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Clem Tisdell[*], Clevo Wilson[†] and Hemanath Swarna Nantha[‡]

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[*] School of Economics, University of Queensland, Brisbane, QLD 4072, Australia.
E-mail: c.tisdell@economics.uq.edu.au

[†] School of Economics, School of Economics, University of Queensland, Brisbane, QLD 4072, Australia.
E-mail: clevo.wilson@uq.edu.au

[‡] School of Economics, School of Economics, University of Queensland, Brisbane, QLD 4072, Australia.
E-mail: h.swarnanantha@uq.edu.au

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For more information write to Professor Clem Tisdell, School of Economics, University of Queensland, Brisbane 4072, Australia.

Dynamic Processes in Contingent Valuation:
A Case Study Involving the Mahogany Glider

Abstract

This paper reports the results of an experiment involving a sample of 204 members of the public who were assessed on three occasions about their willingness to pay for the conservation of the mahogany glider. They were asked this question prior to information being provided to them about the glider and other focal wildlife species; after such information was provided, and finally after participants had had an opportunity to see live specimens of this glider. The mean willingness to pay of the relevant samples are compared and found to show significant variations. Theories are considered that help explain the dynamics of these variations. Serious concerns are raised about the capacity of information provision to reveal 'true' contingent valuations of public goods.

Keywords: Awareness, contingent valuation, dynamic processes, experiential learning, information, wildlife, willingness to pay.

PsychINFO classification codes: 2229, 3920, 4070
JEL classification codes: D83, D84, Q51, Q57

Dynamic Processes in Contingent Valuation:
A Case Study Involving the Mahogany Glider

1. Background and Purpose

Stated preference methods, such as the contingent valuation method (CV), are widely used in economics to value public goods. Well developed lists of limitations of these methods have been published (see for example, Carson et al., 2001; Venkatachalam, 2004). Nevertheless, these give little or no consideration to variations in contingent valuation by individuals arising from dynamic processes. Lack of attention to such variations possibly reflects the strong grip of neoclassical modelling on economics which assumes that individuals' preferences are predetermined and are static (compare Green & Tunstall, 2001, p. 207). While many such models assume perfect information, even in cases where this is not so, it is usually supposed that if extra information is provided, it will enable individuals to better specify their 'true' preferences. This may be because economists implicitly suppose that individuals have static pre-existing valuations of the attributes or characteristics of commodities.

The standard economic approach contrasts with that in psychology. According to Green and Tunstall (2001, p. 207), "the psychological model is a process model where the emphasis is upon how beliefs and preferences are formed and learnt, and how information is acquired." The approach adopted in this article has much in common with psychological modelling. This is because it explores how individuals' contingent valuation of a wildlife species alters as the information provided to them and their experiences alter with the passage of time.

The purpose of this article is to examine

(1) how a sample of respondents varies their willingness to pay (WTP) to conserve the mahogany glider as they are provided with increased 'information' about it;

(2) how their WTP alters depending upon whether they subsequently see the mahogany glider, or not, alive (have this firsthand 'experience' of it);

(3) to consider how their WTP may be expected to alter with the efflux of time after they have received some information or stimulus relating to the mahogany glider and then subsequently receive no further stimulus relating to this subject;

(4) and finally, to consider theories that are compatible with the observed experimental results.

The species considered here is a rare and endangered arboreal Australian marsupial, the mahogany glider *Petaurus gracilis* (Van Dyck, 1993; IUCN, 2003). The mahogany glider is endemic to a small area in northern Queensland and was thought to be extinct for almost a century until its well-publicised rediscovery in 1989 (QPWS, 2001). This species at present has little or no direct human use value; its value comprises mainly of non-use value, i.e., existence value (Tisdell et al., 2004).

CV is used here because it is a useful non-market valuation method. It has been applied particularly in environmental cost-benefit analyses and environmental impact assessments (Cummings et al., 1986; Mitchell & Carson, 1989; Tisdell et al., 2004) to estimate non-use values (Walsh et al., 1984) and non-market use values (Choe et al., 1996) of environmental goods or benefits. The use of CV to derive a valuation of the mahogany glider is appropriate, as the species can be considered to be a public good with mainly non-use value. The CV method used in this study employed the open-ended single-bid stated preference technique. This method involves asking people their WTP for the desired environmental commodity (in this case for the conservation of the mahogany glider).

WTP values obtained from CV have been found to be sensitive to the quantity and quality of information given about the good being evaluated (Samples et al., 1986; Bergstrom et al., 1990; Ajzen et al., 1996; Spash, 2002). The influence and impact of information provision has consequently been extensively researched in the CV literature (Kriström, 1999, p. 781). However, most of the studies deal with the issue of information effects in the static state, leaving the dynamic nature of WTP formation little explored. The dynamic process in CV has been mentioned by Tisdell and Wilson (forthcoming, a) and Tisdell et al. (2004).

This paper addresses this gap in the literature by examining the dynamic process involved in CV in relation to how WTP to conserve the mahogany glider is influenced by provision of information, and then by the experience of seeing or not seeing the mahogany glider at a wildlife conservation park. For instance, will WTP of respondents who see the mahogany glider, a species with an interesting history and endangered status, be elevated compared to the WTP of those who do not? We examine the role of information provision in forming respondents' expectations and WTP, and how WTP changes with the disconfirmation of expectations as a result of seeing (or not seeing) the mahogany glider. This study is unique

for CV analysis because three stages of a decision-making process have been studied using the same sample.

