The effects of emotions on preferences and choices for environmental goods.

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ABSTRACT

This paper tests whether changes in "incidental emotions" lead to changes in economic choices. Incidental emotions are experienced at the time of an economic decision but are not part of the payoff from a particular choice. As such, the standard economic model predicts that incidental emotions should not affect behavior, yet many papers in the behavioral science and psychology literatures find evidence of such effects. In this paper, we used a standard procedure to induce different incidental emotional states in respondents, and then carried out a choice experiment on changes to an environmental good (beach quality). We estimated preferences for this environmental good and willingness to pay for changes in this good, and tested whether these were dependent on the particular emotional state induced. We also tested whether choices became more or less random when emotional states were induced, based on the notion of randomness in a standard random utility model. Contrary to our a-priori hypothesis we found no significant evidence of treatment effects, implying that economists need not worry about the effects of variations in incidental emotions on preferences and the randomness of choice, even when there is measured (induced) variation in these emotions.

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1. Introduction

Basic emotions, such as anger, fear, surprise, disgust, joy, or sadness, have been argued to play an important role in economic decision making (Elster, 1998, Loewenstein, 2000). However, the conventional economic model used to predict choices and to derive values from preferences is not well set up to recognize how day-to-day emotions might affect these choices and values. A fundamental assumption in micro-economic theory is that individuals are fully aware of their preferences and that these preferences are stable and consistent (Brown et al, 2008; Rabin, 1998). For a given set of preferences (a given utility function), whether I am happy or sad at some particular moment should not, according to economic theory, determine whether I choose to buy a particular type of coffee for a particular posted price. Yet a literature in behavioural sciences and psychology suggests that there are many examples where emotional states do matter for such decisions. Should economists worry about this? If emotions affect choices, then assumptions of stable welfare measures based on a given set of preferences is perhaps wrong.

2. Literature review

It has been suggested that emotions enter into the decision making process in three important ways (Rick & Loewenstein, 2008). First, certain emotions may be anticipated directly from the outcome of the decision itself and materialize at some future point i.e. through comparing the expected joy or sadness from purchasing a new coat over going to a football game. Second, there are emotions, referred to as integral emotions, which occur at the moment of decision and are directly related to the decision at hand (Lerner, Li, Valdesolo, & Kassam, 2014). For example, the decision itself may pose some element of risk and therefore evoke feelings of fear, or even pleasure (Loewenstein, Weber, & Hsee, 2001). As Rick & Loewenstein (2008) argue, such emotions do not pose a major challenge for the utility maximizing framework of economics, since they influence the utility associated with

choice alternatives. Third, and posing a more fundamental challenge to the utility maximizing framework of economics, comes from the consideration of "incidental emotions", which occur at the moment of the decision but are irrelevant to the payoffs from the decision at hand.

Incidental Emotions and Decision-Making.

Incidental emotions, such as anger, fear, surprise, disgust, joy, or sadness, may be present whilst individuals are making important decisions for many different reasons. For example, an individual may be sad from thinking about an argument they had that morning, or from a recent bereavement, or they might be happy from having just watched an uplifting film, or just from the fact that it happens to be a sunny day. Incidental emotions influence high level cognitive processes, such as interpretation, judgement, decision-making, and reasoning (Blanchette & Richards, 2010) and it has thus been suggested that incidental emotions have the power to "reprogram us into effectively different people" (Loewenstein, 2010). On the basis that sunshine causes greater feelings of happiness (e.g., Schwarz & Clore, 1983) the amount of sunshine in a given day has been shown to influence stock market performance (Hirshleifer & Shunway, 2003; Kamstra, Kramer, & Levi, 2003). Further, when a country's team is eliminated from the World Cup, stock market returns decline (Edmans, Garcia & Norli, 2007). Such evidence suggests that incidental emotions may pose a fundamental threat to conventional economic models, since this psychological evidence suggests a strong likelihood that incidental emotions will influence an individual's preferences for public goods. However, this proposition has yet to be tested.

A substantial amount of the research highlighting the importance of incidental emotions has come from experiments whereby researchers induce specific emotions within an individual prior to them carrying out some decision-based task (Lerner, Li, Valdesolo, &

Kassam, 2014). Before the task, researchers randomize individuals into an "emotion manipulation", whereby a procedure such as watching film clips, reading stories or listening to music, is used to elicit specific emotions (Gilet, 2008; Westerman, Spies, & Stahl, 1996). Johnson and Tversky (1983) provided one of the first empirical demonstrations that inducing a specific emotional state, via reading newspaper stories, resulted in different risk perceptions. Since then, notable findings have been that the classic endowment effect, whereby individuals more highly value something they possess than those who do not possess the good, was eliminated when inducing disgust and completely reversed when inducing sadness (Lerner, Small, & Loewenstein, 2004). Andrade and Ariely (2009) demonstrate using ultimatum and dictator games (Kahneman, Knetsch, & Thaler, 1986) that the emotions induced via showing a film can endure by not only influencing decisions in the moment but also by influencing subsequent decisions, and can thus result in sub-optimal outcomes. It has also been shown that when a charity appeal invokes feelings of sympathy, guilt or personal nostalgia, then donations increase (see e.g., Kogut & Rigove 2005; Small & Loewenstein, 2003; Ford & Merchant, 2010). When induced specifically with happiness, individuals have higher productivity in a paid piece-rate task (Oswald, Proto, & Sgroi, forthcoming).

