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Accounting for Protest Zeros in Contingent Valuation Studies: A review of literature

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Abstract

The Contingent valuation (CV) approach is commonly used in environmental and agricultural economics and is becoming increasingly popular in the valuation of health and health care. Whatever the context, CV surveys risk eliciting "protest" responses where respondents state a zero valuation for a good even though their true valuation is greater than zero. Protests may result in study sample, information and hypothetical biases in analysis if censored, or cause inaccurate reporting of the true economic value of the good if uncensored. We review the prevalence of zero valuations, the classification of "protests" and the sociodemographic variables associated with protesting in CV studies in across a range of contexts including health. The results of the search found there is consensus that zero valuations due to concerns about taxation and/or trust in government should be classified as "protests". Those motivated by inability to pay should be classified as "true" zeros and retained in the data. A "don't know" option and follow-up questions should be used to detect protesters. Our results show it is unlikely those protesting are representative of the population, hence, removing protests will lead to unrepresentative samples. Therefore, econometric techniques allowing valuation estimates to be 'debiased' should be utilised. Whilst much of the evidence on the issues of zero and protest valuations comes from the fields of environmental and agriculture economics, this is the first paper to review the classification, modelling and the sociodemographic variables of zero and protest bids within health economics. We have identified a number of lessons of best practice for the future designs of CV studies conducted in health.

Key Points for Decision Makers

The review addressed a number of methodological issues arising with strategic behaviours such protest responses in WTP studies. Due to the nature of goods valued in health care, protest responses may be of a great importance within this area of research, which currently has not received much attention. The literature reviewed found 1) a number of different classifications of a "protester"; 2) there are a number of methodological and econometric methods available to allow the "diabiasing" of estimates and 3) sociodemographics of protesters are likely to vary from non-protesters.

Introduction:

Background

Cost Benefit Analysis is a systematic process for calculating the costs and benefits of a decision by assigning monetary values to outcomes using prices revealed in functioning markets. Where such markets do not exist, individuals can express their hypothetical maximum willingness to pay (WTP) (or accept) for an increase (or decrease) in a good using Contingent Valuation (CV) survey methods. Contingent valuation methods are a type of stated preference which rely on the direct reporting of valuations from individuals, opposed to inferring them from observed behaviour in regular market places (revealed preference methods). The most extensive use of CV methods is found in the area of valuing environmental benefits, with the first reported use of the method in the 1960s (1). The interest in using the method in health stemmed from dissatisfaction with the Human-Capital approach and studies of the economic costs of illness (2) in valuing health interventions. CV methods in health were first applied to methods in improving ambulance services (3), followed by willingness to pay (WTP) methods in reducing risk to human life (4, 5). WTP methods were previously seldom used in health economics (2) due to disagreement in how WTP should be measured and incorporated into economic evaluations, but are rapidly increasing in recent years (6-8). CV methods have been utilised for evaluating all types of health care strategies such as preventative, therapeutic and diagnostic services (9).

In the present day economic evaluations within health care are becoming increasingly popular and are primarily undertaken using Cost-Effectiveness analysis or Cost-Benefit analysis which enable frameworks for exploring the desirability of interventions (10).

There remain, however, a number of widely recognised methodological problems (11) most notably: insensitivity to scope (12, 13) e.g. violating the economic rationality associated with more is better in consumer preferences; warm glow or moral satisfaction e.g. overstating support for goods being valued (14); strategic behaviour e.g. underbidding or overbidding to influence the provision of the good in question (15), and zero and protest responses (6, 16). It is the last which is the focus of this paper. Respondents who report zero valuations in CV studies may genuinely value a service or good at zero, which is a “true” zero valuation. However, zero valuations may be “protest” responses. Several studies estimate protest responses may range from 50-73% of overall zero valuations (17-20) in CV studies, depending on the amenity being valued. Protest votes are a well-known phenomenon within politics whereby voters disillusioned with the choice of candidates choose to vote in a way to express their dissatisfaction, or for strategic reasons to “spoil” the ballets (21). Similarly, protest responses in willingness to accept studies may be expressed as bids which are outrageously high (22). Within WTP studies protest responses are generally classified as respondents who state zero for a good (even though their true valuation is greater than zero) for reasons relating to the responsibility of the government or against taxation in general, although this is debated and there is no current standard classification for such responses. This can cause a threat to the validity of the CV method (23), as protests are deviations from “true” values with economic significance (24). The dichotomy between true economic expressions and non-economic protest responses is unclear (25).

