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**A Critique of Contingent Valuation Methodology
and its Application in Public Policy**

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A CRITIQUE OF CONTINGENT VALUATION METHODOLOGY AND ITS APPLICATION IN PUBLIC POLICY

by Roger Bate

EXECUTIVE SUMMARY

How much would you be willing to pay for an untouched expanse of wilderness? The process by which this question can be answered is called Contingent Valuation (CV). CV attempts to quantify the "satisfaction" of knowing that a natural resource exists, called a "nonuse value" (NUV), regardless of any actual attempt to enjoy it. Once enumerated, NUVs could be used to impose liability for injuries to natural resources placing billions of dollars at stake.

The CV procedure involves asking people what they would pay, through increased taxes, prices, or some other mechanism, to protect a valued environmental resource. For example, CV surveys provide respondents with a selection of choices, such as a set of charities. You may be willing to give \$100 to charity and there may be eight separate charities that you find appealing. It is therefore possible that in separate CV surveys, your stated willingness to donate to charity could equal \$800 in total, even though \$100 is all that will be given. Obviously, this approach has serious problems including the following:

- the survey process can create the very values which they purport to measure;
- answers are likely to be biased by strategic considerations regarding the uses to which the survey could be put;
- survey results are often inconsistent;
- individuals are ill-trained to evaluate the monetary value of environmental damage;
- rarely do individuals have experience in purchasing environmental assets;
- results cannot be empirically verified.

In sum, CV results are uncertain, subjective and speculative.

CV surveys are further hindered by a fundamental difference between an actual choice and a potential preference. People may state a preference for many things but in actuality choose something entirely different.

- A choice is superior to a preference because with the latter "there is no cost to being wrong, and therefore no incentive to undertake the mental effort to be accurate;"
- The only way to discover the values people place on things is through the actual choices made by individuals.

Contingent valuation is an attempt to replicate the workings of the market without a system where natural resource sites have well-defined private property rights. Markets allow people to make choices based on the amount they are willing to pay for a good or service. CV surveys bypass the workings of a true market process. The results from these surveys therefore cannot be equated with market behavior, and any use of these figures should be treated with skepticism.

Despite these problems, CV surveys are becoming more prevalent. For instance, the 1989 Supreme Court declared, in *Ohio v. U.S. Department of Interior*, that nonuse values can be used to measure damages in liability cases. *CV surveys are likely to result in unwanted litigation, and could be presented in liability claims at considerable social cost.* Because the use of surveys cannot be tested or verified empirically the valuation of natural resources through CV is simply inappropriate. The results may be interesting, but are little more than picking a number, any number.

FOREWORD

This paper is part of a series of studies at the Competitive Enterprise Institute (CEI) dealing with various aspects of Free Market Environmentalism (FME). FME takes an “institutional” market-based approach to the formulation of environmental policy. Therefore, CEI favors the extension of property rights and voluntary arrangements (contracts) into the ecological realm. The extension of such institutions provides an effective means of enabling individuals and communities to define and advance environmental goals privately. Within the FME framework, individuals would protect their own corner of the world—and thus conserve ecological values for the general public.

The FME paradigm stands in stark contrast to the “market failure” paradigm that now dominates environmental policy. This outlook recognizes the virtues of markets, but views them as inherently incapable of protecting the environment. Pollution, for example, is external to the market (an “externality”), and thus the market “fails” to account for it. Political intervention, in such cases, is thus seen as necessary to “correct” such “failures” of the market system. However, the result is the ecological equivalent of central planning—a range of policy prescriptions from command-and-control regulation to pollution taxes and other attempts at “market pricing” without markets.

Because environmentalists seek to value environmental resources without actually creating a system of property rights which would permit such resources to be exchanged, they are forced to rely on abstract estimation techniques. One such technique is contingent valuation, the subject of this paper. Contingent valuation seeks to quantify the “satisfaction” that people have from knowing that particular things exist, and/or that they exist in a particular condition, through the use of surveys. As this paper shows, such efforts are highly controversial and their application to public policy is of questionable value. No matter how sophisticated the contingent valuation technique, markets cannot be designed from above. There is simply no substitute for the pattern of real-world exchanges and the infinite volume of information that such exchanges generate.

As this paper notes, real world markets process information in a highly creative and efficient fashion. For example, markets consider future values (“bequest values” in some circles) because speculators and investors seek to

estimate future demand and supply. Markets also consider "existence values" because people are willing to expend resources to ensure the continued existence of goods. The Nature Conservancy has long encouraged contributions on this basis. Such values, however, cannot readily be assessed for resources left outside the system of exchange made possible by property rights.

In brief, markets without property rights are fantasies. The contingent valuation game is merely an attempt to gain the values of the market while preserving political privileges. Rather than relying upon questionable survey techniques and economic calculations, FME suggests that we embark upon the difficult but critical task of integrating ecological resources into the market system.

Fred L. Smith, Jr.
President

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A CRITIQUE OF CONTINGENT VALUATION METHODOLOGY AND ITS APPLICATION IN PUBLIC POLICY

by Roger Bate

INTRODUCTION

"For at least the last twenty-five years, economists have recognized the possibility that individuals who make no active use of a particular...natural resource might, nevertheless, derive satisfaction from its mere existence, even if they never intend to make active use of it."¹ For example, the delight one may feel at the vast expanse of the untouched wilderness of Antarctica would be one such "existence value."

While a heated debate is raging among academic environmental economists as to whether such existence values or nonuse values² can be quantified, the federal government is attempting to legislate for their enumeration. Under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Oil Pollution Act of 1990, the Departments of Commerce and the Interior are developing federal regulations to impose liability for injuries to natural resources caused by discharges of hazardous substances and petroleum. For example, if toxic waste is released into a river, the commercial value of the fish killed can be established and some form of enjoyment loss can be assessed for amenity users. However, it is the question of whether nonuse values can be applied in these liability claims that has caused interest in the calculation of NUV over the past few years.

