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Patricia A. Champ US Forest Service Rocky Mountain Research Station Fort Collins, CO <u>pchamp@fs.fed.us</u>

Rebecca Moore University of Wisconsin Department of Agricultural and Applied Economics Madison, WI reba_moore@yahoo.com

Richard C. Bishop University of Wisconsin Department of Agricultural and Applied Economics Madison, WI <u>bishop@aae.wisc.edu</u>

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Hypothetical Bias: The Mitigating Effects of Certainty Questions and Cheap Talk

I. Introduction

Studies comparing contingent values to actual payments consistently find that respondents report higher willingness to pay in a hypothetical payment situation than in an actual payment situation. Such results provide evidence of the existence of "hypothetical bias." One definition of hypothetical bias is "the potential error induced by not confronting the individual with an actual situation" (Schulze, d'Arge et al. 1981). While the existence of hypothetical bias has been confirmed in many studies, less attention has been focused on the nature and causes of hypothetical bias. Meta-analyses (List and Gallet 2001)(Little and Berrens 2003) have recently been conducted to investigate study design factors affecting hypothetical bias. List and Gallet found private good studies result in less hypothetical bias than studies in which public goods are valued. Likewise they found hypothetical bias to be larger in willingness to accept studies than willingness to pay studies. Certain elicitation methods were also found to affect hypothetical bias. Little and Berrens (2004) expanded the List and Gallet metaanalysis by adding many more studies and including variables for referendum formats, certainty corrections and cheap talk scripts. Little and Berrens found negative significant coefficient estimates on the referendum and certainty correction variables, suggesting that the use of the referendum format and a certainty correction reduce hypothetical bias. The use of a cheap talk script was found to reduce hypothetical bias in one of the four models estimated in this meta-analysis.

The two approaches to mitigating hypothetical bias explored in this paper are use of a follow-up certainty question and cheap talk. In the follow-up certainty question approach, study participants are asked to rate on a 10-point Likert scale (1=very uncertain and 10=very certain) how certain they are that they would actually pay (or not pay if they said *no* to the contingent donation question). Then information on reported levels of certainty is used to re-code responses to the willingness to donate question to provide an estimate of mean willingness to pay similar to the actual donation treatment. More importantly, the certainty scale information can be used to provide a pool of yes respondents to the contingent donation treatment that are not distinguishable from the individuals who actually made donations across a range of measures collected in the survey (attitudes, experience, demographic characteristics, etc.).

Cummings and Taylor (1999) were the first to implement cheap talk in the contingent valuation setting. They developed a script for laboratory experiments to encourage study participants to respond to the contingent valuation question as they would if they were making an actual financial decision. The script, that explicitly described the hypothetical bias problem, was read aloud to the study participants prior to completion of a contingent valuation question. The original script was quite long (see Cummings and Taylor 1999 for the substance of the script). The results of the Cummings and Taylor experiments were promising in that the contingent valuation treatment that included the cheap talk script provided responses that were similar to responses in the actual payment treatment. Since the original Cummings and Taylor study, several others have investigated the use of a cheap talk script. One of the unanswered questions is how long does the cheap talk script needs to be and what information needs to be provided. Implementing a cheap talk

script with a mail survey necessitates a shorter script. Lusk (2003) and Aadland and Caplan (2003) investigated the use of a cheap talk script with a mail survey. Lusk used a fairly long script while Aadland and Caplan used a much shorter script. In both studies, the cheap talk script was found to reduce hypothetical bias for some types of respondents. We build on these studies to develop a "medium" length cheap talk script in a mail survey.

We have been interested in the broader issue of hypothetical bias for a long time. We conducted our first study together in 1993 and Bishop's first actual/hypothetical comparison study dates back to the 1970's (Bishop and Heberlein 1979). Our previous research (Champ, Bishop et al. 1997; Champ and Bishop 2001) suggests that a small and potentially identifiable group of respondents to a contingent valuation survey are responsible for the observed hypothetical bias. We have conducted three field studies that allowed us to test for the existence of hypothetical bias and explore an approach to mitigate the bias. In this paper, we briefly summarize the findings from our first two studies and describe our most recent effort to compare different approaches to mitigating hypothetical bias.