There is relatively scant evidence where affective states have *not* influenced decision-making in some way (Blanchette & Richards, 2010; Lerner et al., 2014). Thus based on this prior empirical evidence, we hypothesize that emotions, such has happiness and sadness, will influence preferences for public goods, potentially changing willingness to pay. More specifically, and based around theoretical reasons for the mechanisms driving such differences in decisions, positive and negative emotions have been shown to lead to very different ways of processing information. Decisions, which are based on an individual's expected utility, often do not conform to an individual's experienced utility (Kahneman,

Wakker, & Sarin, 1997). Often expected utility can be dependent on some reference point, for example an individual's initial state (Tversky & Kahneman, 1991). As such, if an individual makes a decision whilst in a happy or positive state, then losses may be perceived more negatively than those who are not happy or even sad owing to the expectation that the outcome will be more consequential (Isen, Nygren, & Ashby, 1988).

Thus we may expect individuals in a positive state to generally avoid losses more (in our experiment, losses correspond to declines in environmental quality at beaches). Further, being in a happy state generally increases the reliance on heuristic processing and also decreases systematic possessing (Blanchette & Richards, 2010). For example, there is stronger reliance on using stereotypes to make judgments (Bodenhausen, Kramer, & Susser, 1994) and a reliance on pre-existing knowledge structures i.e. scripts (Bless et al., 1996), resulting from lower motivation to process decisions systematically (Bless, Bonher, Schwarz, & Strack, 1990) and possibly a temporary depletion of cognitive resources (Mackie & Worth,1989). As such we expect those induced to feel happiness to make relatively quick decisions, to be biased toward the status quo, to be more sensitive to losses, more guided by self-interest and therefore have a different willingness to pay for changes in environmental quality, ceteris paribus, than those who are not induced to feel happy. Due to overreliance on heuristics, we also expect them to make more mistakes i.e. have more randomness in their preferences.

Contrastingly, sadness induces more careful and systematic processing over decisions (Bodenhausen, Gabriel, & Lineberger, 2000), We therefore hypothesize that individuals induced to feel sadness will take more time over their decisions, potentially be more considerate towards the interests of others, and make less mistakes i.e. exhibit less randomness in their decisions relative to those who are not sad. However, we also note that there is some evidence that those that exhibit the most emotional reactivity have better

decision-making performance (Seo & Barrett, 2007) and so we expect those who experience the strongest reactions to our emotion inductions to show more consistent preferences.

We now describe an experiment where these hypotheses are tested.

3. Experimental design

Prior to the choice experiment we randomized individuals into one of three different conditions: a sadness condition, a happiness condition, and a neutral condition. In each condition participants were asked to watch a collection of short film clips (approximately 6-7 minutes in length) of the same valence. The film clips were selected based on prior research which has illustrated the effectiveness of such clips in eliciting specific emotions (Rottenberg, Ray, & Gross, 2007; Schaefer, Nils, Sanchez, & Philippot, 2010). It has been shown that showing a short film with some emotional content before a task is the most effective way to induce a specific emotion (Gilet, 2008; Westerman, Spies, & Stahl, 1996). Specific clips from well-known films have been used to induce fear (The Shining: Van Boven, Loewenstein, Welch, & Dunning, 2012), anger (Cry Freedom: Inbar & Gilovich, 2011), or happiness (various comedy clips: Forgas and East, 2008). Such a technique has been well validated with several attempts to systematically review the effectiveness of different film clips, as well as categorize the precise emotions they elicit (see e.g., Schaefer, Nils, Sanchez, & Philippot, 2010).

In our survey, we used similar clips based on Feinstein et al. (2010) to elicit two incidental emotions, sadness and happiness, prior to decisions relating to the environment. Typically, studies include neutral conditions which involve showing documentaries relating specifically to nature (e.g., Andrade & Ariely, 2009; Forgas & East, 2008). To avoid priming subjects with concerns about the environment (given that this was the object over which people were then being asked to make choices), we ensured our neutral condition consisted

instead of various non-emotional clips unrelated to the environment. The specific film clips used are listed in Table 1.