Even those in favor of measuring nonuse values acknowledge there are many problems in doing so. The contention of this paper is that the values measured are unreliable, both statistically and methodologically, and do not conform to any recognized economic theory. The one legal application, so far, of nonuse values suggests that further use in liability claims would impose unacceptable risks on the insurance industry, and lead to vastly increased social costs.

This paper is divided into several sections. The first details the origins of nonuse value theory, and the method chosen to calculate these values. The second section details the epistemological and methodological objections to the method of NUV calculation. The third section outlines the measurement problems of nonuse values. The fourth section explains the role of an expert

Even those in favor of measuring nonuse values acknowledge there are many problems in doing so.

panel convened to analyze the role nonuse values could have in liability claims. The conclusion summarizes the findings of this paper.

THE ORIGIN AND DEVELOPMENT OF NONUSE VALUE THEORY

The intellectual origin of nonuse values (NUV) is an article by J. V. Krutilla published in 1967.³ He felt that environmental resources would be undervalued if calculations were based purely on recreational user fees of a site. He argues that, "There are many persons who obtain satisfaction from mere knowledge that part of wilderness North America remains even though they would be appalled by the prospect of being exposed to it."⁴ He makes the case for unique, collectively important and irreplaceable assets, such as the Grand Canyon, and he limits his analysis to these sites as he felt that where sites had many substitutes valuation would be made very difficult. Significantly, the tendency of later writers has been to apply NUV to sites of less distinction.

Nonuse values cannot be assessed from observing behavior.

Since Krutilla's article was published resource use has increased, and with it greater knowledge of man's impact on the environment. Most western governments have made various attempts to deal with the perceived consequences. One such attempt was CERCLA. Under the authority of CERCLA, the Department of the Interior and the Department of Commerce have been developing federal regulations calling for damages for "loss of natural resources."⁵ One of the areas of controversy over CERCLA was whether liability could be imposed for nonuse values. Indeed, there was a public meeting to discuss this very point at the Department of Commerce (DOC) on August 12, 1992.⁶ The panel,⁷ convened by the National Oceanic and Atmospheric Administration (NOAA) to investigate the use of NUV, has since reported. Its report is quoted extensively in this paper as it will form the basis of the forthcoming regulation.

Prior to this meeting, there was a very influential ruling in *State of Ohio v. U.S. Dept. of the Interior*⁸ on July 14, 1989, in which the court allowed lost nonuse values to be claimed in damage assessment. However, the Department of the Interior had promulgated regulations in August 1986 which limited damage assessment to actual loss of value. Uncertainty over the legal status of nonuse values has led to inconsistency in legal suits, some being prepared with NUV-derived damage assessments and others without. One of the aims of the 1992 DOC/NOAA meeting was to reduce this uncertainty.

By definition, NUVs cannot be assessed from observing behavior. The chief method of calculation of NUV employed by environmental economists is the survey technique of Contingent Valuation (CV). It is so-called because the amount that respondents say they are willing to pay is contingent upon the particular hypothetical market that is described.⁹ The panel convened by NOAA was dubbed the CV panel as it had to assess whether CV surveys could

measure NUVs. Therefore, it is essential to outline how CV studies are conducted.

How Contingent Valuation Studies are Conducted: Survey Techniques

The usual procedure for a contingent valuation survey is as follows:

- a. Background information is given to the respondent as to the nature of the environmental resource: its history, geography scientific interest, etc.
- b. The respondent is informed about the change in environmental conditions which is envisaged, or which has occurred in the case of damage and liability claims.¹⁰
- c. The respondent is informed how the money he or she may pledge would hypothetically be collected to finance the environmental change. Examples might include a surcharge to the federal income tax, an addition to monthly utility bills or an increase in gasoline prices.
- d. The respondent is asked the maximum he or she would be willing to pay to contribute toward the envisaged environmental improvement.¹¹
- e. Finally the respondents will be asked to give information about themselves, such as age, income, geographical location, sex, education, outdoor activities and membership in any environmental organizations.

Furthermore, respondents may be asked to say how much they would be willing to pay in a variety of approaches:

- a. Dichotomous Choice: The respondent is given a price and asked if he or she would be willing to pay it.
- b. Open Ended: The respondent is asked to come up with a price with no guidance from the interviewer.
- c. The respondent may be asked to select an amount from a list of payment cards (i.e. discrete, as opposed to continuous, contribution levels).

Depending on where the survey is conducted, the information given by respondents in the willingness to pay section may include use value and nonuse value for a resource for some respondents, and only nonuse value for others.¹² Where possible the use values are stripped out and the remaining figure is assumed to be the nonuse valuation of the change in the condition of the natural resource site.

Whether these asserted values elicited can be used within economic analysis is the question to which this paper now turns.

ECONOMIC THEORY AND CONTINGENT VALUATION

An Economic Basis for CV?

Microeconomic analysis is based on the market structure, where supply and demand interact to determine market price and quantity sold. Most economic literature is based on the premise that there is a fundamental difference between people's behavior, as observed in the market, and answers they may give to hypothetical questions about their behavior.¹³ It is assumed that consumers will try to maximize benefits from their market purchases. The consumer will take as much effort in making the decision over a purchase as he or she thinks worthwhile. This maximization of preferences obviously occurs *ex ante* and not *ex post*, as invariably the expectations of the consumer about the good purchased will be, to some slight degree, in error. The ability of the market system to "learn" from the mistakes participants make, due to imperfect information at their disposal, is one of its major attributes. If the initial price of a good, set by a supplier, is too high, (i.e. the demand for the good at that price is lower than the supplier had anticipated) the supplier "learns" and reduces his price, or reduces the quantity he is selling.

*Without choice,
value does not
change.*

However, if the price is set by an authority—able to enforce the price—which is not responsive to demand and supply conditions, then too much (or too little) of the good will be supplied at too low (or too high) a price. A price becomes a value when the desires of individuals, for a good, are absorbed into the price by trade for that good. In other words, exercising choice leads to a continually changing valuation for the good or service in question. Without choice price changes are purely arbitrary and value does not change.

