AN ABSTRACT OF THE THESIS OF

Christian A. Vossler for the degree of Master of Science in Agricultural and Resource Economics presented on June 10, 1999. Title: A Nonexperimental Test of the Contingent Valuation Method: Comparing Hypothetical and Actual Voting Behavior.

Abstract approved: Redacted for Privacy

Stephen Polasky

This study compares the results of a contingent valuation (CV) mail survey and the voting outcome of a bond measure to fund improvements, through property tax increases, to a downtown park and adjacent riverbank in Corvallis, Oregon. In addition to asking survey respondents about their voting decision, respondents are presented with a dichotomous choice CV (DC-CV) question regarding the same project. The DC-CV question mimics a typical CV question, as it involves a random pricing structure and a hypothetical policy. However, the subject of the DC-CV question is the same as a known referendum. Responses to both valuation questions are nonbinding.

In this study, survey referendum responses closely match the actual voting outcome and willingness to pay (WTP) estimates based on survey referendum responses and precinct-level voting results are not statistically different. WTP based on DC-CV responses match WTP based on actual voting behavior only when the survey sample is restricted to respondents that face a random bid price that is close to the proposed tax increase. Otherwise, the WTP based on DC-CV responses is lower than WTP based on

voting behavior. A comparison of responses between the two valuation questions suggests that respondents made rational choices with regards to relative prices in the hypothetical scenario. Tangential CV issues, such as the treatment of "undecided" responses and detection of yea-saying in dichotomous choice responses are also explored.

A Nonexperimental Test of the Contingent Valuation Method: Comparing Hypothetical and Actual Voting Behavior

By

Christian A. Vossler

A Thesis Submitted

to

Oregon State University

In Partial Fulfillment of
the requirements for the
degree of

Master of Science

Presented June 10, 1999
Commencement June 2000

Master of Science thesis of Christian A. Vossler presented on June 10, 1999

Approved:

Redacted for Privacy

Major Professor, representing Agricultural and Resource Economics

Redacted for Privacy

Chair of Department of Agricultural and Resource Economics

Redacted for Privacy

Dean of Graduate School

I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

Redacted for Privacy

Christian A. Vossler, Author

Acknowledgements

First, I thank Steve Polasky and Joe Kerkvliet. They have helped me in countless ways and I believe I am a better applied economist and researcher because of their support. In particular, I thank Steve Polasky for being a great mentor and for giving me excellent guidance and motivation. I thank Joe Kerkvliet for helping me advance my knowledge and pursue my interests in nonmarket valuation. Without him, I either would not have finished this thesis on schedule or would have ended up doing research that I found less interesting.

I thank Rich Adams and Tom Chastain for serving on my thesis committee and for giving me helpful suggestions and comments on my research. I am indebted to Bill Boggess for securing the majority of my research funding. Also, Bill and the classified staff in the department have been extremely helpful and have made my academic endeavors easier.

I graciously acknowledge Jennifer Klebba for her excellent research assistance. She was instrumental in helping me pull off the extensive mail survey in such a short time span. Tim Rice made it possible for survey respondents to answer the questionnaire via the Internet. I also thank my fellow graduate students, in particular Brad Gentner and Leigh Kingsbury, for listening to me babble about this research and for giving me research ideas throughout my stint at OSU.

Finally, I owe eternal gratitude to my parents their perpetual support. Without them, I would not have such high aspirations and the ability and focus to realize them.

Table of Contents

List of Tables

A Nonexperimental Test of the Contingent Valuation Method:
Comparing Hypothetical and Actual Voting Behavior

I.   Introduction

Contingent valuation (CV) is a leading, but controversial, technique used for

estimating the nonmarket benefits of environmental goods and services. CV surveys ask

respondents what they are willing to pay for a well-defined (sometimes hypothetical)

policy scenario. CV welfare estimates are legally admissible in natural resource damage

assessment cases and numerous applications have informed policy makers. However, the

reliability of CV estimates is the subject of an ongoing, heated debate among economists,

government entities, businesses, lawyers, and environmental groups (Portney 1994). The

debate centers on whether individuals respond in a realistic manner to CV surveys, where

there are no direct financial consequences. For instance, will a respondent that indicates

she is willing to pay $40 for a program to prevent a future oil spill at Prince William

Sound, Alaska, actually pay this amount? Similarly, would she vote "yes" in a

referendum on the same program that, if passed, increases her taxes by $40?

The NOAA Panel on Contingent Valuation (Arrow et al. 1993), whose

recommendations have greatly influenced CV methodology, states that a CV survey

should be considered "a self-contained referendum in which respondents vote to tax

themselves for a particular purpose." In a real voting situation, individuals have the

incentive to simply vote their preferences (Moulin 1988). If CV respondents believe the

survey results will lead to implementation of a policy, influence a policy decision, or

behave as they would in a real voting situation, the correct incentives should remain

intact. However, there is some evidence that hypothetical referenda are not incentive

compatible (Cummings et al. 1997; Taylor 1998). Nevertheless, in the majority of applications since the Panel's report, the valuation question is presented as a referendum where the respondent is asked to cast a "yes" or "no" vote for a policy scenario at a randomly assigned price.

An emerging literature investigates the validity of CV by comparing hypothetical responses with actual behavior. This research can be grouped as: (1) comparisons of CV with indirect valuation methods based on observed behavior (Knetsch and Davis 1966; Brookshire et al. 1982; Loomis et al. 1991; Carson et al. 1996; Shabman and Stephenson 1996); (2) comparisons of CV responses with actual market transactions (Bishop and Heberlein 1979; Dickie et al. 1987; Cummings et al. 1995; Berrens and Adams 1998; List and Shogren 1998); (3) simulated market studies that compare one group presented with a hypothetical decision with another group presented with an analogous decision where money is actually exchanged (Kealy et al. 1990; Cummings et al. 1997; Champ et al. 1997; Taylor 1998); and (4) comparisons of hypothetical and actual voting behavior (Carson et al. 1986; Shabman and Stephenson 1996; Champ and Brown 1997; Vossler et al. 1999). While there are numerous applications of (1), (2), and (3), there are only four studies that compare CV responses and actual voting behavior.

Comparing CV responses with actual voting behavior is a straightforward and appealing way of externally validating CV. Each year, numerous referenda take place where voters decide whether to allocate funds (usually through tax increases) for the provision of public goods. Therefore, it should be possible to closely match a CV survey to an actual referendum and compare results. In contrast, other methods are subject to problems. Comparisons of CV with indirect methods are limited to situations where

nonuse values are negligible. Studies comparing CV and actual market transactions involve only private goods. Simulated market studies involving public goods are often sensitive to group size and are prone to free riding when voluntary payments are collected. Also, there is concern that behavior in a controlled, experimental setting may not mimic behavior in an analogous real situation. Studying voting behavior is valuable as it provides a way of actually observing what economic decisions individuals make regarding the provision of public goods and services in a nonexperimental setting.

This study compares the results of a CV survey and the November 1998 voting outcome of a $9.5 million bond measure to fund improvements to a downtown park and adjacent riverbank in Corvallis, Oregon. In the survey, respondents are asked to vote on the bond measure (hereafter referred to as the survey referendum). In addition, respondents are asked if they are willing to pay a randomly assigned price, payable through a fee added to their utility bill, for the same project (hereafter referred to as the DC-CV question). This valuation question is typical of dichotomous choice CV (DC-CV) questions. In addition to comparing survey responses and the voting outcome, survey based willingness to pay (WTP) estimates are compared to WTP estimated with precinct-level election results. Moreover, data from the survey provide a means to directly test for yea-saying bias and explore the treatment of "undecided" responses.

The next section of the paper reviews existing comparisons of CV responses and actual voting behavior. Section III discusses methodology. Sections IV and V describe the riverfront improvement referendum and the survey instrument, respectively. Section VI compares survey responses and the voting outcome. This section includes several tests to determine if individuals were likely to have made the same voting decision in the

survey as in the election. Welfare estimates based on survey referendum responses, DC-CV responses, and actual voting behavior are calculated and compared in Section VII and Section VIII. Section IX provides concluding remarks and suggestions for future research.

II.   Review of Existing Research

Four studies have compared survey responses with actual voting behavior. Carson et al. (1986) compared telephone surveys and the voting outcome for a 1984 California water bond issue. They found that the survey is a good predictor of the vote only when approximately 60% of "undecided" responses are treated as "no" votes. They do not distinguish between voting and non-voting respondents, giving rise to bias if the preferences of voters and nonvoters differed. Respondents were less likely to give an "undecided" response after informed of the approximate costs upon passage of the referendum.

Shabman and Stephenson (1996) compared personal interview CV responses and the voting outcome of a Roanoke, Virginia, referendum on a $7.5 million flood protection bond issue. Eighteen months before the referendum, respondents were asked their WTP using a payment card approach. The study compared the number of respondents stating a positive WTP and the proportion of voters that approved the measure. Of 28 respondents that voted in the referendum, 10 stated a positive WTP and 14 either protested the WTP question or were uncertain of their WTP. The researchers concluded that hypothetical and actual behavior did not match. However, hypothetical responses match voting behavior if the majority of uncertain and protest respondents voted "no" in the election.

Champ and Brown (1997) compared telephone CV responses with a referendum that allowed Fort Collins, Colorado, to retain $764,000 in surplus revenue to use for road maintenance. They found that contingent and actual voting proportions match if all "undecided" responses are treated as "no." However, when presented with information on the proposed refund if the referendum failed, a statistically greater number of

respondents indicated that they would vote "yes." This suggests that the typical voter was not well informed of the details of the referendum.