Secondly, we compare WTP of participants who visited the wildlife park to see the mahogany glider and completed the course of the experiment and those who did not visit the wildlife park and discontinued the course of the experiment after the information provision stimulus. This was done to investigate whether the level of knowledge possessed by participants and their interest in nature conservation affected their decision, and whether there is a difference in the WTP of the two groups.

2. Methodology

The CV experiment in this study is based on three structured questionnaires called Survey I, Survey II and Survey III. These questionnaires were designed to elicit information about: (i) the Brisbane (Queensland, Australia) public's knowledge of 24 Australian tropical wildlife fauna (including the mahogany glider), (ii) their attitude towards these species, and (iii) support for the conservation of these species, such as their one-off WTP to conserve the mahogany glider.

Potential survey participants were reached using letterbox-dropped leaflets distributed in the Brisbane area. The entire sample of responding participants, consisting of 204 persons, was drawn from various suburbs to reflect varying demographic (e.g., age distribution) and socio-economic characteristics. It was mentioned in the leaflet that it was an invitation to participate in a survey on wildlife valuation and that selected participants will be offered $20 for attendance, a presentation, refreshments and an opportunity to win $200[1]. The real aims of the survey were not revealed to the participants to prevent bias.

The 204 participants were invited to attend survey sessions and were divided into five groups of 40 people. Four groups were asked to attend sessions held at the University of Queensland during the working week and weekend, while the fifth group was asked to attend a session held in a church hall on a Sunday. This arrangement was intended to provide adequate flexibility to participants so that attendance can be maximised.

In the first survey sessions, participants were asked to fill out Survey I to gather background and initial knowledge, attitude and support for the conservation of the 24 Australian tropical

wildlife fauna. The completed questionnaires were collected and participants were given a tea break. In the second survey sessions, participants attended an informative and illustrative public presentation by Dr. Steve Van Dyck, the senior Curator of Vertebrates at the Queensland Museum. A highlight of this presentation was the section about the mahogany glider. After the lecture, participants were given coloured photo-booklets containing brief descriptions of all the species concerned, their geographic range, life histories, current status etc. To the extent possible, care was taken to avoid normative statements that could cause bias. Participants were asked to take the booklet home along with Survey II and were asked to read their booklet before completing the questionnaire and returning it in the postage pre-paid envelope provided. Survey II contained overlapping questions with Survey I. When compared to Survey I, Survey II would reveal information about variations in the participants' level of knowledge of the mahogany glider, their concern for it relative to the other mammals in the study and how the provision of information (illustrative presentation, booklet of readings) had changed the WTP of participants to conserve the mahogany glider.

For Survey III, the participants were invited to visit the David Fleay Wildlife Park in the Gold Coast, Australia (EPA, 2003) so that they will be able to see firsthand some of the animals described to them. Those who came to the park (119 out of the initial 204 participants) were given free entry passes. On display at the wildlife park are threatened species that include the mahogany glider. Most, but not all, of the participants who visited the park saw the mahogany glider. After their wildlife tour, participants were asked to fill out the third questionnaire, Survey III, which repeated the one-off WTP question for conservation of the mahogany glider posed in Survey I and Survey II. The purpose of this was to gauge change in WTP to conserve the mahogany glider after an efflux of time and after firsthand experience of the animal.

The main aim was to assess changes in WTP with information provision and with subsequent experiential learning (i.e., seeing the glider). The results are compared with another case study, involving sea turtles, also conducted in Queensland.

We briefly investigate the influence of personal relevance on WTP. Ajzen et al. (1996) found that WTP for an environmental good was higher for people for whom the good has high personal relevance. In line with Ajzen et al.'s findings, we expect that survey participants who visited the wildlife park as part of the third stage of our survey might be primarily

motivated by their interest in wildlife and conservation. We can also expect these people to have higher levels of knowledge about the mahogany glider, for instance, because they are keen on wildlife and its conservation are likely to gather and retain more knowledge about a wildlife species compared to those who have less interest in such conservation. Consequently, one can hypothesise that the group that visited the wildlife park would have a higher WTP for the species than those who did not, and this was tested.

3. Results

3.1. Influence of provision of information on WTP of respondents

Consider the influence on all respondents' WTP on average to conserve the mahogany glider of the initial provision of information about it and about all other species in the sample. In doing so, bear in mind that all respondents were provided with much more information about the mahogany glider as a result of a stimulating lecture by Dr. Van Dyck than for other wildlife species. Initially, the stated degree of knowledge that respondents said they had of the glider was low but this rose considerably by the time Survey II was completed. In Survey I, before information provision, only 48% of the 204 survey participants said that they had any knowledge of the mahogany glider, and only 13% of them rated their knowledge of it as very good or good. In Survey II, after the lecture presentation and provision of the booklet of information about all wildlife species being assessed, 95% of the participants said that they know the mahogany glider and the proportion of participants who said that they had very good or good knowledge rose to 74% (Tisdell et al., 2004). Respondents were given a single bid option in Surveys I and II. They were asked:

> *'If you were asked for a **one-off** donation for a campaign to save the mahogany glider designed to increase public awareness and secure land against clearing, how much would you contribute? Aus$ ……'*

The mean WTP of all survey participants in Survey I was $24.99. With the increase in their knowledge, their mean WTP rose to $35.67 (Tisdell et al., 2004). This is an increase of just under 43% in their WTP. This difference is relatively large and is statistically significant at the 85% confidence level for a two-tailed *t*-test.