What CV surveys do is provide respondents with a selection of choices. Before choosing they can take any of an array of possible choices—i.e., a set of preferences. Therefore you may be willing to give \$100 to a charity and, if asked, you could say that eight charities catch your eye. It is therefore possible that in separate CV surveys, your stated willingness to pay (WTP) to join each of the eight charities could be taken as \$800 in total, even though \$100 is all that will be given.

The fundamental difference here is between actual choice and potential preference. From both ethical and economic perspectives, there are significant reasons why choice is superior to mere preference in the allocation of resources. At most, preference constitutes a disposition to choose. Choice, on the other hand, requires action: it is the behavior itself. Economists recognize the superiority of using choice rather than preference because with the latter (or, in this case, a WTP claim) "there is no cost to being wrong, and therefore no incentive to undertake the mental effort to be accurate."¹⁴

The philosophical reason for preferring choice to preference in allocating resources is because it is considered to be ethically superior. Choice expresses consent, engagement, and commitment. In making a choice one becomes accountable and responsible for it. Also, choice exercises liberty in an open society. By choosing incorrectly one may not satisfy one's preferences. However, at least one was free to make the choice. "To confuse preference and choice is to conflate acts of will with inferred states of mind."¹⁵ Clearly, WTP is a state of mind; it is not an action.

What does a WTP figure represent?

"Willingness to pay" figures are assumed, by proponents of contingent valuation studies, to be capable of interpretation within conventional economic theory, as being synonymous with choice. For example, the assumption is that by hypothetically spending money on conserving a natural resource, the income change of the respondent will leave him or her indifferent between the current situation—higher income and a damaged natural resource—and the post-event situation: lower income and a restored resource. In economic parlance, this is known as a Hicksian compensated variation. However, by their very nature, CV surveys are not observed behavior as, at best, they can only reflect hidden preferences and, at worst, ethical judgments.

The DOC/NOAA CV Panel equates the problem of using the CV procedure with that of firms designing "highly innovative" new products. "The field of market research has developed methods — conjoint analysis, for example — that are similar to the CV approach."¹⁶ However, what the panel ignores is that the product will be tested in a market at some stage. It is at this stage that pricing information will be decided. CV surveys have been tested by valuing marketed goods. The resulting WTP of respondents for marketed products may provide interesting information, but any price information they give will soon be superseded by market-place data.

Property Rights

With all marketed goods and services private ownership is required. For example, when someone purchases a good she owns it. The property rights are well established and easily identified. If the good is damaged by a third party after purchase, the purchaser has the right to pursue damages or replacement of that good from the third party or from an insurer.

Natural resource sites, on the other hand, do not have well-defined private property rights. Each site is most likely owned by "the public": it is a common resource. As the rights will not be traded there is no market for the good, establishing a value for it is not easy and damage assessment is also difficult.

Where a price is charged for entrance to a natural site, this will act as a recreational value for the site. This price will only be an accurate evaluation

Choice exercises liberty in an open society.

Natural resource sites do not have well-defined private property rights.

however, if it is discovered by market forces and not arbitrarily set by a Government agency or other entity. For example, if there is a government subsidy to the site, the valuation will be inaccurate. Yellowstone National Park charges an entrance fee of \$10, which yields far less revenue than is required to meet the cost of running the park. Therefore, using the aggregate of gate charges could undervalue the park.

If no price is charged then valuation becomes even more difficult. Nevertheless some assessment of damage can be made if it is still possible to link underlying choice to observed behavior in a related market good. For example, attempts to calculate lost value have been made by observing the reduction in recreational trips to a site that is damaged.¹⁷ Thus, if toxic waste leaches into a river, individuals may reveal their preferences by decreasing trips to the area. Even though no explicit price is paid for a good, behavior in response to a given event is measurable.¹⁸ However, if no underlying market price is observable no true representation of value can be achieved.

To summarize, economic theory emphasizes how more reliance can be placed on choice than on stated preferences. Consequently, consumer models describe how individuals make purchases of goods according to choice (revealed preference) and a budget constraint. Within such models the state of a natural resource may affect a person's happiness but is not a "good" over which an individual can exercise choice, unless the resource is privately owned. If, as is most likely, the resource is owned by a government, then a true market is not permitted to develop for that resource. Only non-revealed preferences, via WTP answers to CV survey questions, can be estimated.

Where there are no private property rights markets cannot exist and, without markets, no valuation is possible.

Therefore, however statistically reliable such CV surveys results may be, the fundamental flaw of using stated preferences rather than revealed preferences (actual choices) will always exist when using surveys for valuation.

MEASUREMENT PROBLEMS ASSOCIATED WITH CV

The previous section dealt with the epistemological and ethical questions associated with the use of CV surveys. This section looks at the technical details of the method itself. The following is a list of measurement problems associated with the CV technique.

Unfamiliarity

It is generally accepted that over half of all new products introduced into the market place fail. Yet nearly all products are brought on line after market research based on surveys, and real market test sites. Market surveys, although useful, are far from perfect in their predictions of consumer behavior. Furthermore, the respondent in market research surveys is often familiar with the product's substitutes and hence can at least form some opinion as to whether it will sell, and even assess a potential price for the good.

However, anyone who has seen the TV game show "The Price is Right" will know that general knowledge about prices of marketed goods is not perfect. For those who haven't had the pleasure, this is the format. The contestant is asked to put prices on goods and the one who guesses most accurately wins. In general, the contestants will know, reasonably well, the price range of items they normally purchase. However, and this is the strength of the program and the weakness of CV surveys, when they are asked to guess the price of an item with which they are completely unfamiliar, the guesses are generally far off-target.

Compare this to someone asked about the value of a natural resource. As most individuals have no experience with purchasing environmental assets, it would seem unlikely that they will value the sites accurately.

