specified to be linear in the parameters, may be presented as:

$$V_{ij} = \beta_{0ij} + \beta_1 X_{1ij} + \beta_2 X_{ij} + ... + \beta_K X_{Kij} + \beta_c C_{ij} \qquad (4)$$

Where $\beta_{1...}$ β_k are parameters associated with the policy attributes, β_c with the payment attribute and β_{ASC} is the alternative specific constant (normalised with respect to the status quo reference alternative), that accounts for variations in choices that are not explained by the attributes. Specifically for our case, with attributes given in table 2, the symmetric value function is specified as follows:

$$V_{ij} = \beta_{ASC} + \beta_1 X_{WF5} + \beta_2 X_{WF8} + \beta_3 X_{WF12} + \beta_4 X_{Reef\text{-}rec} + \beta_5 X_{Env.policy} + \beta_C X_{Cost} \qquad (5)$$

3.2 Reference dependence

To verify and test the presence of linear asymmetric preferences, we tuse the reference-pivoted nature of our experimental design. Following Lanz et al (2009) and Masiero and Hensher (2010), this is done by dividing the cost attribute (Xc) into decreasing and increasing values by taking the difference between the attribute and its relative reference value. As shown in table 1, the monetary attribute is

the only attribute, which have symmetric utility increasing and utility decreasing levels. The piecewise-linear function is a direct extension of the linear utility function and represents a simple non-linear formulation, whereby:

$$v(X_C) = \begin{cases} \beta_{(INC)} X_C, & X_C > 0 \\ \beta_{(DEC)} X_C, & X_C < 0 \end{cases} \qquad (6)$$

The reference dependent utility function therefore becomes:

$$V_{ij} = \beta_{ASC} + \beta_1 X_{WF5} + \beta_2 X_{WF8} + \beta_3 X_{WF12} + \beta_4 X_{Reef\text{-}rec} + \beta_5 X_{Env.policy} + \beta_{Ci\ (INC)} X_C + \beta_{Ci(DEC)} Xc \qquad (7)$$

With this specification, the gain–loss asymmetry associated with the payment attribute is characterised as a discontinuity in the function at the status quo attribute level (the reference point).

3.3 Observed gain-loss heterogeneity

In the presence of gain-loss asymmetry, it is of particular interest to examine whether there are particular respondent characteristics affecting that contribute or avert reference dependence and loss aversion. After testing various respondent characteristics, we found that higher income; northern European nationality and; experience with wind turbines had a particularly strong impact on reducing asymmetries in the loss domain. To capture gain-loss heterogeneity in the underlying population, we incorporated a piecewise linear-in-spline cost parameter in the deterministic part of the utility function (Morey et al., 2003; Scarpa et al., 2007). The most elaborate specification of the asymmetric piecewise-linear utility function presented in section 2 takes the following form:

$$V_{ij} = \beta_{ASC} + \beta_1 X_{WF\text{-}5km} + \beta_2 X_{WF\text{-}8km} + \beta_3 X_{WF\text{-}12km} + \beta_4 X_{Reef\ Rec} + \beta_5 X_{Env.policy} + \beta_{6i(INC)} Xc_+ + \beta_{7i(DEC)} Xc + \delta_{8(INC)}(X_C \cdot Z_{HIGH\text{-}INCOME}) + \delta_{9(INC)}(X_C \cdot Z_{NORTH\text{-}EUROPEAN}) + \delta_{10(INC)}(X_C \cdot Z_{EXPERIENCE}) + \delta_{11(DEC)}(X_C \cdot Z_{EXPERIENCE}) \qquad (8)$$

Where the vector of coefficients $\beta_{1\ldots}\ \beta_K$ and $\delta_{1\ldots.}\ \delta_m$ are attached to a vector of attributes (X) and interaction terms (XZ) with the payment terms, that influence utility respectively. The definitions of the variables (**Z**) that describe the characteristics of the respondents are provided in table 2. We adjust the relevant cost parameter to take into account of heterogeneity in WTP-WTA discrepancies, as follows – taking the example of higher income:

$$\beta c_{(INC\text{-}higher\ income)} = \beta c_{(INC)} + \beta c_{(INC)} \times \text{higher income} \qquad (9)$$

3.4 Non-linear sensitivity

Another key ingredient of (cumulative) prospect theory is that individual expectations about the likelihood that a gain or a loss will occur, gives rise to different formulations of the curvature of the utility function. In particular, Tversky and Kahneman (1992) provide experimental evidence of a distinctive fourfold pattern of risk attitudes: risk aversion for gains and risk seeking for losses of high probability; risk seeking for gains and risk aversion for losses of low probability. The value function is therefore specified as concave for gains, and convex for losses of high probability, or convex for gains

and concave for losses with low probability' (Tversky and Kahneman, 1992). The piecewise-linear functional form (eq 7) can capture reference dependence and gains-loss asymmetry, but it rules out potential non-linearity within gain and loss domains. By diminishing sensitivity, we assume that the first and second derivatives exist. In that case, diminishing and sensitivity may be represented by the following properties:

$$v''(X_C) \leq 0, \ \forall X_C > 0 \qquad (10)$$
$$v''(X_C) \geq 0, \ \forall X_C < 0$$

That is, the impact of a change diminishes with the distance from a reference point. On the contrary, increasing sensitivity is given by:

$$V''(Xc_{(INC)}) < 0$$
$$V''(Xc_{(DEC)}) > 0 \qquad (11)$$

To capture such non-linearities within gain and loss domains, a good model fit was found using a quadratic function, so that the utility of attributes and the price attribute X_C is given by:

$$V_{ij} = \beta_{ASC} + \beta_1 X_{WF5} + \beta_2 X_{WF8} + \beta_3 X_{WF12} + \beta_4 X_{Reef\text{-}rec} + \beta_5 X_{Env.policy} + \beta_{ci\,(INC)} X_C + \beta_{cci\,(INC)} X_C^2 + \beta_{ci(DEC)} X_C + \beta_{cci(DEC)} X_C^2 \qquad (12)$$

The specifications provided through eq. 5 to 12, will permit us to compare the standard linear function to the two non-linear functional forms, and assess the bearing that gain-loss asymmetry has on our results and survey conclusion.

