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Evidence of Anchoring in a Survey Recall Task

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Abstract: The U.S. Department of Agriculture (USDA) asked farmers for bids to participate in a dairy herd buyout program. Once bids were submitted, USDA set a cutoff bid–$22.50–that achieved program purposes. Successful bidders were paid to slaughter or export their dairy herds and not dairy for five years. Unsuccessful bidders (bids over $22.50) did not participate in this dairy herd buy-out. About a year and a half after bids were submitted, a random sample of farmers was asked to recall their bids in a mail survey. Results were matched with USDA records of actual bids. Successful bidders, whose bids brought income and major life events (quitting the dairy), had unbiased recall of their bids. Recall for the unsuccessful bidders was significantly biased in the direction of the cutoff. They appeared to use the cutoff bid of $22.50 as a cognitive anchor, which they under-adjusted upwards, to reconstruct from memory the amount they bid.

Key words: Response bias; underestimation; questionnaires; memory; judgmental heuristics.

1. Introduction

Loftus and others (Jabine, Straf, Tanur, and Tourangeau 1984; Loftus, Fienberg, and Tanur 1985) have presented compelling arguments for cross-disciplinary research among cognitive scientists and survey researchers. In particular, they note the potential for reducing nonsampling errors by examining the role of cognitive factors in questionnaire design. Among the psychological principles they cited was anchoring and its role in survey judgment tasks. In this paper we directly investigate the role of anchoring in a numerical recall survey task.

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Cognitive anchors refer to starting points people use when they are asked to make judgments. Tversky and Kahneman (1974) suggested that people use cognitive anchors as initial estimates and then adjust these estimates up or down, using other information, to derive final judgments. Typically, these adjustments are not accurate and often lead to final judgments that are biased in the direction of the starting point or anchor. (Bar-Hillel 1973; Tversky and Kahneman 1974).

In their classic study, Tversky and Kahneman (1974) asked people to estimate the percentage of African countries in the United Nations. The subjects watched the experimenter choose a randomly selected number by spinning a wheel of fortune. Subsequently, they appeared to use this number as an anchor for their judgments. When the wheel stopped on 10, for example,

the median estimate of African countries in the U.N. was 25%. In contrast, when the wheel stopped on 65, the median estimate was 45%. Thus, people's judgments were heavily influenced by the initial starting points implied by the wheel.

Tourangeau (1984) and others have suggested that this judgmental heuristic of anchoring may be employed by respondents when they develop answers to survey questions (Bradburn, Rips, and Shevell 1987; Hippler and Schwarz 1987; Markus 1986; Means, Nigam, Zarrow, Loftus, and Donaldson 1989). Effects that could be attributed to anchoring have been found in a range of survey tasks. Schwarz and Wyer (1985) found that ratings on survey items could be influenced by an earlier rank-ordering task. When subjects were instructed to rank items from most to least important, they rated subsequent items as higher in value than when instructed to rank from least to most important.

Survey researchers have also found effects that look like anchoring, although they explain these response distortions differently than psychologists. For example, Schuman and Presser (1981) in their review of the effects of question order refer to part-part consistency effects which are very similar to the anchoring bias described in Hippler and Schwartz (1987). Schuman and Presser found that for two questions at the same level of specificity, question order influenced responses. In their study, subjects were more likely to agree that Communist reporters should be allowed into the U.S. when they were first asked their opinions about the freedom of U.S. reporters to enter Communist countries. The initial question appears to serve as an anchor for the level of endorsement to the second question.

Also, Plous (1989) found that anchoring exerted a strong influence on survey estimates of the likelihood of nuclear war. Respondents in a low-anchor condition were asked whether the chances of nuclear war between the U.S. and the Soviet Union were greater or less than 1%, while respondents in a high-anchor condition were asked if the chances were greater or less than 90%. The biasing effects of these anchors were demonstrated in six survey administrations with different samples of college students. The average responses for those in the high-anchor group were more than twice as high as the average responses of those in the low-anchor group.

Collectively, the literature suggests that the anchoring and adjustment heuristic occurs in a variety of survey situations. We were able to test for anchoring effects in a memory recall task, using survey data from a study of the USDA Milk Production Termination Program (U.S. General Accounting Office 1988).

2. Background

Under the authorization of the Food Security Act of 1985, the U.S. Department of Agriculture (USDA) initiated a national dairy herd buy-out program. Participants in the program were paid by USDA to slaughter or export their dairy herds. Under the program, participating farmers had to agree to quit dairying for at least five years.

USDA invited dairy farmers to submit bids to participate in this buy-out program. Each farmer's bid included the size of the herd to be terminated, a measure of milk production (in hundredweights), and a bid price – the minimum payment per hundredweight of production that a farmer would accept from the government to terminate his or her dairy business.

Once the closing date for receiving bids arrived, USDA inspected the bids and established a cutoff bid that met program purposes – $22.50 per hundredweight of milk

production. The cutoff bid was announced to bidders and used to determine the status of each bid. Everyone who bid $22.50 or less was accepted for participation in the program. Bids higher than $22.50 were rejected.

