AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

WHY THE COSTS OF PERFORMANCE MATTER FOR CONTINGENT VALUATION STUDIES

John Rolfe

Faculty of Business
Central Queensland University
P.O. Box 197 Emerald 4720

Paper presented to the 40th Annual Conference of the Australian Agricultural Economics Society, 11 - 14th of February, 1996, Melbourne.

1.0 Introduction

Rarely do economic practitioners include the cost of performing analysis within the actual results of their work. This paper shows that for one group of economists, practitioners of contingent valuation, information about the costs of performing analysis should form an integral part of the application of the methodology.

This is because contingent valuation, as one form of non-market valuation methods, uses survey techniques to reveal the preferences that people hold about particular goods. These survey techniques often involve respondents gaining new information and enjoying learning effects. In these cases, the respondents are no longer a truly unbiased sample of the population, and any extrapolation of survey results across a population is contingent on the population having similar levels of information and cognisance as the sampled respondents.

The analysis of this contingency is important for two main reasons. First, it is a source of a potential "multiple counting" effect. For example, a contingent valuation study may assess values for the protection of an endangered species by asking a sample of the population for their revealed preferences. Extrapolation of results across a population reveals aggregate demand for the proposed protection. Yet biologists suggest that there are hundreds of thousands of species in danger of extinction (Lovejoy 1986, Hoehn and Randall 1989). By extrapolating results from informed sample groups across a population, the danger is that a succession of independent valuation exercises will significantly overestimate values.

Second, the recognition of information contingencies provides a path for the use of "super informed" respondents to estimate value across a population. Estimates of value for "unknown species" can thus be derived.

To progress these matters, an overview of the contingent valuation method and then more detailed discussion on preference formation, information transfers, and the difficulties involved in extrapolating survey results across a population are presented. This leads into discussions on the limits to the contingent valuation method in Section 6. A brief overview of choice modelling, a more appropriate valuation technique when respondents have limited knowledge or understanding of the good to be valued is presented in section 7. Further implications of recognising information contingencies are examined in section 8, and a conclusion follows in section 9.

2.0 An Overview of Contingent Valuation

Contingent valuation refers to a group of non-market valuation techniques that are used to estimate the demand for and hence

the value of goods that are not marketed. Since its introduction by Davis (1964), it has been widely applied in the area of environmental valuation[1]. The method has provided valuation estimates for environmental goods such as fish and national parks, and thus is capable of supplying some of the missing values needed for performing BCA studies (Just, Hueth and Schmitz, 1982)[2].

Contingent valuation establishes hypothetical markets to draw out the behavioural intentions of people. It uses survey techniques to assess the preferences that people state they have about the particular good in question[3]. These stated preferences allow researchers to estimate in monetary terms how survey respondents trade-off private consumption for the good in question (Carson 1995).

There are two major advantages that the contingent valuation method (CVM) has over other techniques that rely on preferences revealed in market transactions. First, values that are estimated are more inclusive. Preferences revealed in markets relate only to the use values held for an asset. It is also possible that people hold non-use values, such as existence value, and these non-use values can be estimated alongside use values with the contingent valuation method.

Second, CVM is essentially an ex ante method of assessing future intentions, while related preference techniques are limited to data on past transactions. This means that the contingent valuation method is essentially forward looking while revealed preference valuation techniques are backward looking.

The application of CVM generally involves three distinct stages (Mitchell and Carson 1989). These include the detailed description of the good and the hypothetical scenarios under which it is offered to the respondent for varying opportunity costs, the questions which elicit the respondents willingness to pay for the good being valued, and the collection of information about respondent characteristics which allow predictive and validation techniques to be applied.

The CVM does not value an environmental good directly. Instead, it elicits people's valuations of changes in the

---

[1] Carson, Wright, Carson, Alberini and Flores (1995) provide a bibliography of over 2000 contingent valuation studies and papers drawn from more than forty countries.

[2] Not all contingent valuation studies value goods for the purposes of CBA. One important use for the contingent valuation method is assessing compensation, such as for the Exxon Valdez oil spill in Alaska (Carson et al 1992).

[3] This is in contrast to valuation techniques such as the travel cost method or hedonic pricing where the intentions of people are assessed from the preferences that they reveal in associated market transactions.

provision of an environmental good (Wilks 1990). Respondents are usually asked for their willingness to pay for some improvement in an environmental amenity, or more rarely, for their willingness to accept compensation for a reduction in an environmental amenity[4]. Clearly, these are compensated measures. Some studies ask directly for WTP amounts. This format is referred to as the open ended method. In contrast, the dichotomous choice format offers respondents a referendum style question where they answer 'yes' or 'no' to scenarios which include opportunity costs. By varying opportunity costs, a rich data set can be obtained of the choices made, and this is then used to estimate demand and consumer surplus functions (Johansson 1993)[5].