Individuals are, not surprisingly, ill-trained to evaluate the monetary value of environmental damage, much in the same way that it would be difficult for them to choose between competing designs of nuclear submarines. The issues involved can be so complex that the information required to make an astute judgment could take days, or even weeks to assimilate, whereas most information given at the beginning of CV surveys is often related in under five minutes. For example, valuing the damage done by the Exxon Valdez oil spill took experts months to calculate and still remained largely subjective. If one uses CV in liability claims, one is effectively asking the (non-expert) respondent to value the resource in a matter of minutes. At best, he may approximate a realistic value. "At worst, if a respondent is unaware of the existence of the resource, a CV survey may create the very nonuse value it purports to measure."²⁰

The creation of tacit values seems to be an unintended consequence of the CV methodology. For example, the vast majority of people who were angered or upset at the fouling of the rocky shores of Prince William Sound by the Exxon Valdez were unaware that the Sound even existed prior to the spill. One CV survey²¹ estimated that the NUV of Prince William Sound was \$50 to \$100 per U.S. family. This would equate to a total existence value of between \$5 billion and \$10 billion for the 100 million U.S. families, yet remains almost completely arbitrary. The exact same "value" could be calculated by concocting a fictional Sound and surveying the same individuals.

Individuals are ill-trained to evaluate the monetary value of environmental damage.

Strategic Bias

There is a significant possibility with CV surveys that individuals may express a concern over an environmental issue or group of issues, rather than a realistic willingness to pay (WTP). CV answers do not report pre-existing preferences, only the numbers that emanate from respondents while constructing responses. The respondents know that their answers may be used in evaluating policy, and even in the pricing of clean up costs or liability claims. Therefore, they may answer strategically. For example, if they believe that the government does not spend enough on wildlife protection, they may be inclined to state a figure vastly higher than they would actually be prepared to contribute, knowing they will not directly foot the bill. This strategic bias is therefore likely to be prevalent in CV answers.

There is also the probability that the amount that respondents say they are willing to pay will depend upon the method of financing chosen to pay for the environmental change. For example, increases in the income tax rate will affect people differently from a levy on gasoline. Therefore, individuals may carry out personal cost-benefit analyses rather than describe true preferences.

Strategic bias is likely to be prevalent in contingent valuation answers.

Methodologically, it is more acceptable to use a CV survey which is conducted before damage takes place.²² As an accident can occur anywhere, this would entail carrying out CV surveys for every natural resource in the world. The World Bank's Global Environment Facility (GEF), spends some of its money doing just this.

Question Sequencing - The Embedding Problem

One of the key problems that faces CV surveys is the problem of "embedding." Kemp and Maxwell²³ explored this problem. They conducted two separate surveys, one a "single-focus" survey and the second a "top-down disaggregation" survey. The first asked respondents how much they were willing to pay for a 10 year government program designed to minimize the risk of oil spills off the Alaskan Coast. The average WTP was \$85 per household.

The second survey (using an identical selection procedure) was more complex and embedded the above Alaskan question much later in the sequence of questions, initially asking about alternative uses of government funds. First, they asked the WTP about eight social programs. The topics included education, crime prevention and environmental protection. Next, from the stated amount pledged for environmental protection they went through a series of issues, such as acid rain, deforestation, ozone layer depletion and the protection of wilderness areas. They then disaggregated further and differentiated between human-caused problems and those arising for other reasons, and between all other human-caused problems and oil spills.

The last question was the same as the single question of the first survey. This time the average WTP for 10 years of protection for Alaskan coasts was 29 cents. The one question survey gave an answer 300 times larger than that of the embedded survey. Therefore, the total WTP of the 100 million American households for Alaskan Coast protection could be evaluated to be \$29 million or \$8.5 billion.

Consistency Testing and Empirical Testing

CV cannot be tested empirically,²⁴ and the CV panel acknowledges “the impossibility of validating externally the results of CV studies.”²⁵ One therefore has to look to internal consistency tests to see if CV methodology is acceptable.

One method used to elicit information about the processes involved in respondents’ answers is that of “Verbal Protocol.” In this process, used by psychologists, the interviewer asks a question and the respondent is asked to “think aloud” while answering the question. A paper by Schkade and Payne²⁶ used one such verbal protocol method. The questions were designed to obtain WTP responses to protect migratory water fowl from drowning in waste oil holding ponds. The main type of thought processes involved were explained by the respondent as follows:

One quarter felt that if each household played its part then each household would not have to pay very much.²⁷ One sixth attempted to calculate how much they would be affected by the posited increase in gasoline prices needed to pay for the waterfowl protection. One sixth compared the amount they might give with donations to charities. One fifth guessed an answer.

These responses reinforce the above-mentioned problem of the unfamiliarity of the respondents with the task asked of them, and seem to indicate that the individuals did not have well-formed or consistent underlying preferences.

The most interesting discovery from this study is that a sixth of the respondents said they would compare what they might contribute with accepted norms of charitable giving. Charitable giving can be viewed as a market activity—trading money for psychic income (compounded by tax treatment). Therefore, are the figures from this one-sixth more or less reliable than the figures obtained from the other five-sixths?

A Norwegian study by Seip and Strand²⁸ may help us to appreciate the problem of calculating a reliable figure from a WTP response. This study gathered data on the WTP of Norwegians to join the most important environmental group in Norway. Only six out of the 101 who said they were willing to pay the membership fee actually did join the group. Unlike most CV analysts Seip and Strand wanted to know why their data had proved to be so inaccurate. In follow-up calls, they found that the general feeling of the

Only six percent who said they were willing to pay the membership fee actually did join the group.

respondents was that there were so many good causes to support that they could not support all of them. Hence, less than six percent had done what they said they would do. One sixth of those in the Schadke and Payne survey said they were willing to pay rates similar to charity donations. Yet it is doubtful that most of them would have actually paid the stipulated amount.

Willingness to Pay (WTP) and Willingness to Accept (WTA)

A procedure for testing the stability and reliability of the results obtained from a CV survey is to reverse the question and instead ask how much the respondent would be “willing to accept” (WTA) in compensation if the environmental benefit is not to occur. A survey that looked at air pollutants and hence visibility at the Grand Canyon asked both WTP and WTA questions.²⁹ The hypothetical information given to the respondent was that the government had a costly program underway to reduce pollution and hence increase visibility at the Grand Canyon. The respondents were asked what they would be WTP toward the project’s completion. Next, the respondents were told that the program had been approved but that the government had yet to appropriate the money to fund it. The respondents were asked how much they would be WTA to be in favor of cancelling the project.