4. Welfare measures and the calculation of WTP and WTA

4.1 Welfare measures

Welfare changes resulting from land-use and landscape changes are defined as the income adjustment necessary to maintain a constant level of utility before and after the change of provision. For discrete or fixed changes in the quantity of public good provision, welfare changes are measured using the compensating surplus or the equivalent surplus measure (according to table 3). For a proposed welfare gain the CS corresponds to the payment that the individual would be willing to give up (WTP) to ensure that the change occurs, while the ES measure tells us how much the individual would need to be compensated (WTA) for him attain the final improved quality level in the absence of the provision change occurring. Consequently, the ES measure is used when it is considered that the individual has the right to change, while the CS departs from the consideration that the individual does not have the right to a change (Bateman 1994).

Welfare measure	Price rise or quality decline	Price fall or quality rise
ES : Right to change	WTP to avoid	WTA compensation to avoid
CS : Right to status quo	WTA compensation to accept	WTP to obtain

Table 3: Welfare measures

Analogous to the discussion on reference dependence, is the question of whether the individual perceives that he has the right to the change, or the right to the status quo. Depending on his inferred endowment, the welfare economic consequences of a policy change will vary, driving a wedge between WTA and WTP for the same good. This is illustrated in figure 1, where the indifference curves (U) link combinations of private good and public good consumption, between which the individual is indifferent. The example of a pure public good, whereby the budget line is horizontal is used to illustrate the surplus welfare measures. Following Bateman et al. (2002), under the endowment effect, each indifference curve has a reference point and each reference point has its own family of indifference curves kinked at their respective reference points. Assume the individual considers that he has the property right to the lower level of utility (U_{oA}), then U_{oA} is kinked at A. The higher indifference curve (U_{1A}) associated with an improvement in environmental quality is kinked at D and B. If the individual starts at A, his WTP for an increase in the public good from Q_o to Q_1 to is BC. If instead the individual perceives that he has the property right to a higher level of utility, then for preferences as viewed from B, the appropriate indifference curve is U_{1B} (kinked at B). His WTA compensation for a decrease in the public good to Q_o is then EA consistent with the theory of reference dependence, according to which losses have a greater substantive significance than gains (Bateman et al 2002).

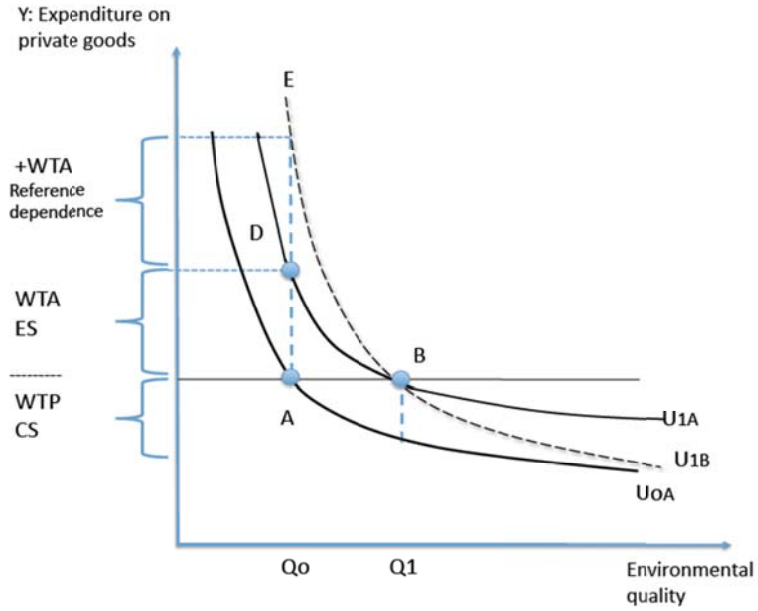

Figure 1: Reference dependence and implied loss aversion

4.2 The calculation of WTP and WTA

Utility-equivalence analysis uses equation 7 to estimate the change in one (or more) attribute(s) that is necessary, on average to exactly offset the utility effect of a change in some other attribute(s). Setting the total derivate of the indirect utility function equal to zero ($dV_{njt} = \beta_k dX_k + \beta_c dC = 0$) and solving for dX_k/dC yields the change in cost (or WTP) that keeps utility unchanged given an improvement in X_k. In the symmetric linear additive RUM, we have:

$$dX_k/dC = WTP_k = WTA = -(\beta_k/\beta_C) \qquad (13)$$

Therefore, WTP and WTA is the ratio of the marginal (dis)utility of an attribute to the marginal (dis)utility of the cost attribute**.** The estimation of two different cost parameters, with positive and negative deviations from a reference point, in the asymmetric model implies the following computation:

$$WTP = -(\beta_k/\beta_{C(INC)}) \qquad (14)$$
$$WTA = -(\beta_k/\beta_{C(DEC)})$$

The same approach can be employed for RPL models, when the price parameter is held fixed (i.e. the denominator is a non-zero constant)(Revelt and Train, 1998). For the purpose of this paper however, we deliberately decided not to keep the price parameter fixed, so as to verify whether there is, unobserved heterogeneity in addition to observed heterogeneity, associated with compensation and payment. If we were to calculate WTP / WTA from this model, marginal rates of substitution would become a ratio of two random distributions. In such cases, the resulting distribution may produce a number of undesirable properties, not the least of which are extremely low or large WTP/WTA values (Rose and Masiero 2010). Therefore, when we examine the existence of reference dependence, we employ the simple CLM model.