Furthermore, another important type of WTP question was asked. Respondents were asked to assume that they were given $1,000 which they could only use to support the conservation of

nine species of Australian mammals. The species in the list were mahogany gliders, tree kangaroos, red kangaroos, koalas, northern bettongs, northern quolls, dugongs, northern hairy-nosed wombats and eastern pebble-mound mice. Respondents were asked in Survey I and Survey II to state the percentage of these funds that they would allocate to each of these species. If equally distributed, each species would receive an average allocation of 11.1% of the sum. In Survey I, participants gave the mahogany glider an allocation of 11.8%. In Survey II, they allocated the mahogany glider 18.7% of the sum. Therefore, the proportion of funds allocated to the mahogany glider rose by more than 59% in Survey II, the largest increase in allocations. Comparatively, the second largest rise in allocation occurred was for the northern bettong and was only 8%. The glider's valuation was much affected by the information provided and the increase in WTP was statistically significant at the 99% confidence level for a two-tailed *t*-test. This shows that after being provided with information about the mahogany glider such as its interesting rediscovery and endangered status, participants' concern for the species had grown considerably.

3.2 Impact on WTP of those respondents who visited David Fleay Wildlife Park and saw the glider compared to those who visited and did not see the glider

Of the 204 respondents in Surveys I and II, 119 visited David Fleay Wildlife Park where mahogany gliders may be seen in captivity. Of the 119 respondents visiting, 90 saw the glider and 29 failed to see it. However, only 77 who saw the glider and 22 who did not responded satisfactorily to all WTP questions in the survey series. Those 99 are the main focus of our analysis. Our query was what impact would seeing the glider have on the WTP for its conservation.

Figure 1 presents the dynamic elements of average WTP of those who visited the wildlife park and saw the glider as well as the pattern of those who visited and did not see the glider. We compare the mean WTP of both groups. With information provision, mean WTP of survey participants increased between Survey I and Survey II for both groups (Figure 1). For the group of participants who would later see the glider, mean WTP increased by 19.5% and for the group of participants who would later not see the glider mean WTP increased by 24.1%. These increases are statistically significant based on a one-tailed *t*-test, though at different levels (see 1st row, Table 1).

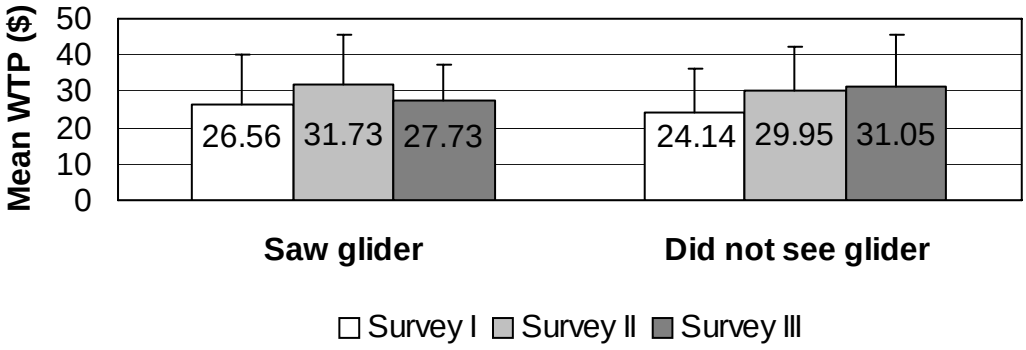


Figure 1: **Comparison of participants' mean WTP for conservation of the glider across all three surveys, divided between those who saw the mahogany glider (*n* = 77) and those who did not see the glider (*n* = 22) at David Fleay Wildlife Park and responded to all WTP questions in survey series. Error bars are at approximately two SE. SD of mean WTP for those who saw glider: Survey I = $60.13, Survey II = $61.89, Survey III = $43.20; for those who did not see glider: Survey I = $27.10, Survey II = $28.40, Survey III = $33.37.**

Table 1:

Paired *t*-test statistics and *p*-values for difference in mean WTP between surveys for participants who saw the mahogany glider and participants who did not

Survey means compared	Sample that saw glider (*t*, *p*)	Sample that did not see glider (*t*, *p*)
Survey I & Survey II	-2.22, 0.01***	-1.07, 0.15**
Survey II & Survey III	1.13, 0.26*	-0.34, 0.74

*** significant difference at 95% confidence level and **significant difference at 80% confidence level for a one-tailed *t*-test

* significant difference at 70% confidence level for a two-tailed *t*-test

After visiting David Fleay Wildlife Park, the trajectory of the mean WTP of participants (based on Survey III) differed for the two sets of participants. For those who saw the mahogany glider at the wildlife park, their mean WTP fell by 12.6% to $27.73. This change is significant at the 70% confidence level based on a two-tailed *t*-test (see 2nd row, Table 1); mean WTP in Survey II and Survey III can be considered significantly different. As for those who did not see the mahogany glider, their mean WTP rose by 3.8% to $31.05, but the

change is not statistically significant (Table 1); it can be said that mean WTP in Survey II and Survey III are not significantly different for this group.