At the end of the choice experiment we carried out a manipulation check and asked participants to report how they felt while they were watching the video clips. We asked two questions relating to valence (the intrinsic attractiveness: positive or negative): "While I was watching the film I felt…1 = sad (bad), 4 = neither happy nor sad (neither bad nor good), 7 = happy (good)". We also asked two questions relating to arousal (reactivity): "While I was watching the film I felt…1 = relaxed (not-aroused), 4 = neither tense nor relaxed (somewhat aroused), 7 = tense (aroused)". Such emotions are typically assumed to carry over into the choice experiment and in accordance with this it has been demonstrated that participants with severe amnesia, and who thus quickly "forgot" the content of the film clips, still experienced the experimentally-induced emotions (Feinstein, Duff, & Tranel, 2010).

3.1 The choice experiment

We designed a choice experiment (Hensher et al, 2005) to elicit preferences for a recreational good, namely visits to the beach on the North Island of New Zealand. Choice experiments describe the objects of choice (here, beach visits) using the attributes of these objects, and the levels which they can take. Price or cost is usually included as one attribute. Beach visits within the North Island of New Zealand were described using a set of four attributes, based on discussions with scientists from the National Institute for Water and Atmosphere, and a survey of the literature.

Having viewed one of the three sets of film clips, respondents read the following text:

"We now want to ask you some questions about the New Zealand coast. Many of us enjoy a visit to the beach, whether to go surfing, swimming or just hanging out. Many people also enjoy fishing and boat trips. The state of the environment can affect peoples' experiences during such visits, and may be one of the factors determining which beaches they choose to

visit. Most of these environmental conditions – such as water quality – are partly determined by how we manage our coastal areas (for example, how much money is spent on pollution control).

Imagine that you have decided to take a day trip to a beach in this area, and are thinking about where to go. On the next screens, you'll see a number of options. We'd like you to make a choice in each case about which beach you'd prefer to visit. Whilst there are many factors determining where you might want to go, these options are all concerned with the environmental conditions at different beaches. Another important factor is obviously how far you would have to travel, so you will see some information in the choice sets about this too. You can assume that it is safe to surf or swim at all of these beaches."

Respondents were then told about the attributes which would describe their choices. The first attribute used to describe beach visits was Water Quality. Water Quality was described as varying along the coastline due to pollution from human wastes (sewage), nutrient run-off from farmland and other contaminants. Respondents were told that such pollution could lead to more beach closures due to increased incidences of algal blooms and rising levels of harmful bacteria in bathing waters. However, they were also told that increased efforts to control pollution were possible, and these would lead to high levels of (better) water quality. The water quality attribute was set at three levels in the experimental design, namely:

- Poor water quality – high levels of nutrients, algal blooms likely
- Good water quality
- Very good water quality – nutrient levels are greatly reduced, algal blooms very unlikely

The second attribute used was sediments. Many areas of the New Zealand coastline have suffered from increased sediment loads, which have resulted in a change in water clarity, the loss of sand areas, and the increased growth of mangroves which greatly impedes access to the water. Respondents were told that "*if we take no further action, sediment will continue to accumulate at the coast and areas of muddy sediment will increase (in coverage and in muddiness). In some places, this will result in further expansion of mangroves. While we can't entirely remove the sediment problem, it is possible to reduce its impacts. With an*

increased effort in storm-water management areas, we may also be able to improve on the current situation, leading to clearer, bluer water and less muddy shores." The levels of this attribute were thus set at:

- High levels of sediment – water is very cloudy, beaches become muddy
- Medium levels of sediment
- Low levels of sediment - water is very clear, beaches stay sandy

The third attribute used to describe visits to the beach was fish populations. Sea angling is a very popular recreational activity in New Zealand, whilst scuba divers and snorkelers are likely to value higher biodiversity in coastal waters. Respondents were told that: "*how good fish stocks are depend on how the coastal environment is managed. Right now, fish populations are under pressure from over-fishing and from water pollution. We can take actions to reduce these pressures, but unless we do so, stocks might continue to decline."* The levels for this attribute were then set at three possible outcomes:

- Declining – fish populations are falling due to too much pollution and too much fishing
- Stable
- Increasing – there are healthy and expanding fish populations of fish such as snapper.

Finally, we included a price or cost attribute to allow welfare measures to be calculated from the choice responses. People in New Zealand do currently pay for some of the costs of water pollution control through their regional and local taxes, but not everyone pays (e.g. students do not), whilst the link between recreational beach quality and variations in such taxes is unclear. Therefore, we did not use regional or local taxes as a bid vehicle, unlike in some similar studies (e.g. Hanley et al, 2006). Access to beaches in New Zealand is free in the sense of no entry fee being levied for access. We could thus not use an entry fee as the price attribute. However, individuals do pay to travel to beaches through fuel costs, and so travel costs were used as a price for each choice option. There are several other environmental

choice experiment studies which have used travel costs as the price attribute (eg Hynes et al, 2013; Christie et al, 2007). We thus told respondents: "*Another important factor is obviously how far you would have to travel (to visit any beach), so you will see some information in the choice sets about this too."*

Given this set of attributes and levels, three blocks of 8 choice sets were constructed. Each choice set contains three choice options: visit beach A, visit beach B, or visit neither and make no beach trip on that choice occasion. Based on random utility theory and Lancaster's characteristics theory of value (see below), we expect each individual to choose that option in each choice set (A,B, neither) which maximizes utility from that choice occasion, independently of any emotional manipulation. The conventional behavioral model underlying choice experiments thus suggests that emotional treatment should have no effect on preferences and thus no effect on choices. We test this below.