Because the answers given in CV studies are contingent on the scenarios presented and the default assumptions of respondents, substantial opportunities exist for bias to occur at the survey respondent level (Mitchell and Carson 1989, Wilks 1990). These potential biases have been the focus of a great deal of criticism of the contingent valuation method. There has been extensive debate about the validity of the technique as a valuation measure[6].

In 1992, a panel of experts was set up by the National Oceanic and Atmospheric Administration (NOAA) in the United States to assess the validity of the CVM in estimating natural resource damages (NOAA 1993). The fundamental conclusion of the panel was that the CVM was capable of yielding results of some reliability, but that practitioners needed to follow a number of guidelines in performing analysis (Portney 1994). Essentially, the guidelines are that:

(1) Personal interviews should be used.
(2) Willingness to pay for projected events should be elicited.
(3) The dichotomous choice questioning form should be used.
(4) The hypothetical situation described should be accurate and understandable.
(5) Reminders regarding respondents' budget constraints should be included.
(6) Reminders of available substitute goods should be included.

---

[4] Contingent valuation practitioners generally prefer WTP measures because of their superior incentive properties (Mitchell and Carson 1989). WTA measures have often been substantially larger than WTP measures (Knetsch and Sinden, 1984).

[5] Results of contingent valuation studies are commonly expressed as mean or median values for purposes of clarity. Consumer surplus is the appropriate measure for valuation purposes.

[6] Examples of a range of these general critiques of the contingent valuation method can be found in Hausman 1993 and Diamond and Hausman 1994. A taste of wider critiques of economic analysis that are focused on contingent valuation can be found in Sagoff 1988, Norton 1991, and Common et al 1993.

(7) Follow-up questioning to ascertain the level of understanding achieved should be included.

Carson (1995) holds that for contingent valuation to work, three conditions must hold:

> (1) the nonmarketed good must be well defined,
> (2) the scenario must provide a plausible means of provision, and
> (3) there must exist a plausible mechanism for making the trade-off between the consumption of private goods and the nonmarketed good of interest.

The methodological challenge for practitioners of contingent valuation is to meet these conditions and minimise opportunities for potential bias. Practitioners have generally been more concerned with bias at the survey respondent level than with bias resulting from aggregation across the relevant population (Mitchell and Carson 1989). This is because the existence of bias in survey results is exacerbated when results are extrapolated across a population.

To minimise the possibility of survey bias, the respondent to a survey has to be presented with enough information to satisfy the conditions outlined above. Further, the information presented has to be concise enough to avoid the problem of respondent fatigue, yet extensive enough to ensure that those conditions are met across a wide range of respondents. A change in the description of the scenario and provision and tradeoff mechanisms will automatically change the way that a respondent understands and values an environmental amenity (Randall 1986, Wilks 1990).

Researchers generally agree that the CVM is limited by the cognisance, knowledge, enthusiasm and ability of respondents to comprehend the scenarios and tradeoff mechanisms (Cummings, Brookshire and Schulze 1986, Mitchell and Carson 1989, Bennett and Carter 1994). Yet there is by no means universal agreement about where this limit exists. For example, Cummings et al (1986) suggest that the use of the contingent valuation method should be limited to situations where, among other conditions;

> (1) subjects must understand, be familiar with, the commodity to be valued.
> (2) subjects must have had (or be allowed to obtain) prior valuation and choice experience with respect to consumption levels of the commodity. (p.104).

In contrast, Mitchell and Carson (1989) argue that scenarios should not be limited to the model of a private goods market, and that:

> "Within the important constraint that the scenario must have plausibility for the respondent, the CV researcher can easily specify a variety of states of the good to be

valued and the conditions of its provision. Moreover, these need not be limited to current institutional arrangements or levels of provision."(p.89).

2.1 Problems in Selecting the Appropriate Population to Sample

There is clearly a link between the appropriateness of scenarios and the selection of the relevant population to sample. Generally, the people most likely to express preferences for an environmental amenity are those with some interest and knowledge, and therefore the ones that are motivated to understand a scenario. As scenarios become more specific, remote and complicated, the pool of people that would be motivated to comprehend it is likely to narrow.

Mitchell and Carson (1989) define the relevant population as "the population of economic agents likely to be influenced by the change in the level of the public good" (p.262). They point out some of the difficulties in identifying the relevant population, particularly when the population benefiting from the provision of a good is different to the population paying for that provision. Population choice bias refers to bias arising from the incorrect selection of a population.

In contrast, the appropriate population for Cummings et al (1986) is that group that has been influenced by the change in the level of the good, and that also meet requirements of familiarity and prior valuation experience. For many goods, this group is a subset of the population likely to be affected by a change in the level of a good.