3.3 Attributes of respondents who visited the wildlife park compared to those who did not

In this study, we also compared the mean WTP of participants who visited David Fleay Wildlife Park with those who did not visit the park, and their level of knowledge and support for nature conservation. We found that there was a greater proportion of participants who stated that they have very good or good knowledge of the glider in Survey II among those who visited the wildlife park (79.0%) than among those who did not visit the park (64.0%) (1st row, Table 2). Participants who stated that they are extremely strong or strong advocates of nature conservation also constitute a larger proportion of those who visited the wildlife park (62.2%) than of those who did not visit the park (48.2%) (2nd row, Table 2). The differences in the proportions in both cases were tested using a chi-square test and was found to be statistically significant at the levels indicated. We also found that a greater proportion of participants who are extremely strong or strong advocates of nature conservation among those who said they have very good or good knowledge (60.8%) than among those who said they have poor or no knowledge (44.6%) of the glider (1st and 2nd rows, Table 3). In other words, the set of participants who possess very good or good knowledge are more likely than those with poor or no knowledge to be amongst those who are extremely strong or strong advocates of nature conservation. The set of participants with poor or no knowledge, however, overlaps with the set of participants who are extremely strong or strong advocates of nature conservation, although to a lesser extent than the set of participants with very good or good knowledge. The results, nevertheless, accord with the hypothesis inferred from the theories of Ajzen et al. (1996) that personal relevance affects the motivation for knowledge uptake and processing and hence could complicate the problem of information bias in CV.

Table 2:

Comparison of participants who visited David Fleay Wildlife Park and those who did not— the frequency and percentage of participants with very good or good knowledge (VG/G) of the mahogany glider, and the frequency and percentage of participants who stated that they are extremely strong or strong (ES/S) advocates of nature conservation. Statistical significance of difference between the two groups was tested using the chi-square test

Knowledge level and attitude towards nature conservation (based on Survey II)	**A. Visited wildlife park, *n* (as a % of total who visited, *n* = 119)**	**B. Did not visit wildlife park, *n* (as a % of total who did not visit, *n* = 85)**	**Significance of difference between A & B (Chi-square, *p*)**
Participants who have VG/G knowledge of glider (*n* = 148)	94 (79.0%)	54 (64.0%)	5.20, 0.02**
Participants who are ES/S advocates of nature conservation (*n* = 115)	74 (62.2%)	41 (48.2%)	3.38, 0.07*

**significant at 95% confidence level, *significant at 90% confidence level

Table 3:

The proportion of participants who are extremely strong or strong advocates (ES/S) of nature conservation amongst (i) those with very good or good knowledge (VG/G) and (ii) those with poor or no knowledge (P/N) of the mahogany glider. This comparison of proportion is done for all participants, for those who visited David Fleay Wildlife Park and for those who did not visit the wildlife park. Statistical significance of the difference between the proportions is tested using the chi-square test

	A. ES/S advocates of nature conservation amongst those with VG/G knowledge of glider, *n* (as a % of VG/G knowledge group)	**B. ES/S advocates of nature conservation amongst those with P/N knowledge of glider, *n* (as a % of P/N group)**	**Significance of difference between A & B (Chi-square, *p*)**
All participants (*n* = 204)	90 (60.8%)	25 (44.6%)	3.69, 0.05**
Participants who visited park (*n* = 119)	62 (66.0%)	12 (48.0%)	2.00, 0.16*
Participants who did not visit park (*n* = 85)	28 (51.9%)	13 (38.7%)	0.43, 0.51

**significant at 90% confidence level, *significant at 80% confidence level

3.4 Is there a significant difference in the WTP between those who visited the wildlife park and those who did not?

We described the differences in attributes such as the level of knowledge and attitude towards nature conservation amongst those who visited David Fleay Wildlife Park and those who did not. Employing an unpaired one-tailed *t*-test, we tested whether mean WTP stated in Survey I and Survey II would be significantly higher amongst participants who visited the park (i.e., the group that consists of a greater proportion of people with a high knowledge level and strong positive attitudes to nature conservation) than amongst those who did not. Note that although 119 participants visited the wildlife park and 85 did not, only 99 and 68 participants from the respective groups answered all WTP questions in the survey series. It is the results from these that are shown in Figure 2.We found no significant difference in mean WTP between both groups ($t_{\text{Survey I}} = 0.04$, $p_{\text{Survey I}} = 0.49$; $t_{\text{Survey II}} = -0.25$, $p_{\text{Survey II}} = 0.40$) (see Figure 2). We can conclude that WTP for the conservation of the glider was not an attribute that distinguished significantly between those who visited the park and those who did not.