At face value the two questions simply seem to be the reverse of each other. However, results from CV surveys have shown large differences in stated values.

Theoretically, one would expect the respondent’s WTP figure to be slightly lower than the WTA figure of the same respondent, as the respondent is becoming worse off financially if the environmental improvement goes ahead. In orthodox markets, as income falls so does expenditure, therefore WTP should be less than WTA.³⁰ Why then, are some WTA figures so much larger than WTP amounts but other WTA figures are zero?

One would expect the difference between WTP and WTA to be very small for two reasons. First, the monetary differential in “initial happiness” between WTP and WTA should be small, as it is assumed that changes in visibility at the Grand Canyon will not take a large percentage of one’s income. Second, CV surveys have shown that WTP does not increase in proportion to income.

The reason that the discrepancies are large is easier to appreciate if we follow the argument put forward by Opaluch and Grigalunas.³¹ They believe that environmental survey questions receive ethically-based responses rather than true preferences. Hence, WTP is the willingness to pursue one’s ethical beliefs; whereas WTA is, in ethical terms, akin to accepting a bribe and therefore can be infinite. This would seem to be consistent with the data, where a large number of respondents refused to participate in the WTA section and hence came up as zero on the analysis.

The refusal to participate indicates that the WTA values should not be zero, but infinity. However, this would make mathematical nonsense of the other figures by giving a mean (average) WTA of infinity. The surveyors therefore make the dubious decision to record these as zero values.

Statistical Bias

The WTA responses, as explained above, are often either very large or zero. The results, therefore, tend to be bi-modally distributed, with the larger mode being zero. Drawing a single mean figure from bi-modal data is pointless as no measure of central tendency can provide an adequate summary of the data. Therefore, use of the figure should be treated with caution and a wide range of possible values should be acknowledged. In addition, a number of the respondents provided implausibly high WTP figures given their level of income.

One could reduce the weighting attached to such extreme figures (outliers), or perhaps just ignore the top and bottom 5% of answers. However, this is yet another reason to avoid using CV studies. *Ad hoc* data manipulation is bad statistical practice, lending force to the argument that the whole technique is flawed.

Legal Aspects of CV

Since, to a large extent, contingent valuation methodology (CVM) is a creature of liability claims, it is essential to see how it is treated by the courts. The 1989 Supreme Court ruling in *Ohio v. U.S. Department of the Interior*,³² declared that nonuse values can be used in damage measurements. It is therefore useful to consider nonuse valuation in both theoretical and applied settings.

Liability assessment is a measurement of harm for the purpose of imposing liability on a party found to be legally responsible for certain injuries or damages. It is essentially in the spirit of contingent valuation that it should be used to ascertain negligence, since this determination requires an assessment of the magnitude of possible harm. A party is considered negligent if the precautions taken were inappropriately low. The decision as to what is "low" is dependent on the value of the resource being harmed.

If CV is used to calculate the value of the resource, then CV will have to be used to ascertain whether there is negligence, as "low precautions" will depend on the total value of that which is damaged and the reasonableness of precautionary measures. There is a further link here: the amount spent on clean up should relate to the value of the good. If CV values the good, then CV dictates the amount of clean up costs.

Contingent valuation methodology is a creature of liability claims.

If CV is Correct

If the NUV is calculated perfectly by a CV study, then firms and consumers would take the full social value (use value plus nonuse value) into account when making decisions. However, if CV is inaccurate, the inclusion of the estimate will distort public decisions through the incentives created for any parties potentially subject to liability. Therefore, due to the fear of unlimited liability, companies may take unnecessarily defensive precautions, or withdraw from activities such as transporting or disposing of toxic waste that, on balance, are socially desirable. Consequently, if the CV survey has a large degree of bias, it would be worse to include the estimate than to leave it out. In this situation, CV would actually increase the risk that socially valuable activities will cease.³³

There is an obvious additional disadvantage to the use of CV in liability claims. Legal costs are likely to increase simply because CV surveys are not empirically testable. For example, a plaintiff may use a CV survey to value a site which the defendant is alleged to have damaged. The defendant disagrees and produces his own survey, neither is testable so some arbiter is called upon to decide between the two, and maybe even produce a third survey. Therefore, even if the plaintiff's CV survey was perfect (that is, it measured what it purported to measure) the increase in legal costs may prove high enough to make the use of the survey socially inefficient even if the winner in court may personally benefit.

Of course, if the costs of the legal wrangling are born by the loser in court, there is an incentive for plaintiffs to "invest" significant sums in the CV survey. The more convincing and detailed the CV survey is, the more likely it is to be paid for by the defendant.

In other tort cases, uncertain, subjective components of loss are usually excluded from damage assessments.³⁴ For example, individuals are not able to collect for non-pecuniary losses they may suffer due to the death of others unless certain conditions are met (such as a close family relationship to the deceased). Individuals are also unable to make claims for the non-pecuniary losses they suffer due to the death of pets. Tort law is interpreted this way because the inclusion of speculative claims would increase the cost of litigation, generating unnecessary and detrimental risk.

CV results are uncertain, subjective and speculative, yet examples of CV use are becoming more prevalent. Since the Valdez tanker accident, Exxon has spent over \$6 million on CV studies.³⁵ The State of Alaska, the Federal Government and Exxon spent an estimated \$100 million on litigation before settling.³⁶ A significant proportion of this was due to Exxon's concern over the size of CV estimates.³⁷

CV results are uncertain, subjective and speculative, yet examples of CV use are becoming more prevalent.

Application of CV in legal cases

Although CV surveys are proliferating, only once so far has a survey been used to assess environmental liability damages. Therefore, it is worthwhile to analyze this case. [The details are in the appendix. The main points are elucidated here.]

A company, Southern Refrigerated Transport, Inc., spilled a toxin into the Little Salmon river in Idaho. The State of Idaho pursued damages for lost existence value as well as lost use value. The court found that the NUV of the fish claimed in the CV survey was over an order of magnitude (over 10 times) larger than the actual commercial value, and it would be “conjecture” to use the CV survey in valuation. The results were found to be “legally insufficient to establish existence value.”