Given that each individual faces 8 choice cards, each respondent provides (8 x3) observations. We model their choices as a function of the attributes and levels in each choice option, and the emotional treatment which they received. An example of choice card is included as Figure 1.

3.2 Lab Procedures

The experiment consisted of 17 sessions conducted in September 2014 at the University of Waikato in Hamilton, New Zealand. A total of 287 subjects participated in the experiment. The participants were university students that were recruited university wide using ORSEE

(Greiner, 2014)[1]. Some of the participants had participated in previous economics experiments, but none had experience with the emotion elicitation methods employed and only participated in a single session of this study. All interaction within the experiment took place via private computer terminals. Each session lasted for less than one hour. The time subjects took to complete the survey varied widely, but each session lasted until the last person had completed their tasks and all had then been paid. Participants were paid $20NZ upon completion of the survey.

Each session proceeded as follows: (1) Upon arrival to the laboratory, participants were free to choose any computer desk to use for the session. The desks are specifically designed with privacy walls surrounding to minimize external influences. (2) Once everyone was seated, a short welcome speech was provided by the experimenter after which the survey program was run simultaneously for everyone. (3) Participants were initially provided a screen asking their area of study and where they are from. Once everyone completed these two questions, the movie clips started simultaneously for everyone. All subjects were provided headphones for viewing the movies. (4) Upon completion of the movie, participants took part in the choice experiment survey. (5) Finally, participants answered a series of questions regarding their personal traits and a self-assessment of emotional state induced while watching the movie. Participants were asked to wait quietly until everyone was finished and then were called back one at a time to be privately paid their participation fee.

4. Econometric Approach

[1] The Online Recruitment System for Economics Experiments (ORSEE) is a subject recruitment and management program specifically designed for economics experiments. More information can be found at http://www.orsee.org/web/.

The theoretical foundations for the analysis of our choice experiment data are provided by the random utility theory (McFadden, 1974). Formally, assume that the utility derived from respondent i's choice of alternative j can be expressed by:

$$V_{ij} = \boldsymbol{\beta}' \boldsymbol{X}_{ij} + e_{ij}, \tag{0}$$

where the utility expression is separable in attribute levels $\boldsymbol{X}_{ij}$ with the vector of associated parameters $\boldsymbol{\beta}$, and e_{ij} a stochastic component allowing for other factors than those observed by a modeler to affect individual's choices.[2]

The stochastic component of the utility function (e_{ij}) is of unknown, with possibly heteroskedastic variance $\left(\text{var}\left(e_{ij}\right) = s_i^2\right)$. Identification of the model is typically assured by normalizing this variance, such that the error term $\varepsilon_{ij} = 6^{-0.5} \pi s_i^{-1} e_{ij}$ is identically and independently extreme value type one distributed (with constant variance, $\text{var}\left(\varepsilon_{njt}\right) = \pi^2/6$), leading to the multinomial logit (MNL) model and the following utility function specification:

$$U_{ij} = \sigma_i \boldsymbol{\beta}' \boldsymbol{X}_{ij} + \varepsilon_{ij}. \tag{0}$$

Note that due to the ordinal nature of utility, this specification represents the same preferences as in (1). Note also that emotional state does not enter the utility function, and so should not influence choices. Estimation of the model parameters is through maximum

[2] In our specification the vector of preference parameters $\boldsymbol{\beta}$ is generic, i.e. each respondent is assumed to have exactly the same preferences. An alternatives exists, in which respondents' preferences in the population are assumed to follow an a priori specified parametric distributions, which allows for taking unobserved preference heterogeneity into account. This approach is called the mixed logit model and although it is not presented in our paper, the results are available as supplementary materials.

likelihood techniques. An individual will choose alternative j if $U_{ij} > U_{ik}$, for all $k \neq j$, and the probability that alternative j is chosen from a set of C alternatives is given by:

$$P(j|C) = \frac{\exp(\sigma \boldsymbol{\beta}' \boldsymbol{X}_{ij})}{\sum_{k=1}^{C} \exp(\sigma \boldsymbol{\beta}' \boldsymbol{X}_{ik})} \quad . \tag{0}$$

We next use this approach to test if the (objective) emotional treatments or the (subjectively reported) emotional states of the respondents lead to statistically significant differences in their observed preferences. The effects of treatment on randomness of choice is investigated by interacting the treatment effect with the scale parameter, σ. The effects of treatment on the preference parameters is tested for by interacting treatment effects with the β values for each attribute[3].

