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Interim Report

# Valuing the Environment Via Bidding Games: A Psychological Perspective

Excerpt from NUREG/CR-0989, PNL-2952
Vol. II Appendix D

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August 1980

Prepared for
the U.S. Nuclear Regulatory Commission

Pacific Northwest Laboratory
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# VALUING THE ENVIRONMENT VIA BIDDING GAMES: A PSYCHOLOGICAL PERSPECTIVE

Excerpt from NUREG/CR-0989, PNL-2952 Vol. II
Appendix D

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## SUMMARY

How to place a monetary value on the environment and manmade environmental change represents a major methodological problem. The merits of using a monetary scale for valuing environmental goods are that it is familiar to all, can be related to wealth, and, if successfully implemented, can be combined with monetary information from actual costs.

Assigning monetary values to "goods" not bought and sold in the marketplace is difficult at best. Several methods are available: direct costing, indirect costing, and bidding games. Direct costs measure the cost of damages associated with environmental change. Indirect costs measure values associated with environmental change (e.g., change in property values). Neither are seen as adequate for measuring net or aggregate social value for public policy decisions. Bidding games are seen as the most appropriate method.

Based on the concept of consumer surplus, bidding games are said to measure the maximum willingness to pay (WTP) for a good (e.g., environmental change). Four valid games can be played: 1) WTP to get a positive environmental change; 2) WTP to prevent a negative environmental change; 3) minimum willingness to accept (WTA) in compensation to forego a positive environmental change; and 4) WTA to put up with a negative environmental change.

Close examination of the assumptions of these games reveals two important considerations: perceived rights and perceived positive or negative nature of the proposed change. For example, if a respondent is asked to state his/her maximum WTP to prevent the construction of a power plant, the game is valid only if 1) the respondent agrees that he/she has no right to the current state and has to "purchase" the right, and 2) that the construction is perceived by the respondent as a negative change. Many environmental changes are, in fact, ambiguous with respect to rights and positive or negative quality. This is often the case across a sample of area residents. Forcing the respondent to play the wrong game (from his/her perspective) results in invalid data.

This paper views the bidding games procedure as basically a social-psychological experiment; accordingly, many of the concerns associated with such experiments are relevant here.

Sampling of respondents is a key issue. To assure an accurate measure of social value for an area (town, region, state, etc.), a representative sample of respondents must give their estimates.

Stimuli or the thing people are asked to bid on must be representative as well. Actual environmental settings (a forest or stream) are not always representative in the sense that the change itself cannot be represented. Photographs and verbal descriptions may suffice, depending on specific circumstances, and, in some cases, may be superior to the "real thing."

Issues of bid format are reviewed. Formats that restrict the response range, say in dollars, have the advantage of structure, but may lead the respondent. Open-ended formats may offer less reliable responses and do not represent a typical market situation where a specific price is proposed.

The bid itself is viewed as a stated <u>behavioral intention</u>, which may or may not correlate highly with actual payment (behavior). Accordingly, the paper examines the relationship variables between attitude and behavior and concludes that the games could be designed to maximize this correlation.

A review of interviewer-respondent biases was made. It was concluded that no insurmountable problems were present so long as these variables of interpersonal dynamics were taken into consideration.

Psychometric concerns were explored, asking the basic question: Are the "dollars" of the response scale equivalent to the dollars exchanged for goods in the marketplace? It was concluded that the scales of response undoubtedly have interval properties, but no evidence exists to suggest the presence of ratio properties. Validation studies must be done.

A final assessment of bidding games must await the future. The techniques already hold much promise. Because bidding games are very new, it would be premature to judge them as not adequate. At this point, they appear to be the best available method for valuing environmental change.

CONTENTS

SUMMARY . . . . . iii
FOREWORD . . . . . vii
ACKNOWLEDGMENTS . . . . . ix
INTRODUCTION . . . . . 1
THE NEED TO VALUE NONMARKETED GOODS . . . . . 3
VALUING IMPACTS . . . . . 3
THE THEORETICAL BASIS OF BIDDING GAMES . . . . . 5
PSYCHOLOGICAL ASSUMPTIONS IN BIDDING GAMES . . . . . 9
THE STRUCTURE OF BIDDING GAMES . . . . . 17
SOCIAL-PSYCHOLOGICAL ASPECTS OF BIDDING GAME PROCEDURES . . . 25
THE BID AS A BEHAVIORAL INTENTION . . . . . 25
THE INTERPERSONAL DYNAMICS OF THE BIDDING GAME OF PROCESS . . 28
The Interviewer . . . . . 28
The Respondent . . . . . 29
Milieu of the Response . . . . . 29
PSYCHOMETRIC CONSIDERATIONS IN BIDDING GAMES . . . . . 33
RELIABILITY . . . . . 33
VALIDITY . . . . . 34
UNRESOLVED PROBLEMS AND CONCLUSIONS . . . . . 37
ECONOMIC MEASURES OF SOCIAL VALUE . . . . . 37
COMPARABILITY OF DIFFERENT DOLLARS . . . . . 38
ETHICAL ISSUES . . . . . 38
THE RIGHTS PROBLEM . . . . . 39
DOLLARS, TIME, AND EFFORT . . . . . 40
HOW GOOD ARE BIDDING GAMES? . . . . . 40
REFERENCES . . . . . 41

# FOREWORD

This report results from a Nuclear Regulatory Commission sponsored project to determine the socioeconomic consequences from people viewing alternative closed cycle cooling systems on nuclear power plant landscapes. This was accomplished by measuring individual perceptions of visual aesthetic differences among alternative cooling systems and relating the perceived differences to individual willingness to pay and be compensated for the differences.

The contents of this report are contained in Appendix D of the following two-volume final report.

Currie, J. W. 1979. The Visual Impact of Alternative Closed Cycle Cooling Systems, Executive Summary. NUREG/CR-0989, PNL-2952, Pacific Northwest Laboratory, Richland, Washington.

Adams, R. C., et al. 1979. The Visual Impact of Alternative Closed Cycle Cooling Systems, Main Report. NUREG/CR-0989, PNL-2952, Pacific Northwest Laboratory, Richland, Washington.

J. W. Currie
Project Manager

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# VALUING THE ENVIRONMENT VIA BIDDING GAMES: A PSYCHOLOGICAL PERSPECTIVE

## INTRODUCTION

A man is about to embark on a backpacking trip at a forest area trailhead. He is approached by another man who asks for his cooperation in a brief survey. After some preliminaries, the surveyor asks the key question: "What is the least amount of money you would be willing to accept to give up all recreation in this forest?" The respondent is urged to give his response to the nearest dollar.

What has been described is a kind of bidding game, an economic game intended to measure the value of the forest use to an individual.[a] The person in charge of this survey, probably an economist, is trying to establish the value of this "good" in the absence of a marketplace, where the willingness to pay or accept money in exchange for a good is inferred from the price paid. However, many environmental goods, such as the backpacking example, are not bought and sold in the market. The economist tries to find other means, such as bidding games, of valuing these "nonmarketed" goods.

Bidding games are playing an increasingly prominent role in environmental decisions. They have been employed in estimating the value of air pollution abatement, waterfowl hunting, river cleanup, and similar applications.[1-3] The advantage of being able to state the value of such environmental goods in dollar terms is that these hard-to-value aspects of the environment can receive full consideration in traditional economic analyses. It is the position of this paper, however, that these games are essentially social-psychological field studies interpreted in an economic theoretical framework. To date, there has been minimal involvement and contribution from psychologists. The technique of bidding games could be greatly improved by an interdisciplinary effort.