Vossler et al. (1999) compared telephone CV responses with the voting outcome for a Corvallis, Oregon, referendum to purchase open space. They find that survey responses matched the voting outcome only when the majority of "undecided" responses (80 to 95%) are coded as "no." Using available resources, they found that the sample of survey respondents that voted in the referendum was characteristic of the voting population. In an investigation of the disparity, they stated that voters may have changed their minds in-between the survey and election or may have engaged in yea-saying. These hypotheses could not be tested with the survey data. The other cited studies did not attempt to explain or test for potential discrepancies between survey and actual voting behavior. Vossler et al. take the next step in validation and compare WTP functions based on survey responses and actual voting behavior. Estimated WTP from survey and election results are not statistically different when "undecided" responses are treated as "no." This gave additional evidence that "undecided" respondents may have voted "no."

This study differs from previous research in that systematic differences between survey and election response behavior, as identified in Vossler et al., are explicitly tested. In addition, a DC-CV question on a hypothetical policy scenario is presented to respondents. This allows us to compare hypothetical responses for a real and a hypothetical policy for a public good. Finally, this study utilizes a mail survey, in contrast to previous studies that use in-person or telephone surveys. Personal interviews and telephone surveys may be prone to response biases. For instance, respondents may give a "yes" response if they feel the interviewer supports the policy. Filling out a mail

survey is cognitively similar to filling out a ballot and so differences in elicitation formats can be avoided.

III.   Methodology

In typical CV applications, respondents are presented with a stylized, unannounced policy scenario that most likely will never be voted on by the public. Respondents obtain much information about the good in question from the framing of the scenario. Even those familiar with the good are unlikely to have thought about what they are willing to pay for it nor believed that they would be asked to pay for it. CV responses may not accurately reflect preferences if the good and scenario are not well defined or if the payment mechanism is not realistic. Moreover, respondents may infer economic values from the wording of the scenario or may make an untruthful decision due to interviewer or other social pressures.

Comparing survey referendum responses with the actual voting outcome is the first step in using voting behavior to externally validate CV. This comparison does not fully capture the distinction between the stylized, unannounced decision posed in CV questionnaires and a socially sanctioned voting decision. Instead, it captures the weaker difference between hypothetical responses for a known referendum and actual voting behavior – the difference between the intent to do something and doing it. In this situation, many potential biases inherent to CV are absent, allowing us to concentrate on whether individuals make the same economic decisions in a non-binding medium as they do in a situation where there are real financial implications. Vossler et al. state "(that) if decisions do differ here, it is highly unlikely that the more elaborate CV scenarios can reveal economic values; tangential issues about CV design and conduct are largely moot."

In addition to the survey referendum, respondents face a DC-CV question that asks if they are willing to pay a randomly assigned price, payable through a monthly fee in their utility bill, for the riverfront improvement project. It is assumed that payment via higher property taxes is equally as (un)desirable as payment via the utility bill. As in the actual referendum, respondents are told that majority approval will lead to implementation of this policy. This valuation question is much like a state-of-the-art CV question, where respondents make a voting decision on a hypothetical policy based on a randomly assigned price. Here, the policy scenario is hypothetical in the sense that uses a hypothetical payment vehicle and a randomly assigned price. However, the subject of the DC-CV question is that of a known future vote and so does not fully capture the distinction between responses to a fanciful CV valuation question and economic behavior.

IV.   Riverfront Park Ballot Measure in Corvallis, Oregon

The Riverfront Commemorative Park occupies a 10-block stretch of the Willamette River in downtown Corvallis, Oregon. The existing park is a narrow corridor of vegetation with a walkway in the middle. A run-down plaza is located in the center and some benches and historic markers are found along the pathway. A slide a few years ago undermined a portion of the park's pathway, bringing attention to the eroding riverbank. The riverbank is eroding at a rate of one foot every three years, according to city officials. Some feel that the park has languished too long (Riverfront Revitalization Committee 1998).

In response to the deteriorating conditions, the mayor formed the Riverfront Revitalization Committee, and charged it to develop a comprehensive restoration plan. The Committee worked more than six years, and asked hundreds of local citizens for their suggestions about riverfront development. This work, in coordination with the City Council, resulted in a $13.1 million plan (Riverfront Commission 1997) to fund riverbank stabilization and improvements to Riverfront Commemorative Park. Proposed park improvements included three major plazas, a multi-modal path, lighting, street improvements, and surface parking. The plan called for the use of stone and vegetation to restore the riverbank and provide enhanced riparian and aquatic habitat.

In November 1998, Corvallis voters faced a referendum on whether to raise $9.5 million, over the next 20 years, through additional property taxes to implement the plan approved by the City Council. The additional cost over what would be financed by the bond measure would come from city funds and state and local grants. The estimated maximum annual tax rate for the bonds was $31.47 per $100,000 of assessed property

value. The timing of the measure was such that it coincided with the city's plan to build an underground pipeline to keep raw sewage from overflowing into the river during rainstorms, as mandated by the state Department of Environmental Quality. This pipeline requires the street adjacent to the park to be torn up. Passage of the referendum would allow riverfront improvements to take place at the same time, reducing total construction time and costs.

V.   Riverfront Park Survey and Description of Data

A. Survey Sample

Two and a half weeks before the November election, a random sample of 1200

Corvallis (adult) residents were sent mail questionnaires.[1] The mail format was chosen

because the process of filling out a survey is similar to filling out a ballot. In addition,

respondents are more likely to give truthful answers to sensitive questions in mail surveys

relative to telephone or in-person surveys (Dillman 1978). Using a modified Dillman

(1978) approach, a follow-up postcard was sent 5 days after the original mailing and a

follow-up survey was sent 5 days later if the original survey was not returned. Returned

surveys postmarked after election day were considered nonresponses and not included in

subsequent analyses.

In addition to filling out the mail survey, respondents were given the option of

completing an analogous survey over the World Wide Web. This survey option was

given to potentially increase the response rate and provide, perhaps, an easier way to

participate. However, less than 4% of the survey respondents used the web format. Most

of these respondents stated that they would have participated in the survey regardless.

Ninety-five surveys were returned as undeliverable. Attempts to contact these

residents by telephone were made before the election. However, most of the listed

numbers were disconnected or the targeted resident was no longer at that number. Out of

26 working (and correct) numbers, 15 telephone surveys were conducted where the

respondent was given the mail survey they were supposed to have received, verbatim.

Phone survey refusals were treated as survey nonresponses.

---

[1] We purchased the sample of names, addresses, and phone numbers from Survey Sampling, Inc.

Six hundred and eighty completed surveys were returned. After deleting undeliverables, targeted residents who no longer lived in Corvallis, and deceased addressees, this corresponds to a 72.3% response rate. Although this response rate is high for a CV mail survey, any potential selection bias needs to be accounted for in order to make credible comparisons between survey and election results. To help test for nonresponse bias, a telephone survey was conducted of all nonrespondents who did not outright refuse the prior mail or telephone survey. Phone numbers were dialed up to three times to get a response. Out of 150 contacts made, 97 completed surveys were obtained. This follow-up survey included only the ballot question and a few demographic questions. These follow-up surveys were conducted after the election and so were not used in the formal analysis, other than to test for selection bias.

B. Survey Overview

In the survey, respondents were first given the exact wording of the ballot measure. Then, information on the proposed property tax increases was presented.[2] The respondent was then asked, if she were voting that day, how she would vote. Depending on the survey version, the respondent was asked to: (1) vote "yes" or "no"; (2) vote "yes," "no," or "undecided/not sure"; or (3) state, on a scale of 1 to 10, her probability of voting "yes." The respondent was asked to indicate her reason(s) for the voting decision. The respondent was then asked about her visitation to the riverfront area and local parks, and the importance of stabilizing the riverbank adjacent to the downtown area.

---

[2] A subsample of survey respondents were not given the tax price information. Comprehensive analysis concluded that the cost information had little, or no, effect on the respondent's voting decision. This is not surprising since this issue was well publicized and the subject of a long-running outreach effort.

In the next section of the survey, homeowners were asked their tax assessed property value and renters were asked their monthly rental payment. Renters were also asked what affect the proposed tax increase was likely to have on their monthly rental rate. This expected rental rate increase likely influenced the renter's voting decision. Homeowners and renters were then presented with a DC-CV question. The respondent was asked if she was willing to pay a randomly assigned dollar amount per year, payable through a fee included in her utility bill, to fund the same project proposed in the ballot measure. The random bid was uniformly distributed and ranged from $0 to $120, in $10 intervals. Depending on the survey version, the respondent may or may not have been given an "undecided/not sure" voting option. The different survey referendum treatments were crossed with the DC-CV response treatments. This means that a respondent, given an explicit "undecided/not sure" voting option, may or may not have had the same option on the DC-CV question. In the concluding section of the survey, respondents were asked demographic questions regarding their voting status, household size, age, gender, educational background, income, and employment. A copy of the survey instrument is included as an Appendix.

C. Other Data

Other information was gathered on respondents and the voting population of Corvallis. Precinct level election results were obtained from the Benton County Elections Office. Using a database of registered voters from the same office, it was determined which respondents were registered to vote and who actually voted in the November 1998

election.[3] This database also included information on the age and gender of registered voters. Addresses were used to calculate the distance between the respondent's residence and the center of Riverfront Commemorative Park. A few survey respondents did not indicate their assessed property values. This information was obtained from the Benton County Elections Office.

---

[3] This information was also gathered in the survey. Only 3 individuals gave misleading voting status information.

VI.   Comparing Survey Responses with Referendum Results

It is important to determine if an individual makes the same economic decision in the survey as in the election. Vossler et al. (1999) identify possible reasons why an individual responds differently in the survey than in the election. First, a respondent may change her mind in-between the time of the survey and the referendum. Second, a respondent may be "undecided" in the survey and vote "no" in the election. Third, a survey respondent may vote "yes" in the survey, due to social pressures, and vote "no" in the election (i.e., the respondent may engage in yea-saying). In order to test for differences between survey and voting behavior, other potential differences, such as between the survey sample and the voting population (due to selection bias), must be ruled out. After testing for response differences, aggregate survey and referendum vote proportions are compared.