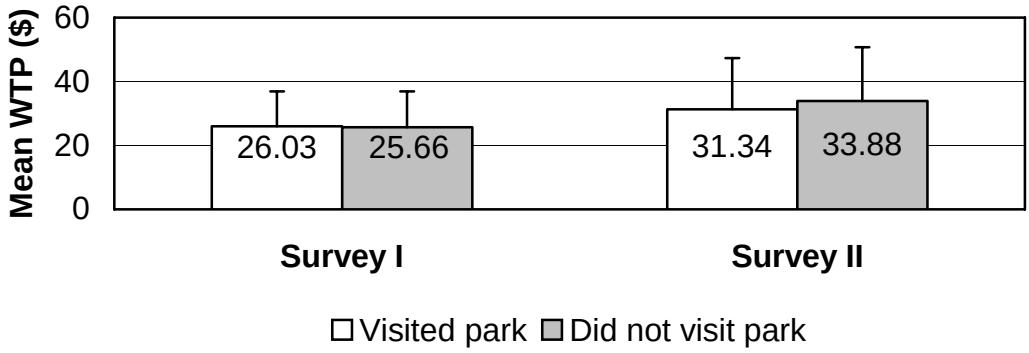


Figure 2: Comparison of respondents' mean WTP for conservation of the glider across the first two surveys, divided between those who went to David Fleay Wildlife Park (*n* = 99) and those who did not (*n* = 68) and responded to all WTP questions in survey series. Note that outliers were removed and only participants who provided WTP in both surveys were included in analysis. Error bars are at approximately two SE. SD of mean WTP for those who visited park: Survey I = $54.43, Survey II = $56.07; for those who did visit park: Survey I = $66.03, Survey II = $69.43.

4. Discussion of Results

Let us now consider possible reasons for the results observed. In turn, let us consider why WTP for conservation of the glider was elevated by the provision of information about it and about other species; the likely normal pattern of decay of such an elevated WTP in the absence of further relevant stimulus; the impact on WTP of viewing the focal animal; and consider whether values pre-exist or are formed by the process of eliciting contingent valuation.

4.1 Elevation of WTP for the conservation of the glider as a result of the provision of information about it

As a result of the experiment performed, there was a substantial and statistically significant increase in the WTP for the conservation of the mahogany glider in Survey II compared to Survey I. To the best of our knowledge, none of the information supplied about the glider and the other wildlife species was misleading. In our judgement, the information was factual. However, more information was provided about the glider than other species in the experiment, and this was done in a very interesting and exciting manner by Dr. Van Dyck who is credited with re-discovering the mahogany glider.

As a result of this lecture:

(1) participants' absolute awareness of the glider rose, but more significantly, their awareness of the glider increased significantly relative to the other focal species (for which extra information was also provided);
(2) participants received a greater exposure to concerns for the future of the mahogany glider than for the other focal species; and
(3) no negative attributes were associated with the mahogany glider.

Therefore, the observed results seem consistent with the Fishbein-Ajzen theory of human behaviour (Fishbein & Ajzen, 1975). The information provided by the lecture influenced the beliefs of participants about the glider and interacted with their attitudes to intentions to influence their behavioural intentions, in this case their WTP. According to Green and Tunstall (2001, p. 216), willingness to pay is a behavioural intention in terms of the Fishbein-Ajzen theory.

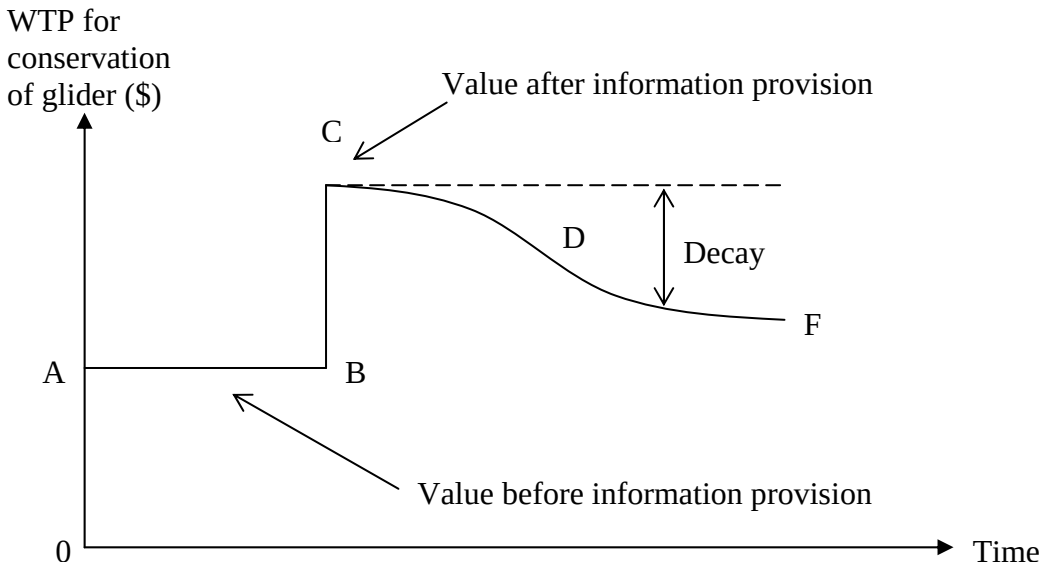
However, the Fishbein-Ajzen theory needs to be supplemented to explain the results. This is indicated by results from changes in participants' allocation of constrained available funds for conservation of mammal species. In the constrained case, involving the allocation of $1,000, the relative increase in funds allocated to the mahogany glider in Survey II compared to Survey I was greater than increases in funds allocated to all other focal mammals species. Information was provided about all focal mammal species and none of this information was negative. Therefore, it seems likely that the much greater 'information' provided relatively about the mahogany glider tended to crowd out participants' awareness of the other mammal species. This probably contributed to the high level of relative elevation in their WTP for the conservation of the mahogany glider. It follows that if another mammal species (for example, the northern bettong) had been the focus of the lecture and if the information about the mahogany glider had been confined to that in the booklet provided to participants, then a much smaller allocation in relative WTP would be expected for the glider (if any elevation occurs at all) and a much larger one would be expected for the northern bettong if it had a true but interesting story. Thus, variations in the composition of information provided to individuals, even when all the information provided is truthful, seems capable of having a major influence on their levels of contingent valuation.