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(a) The variety of games are sometimes called "bidding and asking games," but the simpler term is used here to represent all such games.

This paper has two basic objectives: to introduce, to psychologists, problems in valuing nonmarketed goods, especially by the use of bidding games; and to apply relevant psychological principles to the bidding games procedures. The first section introduces the problem faced in valuing nonmarketed goods and briefly describes the merits of different approaches to dealing with the problem. The second section examines some of the psychological assumptions implicit in bidding games. The third section describes the structural characteristics of bidding games, emphasizing the relationships among these characteristics. The fourth section views the bidding game as a social-psychological field study, and draws from that literature for suggested improvements. Psychometric considerations of bidding games are briefly discussed in the fifth section, while the final section discusses conclusions and some unresolved issues.

## THE NEED TO VALUE NONMARKETED GOODS

As noted in the Introduction, valuation of marketed goods can be estimated by observing the behavior of individuals in the marketplace. For example, if a person freely spends $400 for a television set, it can be concluded that the set is worth at least that amount to the individual. If the person does not purchase the set at that price, it follows that the set is valued at less than $400. This analysis, of course, must be sensitive to the distribution of wealth.

On the other hand, the value of goods not commonly exchanged in the marketplace is more difficult to specify; e.g., national parks, a mountain stream, an unobstructed view, or a wildlife preserve. In fact, the sentiment of many people might be to state that those goods are priceless and should be available to all at no cost.

This sentiment overlooks several facts. First, nonmarketed goods are not currently available to everyone at no cost. One must have the means to enjoy them--the money to get to the national park, or to purchase a view home. Second, these goods are often indirectly valued inasmuch as they are involved in decisions containing trade-offs. For example, the decision to harvest timber versus developing it for recreation implies value limits for the recreation. These goods are valued, but the values are not explicit. (Bidding games, of course, try to make these values explicit.) Finally, the National Environmental Policy Act (NEPA) requires that all impacts be assessed. Too often, easily valued aspects of the impact statement dominate the decision process, while important, hard-to-value aspects are not properly weighed in the overall assessment.

### VALUING IMPACTS

Consider a decision involving siting of a power plant. For simplicity, consider only three impacts associated with the plant: a reduction in the cost of energy; creation of a specified number of new jobs; and negative visual impact (visual pollution) of the plant on vistas in the area. Further

assume that the first two impacts are generally considered as positive and the third as negative. To determine the overall impact of the power plant on the community, the three impacts must somehow be measured and combined.

A traditional social-psychological approach would be to measure the attitudes of people in the community toward each of the three impacts. However, the problem of combining the three separate attitudinal measures to arrive at a measure of overall impact still remains. Alternatively, overall attitudes toward the power plant could be measured. Unfortunately, this does not indicate the trade-offs among the three impacts. To deal with this problem, attempts could be made to regress the overall attitudes toward the power plant on the attitudes toward each of the three individual impacts. The three regression weights could be taken as an indication of the importance of each of the three impacts.[4]

While the attitudinal approaches have merit, they present problems to the economic decision maker. One problem is that attitudes are not "budget based." That is, an individual might have a more positive attitude toward going on an aroud-the-world cruise for his vacation than toward staying home and painting his house, but this attitude does not translate into action, in part due to his own budgetary concerns and limitations. Thus, attitudes are not directly applicable to decision making in many instances. A second problem with an attitudinal approach to impact assessment is that attitudes are not readily translated into the monetary scale that is most familiar to economic decision makers. Attitude measures usually have no easily understood reference or zero point.

A different and more economic-oriented approach to assessing impacts via attitudes is to try to measure all impacts on a dollar scale. This procedure has the advantage of making the trade-offs among the impacts and other goods consumed immediately apparent. It also allows for different estimation procedures to be used for assessing the monetary effects of each of the disparate impacts. In the example of the power plant, bidding games could be used to estimate visual impacts while the savings accruing to the reduction in energy costs and the economic benefits of new jobs can be estimated by some other

method. The application of bidding games for estimating dollar impacts of nonmarketed goods, such as visual pollution, is the primary focus of this paper. Finally, measuring all impacts on a dollar scale has the advantage of being nearly universally recognized and meaningful to people in Western society.

## THE THEORETICAL BASIS OF BIDDING GAMES

Bidding games basically ask an individual how much money he or she would be willing to pay (WTP) to get something good or not get something bad; or, conversely, how much money the individual would be willing to accept (WTA) to get something bad or not get something good.

The WTP (and WTA) notion is based on the concept of consumer surplus, which is an index of value of a good to its consumers. Consumer surplus rests on the very simple notion that the net value of an object is equal to the benefits minus the cost associated with the object. Consumer surplus can be thought of as the difference between what a person would be willing to pay and what he actually pays for the object in question. People usually pay less for a good than they would be willing to pay. Only the "marginal" man pays exactly what the object is worth to him. For marketed goods, consumer surplus can be estimated from a demand curve, as shown in Figure 1.

The demand curve is usually negatively sloped and shows the quantity of the good demanded (on the horizontal axis) as a function of the price of the commodity (vertical axis). The supply curve is usually positively sloped and shows the quantity of the good producers are willing to supply as a function of price. The price line represents the actual selling price. Consumer surplus, then, is the lined area above the price line and under the demand curve, because the demand curve represents what people are willing to pay and the price line is what they actually pay.

In addition to consumer surplus, two other areas under the demand curve are pertinent to this discussion. "Producer" or "seller surplus," which is the dotted area in Figure 1 below the price line and above the supply curve, represents the difference between the price at which the producer would be

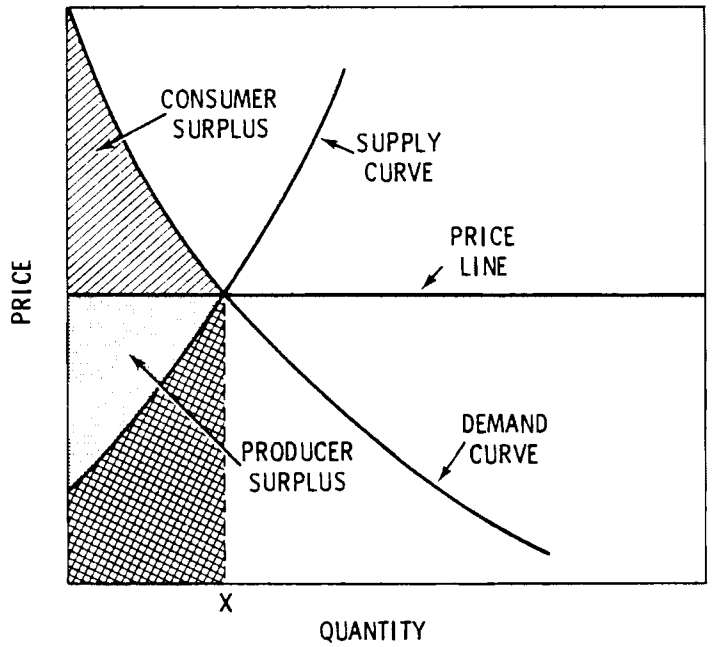


FIGURE 1. Consumer and Producer Surplus as a Function of Price Line, Demand Curve, and Supply Curve

willing to sell his product and the price at which he actually sells it. "Net social value" of a commodity is the sum of consumer surplus and producer surplus. Efficient economic systems tend to maximize the sum of these two surpluses. "Aggregate social value" is the sum of consumer surplus, producer surplus, and the cross-hatched area below the supply curve and to the left of the price line-supply curve intersection. Aggregate social value is a measure of the total economic value of consuming x units of the commodity.