5. Results

In this section we present the results of our empirical investigation into whether emotional states influence individual's preferences. These results are presented in Table 2. To establish a baseline, panel A of Table 2 presents a general model which ignores which emotional treatment group participants were in. The variable names represent improvements in water quality levels – *good* (WQ_1) and *very good* (WQ_2) vs. the current *poor* water quality (reference level); sediment levels – *medium* (SED_1) and *low* (SED_0) vs. the current *high* levels of sediments (reference level); fish populations – *stable* ($FISH_1$) and *increasing* ($FISH_2$) vs. the current *declining* levels; the effects of changes in travel costs to a beach (*DIST*) and respondents' propensity to choose the opt-out ('go to neither') option (*OO*). The coefficients correspond to utility function parameters and although do not have direct interpretation, their signs and relative values represent the marginal utility an individual derives from an

[3] The models were estimated in Matlab. The software (estimation package for DCE data), as well as the dataset and the supplementary materials are available at czaj.org under CC BY 4.0 license.

alternative with a particular attribute. These marginal utilities influence the probability he or she will choose any alternative.

Overall, respondents prefer beaches with better water quality, less sediments and increasing fish populations. This may be seen by looking at the sign, size and significance of the parameter estimates for *WQ, SED* and *FISH.* Distance also plays an important role and, as expected, the longer the drive the less preferred a beach, other things being equal. Finally, on average (across all choice sets and respondents) the opt-out alternative was associated with positive utility, in comparison with beaches with improved attributes but possibly more distant from home.

The next model presented (panel B) accounts for the emotional treatments of the experiment. In addition to the main effects of attributes on choices, each attribute is interacted with a dummy representing being exposed to sadness- or happiness- inducing film clip, relative to the neutral treatment. None of these interaction effects is significant, even at the 10% level. We note, however, that the signs of both interactions are mostly the same which may indicate that being exposed to any emotional clip (happy or sad) changes preferences in the same way. We test this hypothesis using the model presented in panel C. This time there is only one set of interactions for being treated in general (with either happy or sad movies compared to the neutral movie clips). Again, these interaction effects are not statistically significant. As there are no significant effects of emotional treatment on preference estimates, then there will be no significant effects on willingness to pay, since willingness to pay for a marginal change in any attribute is given by dividing the coefficient on that attribute by the coefficient on price, and emotional treatment makes no significant change to either the denominator or the numerator.

A consideration from the preceding is that either the emotional treatments had no effect on respondents' choices, or our sample size is too small to observe statistically significant effects. This last speculation could be to some extent supported by the fact that the signs of interactions for the low and high level of each attribute are consistently the same – if they were completely random we would expect half of the interactions having positive, and the other half negative signs for the same attributes. Note, however, that although not significant, the treatments seem to influence different attributes in different ways – after watching emotional clips respondents seem to care more for the water quality and opt-out option, and less about sediments, fish populations and travel distance.

Next, we test if the effect of being emotionally treated influences the scale of respondents' utility function, rather than individual preference parameters. The scale of utility function is inversely proportional to the error variance of the utility function in (1), and hence can be considered a measure of the observed consistency or randomness of respondents' choices. These results are presented in the panels D and E of Table 2, for the separate or joint effect of the treatments respectively. We find that the treatment-related interactions of utility function scale are not significant, so that there was no observed impact on randomness of choice of the happy or sad treatment relative to the neutral treatment.

Since the effects of treatments on utility function parameters and scale are not significant, we next test if the treatments actually influenced respondents' (subjective) emotional states. That is, we examine whether the film clips did indeed change peoples' emotional states during the experiment. Table 3 presents the results of 3 ordered probit models in which respondents' Likert-scale responses to 3 questions regarding whether while watching the film clips they felt sad compared to happy, bad compared to good and tense compared to relaxed.

The results of the ordered probit models (Table 3) show that our treatments significantly influenced the extent to which respondents self-reported they felt sad or happy (panel A) and bad or good (panel B), while we observed an asymmetric effect of treatments on whether respondents felt tense or relaxed. Sad film clips made respondents feel sadder, worse, and more tense. Interestingly, happy clips made respondents say they felt happier and better, but had no significant effect for how tense or relaxed they felt. In general, however, we can conclude that respondents were not indifferent to the film clips and their emotional states were affected, even though we do not observe an effect of emotional state on the preferences they displayed for beach qualities.

We tested if respondents' self-reported (subjective) emotional states influenced their choices, and hence their observed preferences. To do this, we used each of the three normalized[4] 7-point Likert scale responses mentioned above (*happy-sad*, *bad-good*, *tense-relaxed*), as explanatory variables of respondents' preferences – as before they were interacted with each of the choice attributes or the scale parameter. The results of this approach are presented in Table 4.