One method of dealing with zero valuations has been to exclude them from analysis. However this is controversial as it may remove true zero valuations and introduce biases (26), as it may result in the under-representation of a group of the population which are associated with having a higher probability of protesting. Protest beliefs such as trust, confidence and fairness have a significant effect on respondent valuations, and their exclusion may result in the inconsistent exclusion of beliefs which are important for the preferences that are elicited (27-29). Alternatively, if protest bids are included in calculating average respondent valuations, inaccurate information about the true economic value of the goods being valued may be reported (30). At present, this issue is unresolved and a wide range of methods are currently employed depending on how such bids are identified and classified in analysis. These issues are particularly highlighted in areas such as environment

and health where CV methods are prominent in valuing non-market goods including and/or related to health.

Objectives

Zero valuations and protest responses have previously received attention in the fields of environmental and agricultural economics, but there remains a number of unresolved issues. There is still work to be undertaken on *first*; the debated classification of protest and zero valuations; *second*, modelling such valuations in analysis and *third*; uncovering any sociodemographic variables associated with protest bids which may affect modelling such responses. Therefore, the current paper sets out to carry out a comprehensive literature review of CV/WTP papers drawing upon studies in areas including health, environmental and agricultural economics and has the following objectives:

- To explore the classification of "true" zero valuations and "protest" bids;
- To review of the methods currently employed in dealing with zero valuations and protestors in analysis;
- To explore sociodemographic trends of protestors, as certain groups may be more likely to give zero and protest responses than others.

Literature Review:

Search Strategy

A literature review was undertaken to examine the current available evidence surrounding zero and protest responses. The electronic database search strategy was designed to pick up the following key terms:
("willingness to pay") OR ("contingen* valuation") AND (zero*) OR (protest*)
A wildcard value (*) was used to identify related search terms such as: contingency, zero bidders and protesters. Searches were limited to reports published in English and there was no date or academic field restrictions. PubMed, Ovid, ScienceDirect, EconLit, Wiley Online Library, Sage Journals, Web of Science, Applied Social Sciences Index and Abstracts (ASSIA), JSTOR and the Cochrane Library databases were used. The purpose of the search was to uncover CV/WTP studies and/or literature explicitly acknowledging zero and/or protest bids in any of the following ways: the identification and classification of zero and/or protest bids, modelling zero and/or protest bids or sociodemographic variables associated with the likelihood of zero and/or protest bids. Exact search terms used can be found in Appendix A along with the flowchart of the results (Appendix B).

Results of literature review

Thirty-eight CV/WTP studies were identified as well as a further twenty-nine relevant methodological or review papers. The CV/WTP studies were sourced from: Environmental (16), Health (10), Energy and/or Resource (5), Agriculture (3), Ecology (2), Land (1) and Consumer Policy (1) economic journals. Bibliographies of relevant papers were hand-searched for any sources potentially missed within the database searches. Furthermore, full text searches were conducted post-hoc using the previously employed terms to find additional supporting literature. Time periods of the reviewed literature ranged from 1985 to 2017.

1. Distinguishing between 'true' valuations and 'protest' zeros

There is no consensus on how true zero valuations ought to be distinguished from "protest" zeros, and examples of statements used to detect "protest" zeros can be found in Appendix C. One paper (31) presented possible responses to WTP questions, demonstrating the potential motives behind "untruthful" behaviours (e.g. protesting and strategic behaviours) and "truthful" behaviours (e.g. true zero valuations) for respondents who do not value the good being valued.