II. Previous Studies

In all three studies summarized, we focused on public goods for which we expect a large part, if not all, of the total value to be derived from nonuse value. This type of value is of interest to us as it is the most contentious area in which contingent valuation is applied.

Removal of Roads on the North Rim of the Grand Canyon

The first study we conducted to investigate hypothetical bias was a study in which Wisconsin residents were asked about their willingness to donate to a program to remove old roads on the North Rim of the Grand Canvon so that the area could ultimately be designated as "wilderness." In this study, half the sample was asked in a mail survey about making a hypothetical donation and the other half of the sample was asked to actually donate. A dichotomous-choice format was used (details can be found in Brown et al. 1996 and Champ et al. 1997). In 1993, we collected standard dichotomous choice actual and hypothetical donation data. As shown on Table 1, the hypothetical bias was significant at all offer amounts and the estimated mean willingness to donate based on the contingent donations were over 6 times the mean willingness to donate based on the actual donation data. We conducted an elaborate investigation of the data in an attempt to understand which respondents were responsible for the observed hypothetical bias. When we could not successfully identify the individuals of interest, we decided to collect more contingent donation data in 1994 and directly ask respondents to the contingent donation question how certain they are that they would actually donate. We used a ten point likert scale with the endpoints labeled "very uncertain" for 1 and "very certain" for 10. As shown on Table 2, when we used the certainty scale to recode the affirmative responses to the contingent donation question, we found that coding only the individuals who said they were "very certain" (e.g. circled 10 on the certainty scale) as yes responses resulted in an estimate of mean willingness to donate that was statistically indistinguishable from the mean based on the actual donation data. While this approach was admittedly ad hoc, we were encouraged by the fact that comparing the individuals who actually donated to those individuals who said yes to the contingent donation

question and circled 10 (very certain) on the certainty scale suggested that those two groups of respondents were statistically similar across the wide range of measures we collected in the survey (attitudes, experience with the Grand Canyon, demographic characteristics). However, the results were limited by the fact that we could only make comparisons across two offer amounts (\$15 and \$50). Therefore we set out to conduct a more complete field experiment.

Wind Generated Electricity

In 1997 another opportunity arose for us to collect actual and contingent donation data for a public good. Madison Gas and Electric (MG&E), the gas and electricity utility serving Madison, Wisconsin, had an opportunity to buy a limited amount of wind generated electricity from a wind turbine in northeast Wisconsin. We were able to ask a random sample of MG&E customers about either a hypothetical or an actual purchase of wind generated electricity (see Champ and Bishop 2001 and Champ and Bishop 2004) for study details). This study allowed us to investigate the use of the certainty scale across seven offer amounts (Table 3). While there was evidence of significant hypothetical bias, the mean willingness to donate based on the actual payments was less than half the size of the mean contingent willingness to donate. In this study we found that respondents who said ves to the willingness to donate question and circled 8, 9 or 10 on the certainty scale were indistinguishable from the respondents who actually purchased the wind generated electricity across the broad range of measures collected in the survey. Likewise recoding the contingent donation data so that only the yes respondents who also circled 8, 9, or 10 on the certainty scale were counted a "yes" responses, provided an estimate of mean willingness to donate that was statistically

indistinguishable from the mean willingness to donate based on the actual donation data. We felt confident that our approach not only allowed us to eliminate the hypothetical bias, but also allowed for correct identification of the individuals responsible for the bias. However there were still many unanswered questions. We did not know enough about individuals that we think are responsible for the hypothetical bias. Nor did we know how the follow-up certainty scale compared to other approaches used to mitigate hypothetical bias.