We found that feeling subjectively sad or happier, bad or good and tense or relaxed did not significantly influence individuals' expressed preferences for beach qualities, either if the self-reports were measured on a negative/positive scale (panel A of Table 4) or on an absolute arousal scale (panel B), which reflected how far away from neutral state a respondent was on each scale. One exception to this was that respondents who felt subjectively better 'disliked' the distance that had to be travelled *less*. Similarly, we found that neither self-reported emotional states, nor their absolute levels, significantly influenced the utility function scale parameter - the randomness of respondents' choices from a

[4] The variables were normalized so that each one's mean was equal to 0 and standard deviation equal to 1.

modeler's perspective – as indicated by insignificant explanatory variables of scale in panels C and D of Table 4 respectively.

It might be thought that, despite the evidence of both Feinstein et al. (2010) and Andrade and Ariely (2009) who show that effects of induced emotions can be long lasting, the effects of viewing any of the films would be stronger, the closer in time choices are made to the film viewing. Note that stated preferences might change over a task sequence for many reasons such as preference learning, task familiarity and the increasing use of heuristics, so that identifying the changing effects of film viewing on choices across a sequence would be difficult. Nevertheless, we compared preference parameter interactions with treatment between the first 2, first 4 and all eight choices. In none of these cases were treatment effects significant, so that there does not seem to be a time proximity effect for the emotional manipulation.

Finally, we note that we found qualitatively similar results emerge we applied more elaborate models – namely mixed logit (Revelt et al., 1998), latent trait (Hambleton et al., 1991; Nering et al., 2010) and hybrid choice models (Ben-Akiva et al., 2002). The results of these modelling approaches are available as supplementary materials to this paper.[5] All these modelling approaches consistently showed that emotional states did not significantly influence the stated preferences of our respondents.

6. Conclusions

This paper investigates the effects of emotions on stated preferences for an environmental good. The paper argued that amongst the types of emotion identified by behavioural scientists, incidental emotions could cause problems for the standard model of economic

[5] Supplementary materials are available at czaj.org under CC BY 4.0 license.

choice and the welfare measures based thereon. Incidental emotions are present at the time decisions are made, but are irrelevant to the payoffs associated with alternatives or with the decision itself. They should thus not influence choices according to the standard economic model. By "standard model", we mean here the random utility model, whereby individuals choices are based on the attributes of goods and the levels these take, and where individuals attempt to choose the package with the highest deterministic utility level.

To investigate these issues, a Choice Experiment was implemented in a laboratory setting. The choice experiment relates to decisions as to which beach to visit for recreation, where beaches vary according to their environmental quality and the price of a trip, represented by distance from home. Subjects received one of three emotional "treatments" using film clips: a happy treatment, a sad treatment and a neutral treatment. These treatments were effective in that they have statistically significant effects on respondents' self-reported emotional states and we hypothesized that happy individuals would make relatively quick decisions, be biased toward the status quo, be more sensitive to losses, more guided by self-interest and therefore have a different willingness to pay for changes in environmental quality. Those experiencing sadness were hypothesized to take more time over their decisions, be more considerate towards the interests of others, and exhibit less randomness in their decisions. However, we found no statistically significant effects on preference parameters, and thus no statistically significant effect on willingness to pay for changes in any of the three environmental attributes. In many ways this is surprising since there is very little documented evidence of instances when individual's choices were not influenced by incidental emotions (Lerner, Li, Valdesolo, & Kassam, 2014). Perhaps this may in part be the result of publication bias which is more prevalent in some fields (Yong, 2012). There was also no statistically significant effect of emotional treatment on the randomness of people's choices, as measured by the

scale parameter. This is interesting given the common wisdom that more emotional people make less rational choices.

Given this evidence, the paper suggests that incidental emotions do not create substantive problems for the standard economic model of choice. This is encouraging, given that we are all subject to such emotions during the course of many of our decisions in life, whether it be choosing over private or public goods. However, there is still an open question as to how emotional states relate to the process of preference construction, and how they interact with framing effects, rather than instantaneous measures of preferences such as those undertaken here. These would be interesting areas for future research.

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Figure 1

Example Choice Card

	Beach A	***Beach B***	*Go to neither – I would not want to visit either of these beaches and would stay at home instead.*
Water quality	good	very good	
Sediments	low	high	
Fish populations	stable	declining	
How far from where you live?	120 km	30 km	
I would choose:	□	□	□

Table 1: Film clips used in each of the conditions

Condition	Clip 1	Clip 2	Clip 3	Clip 4	Total Time
Sadness (negative valence)	The Champ (Child experiences his hero's death – 2:42)	Born on the 4th of July (Man injured from war has returned home and is distraught – 1:59)	Forest Gump (Man is at the graveside of his love – 2:01)		6:42
Happiness (positive valence)	Ladder 49 (Man finds out his wife is pregnant – 1:18)	Love actually (Man proposes to a woman – 2:21)	Love Actually (People meeting loved ones at the airport – 1:19)	Indiana Jones (Children return home to their parents – 1:16)	6:14
Neutral	Stock market report (Woman reports on the stock market – 1:30)	Golf grip video (Man describes how to grip a golf club – 1:51)	Abstract painting (Woman describes acrylic painting techniques – 1:06)	Antiques auctions (Man describes items sold at an antiques auction – 1:26)	5:53