For many nonmarketed goods, especially environmental goods, producer and supply considerations are minimized. Who produces a sunset or increases the supply? Further, the cost to the consumer for these environmental goods is often either very low or nonexistent. Consequently, as price and supply considerations are removed, the distinction between consumer surplus and aggregate social value becomes blurred and, for all practical purposes, the same.

Demand curves are estimated by observing the effect of price changes on quantities consumed in the market. By definition, then, demand curves are not available for nonmarketed goods. The bidding game (stated willingness to pay) is a substitute for the demand curve (observed willingness to pay).

Hicks refined the concept of consumer surplus by distinguishing between two types of measures of consumer surplus: compensating and equivalent measures.[5] He described compensating measures of consumer surplus in terms of rises and falls in price. Should a price fall, the compensating measure is the amount of income a person would have to give up to make him as well off as before the price fall. For a price rise, the compensating measure is the amount of income he will have to be paid to leave him as well off as before the rise. In short, compensating measures of consumer surplus estimate the amount of money paid or received to compensate for an event taking place (i.e., the price rise or fall). Equivalent measures of consumer surplus relate to events failing to occur. They estimate the amount of money (paid or received) needed to place the individual in an economic state equivalent to the state he would have been in had the price actually fallen (or risen). Equivalent measures are appropriate when an expected change does not occur, while compensating measures are appropriate when change does occur.

Although these two types of consumer surplus were discussed in terms of marketed goods, they apply equally well to nonmarketed goods.[6] In the opening example, a compensating game was being played; the subject was asked to accept compensation for the loss of recreational use of the forest. He could have been asked to play an equivalent measure game: "What is the most you would be willing to pay to prevent the loss of use of the forest?" Both games are trying to establish in monetary terms the value of the recreational use of the forest.[a]

Economists use other methods for estimating the value of nonmarketed goods, and these will receive only brief mention here: indirect and direct cost methods. Indirect methods try to estimate the demand curve for the nonmarketed commodity by examining the demand for marketed goods associated with

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(a) The two types of measures are assumed equal if there is no income effect.

the nonmarketed good. An example of such an approach is the property value method, where one might regress air quality indices toward property values in a given area. This method has been criticized for its inadequacies,[7] primarily for the inability to specify other variables affecting property values and other dependent variables affected by air pollution. A direct cost method would try to identify the costs directly associated with the change. In the air pollution example, medical bills, costs of air conditioning systems, and the like are used to estimate the damage of pollution. This method yields neither an aggregate nor net social value because it reflects only what people had to pay. The direct cost approach has been criticized because the damages may not be fully specified.[8]

Because neither the indirect nor the direct cost approach is "psychological," only the psychological assumptions of bidding games will be discussed.

## PSYCHOLOGICAL ASSUMPTIONS IN BIDDING GAMES

As noted in the preceding section, in the absence of an exchange of money for goods, one way of placing a monetary value on some object or state is to institute bidding games. In essence, a bidding game asks a person how much money he would be willing to pay (WTP) or how much he would be willing to accept (WTA) to get or prevent some proposed outcome. Because this proposed outcome could be perceived as either positive or negative, it is assumed that people would be WTP to get a perceived positive outcome and WTA to put up with a perceived negative outcome.[a] Further, it is assumed that people would be WTP to prevent a perceived negative outcome and WTA to forego a perceived positive outcome. These variables are summarized in matrix form in Table 1.

Cell 1 states that the individual would be WTP to change to a better state and Cell 2 states that the individual would be WTA to change to a worse state. These cells represent compensating measures because change is to occur. Cells 3 and 4, representing equivalent measures of social value, are a bit more complicated because they imply that an individual is going to pay or get compensated to maintain the status quo, i.e., prevent a change. Cell 3 states that an individual will accept compensation to forego change to a better state; Cell 4 states that an individual will pay to prevent a future negative state. Cell 3 makes sense if the individual was either expecting or felt he

TABLE 1. Bidding Game Variables

| | | Perceived Nature of Outcome | |
|---|---|---|---|
| | | Positive | Negative |
| Proposed Outcome | Get | (1) WTP | (2) WTA |
| | Do Not Get | (3) WTA | (4) WTP |

(a) The term negative outcome is meant to convey the notion that a person is being asked to exchange a superior bundle of goods for an inferior bundle. Similarly, a positive outcome implies an exchange of an inferior bundle for a superior bundle. Thus, positive and negative are relative terms.

deserved the better state. Likewise, Cell 4 makes sense if the individual was either expecting or felt he deserved the worse state. An additional variable is then needed to account for this complexity: the assignment of right to the current state or to the future state.

Hicks made this variable explicit in his discussion of consumer surpluses when he pointed out that equivalent measures of surplus involved bringing the consumer to a "subsequent welfare state" while compensating measures of surplus leave the consumer in his "initial welfare state."[5, n.2] Randall has pointed out that an assumption of assignment of rights has to be made.[6, n.4] Cells 1 and 2 require the assignment of a right to the initial welfare position (i.e., the status quo), while Cells 3 and 4 require the assignment of rights to the subsequent welfare position. Perhaps the conditions of Cells 1 and 2 are more easily understood because an individual tends to think of his current state as his rightful one. However, there are counter-examples where people may feel a right to a better state, but would not be WTP to get that state (e.g., pay to achieve equal educational opportunity), and in fact, may demand compensation because of having been deprived of a right.

From a strictly psychological perspective, "rights" are self-assigned by the bidding game respondent in the sense that the individual's unique history will dictate expectations about current and future states. In some cases, historical precedent or case law has clearly defined "rights", so a reference external to an individual's unique history will dictate expectations about current and future states. In many cases, however, rights are ambiguous, and self-assignment of such rights is likely to dominate WTP and WTA games. Even when there is a clear precedent, but the respondent does not accept his assigned right, the bid can still be influence strongly. The researcher/analyst, strictly speaking, cannot control this variable and assignment of status rights will be effective (in a measurement sense) only when the respondent agrees with the assignment. It is important, therefore, to be sensitive to the conditions under which people perceive a right to (or feel they deserve, or are resigned to, or expect) a current state, and those conditions under which people perceive a right to a future state.

Table 2 summarizes the expanded number of cases if rights were not assigned by the researcher, but by the respondent himself. In a sense, this is an array of eight games instead of the four games implied in Table 1. The researcher has control of one of the three influencing variables (i.e., he can suggest whether the change will occur or be prevented). He cannot, on a priori grounds, be assured that all will see a proposed change as positive or negative, or that people will feel a right to a current state or a future state. Consequently, the researcher cannot be assured that the respondent is playing the game the researcher has in mind. This can easily lead to situations in which large portions of the respondent sample refuse to play the game or give seemingly inappropriate responses. For example, the researcher may be presenting Game VIII (How much are you willing to pay to prevent a power plant from being built?) while the respondent plays Game VII because he feels a right to the current state and refuses to pay anything. If he were to respond "$0," one could hardly conclude he feels no environmental damage.

A refusal to play the game is clear evidence that an inappropriate game is being played, at least from the respondent's perspective. While the custom has been to exclude these respondents from analysis, it is not very appropriate to do so because this group should, in theory, be represented in any aggregate social value. A more worrisome problem is the possibility that people are ambiguous about their rights (to either a present or future state) and that they express their ambiguity by adjusting their bids or requests from what would have been given if they had been clear about rights.

In this regard, Games II, IV, V and VII in Table 2 are not games a researcher would actually propose, but games which the situation compels the respondent to play. The researcher must ascertain just how the respondent sees his rights in the specific situation proposed. (For the same reason, he should also determine whether the proposed outcome is seen as positive or negative.) Ideally, this should be done before the game is played. Failing this, the perceived rights information should be gathered at the same time so that proper interpretation of the bids can be made.