USDA paid successful bidders their bid price to slaughter or export their dairy herds from April 1, 1986 to September 30, 1987 and not dairy for five years. The payouts were based on the lowest of three bids allowed for each farmer and were distributed over the course of five years. Unsuccessful bidders (bids over $22.50) did not participate in this dairy herd buy-out program. Some quit dairying anyway and others remained in the business. (U.S. General Accounting Office 1988).

Approximately 1.5 years after the closing date for submitting bids and announcement of the results, the U.S. General Accounting Office conducted a confidential national survey of successful and unsuccessful bidders. A stratified random sample of 550 successful and 650 unsuccessful bidders was selected from the USDA Agriculture Stabilization and Conservation Service's Total Bid File. In total, there were about 14,000 successful bidders and about 26,000 unsuccessful bidders. Survey data were collected through the mail between October 1987 and January 1988. Of those surveyed, about 73% of unsuccessful bidders and 77% of successful bidders responded.

Among other items in the questionnaire, farmers were asked to recall their lowest bid price and the size of the dairy herd they bid to terminate with the following questions:

Q.3 What was your lowest bid price? (Write in dollar amount.)

$_____ per cwt

Q.12 What was the size of the dairy herd (including cows, heifers and calves) that you bid to terminate? (Write in numbers.)

Number

_____ Milking cows

_____ Heifers

_____ Calves

_____ Total

No reference was made in the questionnaire or its cover letter to the cutoff or its value of $22.50.

Survey responses to the recall questions were matched individually to bid data that were recorded in the computerized bid files used to establish the sampling frame.

3. Cognitive Predictions

Based on hypothesized differences in the availability of bid price memories, we predicted that recall of bid prices would be more accurate for successful than unsuccessful bidders. To the extent that the anchoring heuristic was used, the decreased accuracy for unsuccessful bidders should reflect bias in the direction of the cutoff bid. No such bias in recall was predicted for successful bidders.

3.1. Recall of bids

Successful bidders, whose bids brought income and a major life event (quitting the dairy), had continuing opportunities to rehearse their accepted bid prices. Their monthly income over the next five years would be based on their bid price and the number of cows actually terminated. Having this information available in memory should lead to highly accurate recall of bid prices (Loftus, Fienberg, and Tanur 1985; Tversky and Kahneman 1974).

Unsuccessful bidders, on the other hand, had less reason than successful bidders to retain accurate information in memory about their bids after they were denied participation in the program. For them, the

unsuccessful bid was a lost opportunity. There was little benefit in rehearsing the bid information, thus bid price recall should be less available and therefore less accurate for them than for successful bidders.

In addition, we expect the recall of unsuccessful bidders to be less accurate than the recall of successful bidders because bid rejection was undoubtedly disappointing. Based on the Pollyanna Principle, memories of unpleasant events tend to be less accurate than our recall of pleasant events (Matlin and Stang 1978). However, while both the availability and Pollyanna principles predict lowered accuracy of bid price recall for unsuccessful bidders, neither principle predicts a directional bias in recall.

A salient number for unsuccessful bidders to recall was the cutoff bid–$22.50–which could serve as a marker or guide for future bids should the program be repeated. When asked to recall their bids, these farmers could use the cutoff bid, providing they remembered it, as a cognitive anchor or starting point, which they could adjust upwards to reconstruct from memory the amount they actually bid. To the extent that cognitive anchoring occurred with unsuccessful bidders, recall of their bids should be biased in the direction of the cutoff bid.

3.2. *Recall of herd size*

We predicted that the factors affecting recall of herd size (i.e., the number of cows that farmers bid to terminate) would be the same as those affecting recall of bid price. Successful bidders had continued opportunity to rehearse herd size because they had to document for USDA the slaughter or export of their animals. Their income over the next five years from participating in the program would be based on the number of cows terminated and their bid price.

As was true for bid price recall, unsuccessful bidders had less reason to rehearse the size of the herd they bid to terminate. Thus, herd size recall should be less available and less accurate for them than for successful bidders. As with bid prices, recall of herd size could be affected by use of the anchoring principle. The most salient anchor for unsuccessful bidders, many of whom remained in the dairy business, would be current herd size. Current herd size would be available because it represents potential income for the dairy. Also, it would be a fairly accurate anchor to the extent that it remains stable over time for a given dairy farm. If current herd size operated as a cognitive anchor for the unsuccessful bidders, then the accuracy of their recall would show individual bias in the direction of current herd size. Unfortunately, our questionnaire did not ask farmers to report current herd size and we were unable to test the anchoring prediction.

4. Results and Discussion

In general, results were consistent with predictions and suggest that unsuccessful bidders recalled the cutoff bid and used it as an anchor for reconstructing their own bids.