The difficulty that CV researchers have in selecting their population is that the group that are likely to be influenced by a change in the level of a public good does not usually coincide with geographic or other variables. If the population selected does not correspond well to the "true" population, then there are likely to be a substantial number of non-responses from the sampled respondents. These non-responses can lead to non-response bias or to sample selection bias (Mitchell and Carson 1989). Therefore, researchers are generally reluctant to select a population that is more encompassing than the "true" population because of the possible biases that may be incurred.

What contingent valuation studies have tended to concentrate on is the estimation of the values held by a specific population rather than trying to estimate total value by including all possible population members. This raises the question of where the limits to a relevant population really are. The question of definition turns on what knowledge held by the population is considered to be sufficient for the CVM to be applied.

Implicit in the definition used by Mitchell and Carson (1989) is the assumption that the relevant population is the group of people that could have values for a particular good once they

were informed about its existence and circumstances. The associated analysis and criticism has not turned on the point that respondents have been given new information, but rather has concentrated on the ability of respondents to correctly frame their responses, particularly with regard to substitute goods and budget constraints (Mitchell and Carson 1989, NOAA 1993, Loomis, Gonzalexz-Caban and Gregory 1994).

Consumers for marketed goods typically reassess their preferences and weighting for related goods when information about an attractive new good becomes available. In the same way, survey respondents are expected to reassess their preferences and weighting for an environmental amenity when information about it becomes available. Respondent knowledge and cognition is needed to assess the prospects of a particular good by considering the benefits associated with the particular good and its available substitutes, the opportunity costs involved, and the relevant allocations given individual budget constraints.

Biases can arise in two main ways from this preference reassessment. The first, well debated in the literature, suggests that bias can occur because of the way a scenario is framed, particularly if a respondent is not reminded about substitute goods[7] (Mitchell and Carson 1989, Portney 1994). The second main cause of bias occurs when respondents do not have the background knowledge or cognition to be able to frame the particular amenity in question. Here the respondent is unable to comprehend the scenario or the task involved and bias results from this lack of comprehension.

Two main approaches to these problems are evident. The first is reflected by calls from some practitioners to recognise that the limits to the application of contingent valuation occur at the point where respondents are unable to easily comprehend scenarios (Mitchell and Carson 1989, Bennett and Carter 1993). The second is to explore ways of making scenarios more comprehensible. This is occurring through attempts to understand better the psychology of preference formation (Peterson 1992), and the more rigorous use of tools such as focus groups and pretests (Rolfe and Bennett 1995). Clearly though, limits still apply to the comprehension of scenarios.

Few guidelines exist to identify where the actual limits of CVM lie. This is partly because of the complexity of the issue. For example, a group of respondents will always grasp

---

[7] Mitchell and Carson (1989) and Wilks (1991) refer to this problem as scenario mis-specification and give a range of potential biases that may be involved. Since the Kahneman and Knetsch (1992) paper on embedding, interest has focused on two particular sources of bias. The first occurs because of sequence, where earlier goods presented to consumers attract higher values, principally because of an income effect. The second occurs where a good is nested within a more inclusive good (Randall and Hoehn 1992, Carson and Mitchell 1995).

scenarios to varying degrees of comprehension, and full comprehension and participation is almost never going to be gained from 100% of respondents. Thus one difficulty is to define what level of comprehension is adequate for a respondent to be classified as suitable. Another difficulty is to set the maximum proportion of non-comprehending respondents that make a survey in appropriate.

The selection of the relevant population is linked to the ability of respondents to comprehend scenarios. As the pool of potential respondents is restricted down to people with more ability to respond and direct interests in the environmental good to be valued, scenario comprehension is likely to rise. Yet there is usually little point in defining a population too narrowly. On the one hand, it often becomes more difficult to specify the relevant group because they do not usually correspond to geographic or demographic variables. On the other hand, information about groups more specific than institutional groupings (such as state populations) are often of limited value to decision makers. It is usually more important to measure overall public benefits rather than benefits pertaining to specific interest groups. To be able to do this, an understanding of how preferences are formed is essential.

3.0 The Formation of Preferences

The random utility model gives some insight into the formation of preferences and use of information. The model was first proposed by Thurstone (1927), and further developed by McFadden (1974). The model postulates that an individual's preferences for goods are based on an underlying, but unobservable, utility function. From an outsider's perspective, some of this utility is explainable in a systematic way[8]. However, individuals do not always make choices that reflect observable variables (such as the attributes of a good). Such variations in choices can be attributed to a random component in the individual's utility function. Hence the random utility model hypothesises that an individual's behaviour is comprised of a systematic (explainable) component and a random (unexplainable) component.