TABLE 2. Respondent-Assigned Rights in Bidding Games

| Proposed Change of State | Perceived Nature of Change | Perceived Right to State | Game No. | Type of Game | Illustration |
|---|---|---|---|---|---|
| Change occurs (compensating games) | Positive | Current | I | WTP | Willing to pay to develop a park because you accept the current state of affairs |
| | Positive | Future | II | WTP | Unwilling to pay for a park that the developer promised and you have a right to |
| | Negative | Current | III | WTA | Willing to accept payment for transmission line on or near property because you have a right to an uncluttered landscape |
| | Negative | Future | IV | WTA | Unwilling to demand compensation for the loss of a private vacant lot as park land because you feel you didn't deserve it in the first place |
| Change does not occur (equivalent games) | Positive | Current | V | WTA | Unwilling to demand compensation because an unexpected proposal for a park is withdrawn because you didn't feel it was your right |
| | Positive | Future | VI | WTA | Demanding compensation because a promised park is not going to be built and you had a right to it |
| | Negative | Current | VII | WTP | Unwilling to pay to prevent scenic despoiling since you feel you have a right to the scene because you were there first |
| | Negative | Future | VIII | WTP | Willing to pay to prevent the building of a power plant in a nearby scenic area, because you feel you deserve the plant if you want the power |

A common technique used to get such information in advance is to pre-test the instrument on a variety of respondents. This technique would allow the researcher to check his own perceptions about rights and outcomes against others. Some of the volunteered comments reported in Hammack and Brown indicate that differing perceptions do exist.[2, n.1]

Games II, IV, V, and VII are not good games to play because no valid values can be obtained with them. A critical question can be asked: "Are there other appropriate games for the respondents who see themselves as being forced to play these games?"

The answer appears to be yes. For example, suppose the researcher is asking the respondent to play Game VIII, i.e., "How much would you be WTP to prevent the building of a power plant in a nearby scenic area?" The respondent, however, sees his right to the current state and feels he should pay nothing, i.e., his right is no plant. A proper game will recognize his same right and initial situation. Game III is then appropriate: How much money would he be WTA to allow the plant to be built?

Game I provides a similar parallel. The researcher asks how much the respondent is WTP to have a park developed. Suppose the respondent, for some reason, feels the park is his due (and sees the game as II) and does not want to pay another dime. Game VI becomes the appropriate game because the respondent has the same rights (future) and initial situation, i.e., "How much money would you be WTA to forego a park?"

The two other examples of inappropriate games appear to be a little less realistic. Game III assumes that the respondent does not deserve the proposed inferior state (i.e., has a right to the current better state). Suppose, however, the respondent feels he <u>deserves</u> the inferior state. He may well be unwilling to accept compensation. A low or zero dollar amount may reflect this situation rather than any environmental damages he associates with the change. Is this a credible problem? It may well be, particularly in a situation where the benefits of the proposed change are jointly consumed with costs ("I benefit, therefore I deserve the costs."). The researcher/analyst may be focusing just on the costs and take a $0 WTA as indication of <u>no</u> damage, when

the damages truly are larger than that for this person. Game VIII becomes the appropriate game to measure the damage associated with the change: "How much would you be WTP to prevent the proposed change?"

Game VI can similarly be misplayed. A person may well be reluctant to accept compensation to forego a future desirable state because he feels he has no right to it. Again, a $0 bid could be mistaken to mean that the proposed change has no value to the respondent. Game I becomes the appropriate game for this person.

The same analyses can be applied to the case in which the change is presumed positive but the respondent sees it as negative (or vice-versa). This could be a serious problem when the two states are close in scale values (i.e., small change on the good-bad dimension). Such a situation might be present in a test for preference in cooling tower design in a power plant, for example. The "correct" game for a respondent in Game I who does not see the proposed change as positive, but negative, is to go to Game III. Conversely, Game I is appropriate for those respondents in Game III who see the proposed change as positive, not negative. Similar relationships hold for Games VI and VIII.

While selecting the right game to play represents a challenge to the researcher/analyst, one cannot be assured as noted above of success even if the game is appropriate. Several points need to be made here.

First, some respondents will refuse to play the game on <u>moral</u> grounds. That is, they may feel it is wrong to "sell" environmental quality under any circumstances, or at least under the circumstances proposed in the game. It is easy to forget that the benefit-cost notion assumes that the end (e.g., net benefit) justifies the means. Some respondents may regard certain means as good and other means as bad, regardless of ends. In addition, some may feel a need to be a trustee for future generations and so personal compensation may not adequately compensate those who will lose a birthright, i.e., as good an environment as prior generations had. These concerns, of course, transcend the bidding game approach and are generic problems of economic analysis.

These concerns are brought up here largely because respondents holding these views may well react negatively to the bidding game approach itself. Such reactivity in any method contributes to a lower validity and lowered confidence in the accuracy of the results.

## THE STRUCTURE OF BIDDING GAMES

Bidding games have a structure not unlike any experimental situation: there are subjects, stimuli, and responses. It is helpful to organize the concept of bidding games along a series of questions related to its structure. The first question deals with who the respondents should be.

Who is asked to bid? Because one of the goals of bidding games is to estimate aggregate social value, who is asked to bid is crucial. Clearly, asking only those who favor a development project to bid would introduce a serious distortion in the estimate. The population of interest from which one samples must be clearly defined. When dealing with hunting in a forest, for example, one might define the population of interest as those hunters who do (or would) hunt that area. The assumption with this approach is that non-hunters have no value for hunting that area. If the decision being contemplated involves competing uses of a resource, then the sampling frame must include those competing users.

Defining the population is actually difficult to do in practice. In the hunter example, are there not respondents who do not now hunt but prefer to maintain the option to hunt in the future? A random sample of license-holders or in-the-field sampling would miss these people. Further, the option to hunt may have value not only to the respondent for himself, but also for future generations. Certainly this trustee sentiment is present in the option value associated with national parks. A second kind of value, existence value, also makes defining the population difficult. For example, one might find preserving a unique species very valuable, even though one has no intention of eating, studying, or otherwise making use of this species in the future. Gramlich, for example, tried to measure the existence value of clean rivers.[3, n.1] Existence value appears to have a strong aesthetic component to it.

The problem of obtaining a sample from the population of interest, while conceptually simpler than specifying the population, can also be quite burdensome. Problems of differential accessibility, response rates, and propensities to respond honestly in various segments of the population make it

difficult to secure a representative sample. Random sampling from the defined population is required for estimating social value.

What do people bid on? Having located appropriate respondents, the researcher must clearly represent the objects, states, or attributes upon which to bid.

The descriptions of the alternative actions on which the respondent makes his bid have been presented in one of three ways:

- verbal description - For example, Hammack and Brown asked waterfowl hunters how much additional costs they would have to incur in order for them not to hunt for the season.[2, n.1]
- pictorial descriptions - For example, Randall et al. showed respondents sets of photographs depicting three levels of environmental degradation and asked how much they would be willing to pay to go from one type of scene to another.[6, n.4]
- onsite viewing - For example, Davis asked people *in situ* if they would continue to use the recreation site if the entrance fee were raised by a stipulated amount of money.[9]

There is no one best technique for describing the altenatives. Much depends on the nature and purpose of the specific bidding game. In the Hammack and Brown study,[2] it could be assumed that the respondents were familiar enough with waterfowl hunting, and the concept of foregoing a hunting season was sufficiently clear, so only the verbal description was necessary. Moreover, it is difficult to conceive of a better method of presenting the situation. In the Randall study,[6] the researchers were fortunate enough to have photographs, taken at different points in time, that showed the different levels of environmental quality. In many instances it may not be possible to have photographs depicting the range of alternatives that are desired. However, retuched photographs or artistic renditions may be feasible and the only meaningful stimuli available.

