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Starting Point Bias in Contingent Valuation Bidding Games

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Abstract

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A test for starting point bias in the iterative bidding format of contingent valuation studies is developed in this paper. The test is applied to the data from three contingent valuation studies and to the data from a simulated market study. Starting point bias was found to be a problem in all three contingent valuation studies. A starting point problem did not exist in the simulated market suggesting that starting point bias may be an artifact of hypothetical markets. The validity of using bidding games with fixed starting bids is evaluated.

Starting Point Bias in Contingent Valuation Bidding Games

Contingent valuation has become a commonly used tool for valuing items such as natural amenities that are not traded in markets.[1/] Even though this tool is widely applied, questions remain about the appropriate method of asking the valuation question. The bidding game has become the most commonly used method of asking the valuation question in CV studies. A bidding game is typically conducted by either personal or telephone interview. Bidding begins with an interviewer positing an initial bid (starting bid) to a respondent. If the respondent is willing to pay the initial bid, the interviewer revises the bid upward until a negative response is obtained. A negative response to the initial bid results in the interviewer revising the bid downward until an acceptable amount is found. (The converse would occur in a willingness-to-accept-compensation study.) The final bid is a measure of the respondents Hicksian compensating or equivalent surplus for the item being valued.

In two recent willingness-to-pay studies we explicitly tested for starting point bias in bidding games. That is, we asked whether final bids are influenced by the magnitude of the starting bids. The first study used contingent valuation to measure the value boaters and canoeists place on maintaining scenic beauty along a section of the Wisconsin River. The second study used contingent valuation and a simulated market to measure the value

that hunters place on a special deer hunt at the Sandhill Wildlife Demonstration Area in Wisconsin.[2/] We also applied our starting point test to the data from a recent contingent valuation study on valuing marine recreation by Thompson and Roberts (1983).

Several other methods have been used to ask the valuation question in recent years. Hammack and Brown (1974), among others, have used an "open ended" question that allows respondents to fill in their own values on a mail survey. Mitchell and Carson (1981) have used a technique which they refer to as the payment card method. Using this method, the interviewer shows a card to the respondent which portrays what people in the respondents general income category paid on average for selected public services in the previous year. The respondent is then asked to state the value he or she places on the item being valued, considering the information presented on the card. This response is final. No bidding was involved in the Mitchell-Carson study. Cummings, Brookshire and Schulze (1984) have cited some recent unpublished studies that use payment cards to establish initial bids and then conduct bidding from this starting point. Bishop, Heberlein and Kealy (1983), in their study on goose hunting, asked the valuation question using take-it-or-leave-it offers. The offers and the binary responses to the offers (yes or no) were used to fit a logit model, which in turn, provides a measure of the average Hicksian surplus. These authors also used a simulated market to elicit values for goose hunting. Finally, Schulze et al. (1983), in a study on preserving visibility in National Parklands, used

the iterative bidding method without fixed starting bids. Respondents were asked for the value they placed on maintaining visibility and iterations began from this response. To a greater or lesser extent, each of these methods were developed to avoid the potential for starting point bias that arises when an initial bid is posited to respondents.

Starting Point Bias

Starting point bias arises in the iterative bidding framework when the initial bid (posited by the interviewer) influences respondents final bids. Ideally, the starting bid is merely a tool for initiating the bidding process and should not affect respondents final bids. More precisely, the starting bid should not be an argument in respondents utility functions, nor should it be a parameter in their choice sets.

Randall and Brookshire (1978) have suggested that starting point bias may arise when the item being valued is poorly defined or not distinctly perceived by the respondent. Brookshire et al. (1981) suggest two other possible causes of this problem. First, if the starting bid is significantly different from a respondents actual willingness to pay, the respondent may become bored with the bidding and truncate the process before his or her actual willingness to pay is revealed. Secondly, the initial bid may suggest an appropriate range of final bids to the respondent.

Of the many CV studies that have been conducted using the bidding game method, only two have found clear evidence of starting point bias. Rowe, d'Arge and Brookshire (1980), in a study on the value of visibility, found that an increase of $1 in the starting bid resulted in a $.60 increase in the final bid. The validity of this result has been questioned as it is felt that visibility was not precisely defined for respondents (Schulze et al., 1981). The Brookshire et al. (1981) study found starting point bias in one-sixth of their sample groups. These same authors in another paper on their study concluded that starting point bias was not a problem (Brookshire et al., 1982). As has been pointed out by Rowe and Chestnut (1983), finding starting point bias in one-sixth of the situations examined is not an insignificant result. Mitchell and Carson (1981) suggest that starting point bias may have been more of a problem than the authors realized and their tests may be questionable due to small sample sizes.