5. Results and discussion

Results for the 5 different models estimated are displayed in table 3. For simplicity we will base most of our discussions on the CLM models, but we will include discussion of results from an RPL model where relevant. In the following we start out by comparing the symmetric CLM with the asymmetric CLM. Secondly, we consider the implication of allowing for non-linearity in the gain and loss domain, using a simple CLM with a quadratic function for the cost parameter. Subsequently, we consider two types of respondent characteristics that have a different degree of loss aversion compared to the remaining population.

5.1 The symmetric model versus the asymmetric model

Considering at first the linear symmetric CLM model (column 1, table 4), we observe that all estimated coefficients except the placement of wind farms at 12 km from the shore, are found be statistically different from zero, and have the expected sign. That is, the invigoration of reef-associated recreational activities and a coherent environmental policy, are increasing the tourist's utility, while the installation of a wind farm at 5 or 8 km from the shore, relative to none today, decreases respondents utility. The ASC is negative and significant, indicating that tourists either derive a negative utility from the status quo, or derives a positive utility from a move away from the status quo, all other things equal. The payment attribute is negative and significant, in correspondence with the fact that paying more for housing is associated with a disutility.

Comparing the linear model with the non-linear model, we see that the non-linear specification fit the data better than the linear specification in terms of both log-likelihood and the adjusted R^2 which increases from 0.17 to 0.18. As for the parameter estimates, it is worthy to note that, in all instances

the absolute value of the coefficient estimates associated with the non-linear model, are lower in absolute terms than in the linear model. Specifically, we observe that the magnitude of the coefficient capturing the disutility of the status quo (ASC) declines when gains and losses are estimated separately. This indicates that the constraint imposed by a linear utility specification artificially inflates the welfare estimates attributed to the SQ alternative (Lanz et al 2009; Hess and Rose, 2009).

In the asymmetric model, the coefficient on the accommodation price is as expected negative on both the gain and loss domains (a marginally higher bill is bad whether above or below the SQ). The absolute coefficient estimates, provides evidence of gains-loss asymmetry; a €1 increase in the accommodation bill leads to an incremental disutility of 0.2, whereas a €1 fall in compensation (implied by a rising negative cost attribute) only leads to a 0.1 increase in disutility[2]. Using the asymptotic t-ratio test (or paired t-test[3]) to formally evaluate the significance of the difference between decrease and increase parameters, we find a t-value of 61.06, confirming the presence of asymmetry. Additionally, by taking the ratio in absolute values du/dC(inc)/du/dC(dec), we are able to quantify a value greater than zero in the case of loss aversion. In the linear asymmetric model, the asymmetry ratio for the cost attribute (Bc(inc)/Bc(dec)) is 2. This means that the disutility of an increase in the accommodation price is in terms of absolute value, 100% higher than the utility associated to a decrease of the same amount. This gain-loss asymmetry for the price attribute and how it compares to the linear model and the quadratic function model (discussed below), is illustrated in figure 3

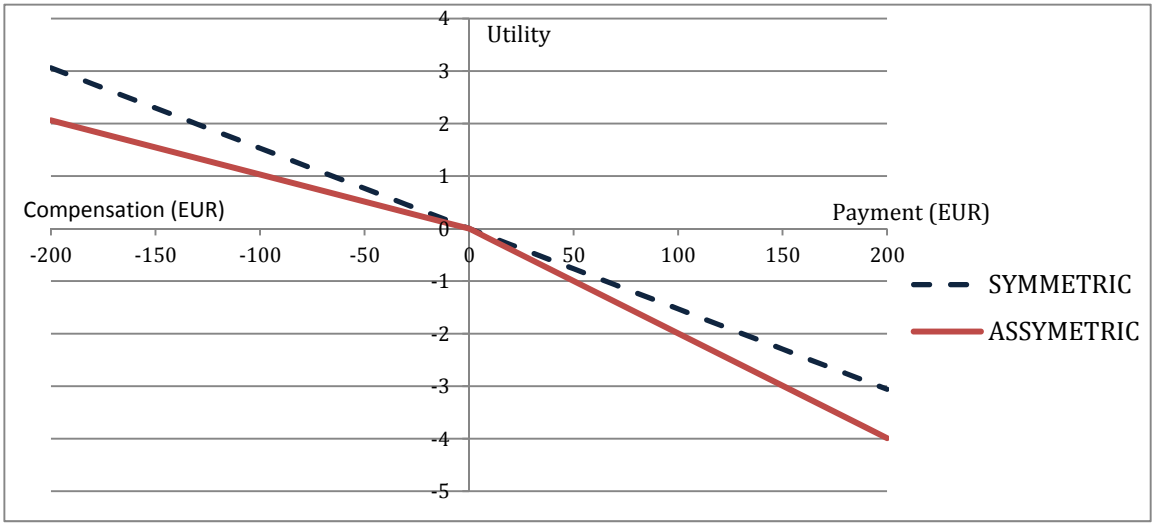

Figure 3: Gain-loss asymmetry for the payment attribute

[2] The negative coefficient of the b(dec) parameter estimates, is inversed when compensation payment increases.
[3] A paired (samples) t-test is used when you have two related observations (i.e., two observations per subject) and you want to see if the means on these two normally distributed interval variables differ from one another.