The method of having the person onsite and actually viewing the situation offers the advantage of the most realistic depiction of the alternative. However, three cautionary notes apply to this procedure. First, if the population of respondents includes people who do not normally visit the site, either

arrangements must be made to transport some of these people to the site or a different type of description must be used in playing the bidding games with these people. Second, care must be taken to do time sampling and perhaps events sampling (e.g., sampling respondents on rainy days) as well, to adequately represent the site at different times of the day, different days of the year, and under different climatic conditions. Third, the scene represents only the status quo, not some past or future state.

The number of alternatives to present to the respondent must also be determined. In some cases a single alternative is sufficient for estimating the aggregate bid curve. For example, in the Hammack and Brown study, asking the waterfowl hunters the amount of extra expenses they would have to incur before they would forego hunting for the season would have enabled them to generate the aggregate bid curve for hunting. In contrast, consider the Randall study, in which the objective was to estimate how much people would be willing to pay for varying levels of pollution abatement. This information would be useful to consider in conjunction with marginal costs of additional pollution abatement. In this case it is desirable to present alternatives representing various levels of pollution. The number of alternatives to present in a given situation depends largely on the purpose of the study. Thus, even in the Hammack and Brown study, it may have been reasonable to inquire about shortening the season by various lengths or decreasing the bag limits by various degrees if this had been meaningful within the intent of the study.

Two biases are relevant to this section: information bias and hypotheticality bias. The former reflects the belief that the obtained bid is influenced to an unknown degree by the information and the experience the person has about the situation. Because some of the information a person has about the situation is communicated by the descriptions of alternative actions used in the bidding game, it is likely that the bidding game itself adds to information bias. Hypotheticality bias reflects the fact that the respondent knows that he is merely "playing a game." There is no a priori reason to expect the person to reveal his true value or preferences in such a game, if the alternatives presented to the individual appear unrealistic and unreasonable. For

example, in the Randall study, all three alternatives were actual photographs of the surrounding area taken at different times to reflect different levels of pollution. Therefore, the respondents should have had no difficulty in imagining each of the three scenes to be likely events. On the other hand, if the researchers had included doctored photographs of pollution levels that the respondent did not deem possible as a result of the power plant, this could have cued the respondent to answer the questions in an equally imaginative manner. In addition, if the task itself seems useless (such as proposing an action that would not likely take place), respondents may give obtained bids bordering on the nonsensical, even if the stimuli appear realistic and reasonable.

What is the format for getting the bid? Even if adequate stimuli are presented, the form in which the bid is obtained is crucial. Response formats for bids are of three types. An open-ended response format is one in which the individual is given absolutely no constraints on his response; he could give a bid of $10 as readily as he could a bid of $9.83. In a categorical format, the respondent indicates his bid by checking off the most appropriate one of a predetermined set of categories (e.g., $0 to 2.50, $2.51 to 5.00, $5.01 to 7.50). Randall and his associates favor an incremental bid format. In this procedure an interviewer asks the respondent if he would be willing to pay X (a small amount) for the good. If the response is "yes," the question is repeated for a slightly higher amount, X + N. This procedure is repeated until the person indicates that he is no longer WTP for the commodity. Randall typically then decreases the bid by fractions of the increment until the person again indicates his WTP for the commodity. This is taken as the final value of the obtained bid.

In both the categorical and incremental formats, care must be taken to minimize the effect of the bid categories or increments on the obtained bid. Starting point bias refers to the possibility that starting the bid at a given dollar value may influence the obtained bid. It seems that such bias would be minimized by carefully pretesting bidding game materials with a small representative group of respondents to arrive at both a reasonable starting point

and a reasonable increment size, for either the categorical or incremental format. Note that a low (or high) value starting point may have a normative influence on a respondent who is unsure of his WTP or WTA. A low starting point may be mistaken for information that others are not WTP very much, for example. The open-ended format does not suggest bid values and therefore cannot influence the obtained bid in this manner. However, it is possible that, in situations in which the person is at a total loss as to the amount to bid, the total absence of any normative information makes it difficult to get a meaningful or reliable bid.

A related issue is whether the bidding procedures should be carried out via an interviewer or by a self-administered questionnaire. Advantages accruing to interviews are the opportunity to develop rapport with the respondent, to answer questions from the respondent (thus minimizing hypotheticality bias), to maintain respondent motivation, to modify questions and manner of questioning based on the respondent's reactions, and a generally higher response rate. Disadvantages of interviewing include cost (in terms of both wages and travel), difficulty in gaining access to certain segments of the population, necessity of selecting, training, and monitoring interviewers, and a range of biasing effects the interviewer may have on the obtained responses. This latter problem has been labeled interviewer bias. This bias includes the effects biosocial characteristics of the interviewer might have on the respondent's bids, as well as the possibility that the interviewer could inadvertently "shape" the respondent's bids by giving nonverbal cues as to what the interviewer believes is an appropriate bid (a particular problem with the incremental bid technique). It is not difficult to imagine different bids being given to a representative of the Sierra Club versus an automobile company agent in a game involving air pollution, even though both interviewers asked the same questions and tried to be as objective as possible. These advantages and disadvantages must be weighed in deciding whether or not to use an interviewer approach. Note that the incremental bid format virtually requires an interviewer or an interactive computer.

In addition to response format, a second question of interest concerning the bid is the "vehicle for payment." That is, by what means should the payment be made? Should the vehicle be in terms of a user fee? A sales tax? An increase or decrease in income tax? An increase or decrease in electricity bills? Vehicle bias is the name given to this area of concern. The mode of payment (or compensation) has three very important implications for bidding games.

First, the vehicle has implications for the definition of the population of interest. For example, if the mode of payment is a surcharge on the monthly electricity bill, then the population is defined as all users of electricity, even if they never visit the source of pollution. Alternatively, if the mode of payment is a regional sales tax, then the population is defined as the residents and visitors to the region who make purchases in that region.

Second, the vehicle for payment has implications for the hypotheticality bias. Even if all the various alternatives seem reasonable and realistic to the respondent, if the vehicle for payment is not perceived that way, then the "game" aspect of the bidding procedure might prevail. As an extreme example, one of the vehicles for payment in the Randall study was an addition to the electricity bill.[6, n.4] The Native Americans living on reservations in the area where the study was carried out generally did not have electricity and, thus, no electricity bills. Obviously, the bids obtained by this group of individuals for the given payment vehicle would be unrealistic.[a] Thus, care must be taken, perhaps through a pretest, to assure that the vehicle is a reasonable one for the bulk of the respondents.

Third, the vehicle for payment has implications for the perceived rights of the respondents in a given bidding game. For example, in a pollution abatement game, a respondent may feel that a surcharge on his utility bill is part of his obligation to reduce air pollution, because this is applied to all users of the energy being produced; but that a regional sales tax is not part

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(a) Randall et al. did not play this version of the game with the Native Americans living on reservations.

of his obligation, because it unfairly burdens only those users of the electricity who live near the site of production, without penalizing those who live farther away. Under each of these two conditions, different responses might be expected. A vehicle for payment must be perceived as fair by the respondent.