Thompson and Roberts (1983) also found evidence of starting point bias. Some studies have produced more tentative indications of starting point bias. Desvousges, Smith and McGivney (1983) in a study on water quality found suggestive, but not conclusive, evidence that starting bids may have influenced respondents final bids. The results of this test are somewhat misleading as the authors removed outliers prior to testing for starting point bias. A review of the outliers removed shows that approximately 44 percent of the outliers removed were participants who received the

highest starting bid. Carson and Mitchell (1983) have argued that a study by Greenley, Walsh and Young (1982) had a starting point problem. Greenley and his associates contend their problem is due to the different hypothetical instruments used to collect willingness-to-pay bids. The design of the Greenley study makes it difficult to draw a clear conclusion, but it is likely that both starting bids and hypothetical collection instruments were influencing final bids.

Finally, several studies have found no evidence of starting point bias (Randall and Brookshire, 1978; Randall, et al., 1978; and Thayer, 1981). The results of the tests for starting point bias in these studies may not be conclusive as only a small number of starting bids (e.g., two or three) and/or a narrow range of starting bid values were used. Additionally, some CV studies have not been designed to test for starting point bias. Desvousges and associates conclude, "...the literature on starting point bias indicates that, when a bidding game is used to elicit willingness to pay, the results can be influenced by the starting point used in the bidding process, suggesting that tests for starting point bias should be included in the research design" (p. 4-7). We agree with this conclusion and would go on to state that merely testing for starting point bias is insufficient when a bias problem is identified.

A Model

Thayer (1981) has developed a model of consumer choice to explain the occurrence of starting point bias when respondents become bored with the iterative bidding process. The Thayer model contains an argument in respondents utility functions to represent the utility derived from participating in a CV survey. This argument expresses the trade-off a respondent faces between taking the time to provide an honest final bid and giving a dishonest final bid to terminate the bidding process.

Desvousges and his associates have pointed out that the assumptions of the Thayer model may limit its general applicability. We also question the general application of the Thayer model. First, it is possible to design a CV questionnaire to minimize the potential for boredom in the iterative bidding process. Secondly, if a respondent desires to terminate the bidding process, there is no need to provide a dishonest response. The respondent can simply jump to their best guess of their actual willingness to pay by telling the interviewer the maximum that she or he is willing to pay. Our experience is that this is generally the tactic respondents take when they wish to terminate the bidding process.

We feel the general cause of starting point bias is that the initial bid suggests a reasonable final bid to respondents. This occurs because people are being asked to value items which they are not used to valuing and they are not familiar with the technique of valuation. Thus, the respondent may interpret the initial bid as market information.

Starting point bias can be modeled in a simple consumer choice framework. Consider a person who is being asked to value a natural amenity such as scenic beauty. The CV question is asked using the iterative bidding format. Assume for simplicity that this person is not behaving strategically and derives utility from a vector of market good and services, and scenic beauty. We will also make the usual assumptions to insure a unique solution.

The easiest way to represent this situation is with the use of indirect utility functions. First, we will examine the case where starting point bias is not a problem and the individual is able to provide an accurate response to the CV question. If these conditions are true, the following result will hold where P is a vector of market prices, e" is the existing level of scenic beauty, Y is income, β_f is the individuals final response to the bidding game, e' is a degraded level of scenic beauty and U is the defined level of utility.

$$V\ (P,\ e'',\ Y - \beta_f) = V\ (P,\ e',\ Y) = U \qquad (1)$$

and

$$\beta_f = \int_{e'}^{e''} h^{-1}(P,\ e,\ U)\ de \qquad (2)$$

Thus, β_f is the Hicksian measure of consumers surplus and $h^{-1}(P,\ e,\ U)$ is the inverse Hicksian demand for scenic beauty (see Maler, pp. 116-118).

If a starting point problem exists, the persons final bid (β_f^*) will not equal β_f and the following result will hold:

$$V\ (P,\ e'',\ Y - \beta_f^*) \gtrless V\ (P,\ e',\ Y) = U \qquad (3)$$

and

$$\beta_f^* \gtrless \int_{e'}^{e''} h^{-1}(P, e, U)\, de = \beta_f \qquad (4)$$

and

$$\beta_f^* = f(\beta_s, X) \qquad (5)$$

In equation (5), β_s is the initial bid and is a representation of the market information conveyed and X is a vector of variables that we would expect to affect respondents final bids. The direction of the inequalities in equations (3) and (4) depend on the starting bids effect on the final bid. For example, the left-hand side of equation (3) would be less than the right-hand side if a respondent overbid and the converse would hold in equation (4). The direction of these two inequalities would be reversed if the effect of the starting bid was negative.