A study on introducing fluoridated tap water into a community in the UK (32) described inability to pay as a true zero valuation, in line with the majority of WTP studies reviewed (6, 7, 33-36). Alternatively one WTP study classified "these actions are interesting, but nowadays I can't afford this payment" as a protest (37). It has been claimed true zero valuations may be those related to irrelevance or non-altruistic reasons e.g. "it would only benefit pregnant women and not all society" and "because I don't need it personally" which were both quoted in a study examining the impact of introducing folate fortification of flour (38). Similarly, a WTP study for different health programmes reported follow-up responses such as "the programme is of no use to my household" which was classified by the authors as a true zero valuation (7). Respondents reporting zero valuations have been identified as those that show an awareness of opportunity cost, "there are other issues that I feel more strongly about" (38), "if I had to pay, I would prefer the alternative project" (6) and "society has more important problems than protecting plants and animals" (34). Respondents who stated a zero valuation because they believed a programme was not necessary at the time, or owing to distrust of the programme, "I am against universal additives in principle" were classified as true zero valuations by the author (38). Alternatively an agricultural study defined those who did not believe in the success of the proposal as protesters (20).
Several studies (29, 33, 39, 40) identified protests as those which were a result of equity or responsibility concerns. e.g. "It is unfair to expect me to pay". Zero valuations related to individual responsibility e.g. "people should know about folic acid already" (38) and reasons pertaining to information; or lack thereof, "people already have good access to information, it is generally available" (38); and "not enough information is given" (20, 34) were classified as protests by the study authors. In a review of health care programmes (7) the authors classified the following as protest bids "other public sector budgets should be cut" and "the health service should be more efficient". Similarly, one study (32) classified "the water companies should pay" as protest responses. The majority of studies reviewed classified zero valuations due to taxation in general as protests (6, 20, 24, 29, 32, 34, 37, 38). Zero valuations due to taxation may reflect a wide range of respondent beliefs including: distrust of authorities and governments (41-43), in which they may use protest behaviours to send a message that they have no faith in the government's resource utilisation and task execution (44); are opposed to new government programs (35); feel it is the government's job to pay for the goods (6, 33, 34, 37, 45, 46); or they think their answer could influence the actual level of taxation (47).
A study within agriculture (42) suggested protest bids are those related to ethical concerns, fairness aspects or scepticism towards some feature the hypothetical scenario (48), for example, "I think the whole idea of paying to avoid illness is unrealistic" (36). Protests have been reported as zero valuations related to the "refusal to play the game" (49) or the act of answering strategically to try and get a free ride (27, 43). Various studies have classified protest bids as those which are objections to: being asked to complete a questionnaire (50), components of the valuation exercise (20), the way the question is asked (34), the bid vehicle used (39, 51, 52) or the oversimplified information in the CV study (53). A number of studies have classified no responses or comments following a zero valuation as being protests (54, 55), reasons other than ability to pay or worth of the public good (56) or reasons other than the lack of current of future use benefits (57).

A number of WTP studies have reported that respondents had difficulty putting a monetary value on emotive goods such as pain and the safety of their child (58) or on ill health caused by pollution (36). One study (58) classified difficulty in answering WTP questions as true zero valuations; asserting that respondents may not fully understand the spirit of the questionnaire and greater emphasis needed to be placed on the explanation of value opposed to cost in WTP studies. In contrast, other CV/WTP studies (36, 43, 55) have classified difficulties in valuing goods and lack of understanding as protest responses. It may be argued respondents in Taylor and Armour's (2002) study fully understood but decided the good was not of sufficient value to them, which is commonly regarded as a true zero valuation (50). One study defined protest responses as those not willing to pay for the proposed program, including outliers (those higher or lower than the average respondent valuation) (59). The studies discussed illustrate the difficulty of distinguishing between those who simply do not value a service, and those who experience difficulty in hypothetically placing a monetary value on a good without additional qualitative information in WTP surveys. The aforementioned literature details the protest identification found a number of studies. Problems faced in understanding zero valuations and protestors is that many researchers do not make their identification rule explicit or are vague (23) and often use the terms "zero valuations" and "protest bids" interchangeably.

2. Treatment of zero valuations and protests

The use of a "don't know" option in CV studies has been suggested as a way for respondents to express uncertainty and reduce protest responses (60). Furthermore, studies have suggested follow-up questions to respondents with zero valuations to distinguish true zero valuations from protests by means of an explicit classification rule (61, 62). The "don't know/refusal" categories are important for analysis of motives and should not be treated as missing data (51). Once identified, the consensus view and simplest solution of dealing with protest responses is to remove them from the data (9) with Freeman (63) asserting:

> "The person who refuses to state a monetary value on the grounds that it is unethical to do so or that he has an inherent right to the environmental good must be dropped from the sample when mean bids are calculated. If a person bids zero on the grounds that he has an inherent right to the good, the bid is not an indicator of his true valuation."