Table 2. The effects of emotional treatments on individuals' preference or scale parameters – the results of MNL models

	(A) General model	(B) Effect of emotional treatments (separate) on preferences			(C) Effect of emotional treatments (combined) on preferences		(D) Effect of emotional treatments (combined) on scale	(E) Effect of emotional treatments (combined) on scale
		Main effects	Interactions with *happy*	Interactions with *sad*	Main effects	Interactions with being treated		
Variable	**Coefficient (s.e.)**	**Coefficient (s.e.)**	**Coefficient (s.e.)**	**Coefficient (s.e.)**	**Coefficient (s.e.)**	**Coefficient (s.e.)**	**Coefficient (s.e.)**	**Coefficient (s.e.)**
WQ_1	2.0291***	1.9117***	0.1831	0.2088	1.9117***	0.1898	1.9857***	1.9875***
	(0.0944)	(0.1584)	(0.2295)	(0.2330)	(0.1584)	(0.1978)	(0.1406)	(0.1406)
WQ_2	2.3953***	2.2318***	0.1351	0.4048	2.2318***	0.2605	2.3473***	2.3465***
	(0.1072)	(0.1846)	(0.2605)	(0.2676)	(0.1846)	(0.2273)	(0.1649)	(0.1649)
SED_1	0.7044***	0.8395***	-0.2595	-0.1438	0.8395***	-0.2033	0.6888***	0.6879***
	(0.0817)	(0.1442)	(0.1976)	(0.2073)	(0.1442)	(0.1753)	(0.0906)	(0.0904)
SED_0	0.7943***	0.8940***	-0.3013	0.0115	0.8940***	-0.1497	0.7795***	0.7764***
	(0.1008)	(0.1825)	(0.2467)	(0.2555)	(0.1825)	(0.2191)	(0.1094)	(0.1093)
$FISH_1$	0.4720***	0.5816***	-0.1529	-0.1718	0.5816***	-0.1627	0.4602***	0.4609***
	(0.0766)	(0.1318)	(0.1854)	(0.1907)	(0.1318)	(0.1622)	(0.0799)	(0.0799)
$FISH_2$	0.4793***	0.5586***	-0.0324	-0.2110	0.5586***	-0.1188	0.4657***	0.4684***
	(0.0994)	(0.1730)	(0.2394)	(0.2508)	(0.1730)	(0.2117)	(0.1018)	(0.1018)
OO	0.9754***	0.8576***	0.1326	0.2612	0.8576***	0.1898	0.9569***	0.9562***
	(0.1146)	(0.1969)	(0.2809)	(0.2817)	(0.1969)	(0.2424)	(0.1225)	(0.1227)
DIST	-1.1516***	-1.2349***	0.0884	0.1621	-1.2349***	0.1241	-1.1242***	-1.1263***
	(0.1101)	(0.1921)	(0.2684)	(0.2743)	(0.1921)	(0.2347)	(0.1264)	(0.1265)
Covariates of scale								
sad							0.0734	
							(0.0928)	
happy							-0.0078	
							(0.0940)	

being treated (*happy* or *sad*)					0.0319 (0.0811)
Model characteristics					
Log-likelihood (constants only)	-2442.06	-2442.06	-2442.06	-2442.06	-2442.06
Log-likelihood	-2050.61	-2043.17	-2047.24	-2050.11	-2050.53
McFadden's pseudo R^2	0.1603	0.1633	0.161675	0.1605	0.16033
AIC/*n*	1.7932	1.8009	1.797355	1.7946	1.794048
n (observations)	2296	2296	2296	2296	2296
k (parameters)	8	24	16	10	9

***, **, * Significance at 1%, 5%, 10% level

Table 3. The effects of emotional treatments on individuals' self-reported emotional states – the results of ordered probit models

	(A) *sad-happy*	**(B) *bad-good***	**(C) *tense-relaxed***
	Coefficient (s.e.)	**Coefficient (s.e.)**	**Coefficient (s.e.)**
Index probability function probability parameters			
constant	2.6731***	2.5598***	0.7838***
	(0.1210)	(0.1153)	(0.1071)
Sad	-2.2936***	-1.4130***	0.7752***
	(0.1660)	(0.1585)	(0.1514)
Happy	1.3987***	1.1684***	-0.2401
	(0.1635)	(0.1574)	(0.1497)
Threshold parameters for index function			
η_1	0.7441***	0.6529***	0.6877***
	(0.1000)	(0.0984)	(0.0643)
η_2	1.5492***	1.1778***	1.0860***
	(0.1108)	(0.1000)	(0.0704)
η_3	3.0243***	2.7623***	1.6018***
	(0.1042)	(0.0936)	(0.0806)
η_4	3.8369***	3.5245***	2.3447***
	(0.1014)	(0.0928)	(0.1045)
η_5	4.7355***	4.3084***	3.0156***
	(0.1326)	(0.1214)	(0.1568)
Model characteristics			
Log-likelihood (constants only)	-541.7879	-498.7284	-525.2163
Log-likelihood	-388.1543	-498.7284	-502.4245
McFadden's pseudo R^2	0.2836	0.1913	0.0434
AIC/*n*	2.7610	2.8660	3.5570
n (observations)	287	287	287
k (parameters)	8	8	8