Simon (1957) characterised individuals as operating within limited rationality bounds. This suggests that individuals make decisions within the constraints of knowledge and cognisance. It is perhaps more useful to think of individuals as decision optimisers. Because individuals forming preferences and making decisions are generally operating within knowledge, cognisance and opportunity cost constraints, they rarely make decisions on fully constructed preferences.

---

[8] A common methodology used here derives from Lancaster's (1972) work on characteristics. For an example of an application, see Adamowicz et al (1994).

Instead, individuals typically improve their knowledge and cognisance levels in a decision making process up to the point where the extra effort involved does not match the benefits resulting from improved decisions. Thus we expect that decisions about purchasing a car typically involve more information gathering and analysis than menu selections in a restaurant. Yet the decision process is still not exhaustive as we move to lumpy goods as cars and houses. People buy cars without knowing every manufacture and performance detail.

Because people make decisions without completely constructing preferences, there is generally a significant random component to their utility functions. Typically, the lower the information about a good, the higher the random component. For goods that are habitual purchases and for which there are well constructed preference functions, the unexplainable (random) component of individual utility functions is likely to be small. For goods that are novel, the random component is likely to be larger. As a good moves from being novel to familiar, the random component of utility is likely to fall. This is because with repeated consumption, individuals are better able to estimate the utility that they can derive from a particular good. Thus familiarity, repeated consumption and learning effects should all help to reduce the random component in a utility function.

Individuals forming preferences for goods also reduce the random component in another important way - by examining the utility that other people have derived from the good. This is information that comes out of any market process where transactions for a good indicate where other people have estimated tradeoff points between utility and opportunity cost. Thus first time home buyers can still gain substantial familiarity with the tradeoff choices involved by a careful analysis of the housing market.

Drawing on these arguments, preferences for non-market environmental goods are likely to be based on substantially larger random components than preferences for normal market goods. This is because:
(i) individuals are generally not experienced in making choices involving environmental goods,
(ii) individuals generally have low levels of knowledge of environmental goods as compared to environmental goods, and
(iii) there is rarely information available about the types of choices that other people have made.

Large random components in utility functions suggest that the construction of preferences is more likely to be an arbitrary procedure. Where preferences are formed on the basis of very incomplete information, any extra information may contribute substantially to the ultimate decision. Thus for people forming preferences about unfamiliar environmental goods, the provision of new information can have a major influence on final preferences.

4.0 Information Transfer in Contingent Valuation Surveys

In the contingent valuation method, the use of surveys involving hypothetical scenarios means that survey respondents are being given new information about the good to be valued. This occurs in both explicit and implicit ways.

There are three main reasons why new information is given explicitly to respondents. The first derives from the situation when there is a wide divergence of knowledge held by people about the good to be valued. The provision of information in this case ensures that the amenity to be valued is defined uniformly across the sample of respondents and that they have the "requisite information for making an informed choice" (Carson 1995 p.18).

The second reason derives from the situation when all respondents are given new information. The provision of new information in this case is to encourage respondents to give a "super informed" choice. For example, Mitchell and Carson (1989) suggest that respondents should be informed about potential quasi option values (p.73), and that for informed respondents in a dichotomous choice study, the situation is analogous to a "super referendum" (p.96).

The third reason why respondents may be given new information is to estimate the potential demand for an as yet unknown good. Like market researchers trying to estimate the demand for a new product, the contingent valuation practitioner here is giving "new" information in order to establish the desired scenario. An example might be a survey involving an endangered species that respondents had never heard of before.

The process of conducting a contingent valuation survey can also convey a number of indirect information signals. These signals relate to the proximity of the good, the importance of the good, and the opportunity for learning effects. These issues are discussed in turn.

Economists are aware that the position of a good within an array of goods influences its valuation[9]. Hoehn and Randall (1982, 1989), show that subcategory benefits that are independently measured cannot be aggregated without overcounting. As well, they demonstrate that the sequential order of subcategory benefits influences the values assigned to those benefits. Highest values tend to be offered for benefits offered first, and lower values for goods offered later in the sequence. Because values held by respondents are not concrete, the order in which goods are offered influence values.

A contingent valuation survey effectively emphasises the good

---

[9] Mitchell and Carson (1989) refer to this as "sequence aggregation bias" (p.286)

to be valued relative to other environmental goods by bringing it to the forefront of a respondent's attention[10]. Some survey techniques such as face to face or telephone interviews provide the personal contact necessary to encourage respondents to participate and focus on the good to be valued. Thus respondents presented with information on a particular good are likely to shuffle that good to a prominent position in their own array of environmental goods. This reshuffling of preferences is one explanation of the "embedding effect", which, simply stated, holds that values for some environmental goods tend to be embedded within more inclusive goods (Kahneman and Knetsch 1992). Environmental goods that are presented to respondents for valuation get shuffled internally to prominent positions. Resulting valuations reflect not only the preferences for that particular good, but the prominence of those preferences in relation to other competing goods.