	Symmetric CLM			Assymetric CLM			Assymetric CLM			Non-linear assymetric CLM			Assymetric RPL model		
Parameters	**β**	**t**	**p**	**β**	**t**	**p**	**β**	**t**	**p**	**β**	**t**	**p**	**b**	**t**	**p**
ASC	-0.59	-6.24	***	-0.67	-7.06	***	-0.66	-7.0	***	-0.85	-7.4	***	-0.99	-6.1	***
ENV1	1.47	17.79	***	1.36	16.24	***	1.38	16.4	***	1.51	14.8	***	2.14	12.6	***
St.dev													1.19	8.9	***
ACT1	0.71	10.27	***	0.56	8.04	***	0.57	8.1	***	0.61	8.6	***	0.85	6.5	***
St.dev													0.92	6.5	***
FIVE	-1.84	-15.52	***	-1.38	-10.51	***	-1.37	-10.4	***	-1.21	-8.7	***	-2.09	-9.7	***
St.dev													1.90	9.5	***
EIGHT	-1.07	-10.36	***	-0.58	-4.73	***	-0.56	-4.5	***	-0.30	-2.1	**	-0.58	-3.2	***
St.dev													0.79	3.3	***
TWELVE	-0.13	-1.4		0.13	1.32		0.14	1.4		0.32	2.8	***	0.34	2.3	**
St.dev													0.57	1.9	*
CAP	-0.015	-22.81	***												
Assymetry															
$\beta c_{(INC)}$				-0.020	-10.99	***	-0.025	-15.5	***	-0.0395	-8.2	***	-0.048	-11.3	***
Std dev													0.021	7.0	***
$\beta c_{(DEC)}$				-0.010	-19.58	***	-0.009	-9.6	***	0.0033	0.9	0.381	-0.013	-7.8	***
Std dev													0.006	3.0	***
Diminishing Sensitivity															
b(inc)*b(inc)										0.00009	4.1	***			
b(dec)*b(dec)										0.00006	3.6	***			
Interactions															
B(inc)*High income							0.004	2.5	**				0.007	1.536	
B(inc)*Northern							0.006	3.6	***				0.010	2.252	**
B(dec)*Experience							-0.002	-2.0	**				0.004	0.968	
B(inc)*Experience							0.003	1.8	*				-0.003	-1.347	
SigmaE01													1.07	6.36	***
Final log-likelihood	-2371			-2345			-2337.8			-2335			2117		
AIC	4756			4705			1.732			1.729			1.576		
Adjusted rho-square	0.169			0.178			0.181			0.181			0.287		
Number of observations	2712			2712			2712			2712			2712		

Table 4: Main models

5.2 Increasing sensitivity versus linear sensitivity

Consulting table 3, column 4, we see that the quadratic function that assures a non-linear value function. Moreover, the non-linear specification fit the data slightly better than the linear specification in terms of both log-likelihood and information criterion. We find little evidence of diminishing sensitivity (implied by an S shaped value function). Our results rather tend to point to increasing sensitivity in both gain and loss domain. The experiments undertaken by Khaneman and Tversky (1992), and cumulative prospect theory predict risk seeking for gains and risk aversion for losses, for low probability events. For high probability events cumulative prospect theory predicts risk aversion for gains and risk seeking for losses. Comparing our results with those of Khaneman and Tversky (1992), we may postulate in the gains domain, that tourists consider it little likely (low probability) that they will actually be compensated for visual 'nuisances'. This will lead to risk seeking for gains. On the other hand, tourists may consider the probability of an actual loss from rising accommodation prices as higher, since they are more likely to be used to experience rising prices, than decreasing prices. Perceiving a loss with greater probability, leads to risk seeking for losses rather than risk aversion. These hypotheses are consistent with what we observe in figure 4. A counter argument to this postulate is that because tourists can easily substitute between different tourist resorts, a site-specific increase in the price levels at one tourist community will have a small probability of having a bearing on the accommodation price of a nearby community to which they may choose to travel. However, that does not seem to be the case here based on our results.

Finally, it must be acknowledged that when conducting CE we have little way of knowing the probability that respondents assign to events occurring. It is often implicitly assumed, that we can ignore it policy uncertainty by making the survey incentive compatible However, since surveys by construct are purely hypothetical set-ups, perfect incentive compatibility is likely to be the exception rather than the rule. This observation, calls for more research into the probabilities that respondents assign to events occurring in stated preference surveys. Moreover, when attributes have different framing effects or are formulated in gain and loss domains as above, it is unlikely that the subjects assign the same probability to the two states of nature. This postulate is consistent with Khaneman and Tversky (1992), who suspect that decision weights are sensitive to the formulation of prospects, as well as to the number, the spacing and level of outcomes. In this regard, there is also some evidence suggesting that the curvature of the weighting function is more pronounced when the outcome are widely spaced (Camerer, 1992). This effect may also be part of explaining, why we see an increasing curvature of the value function as the spaces between the levels of the payment attribute increases[4].

[4] Recalling from table 1, the price levels are: -200,-50,-25,-10,5,(0),10,25,50,200.