A. Nonresponse Bias

The telephone survey of nonrespondents allows comparisons between survey respondents and nonrespondents. More importantly, data from the Benton County Elections Office allow comparisons of demographic variants between verified survey voters and the entire population of referendum voters. The first four rows of Table 1 compare the percentage of registered voters, mean income, percentage of college degree recipients, and the mean household size for respondents and nonrespondents. A one-sample t-test strongly rejects the hypothesis that the percentage of registered voters is the same in the two samples, indicating that registered voters were more likely to participate in the survey. The last three rows of Table 1 compare the percentage of females, mean

property value, and mean age for the sample of survey respondents who voted in the election and the population of referendum voters. The mean property value for the referendum voter population was estimated using a sample of 250 values obtained from the Benton County Assessors Office. Simple t-tests indicate that the survey and population parameters are not statistically different at the 5% level.

B. Time Trends in Survey Referendum Responses

Some respondents may indicate their true preferences in the survey, but vote differently in the election after obtaining new information. Magelby (1989, p. 108) reports that in approximately 3 out of 4 referenda the proportion of "yes" responses fall and the proportion of "no" responses rise as the election draws near. Completed surveys used here are postmarked between October 19th and November 3rd (Election Day). To test for trends in voting behavior, the respondent's voting choice is regressed on indicator variables corresponding to the postmarked date of the returned survey as well as demographic variables. A likelihood ratio test fails to reject the hypothesis that the time indicator variables are all equal to zero, suggesting that day-to-day voting preferences did not change. Including only one time trend variable corresponding to the number of days between the survey and the election indicates a positive, but statistically insignificant correlation. Other various arbitrary time groupings of respondents yield similar results, suggesting that it is unlikely that respondents changed their voting preferences between the survey and the election.

Table 1. Comparison of Selected Survey and Voting Population Statistics

	Survey Respondents	Survey Nonrespondents	Survey Respondents (Actual Voters)	Corvallis Referendum Voters	t-test statistic (p-value)
% Registered Voters	81.80	33.59			9.45[a] (0.000)
Income (mean)	49.69	42.58	48.57		1.72[a] (0.089)
% College Degree	59.20	52.86	60.38		1.20[a] (0.233)
Household Size	2.32	2.12	2.29		1.45[a] (0.150)
% female	51.24	50.23	49.29	51.20	-0.90[b] (0.369)
Homeowner Property Value (mean)	$156,471	$138,578	$156,268	$151,158[c]	1.17[b] (0.243)
Age (mean)	50.43	41.56	50.23	48.78	1.73[b] (0.084)

[a]Test of null hypothesis: $\beta_{\text{survey respondents}} = \beta_{\text{survey nonrespondents}}$
[b]Test of null hypothesis: $\beta_{\text{survey respondents (actual voters)}} = \beta_{\text{Corvallis referendum voters}}$
[c]Based on random sample of 250 homeowners.

C. Treatment of "Undecided" Responses

A substantial literature deals with the interpretation and treatment of "undecided" survey responses (Magelby 1989; Harrison and Kristöm 1995; Wang 1997; Haener and Adamowicz 1998). More importantly, existing comparisons of CV survey results and referendum outcomes are sensitive to how "undecided" responses are treated (Carson et al. 1986; Shabman and Stephenson 1996; Champ and Brown 1997; and Vossler et al. 1999).

To gain insight into how "undecided" respondents were likely to vote, different question treatments were used. Approximately 30% of respondents were offered an explicit "undecided/not sure" voting response in both the survey referendum and the DC-CV question, 15% were offered this option in the survey referendum, 15% were offered this option on the DC-CV question only, and 40% of respondents were not offered this option to either valuation question. The first two rows of Table 2 presents a breakdown of survey referendum responses according to these treatments. Approximately 50% of the "undecided" responses need to be treated as "yes" and "no," respectively, in order for the vote proportions to match between the sample not given the "undecided" option and the sample given this explicit option.

Ninety survey respondents chose the "undecided" option to either the survey referendum or the DC-CV question, but not both. Table 3 presents a breakdown of the voting choices of these respondents. In answering both questions, individuals face two different prices – the tax consequences in the survey referendum and a randomly chosen price in the DC-CV question. Both valuation questions involve the same riverfront improvement project and may have similarly (un)desirable payment mechanisms.

A respondent's "yes" or "no" answer to one valuation question can be used to infer an answer to the other question.[4] Respondents rationally voting "yes" to the scenario at a given price should be willing to pay for the same good at any lower price. Respondents voting "no" to a given price should be unwilling to pay any higher price. Facing similar prices for the same good, respondents should make the same economic decision. Using this basic intuition, the rows 2 through 5 in Table 3 present a reclassification of "undecided" responses as "yes" and "no" responses. The reclassification suggests that approximately 50% of "undecided" responses should be treated as "yes" votes.

From the statistical evidence, both on the aggregate and individual response levels, "undecided" responses should be split evenly between "yes" and "no" responses *in this study*. Unlike previous studies, treating a majority of "undecided" responses as "no" is not needed for survey and election results to match. This difference may be attributable to using the mail survey format, since previous studies used telephone surveys or in-person interviews. It is plausible that telephone or in-person interview respondents may hide their negative opinions on publicly spirited issues by giving an arbitrary "undecided" response. Dillman (1978) suggests that respondents are more likely to give truthful answers to sensitive questions in a mail survey. In addition, respondents have more time to complete a mail survey. It is likely that some respondents give "undecided" responses when asked to make an on-the-spot decision they are uncertain or unclear about. In this study, an "undecided" response option should not have been

---

[4] This requires that respondents, in general, did not have a preference for one payment method over the other. This assumption is validated later in this paper.

offered as it did nothing more than allow respondents to hide their true (defined) preferences, whether they were for or against the ballot question. No respondent wrote in an "undecided" or "not sure" response. As shown in Table 2, offering an "undecided" voting option had little effect on nonresponse.

Table 2. Numerical Breakdown of Survey Responses to Ballot Measure

Survey Subsample	N	"Yes"	"No"	Under Votes (nonresponses)	"Undecided"	Percent "Yes", Excluding "Undecided" and Under Votes
No "undecided" option offered:	166	89 (53.6%)	66 (39.8%)	11 (6.6%)		57.42
Voters Only:	128	68 (53.1%)	51 (39.8%)	9 (7.0%)		57.14
"Undecided" option offered:	288	130 (45.1%)	94 (32.6%)	15 (5.2%)	49 (17.0%)	58.04
Voters Only:	224	102 (45.5%)	75 (33.5%)	13 (5.8%)	34 (15.2%)	58.19
Interval response format:[a]	226	120 (53.1%)	97 (42.9%)	9 (4.0%)		56.22
Voters Only:	146	78 (53.4%)	62 (42.5%)	6 (4.1%)		55.71

[a]Interval responses of 8 and higher are coded as "yes" responses.

Table 3. Analysis of "Undecided" Responses

	Respondents "undecided" on ballot question only	Respondents "undecided" on DC-CV question only
Number of Observations	37	53
"Yes" responses to higher priced scenario	5	7
"Yes" responses to similarly priced scenario[a]	2	3
"No" responses to lower priced scenario	7	8
"No" responses to similarly priced scenario	1	1
Percent quasi-"yes" responses[b]	46.67	52.63
"Yes" responses to distinctly lower priced scenario	9	19
"No" responses to distinctly higher priced scenario	13	7
Nonresponses to other valuation question	0	8

[a]A similar price scenario is where the tax price and the bid price the respondent is presented with are within $10. A distinct price scenario is where the tax price and the bid price are more than $10 apart.
[b]The numbers in rows 2 and 3 are taken to be quasi-"yes" responses, while the numbers in rows 4 and 5 are quasi- "no" responses.

D. Interval Response Approach to Contingent Valuation

Respondents may feel social pressure to give positive responses to DC-CV

questions when the object of valuation is a publicly desirable good or service (Arrow et

al. 1993). Recently, research has been conducted on detecting and quantifying the affects

of social desirability bias, or yea-saying, in survey responses (Kanninen 1995; Holmes

and Kramer 1995; Berrens et al. 1997; Boyle et al. 1998). In this study there may be a

fraction of respondents who say "yes" in the survey but actually vote "no" in the

referendum simply because they feel that saying "yes" is more civic minded. Aside from skewing survey voting results, yea-saying upwardly biases WTP estimates.

Recent studies used either a randomized response format (RRF) or a series of socially sensitive questions to develop an index on which to gauge yea-saying. The RRF is a lottery in which the respondent has a probability of being asked to give a false, randomly generated answer (Smithson and Weaver 1993). In RRF DC-CV applications, the researcher instructs respondents to give an answer to either a CV question or an unrelated question, based on specified respondent-sensitive criteria. Since the researcher only knows the probability that the respondent answered the CV question, the respondent is given heightened confidentiality. Statistical techniques can be used to detect yea-saying (see Berrens et al. 1997), although this question format introduces a considerable amount of 'noise' in analyzing the question of concern. The method of generating a social index measure requires asking respondents many questions that are unrelated to the focus of the survey. This most likely leads to lower response rates and a higher percentage of respondents not taking the survey seriously – both are detrimental to CV practices.

Another technique available for detecting yea-saying is the interval response format (IRF) (Gardenfors and Sahlin 1982; Einhorn and Hogarth 1985; Kahn and Sarin 1988; Smithson and Weaver 1993). This method permits the respondent to give a vague response to a question by, for example, placing her response on a scale divided into fixed numerical intervals. Smithson and Weaver (1993) compared the IRF with the RRF in a survey of socially sensitive questions. Respondents in their study preferred the IRF to the

RRF because they felt it was privacy-enhancing and that there was more incentive to give an untruthful answer to RRF questions.