The practice of censoring is reported in WTP studies in several areas of research (7, 39, 45, 46, 64). The inclusion of such bids can cause inaccurate information in the calculation of the average respondent valuation for the good (30). Alternatively, samples without protest bidders will result in higher valuation estimates (34). Debate centres on the practice of censoring which has been described as "unsatisfactory" (26). It has been reported the practice is erroneous owing to: varying classifications of protest responses (as discussed in Section 1), different elicitation techniques (Section 3.9), different CV models and disparity in sociodemographic variables (Section 3) which are likely to result in CV samples which are not representative of the populations which they were drawn from (65). Censoring of responses is generally incorrect from a statistical point of view (9) and can cause study sample, information or hypothetical biases (66). Since sociodemographic characteristics are commonly used as explanatory variables within the WTP function it is suggested sample-selection bias could be a serious problem when censoring protesters (67); although in general the direction of such biases is "indeterminate" *a priori* (37). It is proposed the removal of protest bids can be sustained only if the characteristics of such bidders do not significantly differ from populations with positive valuations (24) which may not always be the case, as discussed in Section 3. This concern is acknowledged in the renowned the *Report of the NOAA Panel on Contingent Valuation* where a distinguished panel of social scientists including Nobel laureates Kenneth Arrow and Robert Solow. They suggested censoring may lead to a study population which consists of "interested and specially instructed quasi-experts" (68).

In the presence of censored protest zeros, many studies have applied the modelling approach Heckman selection model in CV studies which addresses sample selection by adjusting the analysis to the probability of being a protester (59, 69). It is advocated for its simplicity, however it is also argued to be less robust to co-linearity problems than Full Information Maximum Likelihood estimates (26). The standard linear model Ordinary Least Squares may also be employed (70). However, the method may produce inconsistent and biased estimates because the WTP variable does not take values below zero; and has positive density at zero thus fails to account for the qualitative difference between limit (zero) observations and non-limit (continuous) observations (50). Multiple imputation models may be used (69), whereby missing protest responses were replaced by a number of plausible values drawn from the posterior conditional distribution of the missing values given the observed data. One study found less bias using this method compared to the Heckman selection model (69). Another modelling technique employed is the Type 2 Tobit model (55); a flexible extension of the Tobit model (71), which allows the coexistence of different patterns. However it does not differentiate between zeros generated by economic decisions (true zero valuations) and protest zeros which may make interpretation difficult (50). The last econometric approach reviewed was the Double-Hurdle method (6) which explicitly emphasises protest responses by separating the behaviour of respondents into two parts: the first the reasons for deciding to participate (or not) in the CV study (e.g. to give or to not give a protest response) and secondly, their valuation (50). This allows the socioeconomic and personal characteristics of the protesters to be established, and in a review of health economics literature it was concluded to be the most appropriate approach to account for zero and protest responses (9).

3. Sociodemographic characteristics of 'protestors'

Research on sociodemographic variables and protesting appear to be scarce and underreported. As a result of the wide array of goods valued in WTP studies, the significant sociodemographic variables of protest responses are likely to vary. This section of the literature review focuses solely on protest responses (as classified by the authors of the study).

3.1 Age. A meta-study (72) sourced data from ten stated preference surveys found and increasing age had a highly significant influence on the likelihood of observing a protest response. Similarly, several authors have found evidence of increasing age and the likelihood of protesting (62, 73-75). It has been speculated that if mental capacity declines with age, the "cognitively demanding" nature of hypothetical WTP scenarios used in research could cause protest responses (72). Furthermore, younger people may be more "open-minded" and able to accept hypothetical scenarios more readily than their older counterparts (72). By contrast, one WTP study (76) within environmental economics found the reverse to be true; that is, increasing age decreases the probability of protesting behaviours, whilst other WTP studies have reported no statistical significance between respondents' age and probability of protesting (43).

3.2 Gender. Gender differences have been observed more frequently in WTP studies compared to other sociodemographic variables. Considering this, it is not farfetched to hypothesise that protest responses differ across gender; with several studies having found males were more likely to protest than females (29, 77-80). It has been proposed males are more likely to understate their valuations in hypothetical markets (81). Despite this, several studies (43, 70, 72) have reported no evidence of gender differences in protesting behaviours.

3.3 Household Income. Economic theory would suggest low income groups may have a higher propensity to express a zero valuation than high income groups. It may also be

hypothesised respondents in low income groups with a zero valuation may feel a need to justify their bids with reasons other than inability to pay (72). Findings within several studies (26, 33, 62, 70, 72, 74) support this theory; however, one study (78), *per contra*, reported the wealthy were more likely to protest.

3.4 Employment Status. Research on the probability of protesting and employment status is scarce, however findings from a study on air pollution in China (78) suggested students were less likely to protest than other employment status groups. One study (73) reported non-working respondents had higher levels of protest responses.