III. Radio Collars for Whooping Cranes

In 2004 we conducted our third study to investigate hypothetical bias, specifically designed to address those questions left unanswered by the previous studies. In this most recent study we again chose a public good whose value is largely nonuse and one that is often the subject of CV studies, the protection of an endangered species. Whooping cranes are the most endangered crane species in the world; they are threatened primarily by the conversion of their wetland habitat into agricultural lands or urban development areas. Though once widespread, since the 1950's only one flock of whooping cranes has survived. The International Whooping Crane Recovery Team has been orchestrating efforts to ensure the survival of this species. As part of these efforts, a second flock of whooping cranes is being bred and introduced into the wild. Each year, whooping crane chicks are hatched in captivity and taught behaviors crucial to their survival in the wild. As whooping cranes are migratory birds, one important aspect of this program is teaching the young cranes how to make the 1,250 mile migration journey from northern Wisconsin to Florida. After being led to Florida by an ultralight aircraft their first year, the cranes are then able to make the return trip to Wisconsin unassisted the next spring. They will

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also continue the migration annually as a flock, without the assistance of an aircraft. However, in order to ensure the success of the program, radio transmitters are placed on the leg of each crane and used to monitor the birds during migration and throughout the year. If a bird becomes endangered or sick, scientists will intervene and rescue the bird. The first class of cranes, 18 birds, was hatched in the spring of 2001. Since then, a total of three classes of cranes have been successfully released in the wild and monitored with radio transmitters. The project will continue until the flock has grown to 125 cranes (approximately 10-25 years). At the time of our study, funding was needed to purchase radio transmitters for whooping crane chicks who were to be hatched in the spring of 2004. The transmitters cost around \$300 each, and while survey respondents were not told the cost of the transmitter, they were told that the transmitters could only be provided if there was not sufficient public support in the form of donations.

The Survey

In January 2004, a mail survey was distributed to a random sample of residents of Madison, Wisconsin. The sample was randomly split into three treatments: 1) an actual donation treatment (AD); 2) a contingent donation with follow-up certainty questions treatment (CD C); and 3) a contingent donation treatment with a cheap talk script (CD CT). Each person surveyed received a cover letter, a question and answer sheet, and a survey booklet. The beginning of the survey booklet described the endangered nature of the whooping cranes as well as the ongoing project to establish a second flock of whooping cranes and the role of radio transmitters in this project. A pretest confirmed that the description of the reintroduction project was clear and that many of those surveyed knew of the project before receiving our survey. This is not surprising given

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the proximity of the sample population to the Necedah National Wildlife Refuge where the cranes spend their summers (approximately 100 miles from Madison, WI to Necedah National Wildlife Refuge). Information about the reintroduction project has appeared in the local news from time to time, establishing the credibility of the good, and so also our survey, to the respondent. The willingness to donate question came after the description, and was followed by questions concerning previous knowledge of the reintroduction project, general attitudes towards the environment, and general socio-demographic information. Ten days after the survey packet was mailed, a reminder/thank you postcard was sent to all respondents. A second survey packet was sent to all nonrespondents two weeks after the postcard.

Five hundred five surveys were sent to each of the three treatments. All three treatments used a dichotomous choice question to ask for donations of a specific dollar amount to purchase radio transmitters for the whooping cranes. The five offer amounts used in each treatment were \$10, \$15, \$25, \$50, and \$100. The actual donation (AD) treatment gave the respondents the opportunity to donate a specified amount of money to purchase radio transmitters. Those who said yes were asked to include a check for the stated amount with their completed survey. The contingent donation with certainty Treatment (CD C) asked a contingent donation question that was immediately followed by a certainty question. As in the previous studies, this question asked the respondent to state on a 10-point scale how certain they were that they would actually send a donation if they had been asked to do so, or if they said no to the donation question, how certain they were that they would not make a donation. The endpoints of the scale were labeled with 1 being "Very Uncertain" and 10 being "Very Certain".

The contingent donation with cheap talk treatment (CD CT) included the same dichotomous choice question as the CD C treatment, but did not include the follow-up certainty question. However the donation question was preceded by a medium length cheap talk script (see Appendix A). This script explained to participants that studies have shown that it is difficult for many people to answer about a hypothetical situation as if it was real, and "often more individuals say they will make a donation in the hypothetical situation than when the situation is real". The script then asked respondents to try to avoid this problem and make sure they answer the contingent donation question as if they were being asked to make an actual donation. The three treatments differed only by the presence or absence of the cheap talk script, the certainty question, or the request for a check. The rest of the survey material, including the project description and other follow up questions were identical across treatments.