In addition to format and vehicle bias, a third bid concern has been labeled strategic bias. This refers to the fact that a respondent may intentionally give a false bid in order to influence the mean response. To the extent that the sample favors one policy over another, and uses strategic bias, the mean bid could be an inaccurate reflection of the true value of the policy to the respondents. Strategic bias should not occur if hypotheticality bias effects are present in a given bidding game, because the strategic bias assumes that the respondent is taking the game seriously enough to want to distort his responses so as to affect the mean bid. The only study attempted to systematically test for the effects of strategic bias is that of Bohm.[10] In a game in which respondents were actually given money to spend, he demonstrated that different conditions, designed to be conducive to strategic bias, did not result in significantly different bids. Unfortunately for bidding game researchers, he found that the one condition that led to statistically significant overstatements of bids was the one that most resembled bidding games, i.e., the one in which respondents indicated how much they would be willing to pay rather than having to actually pay for the commodity. Brookshire et al. tried to detect strategic bias by searching for departures in the distribution of obtained bids from some specified population distributions of bids.[11] This assumes that knowledge of this latter distribution is available, an assumption that is difficult to make at this stage in bidding game technique development.

Related to the strategic bias is the problem of how to handle a "protest bid." For example, a person might bid zero dollars for a nonmarketed commodity because he really believes it is worthless, because he is strategically trying to lower the mean bid, or because he is essentially protesting the game due to the belief that the game violates his perceived rights. Protest bids,

typically identified as such by questioning the respondent about the meaning of his zero bids (or infinite bids, in the case of WTA games) are usually eliminated from analysis. However, a large proportion of protest bids in a given sample should serve as a warning signal to the researcher that he may be playing an inappropriate bidding game. It should also be recognized that a protest bid need not always result in a bid of zero dollars; the zero dollar protest bid can be viewed as the tip of the iceberg. A large proportion of zero dollar bids is a sign that many of the nonzero bids are biased downward as a form of protest.

How good is the bid? How do we know that the obtained bid is the "true" bid? Short of having actual exchanges of money, or an "ultimate bid," the obtained value of the bid can reflect the true valuation of the alternative described to the respondents, plus the effects of at least the following elements: information bias, hypotheticality bias, starting point bias, interviewer bias, strategic bias, protest bids, the attribution of rights the individual makes to himself, and random error. There is no reason to expect that these effects (except the last) will be random and therefore balance one another out. A carefully constructed bidding game procedure must try to minimize the influence of each of these effects wherever possible. In addition, the current list of biases is no doubt incomplete.

## SOCIAL-PSYCHOLOGICAL ASPECTS OF BIDDING GAME PROCEDURES

In this section, the bidding game is viewed as a social-psychological field study. The relevant literature is drawn upon for suggested improvements in bidding game techniques.

### THE BID AS A BEHAVIORAL INTENTION

When a respondent indicates that he would be willing to pay an additional $20 in entrance fees to use a given recreation site, that person is stating an intention to behave in a very specific manner. (In most bidding games, this behavioral intention is more in the form of "would do" rather than "will do," because, in reality, there is no intention to charge the individual the additional $20.) Two areas of interest concerning this behavioral intention are the determination of contributive factors to the intention and whether or not the intention is predictive of actual behavior.

According to Fishbein, the best predictors of intention to engage in a particular behavior are the person's attitude about the specific behavior and social pressures to engage in the behavior.[12] Note that the attitude in Fishbein's model is very different from the typical conception of attitude--it is an attitude toward a particular behavior rather than an attitude toward an object or person. This attitude in turn is composed of the person's beliefs about the outcomes of engaging in the behavior (e.g., if I pay an additional $20 entrance fee I will have superior maintenance of the facilities) as well as how that person values each of the outcomes (I am strongly in favor of well-maintained facilities). Thus, to understand the attitudinal component underlying a behavioral intention (e.g., willingness to pay), a person's beliefs about the given situation must be understood. Two people may state the same intention for very different reasons; conversely, two people with similar beliefs about the given action may differ in their stated behavioral intentions because they value each of the beliefs differently.

The second predictor of behavioral intentions in Fishbein's model, social influences, is composed of the important reference persons and groups for the respondents with regard to the particular behavior (e.g., spouse, parents, the

Sierra Club, the Republican Party) and how motivated the respondent is to comply with each of these reference sources.

The importance of this analysis for bidding games is that it emphasizes some of the psychological factors underlying a stated bid. An appreciation and understanding of these factors can be of use in the overall evaluation and development of bidding games. For example, if it is determined that a stated bid is based upon beliefs that are factually incorrect, it could be surmised that the bid would change if the mistaken beliefs were rectified. Knowledge of the beliefs about a given situation could also help in the construction of bidding games. For example, if it is discovered that people believe that user's fees are spent for very different purposes than on what they are actually spent, a bidding game involving user's fees as a vehicle for payment could be constructed such that the information concerning disposition of the fees is specified explicitly in the instructions.

The question of whether the stated behavioral intention (i.e., the obtained bid) predicts actual behavior (i.e., the ultimate bid) is crucial. Ajzen and Fishbein recently specified the conditions under which attitudes should predict behavior.[12] These principles, plus some others, should be of use in determining when obtained bids should correspond to ultimate bids. The four conditions specified by Ajzen and Fishbein are correspondences between attitude and behavior in terms of their action, context, time, and target. Within the framework of the bidding game, these translate as:

- action - The bidding game and the real situation should have in common the same vehicle for payment and the same mode of payment (WTA or WTP) in order to increase correspondence.
- context - The situations depicted in the game should be as accurate and complete as possible; also, the context of the game bid should be as close as possible to the context of a real payment (e.g., for what purposes will money be used? Who will benefit? Who else will be playing? Are the assignments of rights the same in the game as they are in the real situation?).

- target - The person or institution to whom money will be paid or from whom money will be received should be the same in the game as in the real situation.
- time - Does the game specify when payment will be made or compensation received? If the game is played in the "present," but the contemplated action (and therefore the actual payment) is not until some time in the future, a lack of correspondence between the two bids might be expected.

In addition to these four considerations, other factors might result in a lack of correspondence between the bid obtained in the games and the bid that would be obtained under real conditions. These factors stem from the fact that much of human behavior is situationally determined. A respondent might indicate in a bidding game that he would be willing to pay $20 for some opportunity. However, several months later when the opportunity becomes a reality and he must actually pay $20, the situation may have changed substantially enough that he no longer is willing to pay that amount. For example, his budget may have changed, or different opportunities may have become available.

As a general rule, a statement to engage in a particular behavior at some future point in time is more likely to actualize in that behavior if the time interval between the statement of intention and the actual behavior is short. As this time interval increases, there is a greater probability of mitigating circumstances arising, which will result in a discrepancy between the stated intention to behave in a particular manner at some future point in time and the actual behavior at that time.

In addition to the reasons just specified, the obtained bid can be expected to diverge from the ultimate bid to the extent that the obtained bid differs from the true bid (i.e., the obtained bid corrected for all biases and random error). Even by eliminating all the biases, there is no assurance that the obtained bid will correspond to the ultimate bid.

## THE INTERPERSONAL DYNAMICS OF THE BIDDING GAME PROCESS

If the bidding game is to be conducted by an interviewer rather than by mailed questionnaire, one must be aware of the interpersonal dynamics of a research interview. As Bouchard states: "Interviews are special forms of social interaction which depend heavily on mutual trust and the goodwill of respondents. If they are to yield useful information, that goodwill and trust must be maintained, cultivated, and validated by the interviewer."[13] Although the dynamics of the interview process are stressed here, for exposition the process is broken down into the interviewer, the respondent, and the milieu of the response.