3.5 Social Grade. A WTP study on the Scottish environment (73) found respondents in higher social classes such as B and C2; based on the European Society of Opinion and Marketing Research (ESOMAR 2014) social grade scale, had a higher propensity to protest bid than those in lower social classes (E).

3.6 Location. WTP studies in health have found differences in the rates of protest responses. One WTP study (16) reported those living in countries where health co-payments are widespread may be less likely to report protest responses when valuing health care, than those with a collectively funded health care system. It is suggested individuals from such countries may be subject to "unrealistic and immoral" WTP scenarios following the inclusion of an individual payment via the costs attribute of a health related good (82). A WTP study on air pollution in Poland (62) reported protesters were more likely to live in smaller cities; furthermore it has been reported protesters were more likely to live in isolated rural areas, as they may be more conservative and less inclined to trust governments (76).

3.7 Children in Household. Two studies (72, 73) reported parents were more likely to protest bid, which was suggested to be due to a tighter time schedule than that of non-parents (72). Thus, parents may be tempted to choose what they may perceive as an easy exit out of a WTP survey.

3.8 Education Level. WTP studies have reported those with lower education levels were more susceptible to engaging in protesting behaviours (29, 62, 79). By contrast, other studies (43, 70) have found no evidence of differences in respondents' education levels in nonzero and protest bids.

3.9 Survey Specific Variables. Finally, a number of studies report how elicitation formats in WTP surveys influence the rate of protest responses. It is suggested the open-ended approach produces a large number of protest zero responses compared to the bidding game and payment card techniques (26, 66, 72, 83). The dichotomous choice format is speculated to be the most representative of a market and least likely to suffer from non-responses or protesting (48) as it allows respondents to support the program, but oppose the payment vehicle (84). Furthermore, it is reported within the resource and energy sector (85) that web-based questionnaires yielded significantly higher protest responses (4%) than face-to-face interviews (0%), suggesting the way the questionnaire is presented is another important variable in the rate of protest responses in WTP surveys.

Discussion

This review has revealed that the classification of "true" zeros and protest valuations varies across studies and highlighted a need to better understand the phenomena in interpreting and comparing the results of WTP studies.

There seems to be some consensus that zero valuations due to concerns about taxation and/or the role of government should be classified as protests. Zero valuations motivated by inability to pay or due to the fact the good is of no value to the respondent should be classified as true zero valuations. There also seems to be some consensus that legitimate

true zero valuations should be retained in the data as they have a genuine economic rationale. It is suggested future surveys are designed with a “don’t know” option to account for respondents who cannot mentally place a hypothetical price on the good. Follow-up questions should then be used on all zero valuations (and those who have placed a “don’t know” response), asking respondents the reasons for their bid, as it is difficult to detect protesters without follow-up or qualitative information. Once identified the characteristics of the population should be compared against those with a positive valuation to identify whether the populations vary in terms of sociodemographic variables. If they do not vary, they may follow the popular procedure of censoring. Alternatively if they do differ, it is good practice to report separate analyses; including and excluding such responses (86). Our results show that it is unlikely that those reporting a protest zero are representative of the population, hence, removing protest zeros will lead to unrepresentative samples. There do, however, exist a number of econometric techniques that allow for valuation estimates to be ‘debiased’ after allowing for the unrepresentativeness of ‘protestors’ (87). A recent paper (69) found that a multiple imputation method was superior at ‘debiasing’ valuation estimates than the more traditional Heckman approach.

Uniformity in conducting CV studies is essential for comparability and reproducibility of outcomes in such studies. However, a number of methodological issues may still arise, such as the threshold of respondent valuations. For example, participants may value a good at an inconceivably low or high valuation as a means to protest. Subsequently they may be excluded from the zero valuation analyses due to a positive valuation, leading to the underreporting of such individuals and the over reporting of positive valuations. We have concentrated here on protest zero responses, but it is plausible that respondents stating very small positive amounts may also be ‘protesting’. At the other end of the scale, it is plausible that respondents stating implausibly high valuations may be ‘protesting’ too. It will also be important to understand these types of potential ‘protests’ and to study the impact of removing such responses from the data set.

Whilst much of the existing evidence on zero and protest bids comes from outside the field of health economics, it seems likely that the problem is particularly relevant here as valuing health and health care seems likely to provoke emotive issues. Respondents from countries with ‘Beveridge’ type systems, such as the UK, may feel it is inappropriate to be asked to consider their WTP for health and that the state ‘ought to fund healthcare’. The problem of zero and protest responses may, therefore be of greater significance in health than certain other sectors studies. It is, therefore, of vital importance that such response are identified and dealt with appropriately.