Another reason why survey respondents reshuffle preferences regarding the good in question is that there is often an implicit signal conveyed about the importance of the issue. This occurs in two main ways. First, there is the implication that the issue has been selected because of its importance[11], and this prompts respondents to re-evaluate their preferences. Secondly, because the respondent has been involved and has the opportunity to register his or her preferences, the issue assumes some personal significance. Thus respondents to a CV survey are likely to reshuffle their preferences on a particular issue to a more prominent position because of a change in their perceptions of importance.

Respondents to a survey about a particular environmental good also enjoy learning effects as a result of performing the analysis and making the appropriate tradeoffs[12].

The overall effect of stimulating respondents to participate in the valuation exercise, providing new information (directly and indirectly), and generating learning effects all mean that the respondents are no longer an unbiased sample of the population. Difficulties can occur when the preferences of the sample group are extrapolated across a population.

---

[10] Although most CV surveys remind respondents of alternative substitute goods, time and cognisance constraints mean these reminders tend to be brief and general. In contrast, the good to be valued is usually described in detail, often with the use of photos or maps, in order to satisfy the requirements of accurate scenario depiction.

[11] Because many CV studies are carried out by Government or University groups, many respondents will assume that the issues involved are important ones. In fact, the importance is often stressed in CV preambles so as to increase response rates and to reduce hypothetical bias.

[12] Learning effects are not necessarily positive. Cameron (1995) reports where involvement of participants in a water catchment management project saw the willingness to pay of participants for preservation goals fall over time, apparently because of their improved knowledge about the project.

5.0 The Difficulty of Extrapolating Survey Results Across a Population

A potential multiple counting effect will occur if preferences from a "super informed" sample are extrapolated across a population. As well, if values for a number of separate goods are sampled and the resulting preferences are inferred across a population, then substantial potential for double counting results. At the very least, one inference is that the good to be valued will have the same dominant position in a member of the public's queue of potential goods as was held by a sample respondent. Clearly, as the number of goods studied rises, it is impossible for them to all have a dominant position. In fact, each sample group is likely to overstate values relevant to the overall population because the sample group has received more information and learning effects.

The extrapolation of preferences from a sample group across a population is in fact contingent on the assumption that the survey respondents are an unbiased sample of the population. Some mechanism is needed to allow for situations where this assumption is not valid. If respondents to a CV survey are not an unbiased sample because of information transfer and learning effects, then extrapolation of results across a population is contingent on the assumption that the population can enjoy the same information transfer. This is analogous to a market research exercise, where recommendations about the potential demand for a product are contingent on advertising and promotion campaigns that raise a populations' awareness of a product to the same level as that enjoyed by people sampled in the market research exercise.

When values are inferred from a CV survey across a population, there is no necessity to inform the public to the same level of knowledge as held by survey respondents. What is important is to realise that any estimates of public demand or consumer surplus derived by extrapolation from the contingent valuation exercise are contingent on the public holding the same level of knowledge. If the public does not hold that level of knowledge, then the estimates are contingent on resources being allocated to inform the public to the requisite level of knowledge. It is here that the costs of performing a CV survey become relevant.

To inform members of the population to the same level as that enjoyed by sample respondents, it may be necessary to follow the same procedures used in a survey - face to face visits, a clear explanation of the good with photos and other identifying mediums, and then time to make the tradeoff choices.

For example, if a contingent valuation survey into preservation options for an endangered species has elicited a median willingness to pay of $12 per head but it cost $50 per survey respondent to generate that information, then there is potential for it to cost $50 per head of population to bring

the level of knowledge and awareness up to the point where the actual median willingness to pay is $12 per head. Clearly, such a process would be unviable. However it indicates that there is a link between the transfer of new information, the costs of performing a survey, and the potential costs of bringing a populations' awareness up to the level enjoyed by sample respondents.

Some indication of the importance and size of these linkages can be gained by contingent valuation practitioners setting out clearly the amounts of information transfer and learning effects involved in surveying respondents, the costs of performing those surveys, and the resulting willingness to pay amounts. In many cases it can be argued that although the costs of performing surveys indicates the upper level of cost for informing members of the public, the actual cost of performance may be substantially less or even zero.

Once it is accepted that the results of CV studies are contingent on the relevant population having the same levels of knowledge and learning effects as the sample group, the question turns to the size of that contingency. The upper limit to the contingency will be set by the costs of performing the survey i.e. by replicating the survey conditions across the whole population. However, surveys are a two way process, and are not chosen solely for their information transfer strengths.

There are a number of more efficient mechanisms to inform a population. Use of advertising, publicity campaigns and education programs all provide more cost effective means to provide information. As well, the media plays a role in informing the public. An environmental good that receives a lot of media coverage may be perceived little differently by a population compared to sampled respondents. In this case the contingency can drop to zero.

