

Hypothetical versus real payments in Vickrey auctions

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Received 10 December 1996; accepted 15 April 1997

Abstract

We compare hypothetical and real payments in a Vickrey auction. The use of hypothetical payments overestimates the real willingness to pay. The results cast doubt on the validity of hypothetical willingness to pay questions for the typical respondent. © 1997 Elsevier Science S.A.

Keywords: Willingness to pay; Auctions; Contingent valuation

JEL classification: C91; D61

1. Introduction

The contingent valuation method has been developed to measure the willingness to pay for environmental changes (Mitchell and Carson, 1989). The method means that individuals are asked about their hypothetical willingness to pay for a defined good (Mitchell and Carson, 1989). The use of the contingent valuation method is controversial among economists (Hanemann, 1994; Diamond and Hausman, 1994). The controversy is centred around the extent to which the hypothetical choices in the contingent valuation method correspond to real economic choices.

The use of hypothetical choices in experiments was first criticised by Wallis and Friedman (Wallis and Friedman, 1942) and has since been an area of debate in experimental economics (Kagel and Roth, 1995; Thaler, 1987). Relatively little experimental work has, however, been carried out directly comparing hypothetical and real willingness to pay. Neill et al. (1994); Cummings et al. (1995) recently reported the results of experiments comparing real and hypothetical willingness to pay for two different contingent valuation elicitation techniques. Cummings et al. (1995) compared the dichotomous choice (yes/no) contingent valuation approach with real purchase decisions and found

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that the proportion of hypothetical yes responses greatly exceeded the proportion of real yes responses. Neill et al. (1994) compared the open-ended contingent valuation approach with a Vickrey auction with real payments, and found that the hypothetical willingness to pay far exceeded the real willingness to pay. In early work by Bishop and Heberlein (1979) dichotomous choice contingent valuation questions to measure the willingness to accept also have been shown to lead to similar problems of overestimation.

The aim of this study is to compare hypothetical and real payments in a Vickrey auction, in order to test the null hypothesis that hypothetical and real willingness to pay does not differ. Like the above studies the experiment involves a deliverable private good in order to avoid the free rider problem. We start by describing the design of the experiment. Thereafter we report the results. We end with some concluding remarks.

2. Design of the experiment

We used a Vickrey auction to compare real and hypothetical payments (Vickrey, 1961). In a Vickrey auction the highest bidder gets to purchase the good and has to pay the second highest price. Vickrey (1961) showed that this auction procedure gives individuals incentive to reveal their true maximum willingness to pay.

Our experiment involved a pair of sunglasses made by UVEX. These sunglasses are used as protective eyewear in professional laboratories in the US, and are not typically available in ordinary retail shops. The sunglasses are similar in style to sunglasses used for sporting activities such as bicycling and playing volleyball. We ordered the sunglasses directly from the manufacturer at a price of \$9 per pair.

The subjects were divided into two experimental groups. The first group participated in a hypothetical Vickrey auction for the pair of sunglasses followed by a real Vickrey auction for the pair of sunglasses. The second group only participated in a real Vickrey auction for the pair of sunglasses. In both groups the subjects were first given a description of how a Vickrey auction works, along with an example and it was explained that truth-telling is the dominant strategy.¹

The reason that one group of subjects only participated in the real Vickrey auction was that it is possible that the behaviour in the real auction is affected by the subjects already having participated in the hypothetical auction. Such an order effect could arise if the subjects for instance feel an obligation to state the same bid in the real as in the hypothetical auction. Alternatively subjects may protest by giving a too low bid in the real auction if they get upset when they are asked to state their real bid. It can not be ruled out either that there is a learning effect by first participating in the hypothetical auction. Our design makes it possible to compare the hypothetical and real willingness to pay both between subjects and within subjects (to test for an order effect).

Undergraduate students taking an introductory economics class at the University of Kentucky College of Business and Economics were included in the experiment. Participation in the experiment was voluntary and each student received \$5 for participating. In total 61 subjects participated in the experiment that was carried out in August 1996. Five experimental sessions with 10–15 students in

¹ All data and questionnaires are available from the authors upon request.

each were carried out (three sessions in the hypothetical and real group and two sessions in the real only group).

The null hypothesis tested in the study was that the mean willingness to pay in the Vickrey auction is the same for hypothetical and real payments. To test the null hypothesis in the within subjects comparison the non-parametric Wilcoxon test was used (Newbold, 1991). The non-parametric Mann-Whitney test was used to test the null hypothesis in the between subjects comparison (Newbold, 1991). The Mann-Whitney test was also used to test the null hypothesis of no ordering effect.

3. Results

The mean and median willingness to pay for the pair of sunglasses in the hypothetical and real Vickrey auctions are shown in Table 1. The mean willingness to pay in the hypothetical Vickrey auction is \$11.97. This can be compared with the mean willingness to pay of \$3.24 in the real Vickrey auction for the between subjects comparison and \$1.02 in the real Vickrey auction for the within subjects comparison. The null hypothesis of equal willingness to pay for hypothetical and real willingness to pay is rejected at the 5% level ($p = 0.035$) in the between subjects comparison and at the 1% level in the within subjects comparison ($p < 0.000$). The null hypothesis of no ordering effect is rejected at the 5% level ($p = 0.012$), showing that the willingness to pay is significantly lower in the real Vickrey auction for the subjects that first participated in a hypothetical Vickrey auction.²

We also tested if our result was sensitive to outliers by ‘trimming’ the distribution. In one estimation the 5% highest bids in each auction were deleted and in one estimation the 10% highest bids in each auction were deleted. This did not change any of the conclusions and the null hypothesis of equal willingness to pay between hypothetical and real payments was still rejected at the 5% level in all comparisons.

Table 1
Results of the experiment

	Within subjects		Between subjects
	Hypothetical Vickrey	Real Vickrey	Real Vickrey
Sample size	37	37	24
Mean WTP (\$)	11.97	1.02	3.24
Median WTP (\$)	5.00	0.30	1.25
STD WTP (\$)	19.27	1.41	4.77

² We also tested the null hypotheses in the between-subjects comparison using regression analysis with a dummy variable for the experimental group, controlling for the background variables collected in the study (sex, age, monthly spending money above room and board and the number of sunglasses owned by the subject). In the comparison of hypothetical and real bids the group dummy variable was significant at the 5% level ($p = 0.036$) and in the comparison of the real bids in the two experimental groups the group dummy variable was also significant at the 5% level ($p = 0.011$). These tests did thus not yield any different results than the non-parametric tests.

4. Concluding remarks

The null hypothesis of equal willingness to pay in the real and hypothetical Vickrey auctions was rejected in both the between subjects and the within subjects comparison. In the between subjects comparison the mean willingness to pay was nearly four times higher in the hypothetical Vickrey auction than the real Vickrey auction.

Our results confirm the results in the study by Neill et al. (1994) that the use of hypothetical payments overestimates the real willingness to pay in open-ended willingness to pay elicitation. Since the hypothetical Vickrey auction used in the study involves no obvious incentives to overestimate willingness to pay, the overestimation seems to be due to the hypothetical nature of the estimation task rather than strategic misbehaviour. The results thus support the notion of hypothetical bias in studies involving hypothetical payments (Cummings et al., 1986; Neill et al., 1994). To use the contingent valuation method for policy-making purposes it is thus necessary to find ways to correct for this overestimation problem. One possibility is to identify subsets of respondents to hypothetical valuation questions for whom hypothetical and real values can be expected to match better than for the average person. Further research might explore this possibility.

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