The speculative and unreliable value calculated for the existence of Steelhead fish was thrown out by the court in this case. However, because the court accepted—as will others since the Supreme Court ruling, cited earlier—that existence value is potentially measurable, further CV studies will be conducted at great expense and will be presented in liability claims, at considerable social costs.

THE ROLE OF THE CV PANEL

Thus far this paper has concentrated first on the ethical problems of using CV responses in assessing nonuse values, second on detailing the myriad measurement problems of the technique itself, and third in analyzing the legal status of CV and its use to date. In this final section the role of the CV Panel is analyzed.

The National Oceanic and Atmospheric Administration (NOAA) was promulgating regulations under the Oil Pollution Act of 1990 and wanted to assess “whether the CV technique is capable of providing reliable information about lost existence or other passive-use values.”³⁸ The CV panel, whose members were all notable social scientists including two Nobel Laureates (Professors Arrow and Solow), was formed to address this question. However, it did not question the use of the technique at the ethical and theoretical level. It concentrated purely on the measurement problems, bypassing the economic theory to which most members of the panel had adhered for their academic and commercial lives.

The CV panel painstakingly detailed all of the measurement problems outlined in this paper, drawing on all the relevant CV studies. However, it obviously accepted that using only commercial and recreational values could undervalue a site, and that CVM is the only option for measuring NUV. This concurs with the opinion of a senior economist at NOAA, Norman Meade (and not a member of the CV panel), who said, “There are not alternatives

The CV Panel did not question the use of the technique at the ethical and theoretical level.

when it comes to nonuse value. We are setting up a market where we need to determine a value that did not exist before. I do not know how you would do it except by going to the people and asking them.”³⁹

The panel concluded “that CV studies can produce estimates reliable enough to be the starting point for a judicial or administrative determination of natural resource damage—including lost passive-use value”.⁴⁰ The panel accepted the measurement problems but explained that if the surveys are “carefully constructed, administered, and analyzed [they] will contain information that judges, juries and other decisionmakers will wish to use.”⁴¹

Section IV of the panel’s report “includes guidelines to which the panel believes any CV study should adhere if the study is to produce information useful in natural resource damage assessments.”⁴² The guidelines the CV panel puts forward are lengthy and would be costly to implement, although they would undoubtedly lead to more consistent results. For example, they insist on: only using person-to-person interviews because mail surveys and telephone interviews are less likely to be reliable; informing the respondent in detail about the environmental change envisaged; using very long questionnaires to deflect the embedding problem (discussed above); and using a set of benchmark studies against which any survey can be assessed.

The Panels’ report concluded: “We strongly urge the government to undertake the task of creating a set of reliable reference surveys that can be used to interpret the guidelines and also to calibrate surveys that do not fully meet the conditions.”⁴³

They continue in section V, “Recommendations For Future Research”:

The federal government should produce damage assessments for a few specific reference oil spills, either hypothetical or actual, ranging from small to large. These standard valuations could be generated by any method. One possibility would be through a jury of experts. Such a jury of experts might wish to conduct a series of CV studies, satisfying the guidelines laid out above. These CV studies would be inputs into the jury process, to be combined with other information and expert judgment. Once these benchmarks were available, they could serve as reference points for later CV studies. . . . Responses to [the benchmark study] could then be used as one reliable source of information in the damage assessment.⁴⁴

A number of questions arise from this statement. First, the panel is recommending the use of a benchmark study, to be designed by a “jury of experts.” However, there appears to be a moral hazard with this proposal since any “jury” would be likely to include members of the CV Panel itself. Second, as the panel acknowledges, “survey responses are usually found to be...overestimates of WTP.”⁴⁵ Thus, how can the panel be sure that the benchmark survey is accurate? Regardless of this statement the “panel’s

The use of CV surveys in the valuation of natural resources is inappropriate.

conclusion is that a well conducted CV study provides an adequately reliable benchmark."⁴⁶

The Panel's second conclusion is that the appropriate federal agencies should begin to accumulate standard damage assessments for a range of oil spills...That process should further improve the reliability of CV studies in damage assessment. It should thus contribute to increasing the accuracy and reducing the cost of subsequent damage assessment cases. In that sense it can be regarded as an investment.⁴⁷

Pandora's Box

Krutilla intended that NUVs were only relevant to unique and irreplaceable assets. Yet, who determines what is unique? In economic terms, uniqueness is characterized by an absence of substitutes and a low price elasticity of demand. Geologically, all rivers are unique. One could also take the attitude that once you've seen one river you've seen them all. A CV survey is simply an examination of various attitudes which may or may not reflect actual behavior.

This paper has focused on CV surveys in relation to environmental damages. However, what is to stop CV surveys being used in other areas outside of environmental damages? For example, if a plane crash killed several people, CV surveys could be applied by anybody who felt shocked at the news. Airfares would soar to cover the massive insurance needed against future crashes (if such insurance would be offered at all).

To allow CV surveys to be used in one field of public policy will inevitably mean, that at some stage, it will be used elsewhere. However, even before this occurs, the social costs arising from its use in the first field will be immense. Banks and insurance companies are already withdrawing from activities with any hint of environmental trouble. This is leaving the market to a few major players, who can insure and bankroll themselves, and to cowboy firms that, due to the stringency of the liability, operate outside of the law. This leads to inefficient, unstable markets which impose high social costs.

Nonuse values do exist, at least for some people. However, if existence values are measured for natural resources, then there is no reason to prohibit measuring them for goods and services outside the environmental area. If the lid to this Pandora's Box is opened will it ever again be shut?

CONCLUSION

One of the most important features of the market mechanism is the ability of the participants to learn from the mistakes they make. Consequently,

The guidelines the CV panel puts forward would be costly to implement.

What is to stop CV surveys being used in other areas outside of environmental damages?

the values of goods and services are derived over time from adjustments that market participants make in their choices of those goods and services.