6.0 The Limits to the Application of the Contingent Valuation Method.

A consideration of the information transfers involved in a contingent valuation survey provide some indications as to where the limits to the application of the CVM are, and to where the boundaries to the selection of the relevant population lie. Each of these issues is addressed in turn.

As discussed above, contingent valuation practitioners generally set the limits to the technique at the point where scenarios are plausible and definable to potential respondents (Carson 1995). This still allows for scenarios to be hypothetical and for large amounts of new information to be transferred. Thus very elaborate scenarios could be accurately depicted (at great cost) to potential respondents. If the willingness to pay that was revealed was low, the survey would be technically valid, but probably inefficient. This is because the contingent cost of providing the

population with the same level of information as the survey respondents received would be greater than the revealed willingness to pay.

Practitioners of CVM effectively face a tradeoff with information transfer. Large amounts of information, incentives and enthusiasm are needed to stimulate interest and participation, and to minimise framing and other biases. At the same time, the transfer of information, incentives and enthusiasm induces a form of scoping bias to the analysis and thus allows the multiple accounting effect to occur.

Information on costs and comparison to WTP bids helps to reveal where substantial transfers of new information are involved. High costs of providing respondents with information and inducing them to participate indicates that the good to be valued is not well known, is not easy to identify, and that respondents may have difficulties in framing scenarios. The comparison of costs and WTP bids provides a rough test of potential "multiple counting" effects, because they indicate cases where the good to be valued is not prominent in a respondent's queue of potential utility satisfiers. Both the high cost test and the difference between costs and WTP bids indicate that a contingency is attached to any extrapolation of survey results across a population.

Unfortunately, these tests identify only those cases where CVM practitioners have tried hard to depict scenarios accurately and their costs have risen accordingly. They will not be effective in cases where low budget CV surveys attempt to target goods that are poorly understood by respondents.

However, the tests provide some indication to where the limits to the application of CVM lie. At some point, the tradeoff between increasing the accuracy of the individual response (the costs of presenting scenarios to respondents), and the contingency attached to the subsequent loss of representativeness will become untenable. As suggested in the literature (Bennett and Carter 1993), the CVM is limited to cases where respondents can easily comprehend the hypothetical scenarios involved.

As well, the analysis reconciles the difference between Cummings et al (1986) and Mitchell and Carson (1989) on this issue. Cummings et al (1986) effectively set the limit at the point where there would be no information transfers or learning effects, and thus no contingency attached to any extrapolation of results. Mitchell and Carson (1989) effectively set the limit at the point where respondents can easily comprehend scenarios, and thus allow information transfer and learning effects to occur. So long as the contingency in extrapolating results is recognised, this position is compatible with that of Cummings et al (1986).

Further, the analysis provides some indication of the

appropriate population to sample in a CV exercise. For example, an environmental issue may generate intense amounts of interest at a local level, but more distant populations may possess much lower levels of interest and knowledge. Much higher levels of incentives and information transfer are going to be involved in sampling these latter groups. Thus as a CV practitioner samples more and more distant groups from an issue (perhaps regional, state, national and even international populations), the costs of framing hypothetical scenarios is likely to rise, the contingencies attached to any extrapolation of results is likely to increase, and the certainty that can be attached to the results obtained is likely to diminish.

7.0 Choice Modelling

It is clear that the contingent valuation method has difficulties in valuing goods that are poorly known or understood by respondents. Contingent valuation practitioners face an acute dilemma. If they fail to describe and define a good, then they foster a number of problematic biases, such as amenity mis-specification bias. Yet the more they describe and define a good, the less representative the sampled respondents are of the population in question. An alternative valuation framework is needed for some goods.

Choice modelling is a technique that offers some promise here (Louviere 1988, Rolfe and Bennett 1996). Like contingent valuation, it asks respondents to state their preferences for hypothetical scenarios. Instead of asking in terms of willingness to pay bids, choice modelling asks respondents to indicate their preferred choice between two or more different scenarios. Scenarios are based on a number of characteristics (attributes) that can vary across several levels. The combination of attributes at different levels means a very large number of different scenarios can be generated from a small set of basic data. By repeating choice experiments with different scenarios, a very large data set can be generated about bundles of attribute levels (scenarios) that are preferred to others. Statistical analysis then enables the researcher to estimate the contribution of each attribute to respondent choices, and hence, to hypothetical utility functions.

The attraction of choice modelling is that a scenario of particular interest can be embedded within a field of alternative scenarios. This means that respondents are not aware of which particular good is being valued, and hence problems of information transfer and learning effects with respect to a particular good are minimised. As well, by offering people choices between different scenarios, choice modelling more closely reflects consumer behaviour. People often make implicit tradeoffs across a range of attributes rather than just two. Thus choice modelling de-emphasises price and is perhaps a more appropriate technique than contingent valuation for issues involving ethical and moral

considerations.