CV practitioners have used a type of interval response approach where the respondent is asked to give an answer based on their level of response certainty, referred to as the multiple-bounded approach (Ready et al. 1995; Loomis and Ekstrand 1997; Welsh and Poe 1998). For instance, Welsh and Poe asked respondents to choose from response categories of "definitely no", "probably no", "not sure", "probably yes", and "definitely yes" for a range of bid amounts. Others, such as Champ et al. (1997), asked for a referendum-type response and then asked respondents about their level of response certainty. The application of the interval response approach in this paper is the first that is explicitly designed and implemented to test for yea-saying in DC-CV questions.

In the survey, approximately one-third of survey respondents, after given the wording of the ballot measure, were asked the following:

If you were voting on this ballot question today, how likely would you be to vote YES? (Note: it does not matter if you are a registered voter)

DEFINITELY 1 2 3 4 5 6 7 8 9 10 DEFINITELY
VOTE NO   VOTE YES

Respondents given this question format were able to give vague responses, likely enhancing perceived privacy. A choice of 0 was not offered so that respondents were not able to pick an ambiguous observation in the dead center of the response distribution. The vast majority of IRF respondents (65.4%) gave extreme response values (1, 2, 9, and 10), while only 9.7% of respondents gave answers of 5 or 6. This suggests that respondents had defined preferences and little desire to give ambiguous responses. As shown in

Table 2, the percentage of question nonresponse is lowest in the IRF. When responses of 6 and higher, 7 and higher, or 8 and higher are treated as "yes" responses, the proportion of IRF "yes" responses is not statistically different than the proportion of "yes" survey responses for the sample not given the "undecided" option.

If respondents were more likely to give a truthful answer in the IRF, comparing interval and dichotomous responses allows us to detect yea-saying. For instance, a respondent against the measure may be inclined to vote "yes" in the dichotomous response format (DRF). This same respondent is less likely to state a 9 or 10 in the IRF, since she is not asked to take an extreme position, and may feel that the IRF answer is more confidential. Instead, she may only shade her response slightly (if at all) and state, say, a 3 or 4. If there are systematic differences in voting responses between the two question formats, it is likely that these differences are attributable to yea-saying. A caveat in this approach is that differences, if any, may also reflect respondent uncertainty.

A construct validity test is used to detect yea-saying. Separate probit models are estimated for the sample of IRF respondents and the sample of DRF respondents.[5] The dependent variable in the IRF model takes on values of 0 through 1, and takes on discrete values of 0 ("no") and 1 ("yes") in the DRF model.[6] Explanatory variables are those used in the WTP models described below. If there are systematic differences in stated preferences, this should be evident by comparing the estimated parameters across models. A likelihood ratio test is used to test the null hypothesis that the estimated coefficients are

---

[5] The estimation results from the IRF and DRF are omitted for brevity.

[6] The 1 to 10 interval responses were transformed to 0 to 1 responses, so that extreme high and low values matched the discrete choice coding of 0 and 1.

the same for the IRF and DRF models.[7] The test statistic of 6.60 (distributed χ^2, df=10) fails to reject this hypothesis (p=0.475).

Survey respondent comments also indicated that yea-saying is not a large issue in this study. Many respondents were very articulate about their negative opinions towards the bond measure. In addition, answers to the follow-up question to the referendum indicated that respondents have valid reasons for their voting choices. This information, as well as the construct validity test, suggests that respondents are unlikely to have engaged in a significant degree of yea-saying.

In the pooled model (both DRF and IRF respondents), coding interval responses of 8 and higher result in the best model fit. This treatment is used in the remainder of the paper. Similar statistical results are obtained when interval responses of six and higher or seven and higher are coded as "yes" votes.

E. Comparison of Survey and Election Vote Proportions

Table 4 presents election and survey referendum results. "Undecided" and interval responses are coded based on the statistical evidence presented above. Corvallis voters approved the bond measure by a vote of 8,902 (56.41%) "yes" to 6,879 (43.59%) "no." Just over 5% of voters failed to vote either "yes" or "no" (under votes) or voted both "yes" and "no" (over votes) in the election. Using either the entire survey sample (56.43% "yes") or those respondents who verifiably voted in the election (56.38% "yes"), survey results mimic the referendum outcome in terms of the percentage of "yes" and "no" responses. Equally notable is that the percentage of survey respondents that did not

---

[7] $-2(\text{Log } L_{DCF,R} - \text{Log } L_{DCF,U}) = 6.60$, where R and U denote restricted and unrestricted model log-likelihood values for the DCF model. In the restricted model, DCF parameters are forced to be equal to the

answer this question, but completed the rest of the survey (item nonrespondents) is only slightly higher than the percentage of under/over referendum voters. The 95% confidence intervals indicate that survey and referendum proportions are not statistically different in terms of both the proportion of "yes" and "under/over" responses.

IRF model parameters.

Table 4. Comparing Survey and Referendum Results

	Number of "Yes" or "No" Responses	"Yes"	"No"	Percent "Yes"	Under/Over Votes[a]	Percent Under/Over Votes
Referendum Vote	15781	8902	6879	56.41	840	5.05
Total Survey Sample	645	364	281	56.43 (52.60, 60.26)	35	5.15 (3.49, 6.81)
Actual Voters, Survey Sample	470	265	205	56.38 (51.89, 60.87)	28	5.62 (3.63, 7.61)

Note: 95% confidence intervals are in parenthesis.
[a]An under vote is when a respondent did not vote "yes" or "no". An over vote is when a respondent voted both "yes" and "no". The percentage of under/over votes is based on the total number of election or survey participants.

VII. Comparing Survey WTP with Actual Behavior WTP

A. Survey Referendum Model

The external validation of CV requires more than response proportions matching, it requires that welfare estimates using survey data coincide with estimates based on actual behavior. In making a voting decision, voters face individual (household) prices for the Riverfront Park project. Namely, homeowners have to pay additional property taxes and renters (may expect that they) have to pay higher rental rates if the majority of voters approve the measure. Formally, a voter casts a "yes" vote if

(1) $e(R_0, U_0; s) - e(R_1, U_0; s) \geq t$

and votes "no" otherwise.[8] R_0 and R_1 represent the state of the riverfront area before and after the passage of the referendum, respectively; t is the financial consequences of the bond measure to the individual; U_0 is the status-quo level of utility; s is a vector of socioeconomic variables; and $e(\cdot)$ denotes an expenditure function. Intuitively, a "yes" vote is cast when the individual's WTP for the riverfront area improvement is greater than (or at least equal to) the additional tax or rental payment, holding utility constant. The exact specification of the expenditure difference is known only to the individual. To the researcher, the individual's WTP function is known up to a random component such that the probability of a "yes" vote is

(2) $\Pr[e(R_0, U_0; s) - e(R_1, U_0; s) - t > \varepsilon]$

---

[8] Alternatively, the random utility approach developed by Hanemann (1984) can be used to estimate compensating surplus.

where ε is the unobserved random component of WTP. In this study, the error term is assumed to be normally distributed.[9] The probit model is used to estimate a WTP function and associated mean WTP, following Cameron and James (1987).

The probit WTP response function has a dependent variable equal to one for a "yes" vote in the survey referendum and zero for a "no" vote. The tax price or rental rate increase is not independent of the household, unlike in CV surveys where respondents are assigned a random price. The tax price that the household faces is likely correlated with income, household size, and education. Also, a respondent is likely to base her decision on current and future use of the downtown riverfront area. Table 5 describes the explanatory variables used in the probit analysis.

While the homeowner faces a tax increase proportionate to their assessed house, the financial consequences to renters is not known with certainty. Renters may or may not expect that their rental rate will increase if the measure is passed. The perceived monetary consequence of the bond measure is likely to influence the renter's voting decision. In the survey, renters indicate what rental rate increase they expecte, if any. This perceived rental increase is taken to be the true "price" a renter faces for the riverfront project.

There are likely to be systematic differences between the voting preferences of homeowners and renters. Separate WTP functions are estimated for homeowners and renters, as well as a pooled model that controls for renters through an indicator variable. A likelihood ratio (LR) test fails to reject the hypothesis (p=0.346) that the parameter

---

[9] A logistic, lognormal, or Weibull distribution, among others, could alternatively be assumed for the errors. The probit functional form leads to the best overall model fit in this application. Alternatively, one can use a nonparametric estimator such as those developed by Turnbull (1976) and Kristöm (1990).

Table 5. Explanatory Variables for the Model of Willingness to Pay

Variable Name	Description
Tax Amount	Estimated annual increase in respondent's property taxes or rental rate, given the passage of the referendum; the midpoint of the category chosen by the respondent is used
Stabilization	The respondent's rating of the importance of riverbank stabilization on a scale of 1 to 5 with 5 being "very important"
Riverfront Visit	a dummy variable that equals one if the respondent visits the riverfront area of downtown Corvallis at least once a month on average
Change Visit	a dummy variable that equals one if the respondent indicates that she plans to increase riverfront area visits at least once a month, upon the passage of the referendum
College Degree	a dummy variable that equals one if the respondent has a bachelor's degree
Downtown	a dummy variable that equals one if the respondent is employed in downtown Corvallis
Child	a dummy variable that equals one if there is at least one person younger than 18 years old living in the household
Income	Household income (in thousands of $); the midpoint of the category chosen by the respondent is used
Distance	Distance (in miles) between respondent's residence and the midpoint of Riverfront Commemorative Park

vectors from the separate models are equal. The estimated coefficient on the indicator variable in the pooled model is not significantly different than zero (t-ratio=1.05). This

However, such estimators restrict WTP to be positive, which may be inappropriate here in light of survey responses and comments.

statistical evidence supports using a pooled model that does treat homeowners and renters differently.[10]

Model 1 in Table 6 presents a WTP response function using the survey responses of verified referendum voters. Both tax price and downtown employment are negatively related to the probability of a "yes" vote.[11] The factors that positively influence "yes" responses include having an undergraduate degree, frequent visitation to the riverfront area, having children in the household, and an increase in the distance from the respondent's residence to the park, income, the number of the respondent's visits to the riverfront area, and heightened preference for riverbank stabilization. Using the regression results, the estimated annual mean WTP for the riverfront project is $65.24. The 95% confidence interval (C.I.) is estimated using the Krinsky and Robb (1986) simulation method and presented in Table 6.