Results and Discussion

Table 4 shows the response rates for each of the three treatments. Overall, the response rate for the two hypothetical treatments (CD C and CD CT) was significantly higher than that of the actual treatment (AD). When broken down into the response rate for a given offer amount, it is clear that this difference persists for both high and low offer amounts. Significantly more responses were received from the CD C treatment than the AD treatment at \$15, \$25, and \$100, and also from the CD CT at \$10, \$15, and \$100. Not surprisingly, there was not a significant difference in the response rates for the CD C and CD CT treatments. In order to ensure that differences in WTP for the different treatments are not due to any sample selection bias that might be present, answers to several follow up questions were examined for differences in prior knowledge,

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environmental interest and demographic characteristics across treatments. From these comparisons it is clear that all respondents represent the same population. All treatments showed a similar level of prior knowledge about the whooping crane reintroduction project. Respondents were asked if they were aware of the reintroduction project, if they were aware of the International Crane Foundation¹ (ICF), and if they have ever visited the ICF. About the same proportion of respondents answered yes to each of these questions for each of the three treatments. Respondents of the three different treatments also had similar proportions of men and women, similar age, income, and education levels, as well a similar level of interest in the environment, as reported on a five point scale. It can be concluded that any difference in estimated WTP across groups is not generated by different sample selection process.

Since the main goal of this research is to explore different methods of mitigating hypothetical bias, it must be shown that hypothetical bias exists in this case. Table 5 shows the percentage of respondents who reported they would donate money (and in fact did donate in the AD treatment) to purchase radio transmitters broken down by treatment. Comparing columns two and four, it is evident that a significantly larger proportion of respondents answered YES to the CV question in the CD C treatment than the actual treatment for all offer amounts. This is consistent with the results of the previous studies. The last three columns Table 5 recode the CD C respondents so that only those respondents answering YES to the CV question and reporting certain levels of certainty were treated as YES respondents. For example, in the final column, those that said YES to the CV question but reported a certainty level below 9 were treated as if they said NO

¹ The ICF is one of the partners working with the International Whooping Crane Recovery Team and is headquartered 40 miles from Madison in Baraboo, WI.

to the CV question. The fifth and sixth columns consider those who responded positively to the contingent donation question and circled a certainty level greater than 8, and greater than 7, respectively. Comparing these recoded responses to those of the AD treatment allows us to explore how well the certainty question can identify the cause of the hypothetical bias. From our previous work it is unclear which level of certainty is the appropriate cutoff point for recoding the CV responses. The more certain we require YES respondents to be the lower the percent of ves respondents. Table 6 shows the frequencies of responses to the certainty question for those respondents who answered YES to the certainty question. These respondents all appear to be fairly certain of their answers, as only 9% circled 4 or lower. The mean is 7.4 and the median is 8, which are both well above the middle possible response of 5. Keeping this distribution in mind, we recoded the data in three different ways, using 7, 8, and 9 as cutoff certainty values. Using a certainty level of 8, the median certainty level, generates YES response rates most similar to those of the Actual Donation Treatment. In fact, the overall percent YES responses for the two groups are not significantly different, though for some offer amounts the difference is significant. These results are consistent with those of the earlier studies that showed that answers to a follow-up certainty question can help identify those responsible for the hypothetical bias.

Table 5 also shows the percent YES responses for the CD CT treatment. Overall, significantly more respondents said yes in this CD CT treatment than the AD treatment. When broken down by offer amount, however, the difference is only significant for the \$15 and \$100 amounts. The observations at the \$15 level seem to be the main source of the overall difference. These results support the findings of other studies that have shown

a cheap talk treatment helps mitigate hypothetical bias for some respondents; however we can not conclude in this case that it eliminates the bias completely.