Table 4. The effects of self-reported emotional states on individuals' preference or scale parameters – the results of MNL models

	(A) Effect of self-reported emotional states on preferences				(B) Effect of self-reported emotional states (absolute strength) on preferences				(C) Effect of self-reported emotional states on scale	(D) Effect of self-reported emotional states (absolute strength) on scale
	Main effects	**Interactions with *sad-happy***	**Interactions with *bad-good***	**Interactions with *tense-relaxed***	**Main effects**	**Interactions with *sad-happy***	**Interactions with *bad-good***	**Interactions with *tense-relaxed***		
Variable	**Coefficient (s.e.)**	**Coefficient (s.e.)**	**Coefficient (s.e.)**	**Coefficient (s.e.)**	**Coefficient (s.e.)**	**Coefficient (s.e.)**	**Coefficient (s.e.)**	**Coefficient (s.e.)**	**Coefficient (s.e.)**	
WQ_1	2.0408*** (0.0959)	0.0604 (0.1526)	-0.1957 (0.1526)	-0.0501 (0.1073)	2.0416*** (0.0954)	0.0057 (0.1122)	0.0072 (0.1147)	-0.0850 (0.0998)	2.0224*** (0.0946)	2.0465*** (0.1845)
WQ_2	2.4105*** (0.1089)	-0.0380 (0.1792)	-0.1753 (0.1813)	0.0663 (0.1252)	2.4057*** (0.1085)	-0.0226 (0.1298)	0.0432 (0.1330)	-0.1688 (0.1160)	2.3971*** (0.1075)	2.4172*** (0.2133)
SED_1	0.7062*** (0.0825)	0.2232 (0.1401)	-0.2011 (0.1396)	0.0876 (0.0936)	0.7075*** (0.0829)	-0.0060 (0.1011)	-0.0066 (0.1036)	-0.1281 (0.0876)	0.7000*** (0.0818)	0.7111*** (0.0997)
SED_0	0.7974*** (0.1018)	0.3147 (0.1717)	-0.3343 (0.1740)	0.1123 (0.1191)	0.7947*** (0.1020)	-0.0984 (0.1230)	0.0525 (0.1251)	-0.1396 (0.1092)	0.7927*** (0.1010)	0.8060*** (0.1185)
$FISH_1$	0.4701*** (0.0772)	0.0359 (0.1274)	0.0297 (0.1268)	0.1377 (0.0879)	0.4776*** (0.0777)	0.0382 (0.0938)	-0.0106 (0.0954)	-0.0943 (0.0806)	0.4706*** (0.0764)	0.4748*** (0.0844)
$FISH_2$	0.4793*** (0.1002)	0.2393 (0.1659)	-0.3256 (0.1664)	-0.0141 (0.1145)	0.4744*** (0.1005)	0.1159 (0.1238)	-0.0668 (0.1260)	0.0041 (0.1075)	0.4826*** (0.0995)	0.4827*** (0.1062)
OO	0.9820*** (0.1153)	0.1347 (0.1837)	-0.0954 (0.1811)	0.0304 (0.1318)	0.9859*** (0.1159)	0.0651 (0.1356)	0.0254 (0.1397)	-0.1615 (0.1211)	0.9678*** (0.1139)	0.9840*** (0.1393)
DIST	-1.1519*** (0.1110)	-0.3006 (0.1825)	0.3914** (0.1816)	-0.1065 (0.1286)	-1.1538*** (0.1116)	0.0561 (0.1325)	0.0395 (0.1346)	0.1276 (0.1171)	-1.1527*** (0.1097)	-1.1641*** (0.1408)
Covariates of scale										
sad-happy									-0.0402	-0.0434

			(0.0611)	(0.0808)
bad-good			-0.0417	0.0505
			(0.0608)	(0.0802)
tense-relaxed			0.0088	-0.0163
			(0.0435)	(0.0831)
Model characteristics				
Log-likelihood	-2442.06	-2442.06	-2442.06	-2442.06
(constants only)	-2036.81	-2043.40	-2048.03	-2050.35
Log-likelihood	0.1659	0.1632	0.1614	0.1604
McFadden's pseudo R^2	1.8025	1.8082	1.7936	1.7956
AIC/*n*	2296	2296	2296	2296
n (observations)	32	32	11	11

***, **, * Significance at 1%, 5%, 10% level