---

[10] The welfare estimates and conclusions supported in this paper are not sensitive to the use of this pooled model.

[11] Many downtown employees expressed opposition to the riverfront project because they felt that it would worsen downtown parking availability.

Table 6. Estimates of Survey and Referendum-based Willingness to Pay Functions

Variable	Model I	Model II
	Survey Referendum Model	Actual Referendum Model
Tax Amount	-0.010 (-2.833)***	-0.010 (-2.340)**
Stabilization	0.531 (8.339)***	0.443 (2.425)**
Riverfront Visit	0.813 (5.161)***	0.621 (2.875)***
Change Visit	0.597 (3.830)***	0.256 (1.200)
College Degree	0.419 (2.730)***	0.117 (0.324)
Downtown	-0.567 (-2.106)**	-0.704 (-1.740)*
Child	0.375 (2.123)**	0.046 (0.456)
Income	0.005 (2.060)**	0.007 (2.274)**
Distance	0.321 (2.961)***	0.048 (0.792)
Constant	-3.080 (-8.726)***	-1.923 (-3.578)***
Model χ^2	241.83	
McFadden R^2	0.375	
Correct Predictions	81.22%	
Mean WTP	$65.24	$63.62
(95% C.I.)	(48.27, 86.09)	(52.07, 90.12)
Log-Likelihood	-201.56	-27.49
N	474	43

Note: Asymptotic t-ratios are in parenthesis.
*, **, and *** indicate that parameters are significant at 10%, 5%, and 1% level, respectively.

B. Actual Referendum Model

Individual referendum votes cannot be observed, but voting results are available at the precinct level. Using vote proportions from 43 of the 47 Corvallis precincts, combined with precinct-level mean values of socio-economic variables from the survey, a probit model analogous to Model I is estimated.[12] Following Kmenta (1986), the linear probit model is

$$(3) \qquad F^{-1}(p_i) = X_i'B + \frac{\varepsilon_i}{f(X_i'B)}$$

where $F^{-1}(\cdot)$ is the inverse of the standard normal cumulative distribution, p_i is the proportion of "yes" votes in precinct i, X_i is a vector of precinct-aggregated socio-economic variables, B is a vector of coefficients to be estimated, and $f(\cdot)$ denotes the normal density. $F^{-1}(p_i)$ is first regressed on $X_i'B$ using ordinary least squares (OLS) to obtain a consistent estimate of the variance of the error term, $\varepsilon_i/f(X_i'B)$ [which is equivalent to $p_i/f(X_i'B)$]. Then, weighted least squares is used with $\frac{p_i(1-p_i)}{n_i[f(X_i'B)]^2}$ as weights, where n_i is the number of voters in precinct i.

This probit model is presented as Model II in Table 6. Estimated mean WTP is $63.62. A test developed by Poe et al. (1994), based on the method of convolutions, provides an estimate of the statistical difference between two WTP distributions. Using this test, survey referendum WTP is not statistically different than WTP based on actual behavior. Comparing the parameter vectors from the two models, a few parameters are

[12] No survey data is available from 4 precincts. However, less than 1% of actual referendum voters are from these precincts.

substantially smaller, although all coefficients have the expected sign and the coefficient on the tax amount variable is statistically significant. A likelihood ratio test (p < 0.01) rejects the hypothesis that the two parameters vectors are equal. Differences in parameters likely occur because the precinct level model does not take into account the heterogeneity of socio-economic characteristics within each precinct and some precinct-level observations are estimated using a small number of survey observations.[13]

The analysis shows that survey responses *in this study* match actual voting behavior. Furthermore, welfare estimates calculated from these sources are not statistically different. The next step in this line of analysis is to go further than simply assessing the reliability of a preelection questionnaire and beyond comparing WTP from survey responses on a known referendum with WTP based on election data. To do this, responses and WTP estimates based on responses to the hypothetical DC-CV question are compared with survey referendum responses.

---

[13] These "smaller" precincts are given less weight in the estimation procedure. Removing these precincts improves overall model fit noticeably, but the resulting welfare estimates are likely to be biased.

VIII. Analysis of DC-CV Responses

A. Sensitivity of Survey Responses to Relative Prices

Critics of the CV method argue that CV responses do not reveal willingness to pay (Kahneman and Knetsch 1992; Diamond and Hausman 1994; Vatn and Bromley 1994; Gregory et al. 1995). There are no direct financial consequences of indicating a positive WTP in a survey. Also, respondents simply may not be able to put nonmarket values in monetary terms. Instead of economic value, CV responses may simply indicate whether the respondent believes the policy scenario is worthwhile or feasible. Responses may also reflect the respondent's moral satisfaction of contributing to public goods (Kahneman and Knetsch 1992). In order to address this criticism, responses to the DC-CV question are compared to survey ballot question responses.

If a respondent simply takes into account her preferences for the project, regardless of price, responses to both valuation questions should be identical. Also, since the respondent is likely aware that the policy posed in the DC-CV question is strictly hypothetical, she may unrealistically vote "yes." This would suggest a sort of "hypothetical" bias. Here, ballot responses are taken to be indicators of true economic value against which to compare hypothetical DC-CV responses.

In answering the two valuation questions, respondents face two different prices. In the survey referendum the respondent faces a tax or rental rate increase, in the DC-CV question the respondent encounters a randomly assigned price payable through a fee in the utility bill. Both payment mechanisms are assumed to be equally (un)desirable.[14] The

---

[14] This assumption is largely valid since respondents, when faced with similar prices, generally made the same economic decision. If one payment vehicle was preferred over the other, respondents would have

property tax/rental rate increases range from $0 to $119.59, while the DC-CV bid amounts range from $0 to $120. Following a weak postulate of revealed preference theory, if an individual is presented with two economic decisions, the same choice should be made if it is for the same (normal) good with a comparable price. The proportion of "yes" responses to the DC-CV question should increase as the bid amount decreases relative to the tax price. The proportion of "yes" responses should decrease as the bid amount becomes relatively more expensive. In addition, respondents indicating a "no" vote to one situation should not vote "yes" to a higher priced situation involving the same good under similar circumstances.

Table 7 compares voting choices among the two scenarios. In the first row of the table, the sample includes those respondents that face a random bid price that is more than $50 higher than their tax price. Moving down the table, the bid price decreases relative to the tax price. For respondents facing similar prices in the two scenarios (within $10), responses are very similar. In this group, 8.3% indicate different voting choices and only 3.1% indicate a "yes" vote to a higher priced scenario. As the bid price increases relative to the tax price, the proportion of "yes" DC-CV responses decreases systematically. As the bid price decreases relative to the tax price, the proportion of "yes" DC-CV responses increases. There are larger disparities between voting choices when the tax price is less than the bid price than in the polar case. The group of respondents that face a relatively higher tax price are, in general, homeowners

---

voted the same in both scenarios only when one price, payable through the preferred method, was considerably higher than the other price.

Table 7. Sensitivity of Survey Responses to Relative Prices[a]

(Tax Price)[b] – (Bid Price)[c] =	Number of Observations	"Yes" responses to ballot question	"Yes" responses to CV question	% difference in "Yes" responses	"Yes" votes to Higher Price Scenario Only
Less than -$50	88	49	22	30.7	1
-$30.1 to -$50	82	49	27	26.9	1
-$10.1 to -$30	88	49	30	21.6	1
-$10 to $0	61	41	35	9.8	0
$0.1 to $10	35	18	20	-5.7	3
$10.1 to $30	65	40	44	-6.2	3
$30.1 to $50	65	30	34	-6.2	3
Greater than $50	32	20	24	-12.5	1

[a]Excludes respondents who gave an "undecided" or nonresponse to either valuation question.
[b]Tax price is the proposed tax increase the household faces, given the passage of the referendum.
[c]Bid price is the price the individual is presented with in the dichotomous choice CV question.

with above average property values and incomes. The data reveal that there is an "income effect." Respondents that fall into the bottom categories of Table 7 are more likely to vote "yes" to a high priced good and are less sensitive to relative price changes. Overall, only 2.5% of respondents irrationally indicate a "yes" vote only to a higher price. These respondents, perhaps, may have been uncertain about the tax implications of the bond measure or did not take the survey questions seriously. Next, WTP functions are estimated using DC-CV question responses as the dependent variable.

B. DC-CV WTP functions

A WTP function estimated from DC-CV responses analogous to the WTP functions using survey referendum responses and actual voting results is presented as Model III in Table 8. The model coefficients all have the expected signs. Economic variants that are likely correlated with property values (hence, tax increases), such as having children in the household and obtaining a college degree, are not significant in this model. Although statistically significant, the coefficient on income, which is also correlated with property value, is half as large as in the precinct-level voter model.