4.1. *Recall of bids*

Successful bidders had highly reliable and unbiased recall of their bid amounts. As Table 1 shows, 79% of successful bidders recalled their bids accurately to the penny. Of those with memory errors, slightly more recalled higher than actual bids (amounts between their actual bid and the cutoff). The average bias for errors in this direction was $0.53. The average bias for successful bidders who recalled lower than actual bids was $1.07. Overall, among successful bidders the difference between recalled and actual bids was not significant ($t = 0.64$, $p = .521$), thus providing no evidence of anchoring

Table 1. Percent of bidders with perfect and imperfect recall of bids

	Perfect recall	Recalled higher than actual bid	Recalled lower than actual bid
Successful bidders ($n = 388$)	79	12*	8
Unsuccessful bidders ($n = 418$)	40	15	44*

*All recalled amounts were between actual bids and cutoff.

bias. Reliability of bid recall for successful bidders, as measured by the Pearson product moment correlation coefficient, was an amazing .986. (We treated the bid recorded on USDA files as the true bid.)

The responses of the successful bidders were so accurate as to question whether the task was performed from memory. However, as we discuss later, if bidders were relying on records, then their recall of herd size should be just as accurate as bid recall. The data did not support this prediction.

The recall of bid amount for unsuccessful bidders was less reliable ($r = .842$) than the recall of successful bidders (difference in $r = .144$, Fisher's $z = 17.75$, $p < .001$), and, as predicted, was biased in the direction of the \$22.50 cutoff. As Table 1 shows, only 40% of unsuccessful bidders had perfect recall of their bids. Of those with less than accurate memories, most recalled lower than actual bids – that is, amounts between their actual bid and the cutoff. The average bias for errors in this direction was \$7.70. For those who recalled higher than actual bids, the average bias in recall was \$6.70. Overall, recalled bid prices were significantly lower than actual bid prices by an average of \$2.38 ($t = -4.97$, $p < .001$).

It is plausible that social demand effects contributed to the bias in recall of bids for unsuccessful bidders. That is, these bidders may have wanted to appear more capable or knowledgeable by placing their bid closer to the acceptable range of bids, those under \$22.50. However, a similar argument could be made for successful bidders. That is, the savvy successful bidder would have received substantially more money for participation in the program by bidding as close to \$22.50 as possible without going over it. To the extent that the questionnaire invoked social demand effects, successful bidders might report bids higher than actual to appear more capable or knowledgeable. Such a bias in recall was not detected among successful bidders. Further, the likelihood of social demand effects was reduced because the cutoff bid amount was not referred to or provided in the survey.

Even if social demand effects were present among unsuccessful bidders, they do not preclude anchoring. For example, Plous (1989) found that likelihood estimates were affected by anchoring even after correction for social demand biases. We were unable to test for similar multivariate determination of bias.

4.2. *Recall of herd size*

In contrast to the results on bid prices, there was less difference between successful and unsuccessful bidders in the accuracy and reliability of recall for the size of the herds that were bid.

As Table 2 shows, compared to bid amounts, fewer farmers had perfect recall of the herd size they bid to terminate. Only

Table 2. Percent of bidders with perfect and imperfect recall of herd size

	Perfect recall	Recalled larger than actual herd	Recalled smaller than actual herd
Successful bidders (n = 369)	30	49	22
Unsuccessful bidders (n = 421)	10	57	33

30% of successful and 10% of unsuccessful bidders had perfect recall. In this regard, successful bidders were more accurate than unsuccessful bidders (chi-square = 52.39, $p < .001$), as predicted. Of those whose recall was not perfect, there was a tendency among both successful and unsuccessful bidders to recall larger herds. Successful bidders recalled an average of 3.17 more animals than recorded on their bids ($t = 2.68$, $p = .008$). Similarly, unsuccessful bidders recalled an average of 4.81 more animals in the herds they bid to terminate ($t = 2.30$, $p = .022$). The average absolute value of errors for successful bidders with inaccurate recall was about 13 animals; for unsuccessful bidders, 21. However, overall differences in errors between the two groups were not significant ($t = 0.65$, $p = 0.515$).

The less accurate recall of herd size, compared to bid amounts, for successful bidders adds support to our contention that bidders' responses reflect memories as opposed to record checks. The original bid form contained both pieces of information and farmers were required to document the slaughter or export of all their herd. If successful bidders were relying on their records to report bid amounts, they could just as easily have reported herd size with much higher accuracy.

Reliability of herd recall was very high for successful bidders and slightly lower for unsuccessful bidders: Pearson product moment correlation coefficients of .977 for successful bidders and .915 for unsuccessful bidders (difference in $r = .062$, Fisher's $z = 9.41$, $p < .001$).

5. Summary and Conclusion

Recall of bid prices was significantly biased in the direction of the cutoff for unsuccessful, but not successful, bidders. Unsuccessful bidders appeared to use the cutoff bid of $22.50 as a cognitive anchor or starting point, which they under-adjusted upwards, to reconstruct from memory the amount they bid. There was no evidence of an anchoring bias in bid price recall for successful bidders.

Other explanations for these results, such as social demand effects, are less easy to reconcile with the large effects we observed. In general, recall was more accurate for successful bidders, presumably due to enhanced availability of information in memory from increased opportunities for rehearsal, and perhaps its pleasantness.

These results demonstrate that theory and research findings in cognitive psychology can predict sources of measurement error in survey questions. Much more research is needed on the characteristics of survey situations in which cognitive theories, such as anchoring, hold. Such research could lead to better question writing and data interpretation among survey practitioners.

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