At least two types of factors play a role in this result. One is the element of awareness as highlighted in the elaborated Fishbein-Ajzen theory (Green & Tunstall, 2001, Fig. 8.4) and secondly, the relative crowding out of one set of information by an additional set, as would accord with the theory of Simon (1957) about the limited capacities of individuals for storing and processing information. To some extent also the results accord with the views of Spash (2002) that information provision can be preference forming and not neutral in this regard. This seems possible even when all the information provided is true and it is presented in as positive a manner as possible, that is, by trying to avoid normative statements.

4.2 Decay of WTP following cessation of stimulation

It was noted that WTP for conservation of the glider was greatly elevated in Survey II compared to Survey I following the lecture concentrated on it and information obtained in the booklet provided to participants. What are the chances that such an elevated level of contingent valuation will be maintained in the absence of further stimuli focusing on the mahogany glider?

It seems likely that this WTP value will in this case decline with the passage of time. This may be partly a result of forgetting information gathered initially about the glider or the object being valued; the neural trace of information that is unused weakens or decays with time (trace or natural decay) (Ebbinghaus, 1885; Wickelgren, 1972, 1974; Wixted, 2004, p. 265). Furthermore, information about other subjects will come to hand as time passes, and



this will tend to crowd out pre-existing information given limited human capacities. This is a form of retroactive interference (new memories disrupting and pushing out older memories) (Slamecka, 1960; Gleitman, 1971; Bouton, 1993). With the passage of time, awareness of the object being valued, in this case the glider, can be expected to decline in the absence of further stimuli about the glider. Therefore, following Survey II and in the absence of further focus on the glider, WTP might follow the pattern illustrated in Figure 3 by CDF. There, segment AB of the function for WTP for conservation of the species is its 'pre-information' value (corresponds to Survey I) and C represents its value following information about the glider (corresponds to Survey II) and CDF represents WTP subsequently in the absence of further focus on the glider. Zarnikau (2003) in his study of WTP for renewable energy investments reported a similar pattern. He found that intensive exposure to information about energy resource issues led to an increase in the number of respondents willing to pay a modest premium to support renewable energy investments, but the average reported premium declined following the polls as very high outlier responses moved to more reasonable values over time.

Figure 3: A hypothetical dynamic form of the contingent valuation function where WTP is influenced by information provision.

Given the theoretical relationship shown in Figure 3, one is left wondering what is the level of WTP that corresponds to the 'true' contingent valuation of the mahogany glider by individuals. Could it be that there is no such definite value? It seems likely that the most we could determine is a range in which the 'true' value lies, if it exists at all.

4.3 Impact on WTP of the experience of viewing a live focal animal

Some of the participants in our experiment had the experience of seeing a live mahogany glider after they completed Survey II. We found that this resulted in a decline in their WTP for its conservation in Survey III compared to the value in Survey II. By contrast, no significant change in this WTP occurred for those who visited the wildlife park but did not see the glider. How might this be explained?

It is possible that Dr. Van Dyck's lecture painted the mahogany glider larger than real life, even though nothing false was conveyed in this lecture to participants. Therefore, it is likely that those who saw the glider had negative disconfirmation of their expectations about it.

The mean WTP of participants who saw the glider may have followed a path like ABCDFG shown in Figure 4. The decline from Point D to F may represent a correction or an overcorrection of participants' valuation of the species after a negative disconfirmation— i.e., results were poorer than anticipated and produced a less favourable evaluation of the good (Cardozo, 1965; see also Oliver, 1977 and Olson & Dover, 1979). In fact, when asked in Survey III their impressions of the glider, 58.6% of the participants who saw the glider said that they thought it was about as they had expected, compared to 36.4% who said it was more impressive than expected. Nevertheless, those who said their impression of the glider was about as expected may not be fully expressing possible dissatisfaction, due to compliance bias (the participants' tendency to shape their answers to please the experimenter; see Schuman & Presser, 1981; Mitchell & Carson, 1989, p. 238) or due to the social-norm effect (that is, participants give answers to accord with what others would expect of them in the evaluation of a socially desirable good; Green and Tunstall, 2001, p. 220).