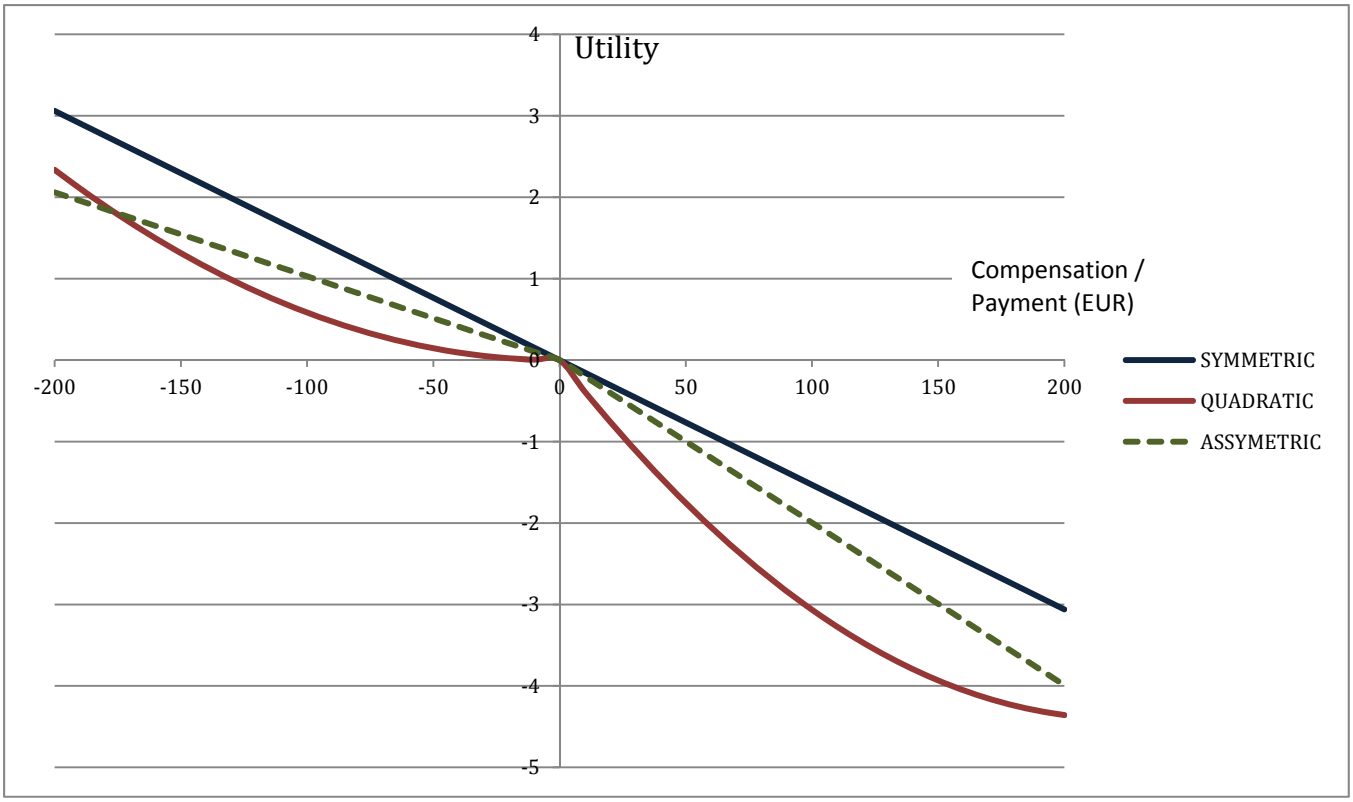

Figure 4: Non-linear gain-loss assymetry

5.3 Respondent characteristics influencing WTP-WTA discrepancies

To the authors' awareness, the influence of socio-demographic characteristics on WTP-WTA discrepancies in valuation surveys has been little studied. In the following we study the effect of income, country of residence (French vs. Northern European), and experience with wind farms on WTP-WTA asymmetry. We provide some preliminary insights into why these various respondent groups display different degrees of loss-aversion.

Consulting the asymmetric model with interactions, table 3, column 3, it is noteworthy that when interacted with the loss domain of the payment attribute Bc(inc) - higher income, northern European (as opposed to French nationals), and experience with wind turbines, are all significant. Income and nationality on the contrary, have no bearing on the gains domain of the payment attribute. For the RPL model we find the same, except that once we have accounted for unobservable heterogeneity, high income interaction looses significance. As in section 5.1, we take the ratio in absolute values du/dC(inc)/du/dC(dec) and incorporate interactions. The results are displayed in table 5.

The table makes clear that respondents with higher income (> 5000 € net / month / household), of northern European nationality, who are used to seeing wind turbines daily, have a significantly lower gain-loss asymmetry than those without these characteristics. In more precise terms, our results show that if someone is of Northern European origin, the disutility of an increase in the accommodation price is in absolute value, 80% higher than the utility associated to a decrease of the same amount. However, for French respondents, who do not have a higher education or household income above > €5000 net, the disutility of a similar increase in the accommodation price is 160%

higher than the utility associated with a decrease of the same amount. Together, higher income, Northern European Nationality, and experience reduce the gain-loss asymmetry by 71%.

Adjusted $\beta c_{(INC)}$ parameters from table 4, column 3	
$\beta c_{(INC)}$	-0.025
$\beta c_{(DEC)}$	-0.009
$\beta c_{(INC\text{-higher income})}$	-0.021
$\beta c_{(INC\text{-North European})}$	-0.019
$\beta c_{(INC\text{-Experience})}$	-0.022
$\beta c_{(INC\text{-higher Income-Northern European-Experience})}$	0.017
$\beta c_{(DEC\text{-Experience})}$	-0.012
Absolute ratio du/dC(loss)/du/dC(gain)	
$\beta c_{(INC)}/ \beta c_{(DEC)}$ for whole sample confounded (column 2)	2.0
$\beta c_{(INC)}/ \beta c_{(DEC)}$ for French, lower education & lower income earners.	2.6
$\beta c_{(INC\text{-higher income})}/\beta c_{(DEC)}$	2.2
$\beta c_{(INC\text{-Northern European})}/\beta c_{(DEC)}$	2.0
$\beta c_{(INC\text{-Experienc})}/\beta c_{(DEC\text{-Experience})}$	1.8
$\beta c_{(INC\text{-higher Income-Northern European-Experience})}/ \beta c_{(DEC\text{-Experience})}$	1.4

Table 5: Respondent gain-loss asymmetries

Our results are note-worthy. Considering at first the effect of higher income, we recall that according to Tversky and Khaneman (1992) and other authors, the observed asymmetry observed between gains and losses in experimental studies, is far too extreme to be explained by income effects or by decreasing risk aversion. In particular it is remarked that the financial incentives provided in experiments, are small compared to peoples income (Tversky and Khaneman, 1992). Our results lead us to postulate that choices that have a bearing on vacation budgets are of a different nature to choices related to an any-day purchase. This is consistent with what was told in the focus group prior to our survey. With regard to how individuals plan for their vacation, focus groups indicated that respondents do not only evaluate changing vacation accommodation prices against their overall income but equally against their allocated vacation budget[5]. As such, it appears that individuals with constrained incomes plan for their holiday in advance, considering carefully the maximum accommodation cost, so as to know approximately how much (remaining) money they can spend on other goods and activities. Therefore provided that a certain tourist's income is below a certain threshold, we postulate that he/she is particularly sensitive to proposed changes in accommodation

[5] In the choice experiment, the maximum proposed change in weekly accommodation price (up to 200€ increase/ week/adult) was above the price (150€) the average tourist was paying for high accommodation during his vacation.

price. On the other hand, beyond that threshold, we expect the actual accommodation cost to play a smaller role[6].