Estimated mean WTP from the DC-CV model is $40.46, roughly $23 less than estimated WTP based on actual voting behavior. The hypothesis of equal WTP distributions is confidently rejected at the 5% level (p=0.020). There are three possible reasons why the WTP distributions differ. First, differences between the distributions of real and hypothetical prices may lead to significantly different WTP estimates. Second,

Table 8. Estimates of DC-CV Willingness to Pay Functions

Variable	Model III DC-CV Model, Uniform Bid Distribution	Model IV DC-CV Model, Adjusted Bid Distribution	Model V DC-CV Model, Similar Tax Prices and Bids
Tax Amount	-0.011 (-4.961)***	-0.014 (-4.293)***	-0.009 (-1.832)*
Stabilization	0.356 (6.192)***	0.356 (4.326)***	0.244 (2.067)**
Riverfront Visit	0.623 (4.451)***	0.628 (3.150)***	0.875 (3.102)***
Change Visit	0.545 (3.820)***	0.527 (2.622)***	0.421 (1.256)
College Degree	0.094 (0.656)	0.198 (0.907)	0.655 (2.225)**
Downtown	-0.911 (-3.877)***	-0.834 (-2.258)**	-0.402 (-0.966)
Child	0.107 (0.685)	0.140 (0.631)	0.246 (0.752)
Income	0.003 (1.912)*	0.004 (1.671)*	0.006 (1.751)*
Distance	0.075 (0.809)	0.177 (1.309)	0.286 (1.795)*
Constant	-1.568 (-4.996)***	-1.731 (-3.761)***	-1.448 (-1.887)**
Model χ^2	169.69	88.76	38.98
McFadden R^2	0.251	0.256	0.263
Correct Predictions	72.34%	72.51%	78.21%
Mean WTP (95% C.I.)	$40.46 (24.46, 52.19)	$42.35 (27.04, 53.00)	$65.60 (39.56, 96.89)
Log-Likelihood	-252.82	-128.73	-54.58
N	488	251	107

Note: Asymptotic t-ratios are in parenthesis.
*, **, and *** indicate that parameters are significant at 10%, 5%, and 1% level, respectively

differences in estimated WTP may arise when hypothetical prices differ substantially from actual prices at the individual response level. Third, there may be systematic differences between DC-CV responses and actual voting behavior. However, previous analysis shows that survey referendum responses are comparable to actual voting behavior and consistent decisions were made among the two survey valuation questions. Therefore, the latter explanation is unlikely.

The distribution of the tax prices and the uniformly distributed random bid price differ substantially, while the range of prices is nearly identical. The distribution of tax prices is such that one-third of respondents face tax increases ranging from $0 to $40, one-third face $40 to $60 increases, and less than one-twelfth face increases greater than $80 per year. To test the implications of this difference, the distribution of DC-CV prices were made to mimic the relevant tax structure. This was done by dividing respondents into $20 intervals and then randomly drawing observations from each group to match the proportions of respondents in each tax category. A WTP function estimated using this adjusted sample of DC-CV responses is presented as Model IV in Table 8. Estimated mean WTP is $42.35 and is significantly different than WTP estimated from the referendum voter model at the 5% level (p=0.020).

For many respondents, the hypothetical price they faced was considerably different than the real tax consequences of the referendum. Even if individuals responded rationally to both valuation questions, the resulting estimates of WTP can differ substantially due to the difference in real and offered prices. Glancing over the data, this is cause for concern. In the survey referendum, nearly 75% of respondents that faced a tax increase of over $60 per year voted "yes." Besides having high property values, these

respondents have high income and education levels. Very few respondents faced these high tax prices. In the DC-CV question, just over 25% responded "yes" when faced with a hypothetical price in this range. The majority of the respondents that faced high hypothetical prices did not face such a high tax burden. Similarly, those respondents with high property values were assigned hypothetical prices that were substantially lower than their revealed WTP.

It is probable that the "yes" responses from the majority of respondents with high property values substantially influence mean WTP.. Truncating the sample to exclude the survey referendum respondents that faced a tax burden greater than $60 results in a WTP estimate of $45.82. This same truncation of DC-CV responses results in a WTP estimate of $39.29. These WTP estimates are not statistically different at the 5% level. Again, it is important to mention that the majority of respondents responded rationally to relative price levels. Differences in WTP estimated from survey referendum and DC-CV responses are not likely a result of systematic differences in revealed preferences for the two scenarios.

To further illustrate the impact of offering random prices that are substantially different than actual prices, the survey sample is restricted to respondents that faced a random bid price that is similar to (within $15) the tax increase. This model is included in Table 8 as Model V. Estimated WTP for this model is $65.60 and is not significantly different than mean WTP estimated from actual voting behavior at the 5% level. A danger in this approach is that the restricted sample may not be representative of the entire survey sample. However, *t*-tests indicate there is no considerable difference

between the means of explanatory variables in the sample and the entire sample of verified voters.

Clearly, estimated mean WTP may be sensitive to both the range and allocation of offered bids. Boyle et al. (1988), Cooper (1993), and Elnagheeb and Jordan (1995) discuss methods for optimally determining the range and allocation of bids among respondents. Cooper and Loomis (1992), Kanninen (1995), and Creel (1998) use Monte Carlo simulations to determine the bias of different bid designs on WTP estimates. Nearly all CV studies to date have assumed a uniform distribution of the bids, despite potential efficiency losses identified in the literature. There is still debate over the number of distinct bids and the range of bids that should be used.

Unlike in other CV applications, the policy-relevant range and distribution of prices are known in this study. The range of prices in the DC-CV scenario match the policy relevant range of tax prices, but the uniform allocation of hypothetical bids does not match the actual distribution of tax prices. However, adjusting the bid structure so that both the range and allocation of DC-CV bids match the structure of actual tax prices has little effect on WTP. In contrast, DC-CV WTP estimates are not statistically different than referendum-based WTP when bid amounts faced by respondents are very close to their actual tax increases. This suggests that DC-CV welfare estimates closely match those based on actual behavior only when hypothetical prices approximate actual prices.

The sensitivity of DC-CV welfare estimates to the prices respondents face is enlightening. Research methods have been developed to determine the range and allocation of bids needed to efficiently estimate WTP. However, CV researchers may be presenting respondents with unrealistic or irrelevant prices. For instance, does it make

intuitive sense to ask a respondent whether or not they are willing to pay $350, through higher taxes, to prevent a future oil spill in Prince William Sound, Alaska? It is unlikely that any respondent would actually have to pay such a price if a policy was implemented. Instead, respondents should be presented with a policy-relevant price that seems realistic to the respondent. If the goal of CV surveys are to simulate real economic behavior in the absence of markets, shouldn't respondents be presented with prices that they would face if presented with a real economic decision? Perhaps CV practitioners should concentrate more on the realism of (hypothetical) economic decisions instead of trying to efficiently estimate WTP based on unrealistic prices.

It may be difficult to offer CV prices according to property values or income. However, this can be done in practice. For instance, when using telephone or in-person interviews, demographic information can be gathered before asking the valuation question(s). Then, the interviewer can offer high property value or high income respondents a relatively higher price. If using mail surveys, the researcher can break the survey population into basic demographic regions such as by state, county, or precinct, and accordingly assign prices. It makes intuitive sense that those respondents that, in reality, pay more in the form of taxes should be offered the higher bid amounts. Similarly, respondents with high incomes should be systematically offered high bids for public or private goods. These respondents are generally willing to pay more for the good and efficiency gains can be expected when offered prices are close to actual WTP.

IX.   Concluding Remarks and Suggestions for Future Research

This paper compares survey responses with actual voting behavior on a referendum to increase property taxes in Corvallis, Oregon, to fund a downtown riverfront improvement project. Survey voting responses match the outcome of the actual referendum, in terms of the proportion of "yes" and "no" responses. Contrary to previous studies, comparability is not sensitive to the treatment of "undecided" responses. This may be attributable to the use of a mail survey, instead of a telephone or in-person survey. Also, a direct test rejects the hypothesis that survey respondents engaged in yea-saying.

In addition to the voting decision regarding the referendum, respondents are presented with a DC-CV question for the same environmental improvement. This valuation question uses an alternate payment vehicle and a randomly assigned bid. Using survey voting responses as an indicator of real economic behavior, comparisons of voting and DC-CV responses show that individuals respond rationally to relative price. Instead of simply giving identical voting responses in the survey referendum and DC-CV question, the proportion of "yes" DC-CV responses increases relative to the proportion of "yes" referendum responses as the tax price faced in the referendum increases relative to the random bid.

Mean WTP based on precinct-level referendum outcomes is estimated to be $63.62, compared to $65.24 using survey referendum responses. The difference is not statistically significant at the 5% level. The estimated mean WTP from DC-CV responses, $40.46, is significantly different than WTP based on actual voting behavior at this same significance level. Adjusting the underlying bid distribution to mimic that of

the tax price yields a similar, conservative WTP estimate. However, when the sample of respondents is limited to those that faced an offered price within $15 of their tax increase, WTP does not differ significantly from that obtained from actual voting behavior.

Survey referendum responses are hypothetical in that economic choices are not financially binding. However, many respondents were presumably well aware of the referendum and their anticipated voting choice, prior to completing the survey. This differs from the normal CV scenario where the respondent may be familiar with the good, but has no *a priori* knowledge of the (usually hypothetical) policy scenario. This study attempts to partially overcome this limitation and presents respondents with a DC-CV question that involves a hypothetical payment mechanism and price. However, the subject of the DC-CV question is the same as a known referendum.

To conduct a more complete external validation study using actual voting behavior, the researcher needs to be aware of an upcoming ballot measure well before it is known by the general population. Then, a sample of voters can be presented with a voting choice, where the respondent does not have a voting preference, *ex ante*. In particular, the respondent will not have thought about what they are willing to pay for the policy and may not believe that there are actual economic consequences of her decision (or the survey outcome). The ballot issue should involve an environmental improvement or natural resource allocation that requires a tax increase or payment upon implementation, so that WTP can be estimated. The survey regarding a forthcoming, yet unpublicized, ballot issue, inherits all potential weaknesses of CV. The difficulty in this line of analysis is that respondents must have the same information set when completing the survey as they will have when actually voting in the referendum. Such a comparison

is moot otherwise. A sample of voters (some of which completed the initial survey) can be surveyed close to the election to test for information effects and trends in voting preferences. Since some voters may make poorly informed decisions, the amount of information given to respondents will presumably have to be less than in a rigorous CV survey. Before moving to more elaborate external validation tests, it is first important to determine if contingent and actual voting behavior match in a more controlled setting, such as present in this study.