8.0 Further Implications

The analysis of information transfers within contingent valuation reveals two important applications. The first of these relates to the possibility that values for unknown goods can be inferred with stated preference techniques such as the CVM or choice modelling. Further, some rationale for "super informing" survey respondents, as a juror is in the legal system, can thus be established. Second, the analysis provides some explanation and estimation of the role provided by media services in the environmental debate. These issues are outlined in the following sections.

Valuing Unknown Goods

Biologists often point out how unknown or little known species are being threatened with extinction (Lovejoy 1986). Insects and plants in rainforest areas that are being rapidly cleared are usually cited as a prime example of potential loss. Yet it is not usually clear that these goods have value in an economic sense because people have no preferences for them. Is it possible to assign value to items that people have no knowledge of?

The analysis above makes it clear that it is possible to assign values to unknown goods, but that such values have a contingency attached - the cost of making the public aware that the good in question exists. Thus a sample group can selected, be "super informed" about the good to be valued, and their preferences assessed through a non-market valuation process such as contingent valuation or choice modelling. The extrapolation though of the results across a population is based on the assumption that the public "knows" about the unknown good. Clearly a contingency has been incurred.

Subsequent estimates of value need to account for this contingency to be accurate. Yet the valuing process itself is realistic, and allows economists to assign estimates of utility to unknown or little known goods.

The Role of the Media

Extensive media coverage prior to a valuation exercise reduces the scope for information transfer and learning effects to occur. Media coverage after a valuation exercise can reduce an existing contingency by informing a population to the same extent as that enjoyed by a sample group. Thus the media can provide a service by informing the public to the same level that a group of surveyed respondents were. In the same way, education initiatives and information help the public adopt the same "super informed" preferences that they would adopt if the information was available and assessed.

The role of media and educational services therefore is to

reduce the contingency attached to any extrapolation of "super informed" preferences. To some extent, their services can be assessed by quantifying the reduction of contingency costs involved in bringing a population to the "super informed" level.

9.0 Conclusion

This paper has shown that the use of surveys and hypothetical scenarios in the application of the CVM often involves the transfer of new information and learning effects. The more unfamiliar the respondent is with the good in question, the larger these effects. The extrapolation of survey results across a population is therefore contingent on the provision of the same level of information to the population as was enjoyed by survey respondents. The costs of performing surveys provide an upper estimate as to the size of this contingency.

Four other important conclusions follow from this analysis. The first is that this contingency shows that practitioners of the CVM face tradeoffs. New information and incentives are often needed to avoid various framing biases and encourage participation. At the same time, these give rise to problems of scoping and the contingency attached to any extrapolation of results.

The second is that some indication of this contingency can be gained from the costs of surveying respondents, and the difference between these costs and WTP bids. The first test indicates situations where goods are difficult to frame, while the second indicates goods that are relatively unimportant to respondents.

The third important conclusion is that the size of the contingency provides some indication as to the limits of the CVM. Large contingencies (especially in comparison to WTP bids) often indicate some form of a scoping effect, where the good in question is essentially seen as first in a queue of alternatives. For goods that are relatively unimportant or unknown, this effect makes the CVM inappropriate as a valuation technique. Choice modelling is suggested as an alternative technique.

The fourth important conclusion is that the recognition of information contingencies provides a path for valuing unknown goods, perhaps through some form of "super informed" jury style process. As well, it provides a basis for examining the benefits provided by media and educational services.

Acknowledgments

Jeff Bennett, University of New South Wales, provided comments and suggestions on an earlier draft.

Bibliography

Bennett, J.W and Carter, M. 1993 "Prospects for Contingent Valuation: Lessons from the South-East Forests", Australian Journal of Agricultural Economics, 37(2):79-93.

Cameron, J.I. 1995 "Contributions of Social Ecology to Ecological Economics", paper presented to the inaugural Ecological Economics Conference, Coffs Harbour, November, pp. 147-154.

Carson, R.T., Mitchell, R.C., Hanemann, W.N., Kopp, R.J., Presser, S. and Ruud, P.A. 1992 "A Contingent Valuation Survey of lost passive use values resulting from the Exxon Valdez oil spill", Report to the Attorney General of the State of Alaska, Natural Resource Damage Assessment, La Jolla, CA.

Carson, R.T., Wright, J., Carson, N., Alberini, A. and Flores, N., 1995 "A Bibliography of Contingent Valuation Studies and Papers", Natural Resource Damage Assessment, La Jolla, CA

Carson, R.T. 1995 "Valuation of Tropical Rainforests. Philosophical and Practical Issues in the Use of Contingent Valuation", working paper, Department of Economics, University of California, San Diego.