As one of the goals of this research is to compare different methods of mitigating hypothetical bias, it is also useful to compare the percent YES responses for the CD C and CD CT treatments. As Table 5 shows, a higher proportion of yes responses to the CD C without recoding treatment than the CD CT for all offer amounts. The difference is significant for all but one of these amounts. This is clear evidence that the inclusion of a cheap talk script affects how a person responds to a CV question. The bigger question is whether or not the cheap talk and certainty treatments have the same effect. Comparing the CD CT results with the recoded certainty results, one can see that recoding the data from the CD C treatment generates percents that are very close to those from the CD CT treatment. This is true when using either 7 or 8 as the minimum certainty level of YES respondents. In both cases, there only offer amount where there is significant difference between the re-coded CD C and the CD CT treatment is \$25.

Another way of comparing the responses to the CD question is to compare the estimated mean WTP for each treatment. The mean WTP for the CD C treatment is over twice that of the AD treatment. When recoded, however, the mean WTP for certain respondents to the CD C treatment is significantly less than that of the standard CD C treatment, making it much closer to that of the AD group. Recoding the certainty groups with a certainty cutoff of 7 or 8 generates mean willingness to donate values that are indistinguishable from that of the Actual Donation group. The mean WTP for the CD CT group is only slightly higher, yet just outside the 95% confidence interval or the AD group. It is, however, indistinguishable from the estimates from the recoded certainty

groups. This indicates that both the cheap talk and certainty treatments successfully mitigate the hypothetical bias.

IV. Conclusion

This study has confirmed the findings or our previous work. Estimated willingness to donate values are significantly higher in a Contingent Donation question than an Actual Donation question. This bias can be mitigated through the use of a follow-up certainty question. In this study, as in the previous study, the willingness to donate of the group of respondents answering YES to the contingent donation question and reporting a certainty level of 8 or higher (on a scale of 1 to 10) is statistically identical to that of the Actual Donation group. This study has also shown that the cheap talk treatment can help to mitigate the hypothetical bias as well, although in this particular study, there is still a difference in the mean willingness to donate values for the CD CT treatment and the AD treatment. The CD CT treatment produced responses very similar to those of the recoded certainty group.

There are still unanswered questions that we would like to explore with the results of this study. In the previous studies, we found that while the demographic characteristics and attitudes of the YES respondents in the CD C treatment and AD treatment were significantly different, these differences disappeared when the certainty group was recoded so that only certain respondents were considered YES respondents. We are currently working to see if this same result holds in this study. This would further support the idea that the follow-up certainty question systematically identifies those respondents responsible for the hypothetical bias. We are also comparing the characteristics of the YES respondents in the CD CT treatment to those of the other

treatments, in order to see if this method also systematically identifies inconsistent respondents or if it lowers the percent of YES respondents randomly. Another issue we are currently working to address is the low sample size of this study. We have generated another sample of 1000 Madison residents from the same sampling frame. This group will be split into three treatment groups and will receive the same surveys as the earlier group. The additional data generated from this mailing will allow us to have more confidence in our willingness to donate estimates and in our comparison of responses across treatments.

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	Actual Donation (1993) n=333	Contingent Donation (1993) n=393
\$1	24%	53%
\$5	15%	51%
\$8	26%	39%
\$12	17%	48%
\$15	14%	39%
\$50 Estimated WTP	4% \$7	34% \$46
95% Conf. Interval	[5,21]	[26,271]

Table 1: Grand Canyon Road Removal Study. Percent "Yes" Responses toWillingness to Donate Question by Treatment and Offer Amount

	Actual Donation (1993)	Contingent Donation (1993)	Contingent Donation (1994)	Contingent Donation (1993+1994)	Contigent Donation with follow-up certainty scale ^a (1994)
					without recoding /recoding yes=10
\$1	24%	53%	*	53%	*
\$5	15%	51%	*	51%	*
\$8	25%	39%	*	39%	*
\$12	17%	48%	*	48%	*
\$15	13%	39%	54%	46%	60%/23%
\$50	4%	34%	19%	27%	36%/12%
\$75	*	*	31%	31%	34%/3%
\$100	*	*	19%	19%	*
\$150	*	*	18%	18%	*
\$200	*	*	28%	28%	*
Estimated WTP	\$9 [6, 24]	\$46 [26, 284]	\$89 [62,271]	\$79 [58, 128]	\$52/\$12 [36,140]/[7,20]