Conclusion

Zero and protest bids represent a serious problem to the integrity of data collected in WTP studies and dealing with them incorrectly may result in biased estimates and erroneous conclusions. We bring together literature from various fields, namely the environment and health on this topic. We have identified a number of other lessons for the design of future CV studies in this area including presenting all respondents with questions designed to detect protestors and using the same procedure to elicit a zero valuation as any other value.

Whilst there has been a small amount of literature published on the classification and modelling of zero valuation protests (23), the authors of this paper are not aware of any papers who have reviewed the aforementioned areas with the addition of the sociodemographic variables associated with protesters to help inform modelling techniques. One meta study included in this review (72) examined the effect of respondent specific variables, however ours is the first to bring together a selection of environmental, health and agricultural economics studies on the matter. Whilst we have reviewed one type of protesters, we advise further research similar to what has been done here on other types of protesting behaviours, including respondents who bid inconceivably low or high amounts in CV studies.

Compliance with Ethical Standards

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Appendices:

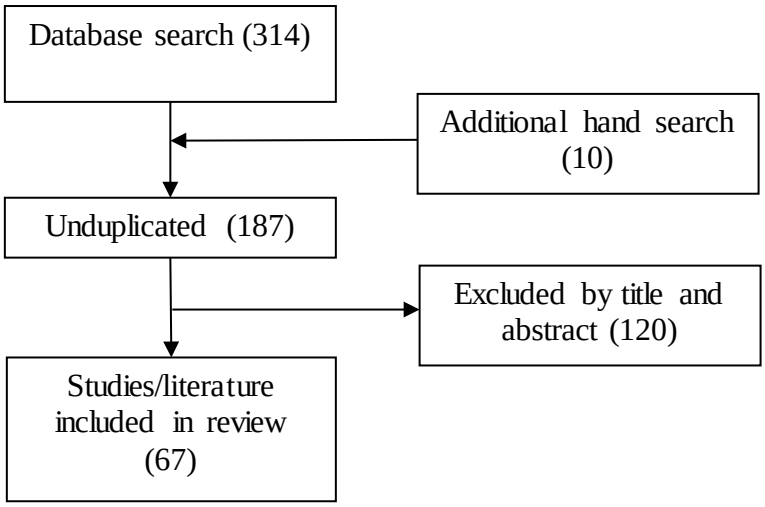
Appendix A

Table 1: Literature review search terms

Database	Search Term
Pub Med	((((“willingness to pay”[Title/Abstract] OR WTP[Title/Abstract]) OR (“contingen* valuation”[Title/Abstract]) OR CV[Title/Abstract]) AND (protest*[Title/Abstract]) OR zero*[Title/Abstract]))
Ovid	(((“contingen* valuation” or CV or “willingness to pay” or WTP) and protest*) or zero*).ab,ti.
Science Direct	(TITLE-ABSTR-KEY(“willingness to pay” or WTP) and TITLE-ABSTR-KEY(protest* OR zero*)).
	TITLE-ABSTR-KEY(“contingen* valuation” or CV) and TITLE-ABSTR-KEY(protest* OR zero*))
Econ Lit	(“willingness to pay” OR WTP OR “contingen* valuation” OR CV) AND protest*
	(“willingness to pay” OR WTP OR “contingen* valuation” OR CV) AND zero*
Wiley Online Library	“contingen* valuation” in Abstract OR “willingness to pay” in Abstract AND zero* in Abstract
	“contingen* valuation” in Abstract OR “willingness to pay” in Abstract AND protest* in Abstract
Sage Journals	“willingness to pay” or “contingen* valuation” in Abstract and protest* or zero* in Abstract
Web of Science	TOPIC:(“willingness to pay”) Refined by: TOPIC: (protest*) ANDTOPIC: (zero*)
	TOPIC:(“contingen* valuation”) Refined by: TOPIC: (protest*) ANDTOPIC: (zero*)
ASSIA	ab(“willingness to pay”) AND ab((protest* OR zero*))
	ab(“contingen* valuation”) AND ab((protest* OR zero*))
JSTOR	(ab:("willingness to pay") AND (ab:(protest* or (ab:(zero*)))))
	(ab:("contingen* valuation") AND (ab:(protest* or (ab:(zero*)))))
Cochrane Library	"'contingent valuation" OR "willingness to pay" in Title, Abstract, Keywords and protest* in Title, Abstract, Keywords in Methods Studies'
	"'contingent valuation" OR "willingness to pay" in Title, Abstract, Keywords and zero* in Title, Abstract, Keywords in Trials'