The bias that results when a starting point problem exists can be defined as follows:

$$\gamma\ (\beta_s) = \beta_f^* - \int_{e'}^{e''} h^{-1}(P, e, U)\, de \gtrless 0 \qquad (6)$$

Once again the direction of the inequality depends on the direction of the starting bids effect on the final bid.

Survey Design

WISCONSIN RIVER STUDY. As should be done in all CV studies, the item to be valued (scenic beauty along the Lower Wisconsin River) was precisely defined for respondents and a hypothetical market was described for valuing scenic beauty. [For a detailed discussion of this study see: Boyle and Bishop, 1984 (a) and

(b).] Scenic beauty and items that detract from scenic beauty were identified using picture boards.[3/]

We designed this study to minimize the potential for boredom in the bidding iterations and to test for starting point bias. To minimize the potential for boredom, increments of $5 were used to iterate bidding below $50 and increments of $10 were used to iterate bidding above $50. Also, the valuation question was the third question asked.

The selection of starting bids provided the basis for a unique starting point bias test. A wide range of starting bids was selected ($10 to $120). Starting bids were randomly selected to provide many different starting bids at small increments within the defined range. This provided an opportunity to estimate the relation between starting bids and final bids.

The source of our data were 188 interviews that were conducted with canoeists and boaters as they completed their trips on the Lower Wisconsin River during the summer of 1982.[4/] The response rate was 83 percent.

SANDHILL STUDY. The item to be valued in this study was a one day deer hunt at the Sandhill Wildlife Demonstration Area in Wisconsin. (For a detailed discussion of this study see: Bishop and Heberlein, 1984; and Bishop et al. 1984.) The iterative bidding format was used to elicit willingness-to-pay values in both a hypothetical market and a simulated market. While participants in the simulated market had a real opportunity to buy a permit to participate in the hunt, participants in the hypothetical market bid on a hypothetical opportunity to hunt.

The bidding games in both markets were designed to minimize the potential for boredom and to test for the presence of starting point bias. Starting bids were randomly selected within a defined range ($0 to $500) and increments of $100, $50, $10 and $1 were used to iterate bidding. The bidding process was conducted by telephone interview and the associated socio-economic data were obtained in a subsequent mail survey.

All of the data were collected in October and November 1983. The response rate was 92 percent. There were 69 completed interviews in the hypothetical market and 68 completed interviews in the simulated market.

THOMPSON AND ROBERTS STUDY. The item to be valued in this study was sport diving around petroleum structures located off the Louisiana coast. (For a detailed discussion of this study see: Thompson and Roberts, 1983; and Roberts and Thompson, 1983.) The iterative bidding method was used to elicit values and six starting bids were used ($20, $60, $100, $200 and $400). The data were collected during the spring of 1982. The response rate was about 66 percent and there were 126 completed interviews. A combination of mail surveys, telephone interviews and personal interviews was used in this study.

Testing for Starting Point Bias

Typically starting point bias is tested for by testing for significant differences between mean final bids, grouped by starting bids. This test was not possible in our studies as we did not have multiple observations at each starting bid. An

alternative test is to fit a linear relation between final bids and starting bids, and test the regression coefficient on the starting bid to see if it is significantly different from zero. This test was possible with our data.[5/]

Standard errors are presented in parenthesis for the following estimation results. Since we are only interested in estimating the starting bid regression coefficient, an omitted variable problem does not exist as the starting bids were randomly chosen. The Wisconsin River and Sandhill equations have been corrected for heteroskedasticity.

WISCONSIN RIVER STUDY. The estimated linear relation between starting bids and the final bids indicated that starting point bias was present. The estimation results are:

$$\beta''_f = \underset{(5.031)}{7.334} + \underset{(0.093)}{0.315}\ (\beta_s) \qquad \text{SSE} = 6{,}379,\ n = 188 \qquad (7)$$

The coefficient on the starting bid is significantly different from zero at the 99 percent level of confidence, indicating the presence of starting point bias.

SANDHILL STUDY. The linear relation between starting bids and final bids was estimated for the CV data and the simulated market data. The estimation results for the CV market are:

$$\beta''_f = \underset{(3.810)}{8.661} + \underset{(0.041)}{0.152}\ (\beta_s) \qquad \text{SSE} = 1{,}423,\ n = 69 \qquad (8)$$

The coefficient on the starting bid is significantly different from zero at the 99 percent level of confidence, suggesting the presence of starting point bias.