Table 2: Grand Canyon Road Removal Study. Percentage "Yes" Responses to Willingness to Donate Question by Treatment and Offer Amount

Offer Amount (Annual)	Actual Donation (N=649)	Contingent Donation (N=761)	Contingent Donation with recoding certainty ≥ 8
\$24	47%	61%	31%
\$48	36%	58%	29%
\$96	23%	50%	26%
\$144	18%	36%	20%
\$192	18%	35%	19%
\$240	16%	29%	20%
\$288	8%	31%	12%
Overall	24%	43%	
Mean Annual Willingness to Purchase Wind Power ²	\$59	\$101	\$52
95% confidence interval	[\$47, \$70]	[\$92, \$109]	[\$44, \$61]

Table 3: Wind Power Study. Percentage "Yes" Responses to Willingness to Donate Question by Treatment and Offer Amount

²These are lower bound non-parametric lower bound Turnbull estimates described in Haab and McConnell (2002).

Table 4: Rad	dio Collars for V	Whooping Cranes.	Response Rates by
Treatment ar	nd Offer Amour	nt.	

Offer Amount	Actual Donation	Contingent Donation with Cheap Talk	Contingent Donation with Certainty
\$10	33%	79%	39%
\$15	28%	35%	39%
\$25	24%	28%	37%
\$50	35%	31%	40%
\$100	24%	40%	37%
Overall	29%	36%	39%

Offer Amount	Actual Donation (N=139)	Contingent Donation with Cheap Talk (N=178)	Contingen t Donation with Certainty (N=188) without recoding	Contingent Donation with Certainty (N=188) with recoding(yes if 7 or more certain)	Contingent Donation with Certainty (N=188) with recoding(yes if 8 or more certain)	Contingent Donation with Certainty (N=188) with recoding(yes if 9 or more certain)
\$10	56%	50%	77%	53%	47%	30%
\$15	23%	48%	64%	48%	46%	30%
\$25	36%	47%	58%	39%	34%	22%
\$50	15%	20%	44%	24%	13%	4%
\$100	6%	16%	36%	21%	18%	14%
Total Overall	27%	37%	56%	37%	31%	20%
Mean Willingness to Donate ³	\$18.23	\$25.59	\$45.42	\$28.29	\$21.53	\$12.75
95% Confidence Interval	[11.37, 25.09]	[17.78, 33.40]	[35.60, 55.26]	[19.74, 36.84]	[13.65, 29.41]	[5.75, 29.41]

Table 5: Radio Collars for Whooping Cranes. Percentage "Yes" Responses to Willingness to Donate Question by Treatment and Offer Amount.

³ These are lower bound non-parametric Turnbull estimates described in Haab and McConnell (2002).

Certainty Level	Percent of respondents	
1- very uncertain	.3%	
2	1.5%	
3	1.2%	
4	1.5%	
5	13.1%	
6	12.2%	
7	17.7%	
8	23.5%	
9	9.8%	
10- very certain	19.0%	
Mean response	7.4	
Median response	8	

Table 6: Distribution of responses to certainty follow-up question

Appendix A: Cheap Talk Script

The Whooping Crane Reintroduction Program is a real program. However, as this is a research project, we are not asking you to make an actual donation. Nonetheless, we would like you to answer the following question as if this were an actual donation solicitation. Studies have shown that answering a question about a hypothetical donation as if the donation is for real is difficult for many people. We consistently find that more individuals say they will make a donation in the hypothetical situation than when the situation is real. One reason we think this happens is because when the donation is hypothetical, respondents might be thinking "Sure I'll donate, this is a worthy cause". But when the decision involves actually making a donation, respondents might think "do I really want to spend my money on this cause?" We ask that you try to avoid this problem and answer the following question as you would a solicitation for an actual donation.