Appendix B

Figure 1: Flow diagram of literature search results



Appendix C

Table 2: Overview of studies and supporting literature included in review

Study	Field	Country	Topic of paper	If a CV/WTP study: The good being valued
Arrow *et al.*, (1993)	Agriculture	n/a	CV	
Barrio and Loureiro (2010)	Environmental	Spain	Protest Bids in Choice Experiments	
Berrens *et al.*, (1997)	Agriculture	Oregon, USA	CV Techniques	
Bonnichsen and Ladenburg (2009)	Health	Sweden	Protest Zero Bids	
Buchli (2004)	Environmental	Switzerland	WTP Study	Low flow enhancement
Calia and Strazzera (1999)	Ecology	n/a	Modelling Protests	
Carrère *et al.*, (2008)	Health	Lyon, France	Validity of CV Method	
Chen and Hua (2015)	Environmental	Guangzhou, China	WTP Study	Urban heritage trees
Dalmau-Matarrdona (2001)	Health	Spain	CV Study	Home case services in day case surgery
Damgaard *et al.*, (2011)	Environmental	n/a	Review of WTP Studies	
Desvousages *et al.*, (1983)	Environmental	US	CV Study	Water quality
Desvousages *et al.*, (1987)	Environmental	USA	WTP Study	River water quality improvement
Desvousges *et al.*, (1993)	Environmental	Atlanta, USA	CV Study	Waterfowl protection
Desvousges *et al.*, (2010)	Environmental	Atlanta, USA	CV Study	Waterfowl protection
Dixon and Shackley (1999)	Health	Sheffield, UK	CV Study	Community water fluoridation
Dixon and Shackley (2003)	Health	UK	CV Study	Fortification of foodstuffs with folic acid
Dominguez-Torreiro and Soliño (2016)	Agriculture	Cantabria, Spain	CV Study	Sustainable rural development program
Dziegielewska and Mendelsohn (2007)	Environmental	Poland	Protest Bids	
Edwards and Anderson (1987)	Land	US	CV Biases	
Fonta (2010)	Health	Cameroon	Protest Bids	
Freeman (1986)	Environmental	n/a	CV Biases	
Grammatikopoulou *et al.*, (2012)	Environmental	Greece	CV Study	Conservation of a Natura 2000 wetland
Gyrd-Hansen *et al.*, (2014)	Health	Denmark	CV Study	Ambulatory services
Gyrd-Hansen *et al.*, (2016)	Health	Denmark	WTP Study	Ambulance helicopter service
Halkos and Matsiori (2016)	Water Resources	Greece	WTP Study	Artifical lakes protection
Halstead *et al.*, (1992)	Agriculture	New England, USA	Protest Bids	
Hanley and Kuhfuss (2015)	Environmental	Scotland, UK	WTP Study	Protection of historic sites
Havet *et al.*, (2012)	Health	Lyon, France	CV Survey	
Jakobsson and Dragun (2001)	Environmental	Victoria, Australia	WTP Study	Species
Jorgensen and Syme (1995)	Environmental	n/a	Protest Bids	
Jorgensen *et al.*, (1999)	Environmental	Australia	Protest Bids	
Kenyon and Hanley (2000)	Environmental	Scotland, UK	WTP Study	Woodland restoration project
Kim *et al.*, (2016)	Energy	Korea	CV Study	Supply security of oil and gas
Le Goffe (1995)	Environmental	France	CV Study	Water quality
Llorente *et al.*, (2011)	Environmental	Spain	Protest Bids	
Loomis *et al.*, (1996)	Agriculture	US	CV Study	Reducing fire hazards to old-growth forests
Macmillan *et al.*, (2002)	Ecology	Scotland, UK	CV Study	Goose conservation
Manning *et al.*, (1999)	Ecology	n/a	Methodological Issues in CV	
Marvasti (2006)	Health	US	CV Study	Delays in medical services
Meyerhoff and Liebe (2006)	Ecology	Germany	CV Study	Forest biodiversity
Meyerhoff *et al.*, (2012)	Agriculture	Lower Saxony, Germany	Using Latent Class Models in Protest Bids	
Milon (1989)	Environmental	US	Strategic Behaviours in CV Studies	
Mitani and Flores (2007)	Economics	Tokyo, Japan	Gender in Public Goods Experiements	
Mitchell and Carson (1989)	Economics	n/a	CV Method	
Mørkbak and Nordström (2009)	Consumer Policy	Denmark	WTP Study	Different animal food production methods
Mørkbak *et al.*, (2010)	Environmental	Denmark	Meta Study of Protest Bids	
Morrison *et al.*, (2000)	Environmental	Australia	WTP Study	Study on payment vehicles
Nielsen (2011)	Resource & Energy	Copenhagan, Denmark	CV Study	Valuing a gain in life expectancy and air pollution
Nocera *et al.*, (2012)	Health	n/a	CV Method	
Osiolo (2017)	Energy	Kenya	WTP Study	Imporved energy
Parkinson and Goodall (2011)	Health	Various	Systematic review of health programmes	
Pennington *et al.*, (2015)	Health	9 European Countries	WTP Study	QALY
Pennington *et al.*, (2017)	Health	n/a	Methodological Issues in CV	
Ready *et al.*, (2006)	Health	5 European Countries	CV Study	Avoidance of ill health due to pollution
Robinson *et al.*, (2013)	Health	9 European Countries	WTP Study	QALY
Rollins *et al.*, (2010)	Environmental	Nevada, USA	Public Goods and Protest Beliefs	
Shackley and Donaldson (2002)	Health	Ireland	WTP Study	Three health programmes
Smith (2005)	Health	Australia	Sensitivity to Scale in CV Studies	
Spash (2006)	Land	East Anglia, UK	CV Study	Environmental improvements
Strazzera *et al.*, (2000)	Economics	n/a	Modelling Zero Bids in CV	
Sun *et al.*, (2016)	Energy	China	WTP Study	Air pollution
Sutherland and Walsh (1985)	Environmental	US	CV Study	Water quality
Taylor and Armour (2002)	Health	Sydney, Australia	WTP Techniques	
von Haefen *et al.*, (2005)	Agriculture	Delaware, US	CV Study	Forestry management
Whittington *et al.*, (1992)	Environmental	Anambra State, Nigeria	CV Study	Drinking water services
Yu and Abler (2010)	Environmental	Beijing, China	CV Study	Air pollution
Yuan and Yabe (2014)	Environmental	Beijing City, China	WTP Study	Household kitchen waste