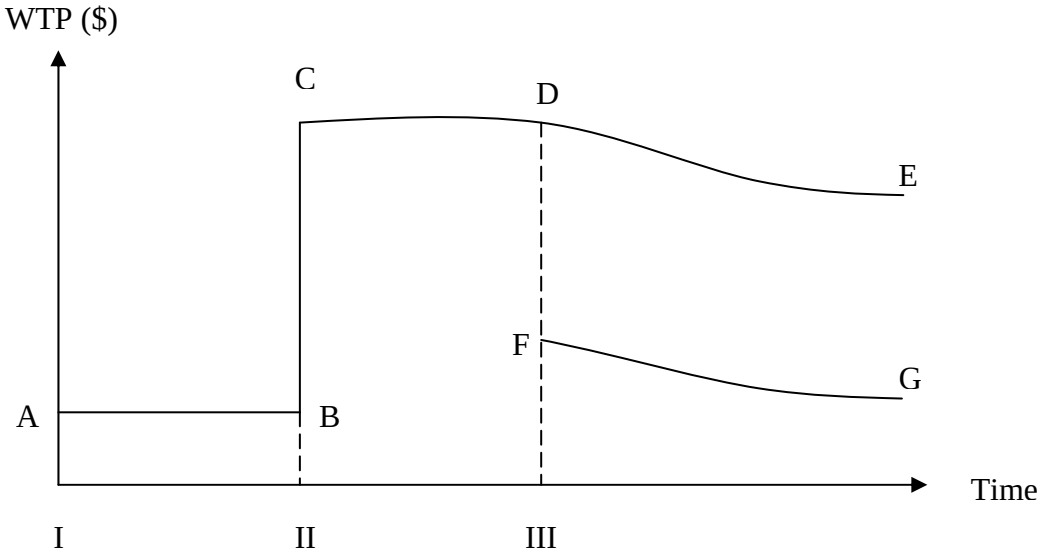


Figure 4: Mean WTP to conserve the mahogany glider and its dynamics given the following conditions: no stimuli (Survey I), stimulus in the form of presentation and information provision (Survey II) and stimulus in the form of experience (Survey III). In Survey III, there were two outcomes: participants did not see the mahogany glider at David Fleay Wildlife Park (mean WTP represented by Point D) and participants who saw the mahogany glider (mean WTP represented by Point F).

Amongst those who said that they did not see the glider but visited the wildlife park, the impression left by previous learning/stimulus (illustrative presentation, booklet of readings) continued as the sole influence on its valuation, hence the similarity of their mean WTP in Survey III with their mean WTP in Survey II. Their mean WTP could follow path ABCDE (Figure 4). Paths DE and FG represent decay in WTP over time as a result of forgetting with the passage of time (natural decay of information) or as a result of retroactive interference, or as a result of reduced relative awareness of the glider for other reasons mentioned earlier. We cannot also dismiss the possibility that an embedding effect was present for this group (compare Green & Tunstall, 2001).

The pattern of mean WTP observed here for the mahogany glider differs from WTP results obtained from Tisdell and Wilson's study of sea turtles (Tisdell & Wilson, 2001). In the sea turtle experiment, participants were probably exposed to a lower initial stimulus than in the experiment involving the glider. Nevertheless, participants who visited Mon Repos Conservation Park (Bundaberg, Queensland) to view turtles were exposed to information about sea turtles in the exhibition and displays section and some movies before proceeding to

the turtle viewing section of the park. This exposure (which was probably a little subdued) may have raised their initial level of WTP to some extent, e.g., from B to C in Figure 5. However, those values were not measured. WTP for the conservation of sea turtles was only measured after participants had had an opportunity to view sea turtles. It was found that the mean WTP of those who saw sea turtles was higher than those who did not (Tisdell & Wilson, forthcoming, b). The mean WTP probably followed a path like ABCDKL (Figure 5) for those who saw the turtles. The prior knowledge/information received by participants seemed to have a positive, reinforcing impact, observed from the rise in mean WTP shown by DK. A positive disconfirmation of expectations occurred. For those who did not see the turtles, the mean WTP path could be ABCDH. A decay effect over time along CH and KL is similar to that described for Figure 4. Or alternatively, it might be like ABCDMN, the gap DM reflecting the disappointment of those who failed to see turtles.

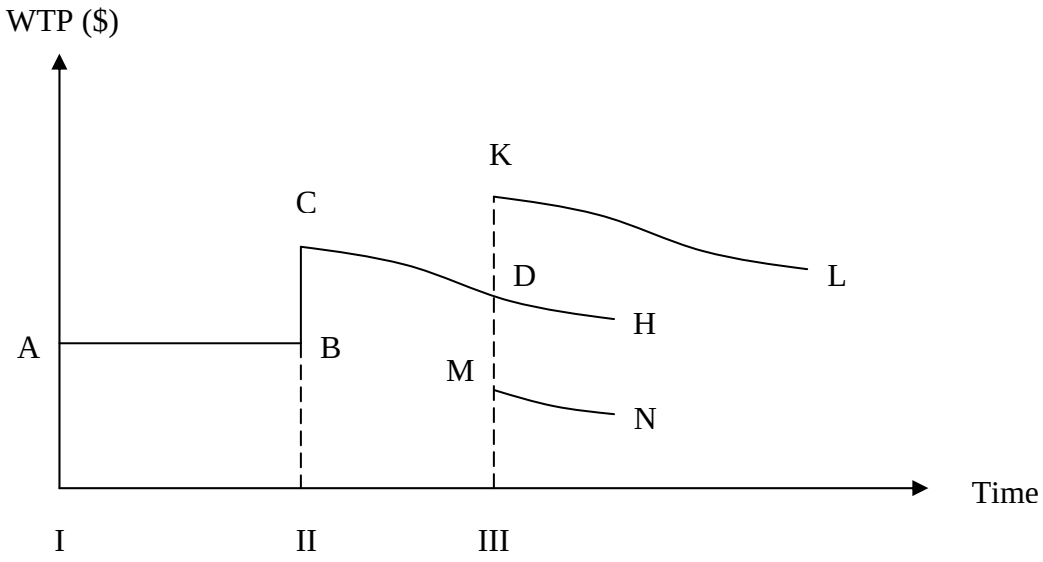


Fig. 5: **Mean WTP to conserve sea turtles. At Stage I, initial mean WTP is at the level described by Point A. At Stage II, mean WTP rises to Point C after exposure to information about sea turtles. At Stage III, there were two outcomes: survey participants who saw the sea turtles at Mon Repos Conservation Park had a mean WTP represented by Point K and participants who did not see the sea turtles had a mean WTP represented by Point D.**