CV surveys bypass this learning process. Genuine purchases do not occur and therefore there is no way that mistakes can be recognized. The results from these surveys therefore cannot be equated with market behavior, and any use of these figures should be treated with skepticism.

The CV panel brought together by NOAA acknowledges that there are myriad problems in accurately measuring NUVs. As outlined in this paper, respondents tend to be unfamiliar with what they are asked to measure and therefore CV surveys can create the very values which they purport to measure. The results given can be ethically and strategically biased depending on what is being valued and how it is expected to be paid for. The results are also open to conjecture, as they cannot be tested empirically and are likely to lead to unwanted litigation.

The CV Panel in its capacity as adviser to the NOAA on the use of CV in litigation has recommended that under strict guidelines it be used for liability damage claims. The study conducted was thorough and, given the charge, well accomplished. Considering the restrictions placed on the panel by the original charge it was not unexpected that they would seem to endorse CV. However, the possibility of self-interest by the economic profession is hard to ignore: any future applications of CV surveys are likely to employ legions of economists. Even if the problems outlined in this paper can be reduced, if not removed, by very thorough, detailed, and expensive studies, the values deduced are unlikely to reflect market values for the identical resources. These values can only be discovered through the actual choices made by individuals. Therefore, the results found in CV surveys are certainly of interest, but their use in the valuation of natural resources is inappropriate.

APPENDIX: State of Idaho v. Southern Refrigerated Transport, Inc.

On December 15, 1987, Southern Refrigerated Transport, Inc. (SRTI) transported the chemical fungicide Thiram into the State of Idaho. The tractor and trailer carrying the fungicide overturned on the banks of the Little Salmon River. The company salvaged most of the Thiram but 375 gallons were missing. Observers at the scene estimated that 110 to 250 gallons reached the river, the remainder being absorbed by the bank.

The court trial was held at Boise, Idaho, commencing on September 17, 1990, and continuing through October 2, 1990. The plaintiff was the State of Idaho and the defendant was SRTI. The State of Idaho claimed that the fungicide killed 90% to 100% of the fish in the river, and sought to recover damages for the injury to the natural resource — the fish. Substantial and significant damage was considered, by both sides, to have been suffered by the Steelhead fish population in the Little Salmon River.

The first thing that had to be established by the plaintiff was how many fish there were in the Little Salmon River at the time of the spill. There were no specific samples from the site of the spill taken before the accident. However, there were a number of samples (snorkel surveys) which had been undertaken by in 1987 and 1988 at two sites on the Little Salmon River. These samples were taken as evidence because they provided “the best information available, and, in fact the only information that can be provided on this issue. The court further finds that these scientific studies, not prepared with any view towards litigation, rise above the level of speculation and conjecture.”⁴⁸

After a variety of toxicity tests and aggregated calculations, it was estimated by the expert witnesses that the number of lost Steelhead fish was approximately 35,500. Idaho requested damages for the lost fish on the basis of three valuations: commercial, existence and recreational. The court (partly due to the Supreme Court ruling in *Ohio*), recognized that the three values existed, and were considered to be compensable items of damage if proved at trial.

Idaho requested commercial value for all the fish lost and existence/recreational value for the non-returning adult Steelheads. (It was accepted by the court that approximately half of 1% of those killed would have returned as adults.) As such, there was no market price for the fish which were lost. Idaho suggested that the value found in the American Fisheries Society’s (AFS) publication, “Monetary Values of Freshwater Fish and Fish-Kill Counting Techniques,” be used. The techniques assign a monetary value to fish by size and species. The values set by AFS approximate the average commercial fish prices set by hatcheries around the country. The price per Steelhead given was 88 cents.

Idaho attempted to ascertain the existence value of the non-returning Steelhead by using a CV study. The study was not conducted for the purpose of litigation and had been conducted before the spill—both being factors which favored the survey. However, the study was performed by Batelle Northwest for the Northwest Power Planning Council. The aim was to elicit how much residents would be willing to pay in the form of increases in their power bill to double the runs of Steelhead and Salmon in the entire Columbia River Basin. The theoretical doubling could have occurred via operational changes in the Northwest Hydropower system.

Using this study, Idaho requested \$16.97 per non-returning adult Steelhead as existence value. While the court acknowledged that the Salmon River drainage is part of the Columbia River Basin, it found that the survey was “not persuasive and it would be conjecture and speculation to allow damages on this study. Idaho must prove its damages with reasonable certainty and this study does not do so.”⁴⁹

The court found that the survey gave no degree of certainty to the existence value of the fish and hence the method chosen by Idaho was "legally insufficient to establish existence value." It is worth noting that the existence value requested by Idaho was over 19 times larger than the commercial value of the fish. If one aggregates from this assumed existence value for the increase in fish in the Columbia River Basin, we get \$37 million. This is a rather large sum, if it were to be borne by the power bill payers of the Northwest, for a good that most of them would never use.

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Endnotes

¹ *Report of the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA) Panel on Contingent Valuation*, (Washington, D.C.: U.S. Department of Commerce, January 12, 1993), p.2.

² Environmental economists have defined a series of NUVs including existence value, bequest value and option value. Existence value is the most important.

³ J.V. Krutilla, "Conservation Reconsidered," *American Economic Review*, vol. LVII (September, 1967), pp. 777-786.

⁴ Ibid.

⁵ The OPA also requires damages for "the diminution in value of...natural resources pending restoration." Furthermore, under the OPA damages can be recovered for "the reasonable cost of assessing damage...". Therefore, if CV surveys provide acceptable measurements of NUVs then the defendant is liable for the cost of the survey as well as the natural resource values it arrives at.

⁶ Of the 22 speakers at the meeting, 15 speakers spoke against the use of the Contingent Valuation Method (CVM) in calculating NUV's and only 5 were in favor.

⁷ The panel consisted of Kenneth Arrow (co-chair), Robert Solow (co-chair), Paul Portney, Howard Schumann, Ed Leamer and Roy Radner.

⁸ 880 F.2d 432 (D.C. Cir. 1989).

⁹ Other methods of calculation exist, however, CV is the most important. A detailed description of all the techniques is to be found in: D.W. Pearce, *Economic Values and the Natural World* (London: Earthscan Publications, Ltd., 1993).