In table 2 we have illustrated the average accommodation prices for the two categories of income earners. As expected, higher income earners pay significantly more (€200 / week / adult) in accommodation price relative to their 'lower income' counterpart (€120/ week / adult). As such, the payment levels used in the Choice Experiment, ranging from ± 10€ - 200€ constitute a significant share of their total accommodation budget, and especially so for the lower income earners. We therefore conclude that the Hicksian theory comes some of the way in explaining observed gain-loss asymmetry, but does not suffice to explain all of the observed gain-loss asymmetry. Finally, it also remains to be explained is why income seems to be effective in reducing asymmetry in the loss-domain, but not gains-domain for which there is no upper bound as to possible compensation. Our postulate is that framing may play a role. In particular, by framing a valuation question in WTA, feelings of loss aversion may accentuated by inducing respondents to think that something is lost (Freeman 1993).

Turning subsequently to the role of nationality in explaining gain-loss asymmetry, we depart from the hypothesis that French respondents may have, on the whole a different sense of endowment, or reference point than their Northern European counterparts. In particular, we are induced to think that French respondents are more prone to consider that their endowment (or property right) is one in which the land-use policies have been invigorated. Northern Europeans on the other hand, are likely to consider a larger range of potential future vacation destination choices (incl. outside France), and as such are more likely to elicit their preferences from the point of view of a 'status quo endowment' without wind farms, a coherent environmental policy and recreational activities. As for French and Northern Europeans alike, their WTA compensation for not enjoying a certain destination attribute is greater than their WTP for attaining that same attribute. However, the disutility of paying is smaller for Northern Europeans than their French counterpart. We postulate that because French respondents are more prone to consider the policy attributes (such as the installation of wind farms) as their endowment, they also have a greater propensity to 'protest' towards paying for recreation, eco-efficiency or avoiding the wind farms. Loss aversion is thus larger for the respondent group whose stakes are larger – in this case, French nationals. This is in correspondence with Vieder (2011) who find that loss-aversion increases with stake sizes for mixed prospects.

Turning lastly to the impact of experience on gain-loss asymmetry, we can see by consulting figure 5 that respondents, who are used to seeing wind turbines daily, have a lower gain-loss asymmetry, both in the gains and the loss domain. Even if this is not so clear from the RPL model, the findings from the CLM is in accordance with earlier empirical results, according to which the endowment effect is essentially the result of an inexperienced consumer's mistake, which disappears in the process of learning (e.g. Coursey, Hovis and Schulze (1987), Shogren et al. (1994), List 2004). In our

[6] When we interacted the cost parameters with tourist's declared accommodation prices, gain-loss asymmetry was further reduced. But the changes were only significant at 88% level of confidence. We expect this has to do with the large number of tourists who were lodging for free with friends and family.

case, we are thus tempted to conclude that respondents with limited experience of wind turbines, will be more inclined to elicit WTP (for avoiding wind turbines) at the lower end of the interval, while compensation requirements will be drawn from the higher end. If in addition, respondents had experience with reef–associated eco-tourism, and eco-efficiency, we stipulate that the gain-loss assymetry would be even further reduced. This resonates Bateman et al. (2009) who finds that if individuals are able to connect with and understand a piece of information on an 'affective' level, their responses are more likely to tap into any underlying true preferences rather than using simple gain-loss heuristics (Bateman et al 2009).

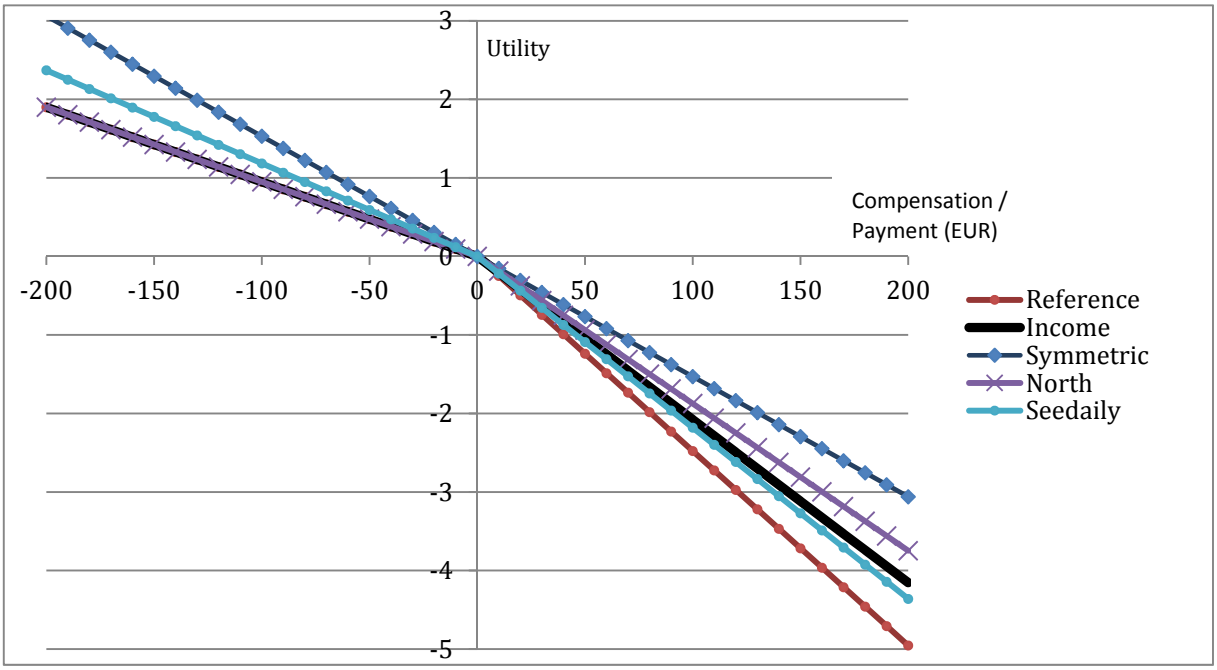

Figure 5: Gain-loss asymmetry in utility space across different respondent characteristics