References

Arrow, Kenneth J., Robert Solow, Paul R. Portney, Edward E. Leamer, Roy Radner and Howard Schuman. 1993. Report of the NOAA Panel on Contingent Valuation. *Federal Register* 58: 4601-4614.

Berrens, Robert P. and Richard M. Adams 1998. Applying Contingent Valuation in the Design of Fee Hunting Programs: Pheasant Hunting in Oregon Revisited. *Human Dimensions of Wildlife* 3(3): 11-25.

Berrens, Robert P., Alok K. Bohara, and Joe Kerkvliet. 1997. A Randomized Response Approach to Dichotomous Choice Contingent Valuation. *American Journal of Agricultural Economics* 79: 252-266.

Bishop, Richard C. and Thomas A. Heberlein. 1979. Measuring Values of Extramarket Goods: Are Indirect Measures Biased? *American Journal of Agricultural Economics* 61: 926-930.

Boyle, Kevin L., H. MacDonald, H. Cheng and D. McCollum. 1998. Bid Design and Yea-Saying in Single-Bounded Dichotomous Choice Questions. *Land Economics* 74(1): 49-64.

Boyle, Kevin L., Michael P. Welsh, and Richard C. Bishop. 1988. Validation of Empirical Measures of Welfare Change: Comment. *Land Economics* 64: 94-98.

Brookshire, David S., Mark Thayer, William D. Schulze, and Ralph d'Arge. 1982. Valuing Public Goods: A Comparison of Survey and Land Hedonic Approaches. *American Economic Review* 72: 165-177.

Cameron, Trudy Ann and M.D. James. 1987. Efficient Estimation Methods for Use with "Closed-Ended" Contingent Valuation Survey Data. *Review of Economics and Statistics* 69: 269-276.

Carson, Richard T., Nicholas E. Flores, Kerry Martin, and Jennifer L. Wright. 1996. Contingent Valuation and Revealed Preference Methodologies: Comparing the Estimates for Quasi-Public Goods. *Land Economics* 72(1): 80-99.

Carson, Richard T., W. Michael Hanemann, and Robert Cameron Mitchell. 1986. The Use of Simulated Political Markets to Value Public Goods. Economics Department, University of California, San Diego.

Champ, Patricia A., Richard C. Bishop, Thomas C. Brown, and Daniel W. McCollum. 1997. Using Donation Mechanisms to Value Nonuse Benefits from Public Goods. *Journal of Environmental Economics and Management* 33(2): 151-162.

Champ, Patricia A. and Thomas C. Brown. 1997. A Comparison of Contingent and Actual Voting Behavior. *Proceedings from W-133 Benefits and Cost Transfer in Natural Resource Planning, 10th Interim Report.*

Cooper, Joseph C. 1993. Optimal Bid Selection for Dichotomous Choice Contingent Valuation Surveys. *Journal of Environmental Economics and Management* 24: 25-40.

Cooper, Joseph and John Loomis. 1992. Sensitivity of Willingness-to-Pay Estimates to Bid Design in Dichotomous Choice Contingent Valuation Models. *Land Economics* 68(2): 211-224.

Creel, Michael. 1998. A Note on Consistent Estimation of Mean WTP Using a Misspecified Logit Contingent Valuation Model. *Journal of Environmental Economics and Management* 35: 277-284.

Cummings, Ronald G., Steven Elliott, Glenn W. Harrison and James Murphy. 1997. Are Hypothetical Referenda Incentive Compatible? *Journal of Political Economy* 105(3): 609-621.

Cummings, Ronald G., Glenn W. Harrison, and Elisabet Rutstr¬m. 1995. Homegrown Values and Hypothetical Surveys: Do Dichotomous Choice Questions Elicit Real Economic Commitments? *American Economic Review* 85(1): 260-266.

Diamond, Peter A. and Jerry A. Hausman. 1994. Contingent Valuation: Is Some Number Better than No Number? *Journal of Economic Perspectives* 8(4): 45-64.

Dickie, Mark, Ann Fisher, and Shelby Gerking. 1987. Market Transactions and Hypothetical Demand Data: A Comparative Study. *Journal of the American Statistical Association* 82(1): 69-75.

Dillman, Don A. 1978. *Mail and Telephone Surveys: The Total Design Method.* New York: Wiley.

Einhorn, Hillel J. and Robin M. Hogarth. 1985. Ambiguity and Uncertainty in Probabilistic Inference. *Psychological Review* 92: 433-461.

Elnagheeb, Abdelmoneim H. and Jeffrey L. Jordan. 1995. Comparing Three Approaches That Generate Bids for the Referendum Contingent Valuation Method. *Journal of Environmental Economics and Management* 29: 92-104.

Gardenfors, Peter and Nils-Eric Sahlin. 1982. Unreliable Probabilities, Risk Taking, and Decision Making. *Synthese* 53: 361-386.

Gregory, Robin, Sarah Lictenstein, Thomas C. Brown, George L. Peterson, and Paul Slovic. 1995. How Precise Are Monetary Representations of Environmental Improvements? *Land Economics* 71(4): 462-473.

Haener, Michel K. and Wiktor L. Adamowicz. 1998. Analysis of "Don't Know" Responses to Referendum Contingent Valuation Questions. *Agricultural and Resource Economics Review* 27(2): 218-230.

Hanemann, W. Michael. 1984. Welfare Evaluations in Contingent Valuation Experiments with Discrete Responses. *American Journal of Agricultural Economics* 66: 332-341.

Harrison, Glenn W. and Bengt Kristöm. 1995. On the Interpretation of Responses to Contingent Valuation Surveys. In *Current Issues in Environmental Economics*, P.O. Johansson, B. Kristöm and K.G. Maler (eds.). Manchester: Manchester University Press.

Holmes, Thomas P. and Randall A. Kramer. 1995. An Independent Sample Test of Yea-Saying and Starting Point Bias in Dichotomous-Choice Contingent Valuation. *Journal of Environmental Economics and Management* 29(1): 121-132.

Kahn, B.E. and R.K. Sarin. 1988. Modelling Ambiguity in Decisions Under Uncertainty. *Journal of Consumer Research* 15: 265-272.

Kahneman, Daniel and Jack L. Knetsch. 1992. Valuing Public Goods: The Purchase of Moral Satisfaction. *Journal of Environmental Economics and Management* 22: 57-70.

Kanninen, Barbara J. 1995. Bias in Discrete Response Contingent Valuation. *Journal of Environmental Economics and Management* 28: 114-125.

Kealy, Mary Jo, Mark Montgomery, and John F. Dovidio. 1990. Reliability and Predictive Validity or Contingent Values: Does the Nature of the Good Matter? *Journal of Environmental Economics and Management* 19: 244-263.

Kmenta, Jan. 1986. *Elements of Econometrics*, 2nd Edition. New York: Macmillan Publishing Company.

Knetsch, Jack L. and Robert K. Davis. 1966. Comparisons of Methods for Recreation Evaluation. In *Water Research*, A.V. Kneese and S.C. Smith (eds.). Baltimore: Resources for the Future Inc., John Hopkins Press, pp. 125-142.

Krinsky, Itzhak and A.Leslie Robb. 1986. On Approximating the Statistical Properties of Elasticities. *Review of Economics and Statistics* 68: 715-719.

Kristöm, Bengt. 1990. A Non-Parametric Approach to the Estimation of Welfare Measures in Discrete Response Valuation Studies. *Land Economics* 66: 135-139.

List, John and Jason F. Shogren. 1998. Calibration of the Difference Between Actual and Hypothetical Valuations in a Field Experiment. *Journal of Economic Behavior and Organization* 37: 193-206.

Loomis, John, Michael Creel, and Timothy Park. 1991. Comparing Benefit Estimates from Travel Cost and Contingent Valuation Using Confidence Intervals for Hicksian Welfare Measures. *Applied Economics* 23: 1725-1731.

Loomis, John and Earl Ekstrand. 1997. Economic Benefits of Critical Habitat for the Mexican Spotted Owl: A Scope Test Using a Multiple-Bounded Contingent Valuation Survey. *Journal of Agricultural and Resource Economics* 22(2): 356-366.

Magelby, D. 1989. Opinion Formation and Opinion Change in Ballot Proposition Campaigns. In *Manipulating Public Opinion*, M. Margolis and G. Mauser (eds.). Pacific Grove, CA: Brooks/Cole Publishers.

Moulin, Harv—. 1988. *Axioms of Cooperative Decision Making*. Cambridge: Cambridge University Press.

Poe, Gregory L., Erik K. Severance-Lossin, and Michael P. Welsh. 1994. Measuring the Difference (X-Y) of Simulated Distributions: A Convolutions Approach. *American Journal of Agricultural Economics* 76: 904-915.

Portney, Paul R. 1994. The Contingent Valuation Debate: Why Economics Should Care. *Journal of Economic Perspectives* 8(4): 3-17.

Ready, Richard C., John C. Whitehead, and Glenn C. Blomquist. 1995. Contingent Valuation When Responses are Ambivalent. *Journal of Environmental Economics and Management* 31: 145-159.

Riverfront Commission. 1997. Riverfront Commemorative Park and Riverfront District Master Plan.

Riverfront Revitalization Committee. 1998. Riverfront Needs 'Yes" for Bonds. *Corvallis Gazette-Times* (October 14).