The estimation results for the simulated market are:

$$\beta''_f = \underset{(8.045)}{29.689} - \underset{(0.023)}{0.026}\ (\beta_s) \qquad \text{SSE} = 8{,}786{,}300,\ n = 68 \qquad (9)$$

The coefficient on the starting bid is not significantly different from zero at the 90 percent level of confidence, indicating that starting point bias did not occur in the simulated market.

We did a test to see if the vectors of regression coefficients in equations (8) and (9) were the same. We could reject the hypothesis that the two vectors of regression coefficients were the same at the 99 percent level of confidence. This indicates that starting point bias may be an artifact of hypothetical markets.

THOMPSON AND ROBERTS STUDY. Starting point bias was tested for in this study by testing for significant differences between mean final bids, grouped by starting bids. Thompson and Roberts found that the starting bids did influence final bids. We estimated a linear relation between their mean final bids (grouped by starting bids) and starting bids. The estimation results are:

$$\beta''_f = \underset{(4.641)}{98.904} + \underset{(0.022)}{0.405}\ (\beta_s) \qquad \text{SSE} = 139,\ n = 5 \qquad (10)$$

The coefficient on the starting bid is significantly different from zero at the 99 percent level of confidence. This confirms the results of the Thompson and Roberts test.

Alternative Bidding Formats

A possible solution to the starting point bias problem has been proposed by Cummings, Brookshire and Schulze. Respondents might be asked to state their initial bids, perhaps with the aid of payment cards. Whether payment cards introduce a starting point bias of their own remains an issue for future research.[6/] Another alternative is to allow respondents to state their initial

bid without the prompting of a payment card. This type of modified bidding game was conducted in the Sandhill study.

In the Sandhill study, a bidding game that allowed respondents to select their initial bids was applied in a hypothetical market and a simulated market. The increase in the mean bid in the hypothetical market due to bidding was statistically significantly larger than the increase, due to bidding, in the simulated market. Thus, iterative bidding in the hypothetical market caused people to bid money that they would not have bid if the money was real. In addition, the mean final bids for the traditional bidding games and the modified bidding games were not significantly different from the final means from several other methods of eliciting values in the Sandhill study. Also, the final mean bid in the Wisconsin River study was not significantly different from the final means estimated with two other contingent valuation methods. These results raise additional questions about the efficacy of bidding games. In addition, bidding procedures rule out mail surveys and thus force the use of more costly telephone or personal interviews.

Implications

We found that starting point bias existed in the three contingent valuation applications of the bidding game, but was not a problem in the simulated market application. As we said earlier, this indicates that starting point bias may be an artifact of hypothetical markets. A motivation for this conclusion is that the losses from making an error in the simulated market may be greater than the losses from making a

comparable error in a hypothetical market. In addition, respondents are not used to valuing environmental amenities that are not traded in markets and are not familiar with the CV technique. On the other hand, most people are familiar with actual auctions. In these auctions, starting bids are often used to suggest a reasonable price from which to begin bargaining. Thus, if the cost of an error in the hypothetical market is less than the cost of a comparable error in the simulated market, respondents may tend to fixate on the starting bid as being indicative of a "reasonable response."

Our conclusion, then, is that it is possible to influence a respondents final bid over a substantial range by the choice of the initial bid. The problem is, one does not know what values to choose for appropriate starting bids and no single starting bid will be appropriate for all respondents. In addition, our empirical results are very discouraging for those who would argue that bidding helps people to consider their preferences more carefully in contingent valuation studies. The ultimate conclusion may be that iterative bidding is not worth the trouble and expense.

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Footnotes

1. The term contingent valuation is used because people are asked to state the value that they place on a nonmarket good or service contingent on a hypothetical market existing in which to trade this item.

2. A valuation study that uses a simulated market is conducted in exactly the same manner as a contingent valuation study except real money is used for transactions instead of hypothetical payments, and real opportunities are exchanged.

3. Scenic beauty in our study was defined as natural landscapes. Our definition of scenic beauty was developed using two years of survey work by the Landscape Architecture Department at the University of Wisconsin-Madison. These studies were done to determine what river users find beautiful and what they think detracts from scenic beauty along the Lower Wisconsin River.

4. Since we interviewed river users as they completed their river trips, our sample may not have been random. A comparison of socio-economic characteristics of respondents in our subsamples and with previous surveys of river users leads us to believe that our sample adequately represents the cross-section of canoeists and boaters who use the Lower Wisconsin River.

5. We estimated a linear relation between starting bids and final bids, and a semi-log relation. We only present the linear functional form here as it fit the data better than the semi-log functional form.

6. Mitchell and Carson tested to see if the anchors on their payment cards influenced respondents willingness-to-pay responses. As no bidding was involved in the Mitchell-Carson study, their test does not answer the question of whether payment cards influence final bids when bidding is involved.