The following could be inferred from the two cases we have discussed so far. Elevation in WTP when seeing the animal depends on positive, satisfactory or non-negative experience when seeing the animal (expectations are met or exceeded), and on previous impression of the animal not being larger than life (i.e., the absence of excessive hype or puffery). Depression or decline in WTP is more likely of an unsatisfactory or negative experience when viewing the animal and/or if previous impression of the animal is greatly inflated or hyped. This hype or puffery phenomenon has been described mostly in relation to consumer products evaluation in the marketing literature (see Olshavsky & Miller, 1972; Kamins & Marks, 1987). However, Kamins & Marks (1987) pointed out that an assimilation effect could occur whereby a slight exaggeration in information provision could still be effective in positively influencing evaluation, provided it is within a reasonable range of expectation. A CV experiment to verify this could be a possible avenue for future research.

4.4. Do true contingent values exist and does the provision of 'true and accurate' information reveal true contingent values?

In the case of many public goods, individuals have only limited knowledge of these, and hence may not have formed preferences or settled values for these (Diamond & Hausman, 1994, p. 63). This is true for example of many wildlife species. We found it to be so for the mahogany glider, and to be the case for many other Australian tropical wildlife species. As Munro and Hanley (2001, p. 277) point out, where we wish to estimate the CV of a good, citizens often have limited information about it. They suggest that the provision of information is justifiable in such a case but they are uncertain about how much information should be provided and emphasise that it should be unbiased. In doing this, they touch on 'the tip of an iceberg', and indirectly raise a major problem.

In a world in which many commodities are to some extent substitutes, the provision of accurate information on one or a few may increase citizens' awareness of these and reduce their awareness of others, especially those for which they have little knowledge. In this experiment, accurate extra information about all mammal species in the sample was provided but relatively more information was presented in an interesting way about the glider that significantly raised the awareness of participants of the mahogany glider. This raised the relative mean WTP to pay for conservation of the glider. It is hypothesised that if less had been presented on it and more on another species in an interesting way, such as the northern

bettong, then relative valuations would have altered in favour of the latter species. How do we get the balance of information 'right' if WTP depends on this balance? This is a major dilemma.

The psychological set and the personal relevance of information and experience provided to individuals is likely to influence the way in which they respond to information and experiences provided to them; in this case the contingent valuations that emerge. Thus CV may show path dependence. Furthermore, an interviewer may consciously or subconsciously raise the perceived personal relevance of a focal object to the respondent. This could, however, conceivably block out to some extent the personal relevance of other objects and thereby 'bias' estimates of WTP. To some extent the more information that is provided about a particular focal good, the more likely is 'bias' to arise, given the partial nature of the exercise and the fact that human beings only seem capable of taking into account a limited amount of information at a point in time. This gives particular force to Spash's contention that information provision tends to form preferences in many cases involving environmental valuation (Spash, 2002).

5. Concluding Comments

This case study reveals that variations in information provided to citizens and differences in their experience with environmental commodities can substantially alter their stated valuations of commodities. These variations depend on the patterns of information conveyed and the nature of the experiences of citizens. Even when only 'authentic' information and experiences are provided to individuals, the presentation of different sets of these is capable of generating considerably different relative valuations of commodities and objects. Thus it is not merely a matter of whether to convey accurate information to individuals but also a matter of deciding on the appropriate set of a large variety of possible sets of accurate information to convey if one wishes to elicit the 'true' preferences of individuals. In terms of the theory of Todd and Gigerenzer (2003), every alternative possible set of information appears to alter the environment structure of the individual.

This whole matter seems to be greatly complicated by the fact that the provision of information and experiences alters subjects' relative awareness of objects, because of the presence of attributes associated with bounded rationality. One, therefore, wonders if WTP values have an objective and independent existence of the type suggested by Hanley et al.

(1997, p. 377) and Cummings et al. (1986). If so, finding such values would be a formidable task given the type of complications identified in this paper such as those arising from information provision/exposure, personal experience and the efflux of time and interaction between these factors. The best one might hope to do is to discover a range in which such values might lie. The magnitude of this problem is brought home by the type of dynamic paths of valuation described above. In considering such paths, one is left wondering which value on the path is the appropriate one to choose for valuation. For example, is it the value corresponding to point B, C, D or F or neither of these in Figure 3? If one selects the value immediately or soon after a favourable stimulus is given to respondents about the good to be valued, the good may be overvalued because of their reduced awareness of other objects. But then what is the appropriate degree of awareness? The problem is not a trivial one for contingent valuation and valuation of public goods in general.

Notes

1 All dollar values mentioned in this paper refer to the Australian dollar.

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