### The Interviewer

The interviewer has the task of motivating the respondent to answer and to answer honestly, maintaining rapport with the respondent, maintaining a neutral stance, answering questions, and making the respondent feel that his responses are valued, all in a minimal amount of time. The interviewer can accomplish this by giving the respondent as much information as possible concerning the reason for the interview, telling the respondent why he was chosen to be interviewed, and stressing the importance of his giving an accurate response. The biological (e.g., sex, race) and social characteristics (e.g., appearance, regional differences in speech) of the interviewer may all have an effect in building the necessary trust and rapport between the respondent and the interviewer. In some cases, it may be possible to have an interview team consisting of two potential interviewers, who could take turns interviewing depending upon the characteristics of the respondent.

It is essential that the interviewer maintain a stance of neutrality. To accomplish this the interviewer should not have or seem to have a vested interest in the outcome of the study. Actually maintaining neutrality is difficult to accomplish. The interviewer's expectations can affect the answers of the respondent by emitting nonverbal cues that signal the respondent which answers are appropriate. These cues are often given unconsciously by the interviewer. The interviewer must maintain a fine line between reinforcing

the respondent for responding without reinforcing any particular response. Training of interviewers is essential for obtaining interviewers competent in conducting bidding games.

## The Respondent

Respondents will enter into the bidding game situation with diverse motives, only some of which are consistent with giving honest responses. The first hurdle, getting the respondent to play the game, should be overcome by convincing the respondent that the questions are meaningful and important. Once the respondent agrees to play, his answers may be based on the motivation to avoid appearing foolish (labeled "evaluation apprehension" by psychologists) or by a motive to make the interviewer appear foolish, or perhaps by a motive to please the interviewer. Still other respondents may engage in strategic behavior, as discussed previously. The best an interviewer can do is to try to arouse the motive of the respondent to answer honestly by convincing the respondent of the importance of doing so. Finally, due to the inherent nature of the bidding game, there may be many cases in which a person refuses to play the game or, if he does play, proffers protest bids. The reasons for such behaviors should be ascertained by the interviewer, because this has implications for the appropriateness of the specific bidding game.

## Milieu of the Response

How is the situation presented to the respondent? Assuming the person is willing to play and he perceives the game as not violating his rights, how does the respondent interpret his own bid and how does he think the interviewer will interpret it? Most bidding game researchers have emphasized that the situations presented in the game must be realistic and credible. In an attempt to be as realistic as possible, there may be a tendency to have the person play the game under the guise that it is for real, in the sense that his response will determine the actual payments to be paid or received.[a]

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(a) That this is actually the case will be true in only a few instances; it is more often the case that the game is being played in an attempt to value the nonmarket good in question. Although this value is useful in decision making, it usually is not used explicitly as the basis for collection or compensations programs.

It is believed that if the person can be led to believe that the game is being played "for real," his response will be a more accurate gauge of his actual behavior. In this way, the hypotheticality bias could be eliminated.

Whether or not to try to convince the person that the game is being played "for real" has an analogy in experimental social psychology in the deception versus role-playing controversy. Without delving into the evergrowing literature concerning this issue,[14-16] the advantages and disadvantages of each method will be stated. The major advantage of deception is that, if it is successful, i.e., if the respondent believes he is playing "for real," then greater confidence can be placed in the responses of the participant. However, this methodology presents ethical dilemmas; e.g., does a researcher have a right to lie to the person upon whom he is dependent for doing the necessary research? Argyris has argued forcibly for the need to establish trust between social scientists and their respondents.[17] Deception also poses methodological problems: How can the researcher tell for sure whether the participant really believes what he was told--that his responses are actually to be used in determining payment or compensation policy? If deception is used, the question is, who is being deceived, the researcher or the participant? Moreover, if the participant does believe that the researcher is trying to deceive him, can the researcher then have much confidence in his responses? Of course, even if the respondent is not purposely deceived, he may believe the researcher is being deceitful and may respond accordingly. This is a less likely occurrence, given no previous history of deception in the respondent's research experiences.

Alternatively, the role-playing method does not involve deceiving the participants about the nature of the research. A disadvantage of this procedure is that it lacks "realism" to the participants. Therefore, the researcher does not know how accurate the responses obtained under these conditions are to the responses that would be obtained under the real situation. Defenders of the role-playing method point out that the participants in a carefully designed study do become fully involved and actively participate in the study, and that the responses obtained from such studies are accurate

reflections of what would be obtained in the real situations. In role playing, the participant is instructed to respond as if the conditions that the researcher would like to exist do, in fact, exist. For example, the participant would be asked to respond as if the amount of money he is willing to pay to maintain a recreation site would actually be collected and used for the intended purpose. Although social psychology cannot definitively state whether role playing or deception is the better method, the authors are personally disposed toward being as honest as possible with respondents, thus obviating deception as a method in bidding game research.

## PSYCHOMETRIC CONSIDERATIONS IN BIDDING GAMES

Two important psychometric notions--reliability and validity--are discussed in this section.

### RELIABILITY

Reliability refers to the dependability and accuracy of responses. Cronbach refers to three facets of reliability, using the more descriptive term "generalizability."[18] If a set of bids is obtained from a group of people, the researcher can ask how well these bids reflect what would be obtained across different occasions, situations, and observers (or interviewers). To the extent that the set of bids differs as these three facets are varied, the scores are unreliable with respect to the three facets.

Within the context of bidding games, generalizability over the facet of occasions reflects stability of the bid. If bids were to display very wide variations across different occasions, the researcher would not know which set of bids to use. If decisions are to be made on the basis of the obtained bids, temporal stability of these bids is essential.

The facet of situations corresponds to different versions of the game. To the extent that the bids differ dramatically over different versions of the game (e.g., games using different vehicles, or ones differing in compensating versus equivalent measures of valuation) the researcher would not know which bids to accept as the appropriate index of valuation. In this case, however, a researcher should be in a position to discard several versions of the game as being inaccurate reflections of what the real situation might be (e.g., those games in which a participant feels his rights are being violated), and therefore he should not be concerned with these games.

Finally, any variation over interviewers is a reflection of the interviewer bias. If different interviewers obtain different bids from the same set of respondents, there is no basis on which to judge which set of bids to use.

Reliability with respect to any one facet or combination of facets cannot be specified a priori; reliability requires empirical observation. This experimentation is essential, because lack of relaibility limits the uses that can be made of the data.

A large reliability index does not indicate freedom from systematic sources of influence that have not been manipulated in the reliability experiment. Thus, it is possible to have obtained bids that are highly reliable (e.g., can be replicated over numerous occasions), but which bear no relation to the ultimate bids due to the nonrandom influence of biasing factors such as starting point bias and hypotheticality bias. Reliability is a necessary, but not sufficient, condition for validity.

## VALIDITY

Validity refers to how well a score "does what it is supposed to do." Although psychologists deal with several types of validity, the type of most concern here is criterion-related validity, which addresses how well the score predicts the criterion of interest. In the context of bidding games, this can be translated to asking how well the obtained bids (predictor) reflect the ultimate bids (criterion). Criterion-related validity is adversely affected by all of the biases discussed thus far, as well as by lack of reliability of the scores. What is required is empirical demonstration that the obtained bids accurately predict the ultimate bids. There is no substitute for this type of validity evidence. Content validity is obtained from examining the content of the bidding games to see if they contain the elements essential to a good bidding game. These elements include lack of biases, nonviolation of participants' perceived rights, and good interviewing technique (where an interview is used). Content validity indicates how representative the actual bidding game is of the population of potential relevant bidding games. It is usually not considered to be quantifiable in the same way that predictive validity is quantifiable. Content validity relies much more on judgments of relevance of the game.