Carson, R.T. and Mitchell, R.C., 1995 "Sequencing and Nesting in Contingent Valuation Surveys", Journal of Environmental Economics and Management, 28:155-173.

Common, M.S., Blamey, R.K. and Norton, T.W. 1993 "Sustainability and Environmental Valuation", Environmental Values, 2(4):299-334.

Cummings, R.G., Brookshire, D.S. and Schulze, W.D. (eds) 1986 Valuing Environmental Goods: A State of the Arts Assessment of the Contingent Method, Rowman and Allenheld, Totowa NJ.

Davis, R.K. 1964 'The Value of Big Game Hunting in a Private Forest', in Transactions of the 29th North American Wildlife Conference, Wildlife Management Institute, Washington, D.C.

Hoehn, J.P. and Randall, A. 1989 "Too Many Proposals Pass the Benefit Cost Test", American Economic Review, 79 (3):544-551.

Johansson, P. 1993 Cost Benefit Analysis of Environmental Change, Cambridge University Press, Cambridge UK.

Just, R.E., Hueth, D.L. and Schmitz, A., 1982 Applied Welfare Economics and Public Policy, Prentice-Hall, Englewood Cliffs, NJ.

Kahneman, D. and Knetsch, J.L. 1992 "Valuing Public Goods: The Purchase of Moral Satisfaction", Journal of Environmental Economics and Management, 22 (1):57-70.

Loomis, J., Gonzalez-Caban, A. and Gregory, R. 1994 "Do Reminders of Substitutes and Budget Constraints influence Contingent Valuation Estimates", Land Economics, 70 (4):499-506.

Louviere, J.J. 1988 Analysing Decision Making: Metric Conjoint Analysis, Sage Publications, Beverly Hills, California.

Lovejoy, T.E. 1986 "Species Leave the Ark One by One" in B. Norton (ed), The Preservation of Species, Princeton University Press, Princeton.

McFadden, D. 1974 "Conditional Logit Analysis of Qualitative Choice Behaviour", in P. Zarembka (ed) Frontiers in Econometrics, Academic Press, New York, 105-142.

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

National Oceanic and Atmospheric Administration, 1993 "Report of the NOAA Panel on Contingent Valuation", Federal Register, 1993, 58, 10, 4602-4614.

Norton, B.G. 1991 "Thoreau's Insect Analogies: Or, Why Environmentalists Hate Mainstream Economists", Environmental Ethics, 13:235-251.

Peterson, G.L. 1992 "New Horizons in Economic Valuation: Integrating Economics and Psychology", in Lockwood M. and DeLacy, T. Valuing Natural Areas: Applications and Problems of the Contingent Valuation Method, Johnson Centre of Parks, Recreation and Heritage, Charles Sturt University, Albury NSW.

Portney, P.R. 1994 "The Contingent Valuation Debate: Why Economists Should Care", The Journal of Economic Perspectives, 8(4):3-17.

Randall, A. and Stoll, 1982 "Existence Value in a Total Valuation Framework", in R. D. Rowe and L.G. Chester, eds. Managing Air Quality and Scenic Resources at National Parks and Wilderness Areas, Westview Press, Boulder CO.

Randall, A. and Hoehn, J.P. 1992 "Embedding Effects in Contingent Valuation: Implications for Natural Resource Damage Assessment", Staff paper 92-14, Department of Agricultural Economics, Michigan State University.

Randall, A. 1986 "The Possibility of Satisfactory Benefit Estimation with Contingent Markets", in R.G. Cummings, D.S. Brookshire, and W.D. Schulze (eds) Valuing Environmental Goods, An Assessment of the Contingent Valuation Method, Rowman and Allenheld, New Jersey, pp 114-122.

Rolfe, J.C. 1995 "Ulysses Revisited - A Closer Look at the Safe Minimum Standard Rule", Australian Journal of Agricultural Economics, 39(1):55-70.

Rolfe, J.C. and Bennett, J.W. 1995 "International Demand for Rainforests: Using Focus Groups to Establish Valuation Frameworks", Vanuatu Forest Conservation Research Report No 9., Department of Economics and Management, University College, University of New South Wales, Canberra.

Rolfe, J.C. and Bennett, J.W. 1996 "Valuation of International Rainforests: A Choice Modelling Approach", paper presented to the 40th Australian Agricultural Economics Conference, Melbourne, February.

Sagoff, M. 1988 The Economy of the Earth, Cambridge University Press, Cambridge, Mass

Simon H. 1957 Administrative Behaviour, Macmillan, New York.

Thurstone, L.L. 1927 "A Law of Comparative Judgement", Psychological Review, 4:273-286.

Wilks, L.C. 1990 A Survey of the Contingent Valuation Method, Resource Assessment Commission, AGPS, Canberra.