Shabman, Leonard and Kurt Stephenson. 1996. Searching for the Correct Benefit Estimate: Empirical Evidence for an Alternative Perspective. *Land Economics* 72: 433-449.

Smithson, Michael and Stephen Weaver. 1993. Effects of Vagueness versus Randomization on Self-Reported Information. Department of Psychology and Sociology, James Cook University, Queensland, Australia.

Taylor, Laura O. 1998. Incentive Compatible Referenda and the Valuation of Environmental Goods. *Agricultural and Resource Economics Review* 27(2): 132-139.

Turnbull, Bruce W. 1976. The Empirical Distribution Function with Arbitrarily Grouped, Censored and Truncated Data. *Journal of the Royal Statistical Society* B38(3): 290-295.

Vatn, Arild and Daniel W. Bromley. 1994. Choices without Prices without Apologies. *Journal of Environmental Economics and Management* 26: 129-148.

Vossler, Christian A., Joe Kerkvliet, Stephen Polasky, and Olesya Gainutdinova. 1999. Externally Validating Contingent Valuation: An Open-Space Survey and Referendum in Corvallis, Oregon. *Journal of Economic Behavior and Organization*, submitted.

Wang, Hua. 1997. Treatment of "Don't-Know" Responses in Contingent Valuation Surveys: A Random Valuation Model. *Journal of Environmental Economics and Management* 32: 219-232.

Welsh, Michael P. and Gregory L. Poe. 1998. Elicitation Effects in Contingent Valuation: Comparisons to a Multiple Bounded Discrete Choice Approach. *Journal of Environmental Economics and Management* 36(2): 170-185.

APPENDIX

Appendix. Riverfront Park Survey

SECTION A: ABOUT WILLAMETTE RIVERBANK RESTORATION AND RIVERFRONT PARK

A1.   The city of Corvallis will be voting on a ballot measure in the upcoming November 3rd general election that I would like your opinion on. The ballot question reads:

"Shall the City issue $9.5 million of general obligation bonds to restore the Willamette Riverbank and improve Riverfront Commemorative Park?

If the bonds are approved, they will be payable from taxes on property or property ownership that are not subject to the limits of sections 11 and 11b, Article XI, of the Oregon Constitution."

If the measure passes, it is estimated that property owners will pay an additional $31.47 per $100,000 of their assessed property value annually, for 20 years, to fund this project. If you were voting on this ballot question today, how would you vote? (Note: it does not matter if you are a registered voter)

    1   YES
    2   NO

A2.   Please indicate the reasons for your voting decision on the ballot question presented above. (CIRCLE ALL THAT APPLY TO YOU)

1   I believe that funding this project is well worth it to me.
2   I believe property taxes are too high already and am against any measure that will increase my property taxes.
3   It is hard for me to decide either for or against this ballot measure.
4   I feel that users of the area should have to pay for it directly.
5   I would like to see this project completed, but I cannot afford to pay for it.
6   I feel that downtown businesses should have to pay for the entire project.
7   I do not have to pay property taxes and there are no financial consequences of my decision.
8   I do not have enough information on this issue to make a comfortable decision.
9   Other (please specify) _____

A3.   How often do you visit the riverfront area of downtown Corvallis?

1	NEVER	5	2 TO 3 TIMES A MONTH
2	DAILY	6	ONCE A MONTH
3	2 TO 6 TIMES A WEEK	7	5 TO 11 TIMES A YEAR
4	ONCE A WEEK	8	1 TO 5 TIMES A YEAR

A4.   How often do you visit any park or open space in or near Corvallis?

1	NEVER	5	2 TO 3 TIMES A MONTH
2	DAILY	6	ONCE A MONTH
3	2 TO 6 TIMES A WEEK	7	5 TO 11 TIMES A YEAR
4	ONCE A WEEK	8	1 TO 5 TIMES A YEAR

A5.   Proponents of the ballot measure contend that the west side of the Willamette riverbank from Western Blvd. to the Van Buren Bridge is eroding at an average of one foot every three years. How important is it to you for the riverbank in this area to be stabilized? (Circle the appropriate number)

UNIMPORTANT   1   2   3   4   5   VERY IMPORTANT

A6.   If the ballot measure is PASSED how would you change the number of visits you make to the riverfront area of downtown Corvallis?

    1   NO CHANGE IN NUMBER OF VISITS
    2   VISITS will INCREASE by about _____ TRIPS PER MONTH
    3   VISITS will DECREASE by about _____ TRIPS PER MONTH

A7.   Do you own or rent the dwelling unit in which you now live?

    1   RENT ====> **SKIP TO SECTION C**
    2   OWN   ====> **CONTINUE ON TO SECTION B**

SECTION B: QUESTIONS FOR HOMEOWNERS

B1.   What is the approximate 1998 tax assessed property value of your residence?
(Circle the most appropriate category, in thousands)

Less than $50	100-119.9	160-179.9	220-239.9	280-299.9	340-359.9
$50-79.9	120-139.9	180-199.9	240-259.9	300-319.9	360-379.9
$80-99.9	140-159.9	200-219.9	260-279.9	320-339.9	over 380

B2.   Do you OWN other property in Corvallis in addition to your place of residence?

1   YES
2   NO

B3.   Suppose instead of a property tax, Corvallis residents were asked to pay for the proposed Willamette Riverbank Restoration and Riverfront Park project through a fee included in their monthly utility bill. Majority approval would be required for implementation. Would your household be willing to pay $_____ a year, for 20 years, in order to pay for the Willamette Riverbank Restoration and Riverfront Park project?

1   YES   =========>   **PLEASE PROCEED TO**
2   NO   =========>   **SECTION D**

SECTION C: QUESTIONS FOR RENTERS

C1.   What is your approximate rent or lease per month? (Circle the number next to the most appropriate category)

1	less than $250	5	$800 - $999
2	$250 - $399	6	$1000 - $1249
3	$400 - $599	7	$1250 - $1499
4	$600 - $799	8	over $1500

C2.   If the Willamette Riverbank Restoration and Riverfront General Obligation Bond Measure was PASSED, what increase in your MONTHLY rent or lease would you expect as a direct result of this?

1	NO CHANGE	6	$1.65-$2.50 ($20-$30 a year) more
2	Less than $0.40 ($5 a year) more	7	$2.50-$3.30 ($30-$40 a year) more
3	$0.40-$0.80 ($5-$10 a year) more	8	$3.30-$4.20 ($40-$50 a year) more
4	$.80-$1.25 ($10-$15 a year) more	9	$4.20-$5.00 ($50-$60 a year) more
5	$1.25-$1.65 ($15-$20 a year) more	10	More than $5 ($60 a year)

C3.   Do you plan on purchasing a home in Corvallis?

1   YES, I PLAN ON PURCHASING A HOME WITHIN _____ YEARS
2   NO
3   I ALREADY OWN A HOUSE IN CORVALLIS
4   I AM NOT SURE

C4.   Suppose instead of a property tax, Corvallis residents were asked to pay for the proposed Willamette Riverbank Restoration and Riverfront Park project through a fee included in their monthly utility bill. Majority approval would be required for implementation. Would your household be willing to pay $_____ a year, for 20 years, in order to pay for the Willamette Riverbank Restoration and Riverfront Park project?

1   YES
2   NO

PLEASE CONTINUE ON TO THE NEXT SECTION

SECTION D: ABOUT YOU AND YOUR HOUSEHOLD

D1.   Are you registered to vote at your current address in Corvallis?

   1   YES   2   NO

D2.   How many people, including yourself, are in your household?_____
       How many people are 18 years or older?_____

D3.   How old are you? _____ years old

D4.   How long do you plan on residing in Corvallis?

   1   Less than 1 year   4   Between 5 and 7 years
   2   Between 1 and 3 years   5   Between 7 and 10 years
   3   Between 3 and 5 years   6   More than 10 years

D5.   What is your gender?

   1   FEMALE   2   MALE

D6.   Describe your level of education. (Circle the number next to the most appropriate response for you)

   1   OBTAINED GRADUATE DEGREE
   2   SOME POST-GRADUATE STUDY
   3   COMPLETED UNDERGRADUATE DEGREE
   4   SOME COLLEGE
   5   TRADE SCHOOL/VOCATIONAL TRAINING
   6   COMPLETED HIGH SCHOOL
   7   DID NOT FINISH HIGH SCHOOL

D7.   Do you work in the downtown Corvallis area?

   1   YES
   2   NO

D8. Because income is often a very good indicator of participation in outdoor recreation and perspectives on community improvements, we would like to ask you a sensitive question. **Please remember your name will not be used in any way relating to your responses.** What is your approximate 1998 household income, including income from interest and dividend income and/or retirement income before taxes? (Circle the most appropriate category for your household, in thousands)

$0-9.9	20-24.9	35-39.9	50-54.9	65-69.9	85-89.9	100-109.9	150-174.9
$10-14.9	25-29.9	40-44.9	55-59.9	75-79.9	90-94.9	110-129.9	175-199.9
$15-19.9	30-34.9	45-49.9	60-64.9	80-84.9	95-99.9	130-149.9	over 200

D9. Was this year's annual income unusual in any way?

1   NO
2   YES, UNUSUALLY HIGH
3   YES, UNUSUALLY LOW

D10. Please describe your employment status by circling the most appropriate number below:

1   EMPLOYED FULL TIME   4   FULL TIME STUDENT
2   EMPLOYED PART TIME   5   SELF EMPLOYED
3   UNEMPLOYED, BETWEEN JOBS   6   RETIRED

D11. On a scale of 1 to 5, how likely are you to vote in the upcoming November 3rd general election? (Circle the best number)

No chance of voting   1   2   3   4   5   Will definitely Vote

THANK YOU VERY MUCH FOR COMPLETING AND RETURNING THIS SURVEY!