5.4 Unobserved preferences and the error component

Before turning to welfare estimates, we turn to the RPL model with error component. Consulting Table 3, column 5, we note a very significant improvement of the measures of fit when comparing the RPLEC component model with the CLM model. The adjusted R^2 increasing from 0.18 to 0.28, and there is evidence of significant latent preference heterogeneity for all attributes. This confirms the importance of accounting for the panel nature of observed choices, unobserved heterogeneity and the error component. Of particular interest with regard to the gain-loss asymmetry, it is noteworthy that the standard deviation coefficient is more pronounced in the loss-domain of the payment attribute, than in the gains domain. This implies that there is a greater degree of unobservable heterogeneity associated with paying, which is not explained by experience, income or nationality. The error component, σi, is implemented as an individual-specific parameter and is assigned to the two non-status quo alternatives. The fact that the error component is positive and significant indicates that respondents overall experiences greater uncertainty, when choosing any of the two

future hypothetical destination alternatives relative to staying at the community resort where he is interviewed. This is in accordance with what we may expect.

5.5 Implication of reference dependence on WTP and WTA

In studying the implications of reference dependence on welfare measures, we will draw use of the linear asymmetric CLM model (2rd column table 4)[7], and compare it to the symmetric CLM model (1 column table 4). This allows us to examine how our results are modified according to whether we explicitly incorporate reference dependence into the estimation of welfare measures or not. Furthermore, we highlight how income and education can be part of attenuating differences in the symmetric versus the asymmetric approach to studying welfare consequences. In the following we draw on section 4.2, to define how WTP and WTA should be calculated for the asymmetric indirect utility function. We subsequently compare our results to the symmetric treatment.

Supposing that the tourist have property right to the landscape as it is today, then the CS measure is adapt for measuring the respondents WTA compensation requirement for allowing a welfare loss from wind farm installation, to occur. With regard to eco-tourism activities and eco-efficiency, the CS for a gain is the appropriate measure of value, telling us how much money income the individual would be willing to give up (WTP) to ensure that the change occurs. We solve for dC/dX_k (in eq. 7) to find the change in the accommodation price that keeps utility unchanged for a change in the seascape, eco-efficiency, or recreational activities. Results are displayed in column 3, table 6.

Supposing instead that the tourist perceives that he has the endowment of (or property right to) a community resort with eco-efficiency, a wind farm and associated recreational activities, then the compensating variation is the appropriate measure of value. We use it to estimate how much an individual is willing to pay to prevent the welfare loss occurring, and how much how much extra money income, would have to be given to an individual (WTA) for him to attain the final improved quality level with eco-efficiency and eco-tourism, in the absence of the provision change occurring. Results are displayed in column 4, table 6.

	WTP = -(β/βc(inc))	WTA = -(β/βc(dec))	Asymmetric model: Perceived status-quo endowment	Asymmetric model: Perceived right to future endowment	Symmetric model WTP=WTA=β/βc
ASC	-33.42	-64.7	-64.7	-33.42	-38.3
Eco-efficiency	68.28	132.3	68.3	132.3	96.3
Eco-tourism activities	28.25	54.7	28.3	54.7	46.1
WF 5 km	-69.13	-133.9	-133.9	-69.1	-120.1
WF 8 km	-29.03	-56.2	-56.2	-29.0	-69.9
WF 12 km	0	0	0	0	8.6

Table 6: Implied WTP and WTP

[7] The RPL does not invite itself for such an analysis, because dividing one random parameter with another random parameter does not provide meaningful results.

5.6 Interpretation of results

The welfare estimates resulting from the linear symmetric and the linear asymmetric model are summarized in table 6. When the perceived endowment is the landscape as it is today, the linear asymmetric model estimates, yield lower WTP estimates (for recreation and eco-efficiency) compared to the symmetric model. In contrast, the WTA compensation for the removal of such undertakings is significantly higher than the WTP in the symmetric model. Considering subsequently, the asymmetries associated with wind farm installation, we can see that WTA compensation for their installation 5 km or 8 km from the coast, decreases from 134€ (56€) in the asymmetric model to 120€ (70€) in the symmetric model. In contrast the implied WTP to avoid the wind farms (when the tourists perceive them as their endowment), is only of an order of 69 EUR, and thus significantly lower. The implication of this asymmetry on WTP and WTA measures for wind farm installation/removal at 5 km from the coast is illustrated in figure 6.

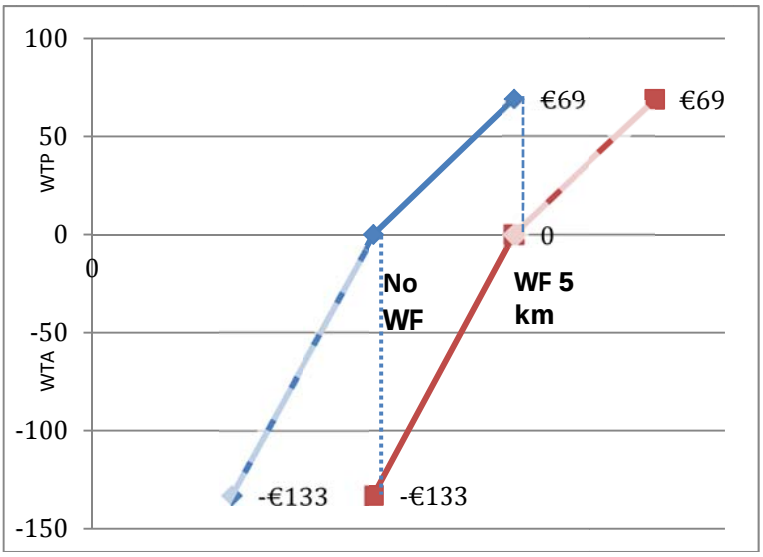

Figure 6: Imputed gain-loss asymmetry with regard to the installation of off-shore wind farms