¹⁰ To escape the emotional response of a recent accident, it has been suggested the respondents be "asked to pay to prevent future occurrences of similar accidents." (NOAA Report 1993, p. 4.)

¹¹ If, however, damage has occurred to the environment then the respondent is asked how much he or she would be willing to accept (WTA) in compensation. The theory from which this idea is drawn is that of Hicksian consumer surplus variations. I do not intend to discuss the theory here. WTP is derived from, and supposed to represent, the Equivalent Variation, for an improvement in environmental quality. WTA is derived from and supposed to represent the Compensating Variation.

¹² It will probably be impossible to distinguish between the two sets of values, unless further specific questions are asked. There will still be a great deal of subjectivity about the data even with extensive questioning.

¹³ The consumer theory usually studied is that of "revealed preference" developed by Paul Samuelson. More weight is attached to an individual's choices—revealing of preferences—than to the statement of those preferences in surveys.

¹⁴ A. Myrick Freeman III, "Approaches to Measuring Public Goods Demands," *American Journal of Agricultural Economics* (1979), no. 61, p. 157.

¹⁵ M. Sagoff, "Should Preferences Count?" at p. 4. This paper was presented at *Resources For The Future* in 1992 and is available from its author at the University of Maryland, Institute for Philosophy and Public Policy.

¹⁶ NOAA Report 1993, p. 37.

¹⁷ Of course, political management of the park guarantees that revenues will rarely be related to expenditures or costs.

¹⁸ This reduction in recreational trips may not occur. Yellowstone Park had an increase in visitors after the 1989 fires.

¹⁹ The standard technique for calculating recreational use value is the Travel Cost Method. There are significant problems with this constructed market methodology. When calculations of value are conducted as to the amount of money that people are willing to spend to go to a resource the calculated value depends on the price of admission to that resource. If this was a market price it would be acceptable, however, as mentioned previously where the price is too low as in Yellowstone Park, people will come from farther away and spend more money than they would if the correct price was charged. Consequently the recreational value is over-emphasized as the government subsidy is not deducted.

²⁰ R. Niewyk, "Ask a Silly Question....Contingent Valuation of Natural Resource Damages," *Harvard Law Review* (June 1992), p. 1986. This problem is mirrored in physics by what is known as Heisenberg's Uncertainty Principle. The act of measurement of the properties of sub-atomic particles alters the properties themselves making absolute measurement impossible, even in principle.

²¹ M. Kemp and C. Maxwell, "Exploring a Budget Context for CV Estimates" in *CV: A Critical Assessment* (Cambridge Economics, Inc., 1992).

²² To avoid this impact the CV Panel advises that surveys measure similar future damage and not the actual damage that has occurred due to its emotional impact (NOAA Report 1993, p. 3.).

²³ Kemp and Maxwell (1992).

²⁴ From the work of Karl Popper and Imre Lakatos, if a theory is non-refutable it cannot be classed as scientific, only pseudo-scientific. The failure of CV to be testable, reduces its applicability to valuation, as interesting but not verifiable and consequently unusable.

²⁵ NOAA Report 1993, p. 6.

²⁶ D.A. Schkade, D.A. and J.W. Payne, "Where do the Numbers Come From?: How People Respond to Contingent Valuation Questions" in *CV: A Critical Assessment* (Cambridge Economics, Inc., 1992).

²⁷ This type of response is similar to the attitude one would expect of public goods in general and the free rider problem in particular.

²⁸ K. Seip and J. Strand, "Willingness to Pay For Environmental Goods in Norway: A Contingent Valuation Study With Real Payment" Unpub., SAF Center for Applied Research, Department of Economics, University of Oslo, 1991.

²⁹ J.L. Opaluch and T.A. Grigalunas, *Ethical Values and Personal Preferences as Determinants of Nonuse Values: Implications for Natural Resource Damage Assessments* (Peacedale, Rhode Island: Economic Analysis, Inc., 1991).

³⁰ This follows from the economic theory, mentioned in footnotes 6 and 7, developed by John Hicks. The WTP is the equivalent variation. The WTA is the compensated variation.

³¹ Opaluch and Grigalunas, 1991.

³² 880 F. 2d 432 (D.C. Cir., 1989)

³³ Very few proponents of CV surveys deny that responses have a large mean and variance.

³⁴ Torts are essentially involuntarily imposed contracts (rather than criminal malfeasance).

³⁵ Exxon Annual Reports 1989, 1990 and 1991.

³⁶ This amount was high due to the inexplicable assessment by NOAA that "Exxon...could have no participation in planning the assessment and no access to the data. Thus, Exxon was forced to conduct separate assessment studies." G.R. Cecil and N. Foster, "Natural Resource Injury at Oil Spills: A New Approach" (1993) *Baylor Law Review*, Spring, Vol. 45, No. 2, p. 424.

³⁷ S. Shavell, "Should CV Estimates of the Nonuse Value of Natural Resources be used in Public Decisionmaking and the Liability System?" in *CV: A Critical Assessment* (Cambridge Economics Inc., 1992).

³⁸ NOAA Report 1993, p. 5.

³⁹ J. McLaughlin, "CV: A Scary Prospect for the Oil Industry" *Lloyd's List* (Insurance Market) 10.2.92.

⁴⁰ Information in a letter accompanying the NOAA report 1993 to T. Campbell (General Counsel for NOAA) from CV panelist P. Portney, January 11, 1993.

⁴¹ Ibid.

⁴² NOAA report 1993, p. 37.

⁴³ Ibid., p. 38.

⁴⁴ Ibid., p. 37.

⁴⁵ Ibid., p. 43.

⁴⁶ They did not question the use of values found in surveys as distinct from values discovered in the market process. The Panel merely considered whether CV techniques could be statistically reliable.

⁴⁷ P. Portney letter, January 11, 1993.

⁴⁸ Judgment from *State of Idaho v. Southern Refrigerated Transport, Inc.*, 1991 W.L. 22479 (24.1.91).

⁴⁹ Ibid.