Some readers will recognize the problem of social value of a nonmarketed good as a problem of construct validity. This type of validity addresses how well a given method measures some theoretical construct or trait. At the individual level, the value of an object to the individual is similar to other constructs with which psychologists often deal, such as attitudes and interests. Social value of the good in the bidding game method is obtained by aggregating the individuals' estimates of value of the object to them. Thus, in terms of construct validity, the question becomes one of gaining confidence that the method is, in fact, measuring social value. According to this view, other types of validity, as well as reliability, can be subsumed under construct validity.[19] One method of gaining this confidence is by observing how well different, independent methods of estimating social value correspond to one another. For example, how well does the social value of a recreation site obtained via a direct cost method correspond to the value of that site obtained via the bidding game method? To the extent that these methods result in values that corresond for a large number of different sites, they are adequately measuring what they are purported to measure, i.e., social value. Of course, it is possible that both methods result in values that agree but are incorrect.

A lack of correspondence among different methods of obtaining social valuation is also of interest. On the basis of the data alone, there is no prima facie justification for accepting one method. A researcher must resort to scientific intuition and prior theory to estabish preferences for one method over another in such cases. The field of valuing nonmarketed goods is still in the developmental stages. There is no justification at this point for establishing one method of valuation as the standard by which to judge other methods.

## UNRESOLVED PROBLEMS AND CONCLUSIONS

### ECONOMIC MEASURES OF SOCIAL VALUE

Humans have incomplete knowledge of the benefits and costs involved with nonmarketed goods such as pollution and national parks. Much scientific endeavor is aimed at determining these benefits and costs. However, by stating that aggregate social value is identical to the area under the deand curve (or aggregate bid curve for bidding game applications), one is assuming that the consumer is aware of the total benefit package available to him from the given good, which is almost never the case. Consider, for example, the different bids expected from two consumers concerning the value of clean air, one of whom is aware of the health effects of clean air and the other who is not. Thus, at best, any measure of social value of a nonmarketed good, including economic measures, is a measure of perceived social value of the good at that particular time. Of course, the most one can do is to act on the basis of the best information available at a given time; however, it is easy to lose sight of the fact that measures of social value reflect the incomplete knowledge of society when dealing with intricate and involved methods for estimating social value.

There is no prima facie reason for assuming that current measures of social value are either over- or underestimates of the actual benefits derived from a given commodity, because knowledge about costs of the commdity may be just as incomplete as knowledge of the benefits of the commodity. Westman argues that the benefits of many environmental goods, such as ecosystems, are still in the early stages of discovery; in the long run, the number of benefits discovered will far outweigh the cost.[20] If this were the case for environmental goods in general, a necessary concusion would be that an economic estimate of social value of these goods at any given time will undervalue the true benefits attributable to these goods. As an extreme example, imagine a bidding game had been played with the first white visitors to the Grand Canyon to value what lay before their eyes, which they saw as a vast,

empty, useless space. If some land use decision had been made at that point on the basis of those bids, the Grand Canyon might now exemplify the largest landfill project known to man.

## COMPARABILITY OF DIFFERENT DOLLARS

In determining the dollar value associated with different aspects of a decision, the values assigned to these different aspects must all be measuring the same concept. Specifically, exchange value (i.e., price multiplied by quantity) represents the area under the price line and to the left of the price line-supply curve intersection in Figure 1. Aggregate social value measures exchange value plus consumer surplus. It is important to correctly classify which method is being used and what is being measured to properly assess the value of each separate outcome of a decision.

The second problem concerning comparability of different dollars has already been discussed in the validity section, namely, do the "dollars" that respondents bid during bidding games have the same meaning to them as the dollars that they spend in the marketplace? Only further research, perhaps using bids for marketed as well as nonmarketed goods, can determine if the answer to this question is in the affirmative. To the degree that the respondent plays the game sincerely, this correspondence would increase.

It is important to note that summing individual bids to get an aggregate social value assumes that the marginal utility of money is the same for all individuals. Unequal distribution of wealth in our society certainly challenges this assumption. These problems, however, apply not only to bidding games, but to any budget-based economic analysis. Randall has urged that WTA games be played to best alleviate this problem.

## ETHICAL ISSUES

As stated previously, some respondents may feel that it is wrong to buy and sell environmental goods. Concern about the rights of future generations and one's ethical obligation to act as environmental trustee makes any current transaction (especially an "irreversible" decision) appear expedient and

wrong. A respondent who states that he would not be WTA any amount of money to give up a valued environmental good is trying to make a moral, not economic, statement. It is a qualitative, not quantitative, statement. The act of offering money may be offensive and lead to strong reaction, as happened in the Hammack and Brown study of the sale of waterfowl hunting rights.[2, n.9]

## THE RIGHTS PROBLEM

The foregoing discussion has made clear that the bid will likely be sensitive to the perceived rights issue. Property rights, especially in the area of environmental amenities, are not clear and constant, but ambiguous and changing. It is perhaps unrealistic to expect most respondents to clearly understand and appreciate, say, the right to obstruct a view with another building, even if the law is clear. Yet the reseacher feels a need to evaluate all responses from a common framework; i.e., an assignment of rights must be made.

A strong case can be made that any valid measure of social value cannot be based on assigned rights under conditions in which many people lose under the assigned rights. Suppose, in the view-blocking example, the law were clear: the builder has a right to build his structure even if it blocks your view, i.e., you have no legal right to damages. An insensitive, although legally consistent, application of bidding games would ask only, "How much would you be WTP to prevent the structure from being built?" The damages that would be suffered are real enough, although there are no legally recognized damages. If bidding games are to serve a social policy decision, perhaps people should be asked to play the game they think is consistent with their perceived rights, as opposed to legal rights. This somewhat anarchistic view of individual rights may be the only way to accurately measure the psychological losses and gains distributed across individuals, as opposed to the recognized gains and losses.

## DOLLARS, TIME, AND EFFORT

The theory underlying bidding games assumes that money paid or received (a behavior) for environmental goods is substitutable for other value-revealing behaviors--time and effort. A meaningful response to a proposal to pay to prevent the construction of a power plant may be: "I couldn't pay anything, but I'll fight it politically with volunteer time." This might be a response from a low-income, high education student. Can the researcher merely assign an economic value to the respondent's time, and use this estimate as a WTP bid substitute? The respondent may well play the "time and effort" game, but refuse to play the "dollar" game, indicating that these value-revealing behaviors are not equivalent to him. The willingness to devote time in opposition to the proposed plant cannot be taken as accepting the presumed rights assignment: you deserve the future state--the plant. The bidding game structures must be designed to capture this complexity.

## HOW GOOD ARE BIDDING GAMES?

Although this paper has taken a strongly critical look at bidding games, bidding games must still be regarded as potentially superior to other methods of valuing nonmarketed environmental goods.

The authors state this for a number of reasons. One, the technique is only newly emerging. Many of the flaws in earlier studies can be corrected in the future. Assumptions are now clearly understood. Traditional valuation methods dependent on historical data (e.g., observation of price behavior) are locked into problems of insufficient information, distributions of wealth and power, and the like. Bidding games, in principle, can be designed to overcome those difficulties. Further, bidding games can be applied to future events and alternatives and so are more timely and relevant to social policy decisions that are being contemplated.

The specific answer to the question, "How good are bidding games?" lies in the future. Careful and helpful applications of the technique, coupled with research efforts to validate the approach, will likely lead to a very positive answer to the question.

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