From table 6 we find a WTA / WTP ratio of 1.94. Considering specifically the implication for welfare estimates associated with wind farm installation, the ratio imply that the disutility of seeing an offshore wind farm in the near view shed, is 94 % higher than the utility associated with removing the wind farm, once it is in place. Our results conform to previous findings. In their review of 45 studies, Horowitz and McConnelll (2002), find that the mean WTA/WTP ratio to be 7.2 with a median of 2.6, suggesting a pre-dominance of WTA/ WTP ratios in the lower end (like ours). More recently, in the choice modelling transport literature, Masiero and Hensher (2010) find a WTA/WTA ratio ranging between 2.7 for transport time and 2.9 for punctuality. Depending on reference point for transport time, Strathopoulos and Hess (2011) find the asymmetry to vary between 0 and 4.5. Lastly, Lanz et al. (2009) test loss aversion for internal sewer flooding in an environmental water supply CE, and find a WTP /WTA ratio as high as 65.

Conclusively, the evidence from our WTP and WTA estimates suggest that when the implied property right is 'the landscape and land-use as we know it today', there is a tendency for the symmetric model to overestimate WTP and under-estimate WTA relative to the asymmetric model. On the other hand, if respondents had property right to the future scenario, the results are reversed. The symmetric model over-estimates WTA and under-estimate WTP compared to the asymmetric linear model. Since the symmetric model provides welfare estimates that are in-between those of the asymmetric model with two different property right regimes - our results suggest that the reference point or perceived property right of the respondents in our sample are not uniform across respondents.

From a policy perspective, the above analysis implies that if tourists are considered to have the property right to the landscape and land-use activities as we know them today (not a bad assumption), then Westerberg et al. 2013 underestimates the disutilility associated with wind farm installation, and overestimates utility from recreational activities and eco-efficiency. If we instead picture a situation at a future date, in which the wind farm is already installed in conjunction with reef associated recreational activities and eco-efficiency, then the symmetric model in Westerberg et al 2013, overestimates the visual disamenities associated with wind farms, and underestimate the welfare benefit that comes from the eco-efficiency and the offer of eco-tourism activities.

The pinnacle question that follows is whether one should correct for gain-loss asymmetry when estimating welfare economic consequences of new initiatives at coastal community resorts? The natural response would be: Yes, if there is clear consensus about the implied property right of the respondents. In our context, it is ambiguous. The French government has decided to increase its share of renewable energies – a target, which will be fulfilled in part through the installation of offshore wind farms, in the Atlantic and potentially in the Mediterranean. Once installed, wind farms will be visible from a number of coastal community resorts. In the presence of a firm government decision to install wind farms, the implied property right is no longer the 'landscape as it is today'. However, it is far from guaranteed that artificial reefs will be installed, and eco-efficiency will follow. Therefore, the actual property rights, or endowment of the respondents is not clear-cut. In this case, correction for asymmetries is sub-ordinate. More relevant it seems, is to limit sources of WTP-WTA discrepancies. In this regard, Bateman (2007) note that a focus on accuracy of information provided to survey respondents should be coupled with an equal concern about the 'evaluability' of that information (Bateman et al 2007). The results presented in this paper point to the importance of familiarizing respondent with the goods that they are being asked to value.

6. Conclusion

Within the context of an analysis of tourist demand for or aversion to land use and land management destination alternatives, this paper confirms the widespread evidence of a consistent discrepancy between a person's willingness to pay (WTP) for a good and his willingness to accept (WTA) compensation to forgo the same good. We find that the disutility associated with an increase in the accommodation price is in terms of absolute value, 100% higher than the utility associated with a decrease of the same amount.

Secondly, by specifying the loss and the gain domain of the payment attribute as a quadratic function, we find a slightly better model fit, and evidence of a non-linear value function. Drawing on Tversky and Kahneman (1992), we conclude that non-linearity in the value function is most likely associated with risk seeking or risk aversion behavior, which in term depends on whether respondent consider 'paying' or 'receiving' compensation as likely. This observation calls for more research into the probabilities that respondents assign to events occurring in stated preference surveys.

Thirdly, we also investigate whether and how, experience, nationality, income may influence gain-loss asymmetry. Smaller gain-loss asymmetry for higher income and more experienced subjects is in accordance with standard neoclassical theory. We stipulate that smaller gain-loss asymmetry among Northern Europeans has to do with the fact that their reference point (perceived endowment) is different from French nationals, and that the respondent group whose stakes are larger (i.e. the French), have a larger aversion to losses.

In the presence of gain-loss asymmetry, the question that logically follows is whether analysts should explicitly account for gain-loss asymmetry in choice experiments that use attributes that are both utility increasing and utility decreasing? Our response is that it depends on whether there is clarity with regard to the implied property right (endowment) of the respondents. Our WTP and WTA estimates suggest that the symmetric (non-corrected) model overestimate WTP and under-estimate WTA, if respondents implied property right is the landscape and land-use activities, as we know them today. On the other hand, if respondents had property right to the future scenario in which policy changes are invigorated, the results are reversed: The symmetric model over-estimates WTA and under-estimate WTP compared to the asymmetric linear model. Thus, when the appropriate property rights are ambiguous for the population under scrutiny, our analysis suggest that it is not 'incorrect' to use the standard symmetric model to estimate welfare economic consequences of land use changes. This is because the symmetric model provides welfare estimates that are in-between the present and future property right regimes of the asymmetric model (fig 6). More importantly, our results suggest that the reference point or perceived property right of the respondents in our sample is not uniform across respondents. This fact calls for amendment and advancement of stated preference surveys, as we know them today. In particular, when the implied property right is unambiguous, survey instruments should be more explicit about 'what right' respondents have. In the absence of such affirmation different perceived endowments will remain a potentially important source of latent heterogeneity.

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