Appendix D

Table 3: Classification of "true" zero valuations and protest bids in selected willingness to pay/contingent valuation studies

Study	Classification	Reason
Taylor and Armour (2002:350)	Protest bid	"I didn't feel I could complete the questionnaire because I believe very strongly about free healthcare and the Medicare system. I would be prepared to pay a higher Medicare levy to ensure that no one is faced with the choice this questionnaire poses; i.e. make a choice knowing what you feel is the right medication for you but then having to finally make the choice because of money. If I felt that Treatment B was the right choice, I would probably make it, but I would feel hugely resentful that the hospital was forcing me to make a choice about my health, and complicating it with money. Especially if this choice had to be made once I got to hospital, it's a bit like holding people to ransom"
	Zero valuation	"Just about pricing. Not really sure because I can't really put a price on something that involves your unborn child."
Dixon and Shackley (1999:127)	Zero valuation	Inability to pay
	Zero valuation	Benefits not large enough to warrant payment
	Protest bid	"Paying enough taxes/water rates already"
	Protest bid	"The water companies should pay"
Dixon and Shackley (2003:143-144)	Protest bid	"Manufacturers should pay or simply increase the price of food"
	Protest bid	"There are other ways of doing it"
	Zero valuation	"There are other issues that I feel more strongly about"
	Zero valuation	"It would only benefit pregnant women and not all of society"
	Zero valuation	"Because I don't need it personally"
	Protest bid	"People should know about folic acid already"
	Protest bid	"People already have good access to information, it is generally available"
	Zero valuation	"It is not necessary at the current time"
	Zero valuation	"I would want to know the outcome of further research"
	Zero valuation	"I am against universal additives in principle"
Meyerhoff *et al*., (2012); Strazzera *et al*., (2000)	Protest bid	Distrust of authorities and governments
Chen and Hua (2015)	Protest bid	Respondents lack of faith in government's resource utilisation and task execution
Havet *et al*., (2012)	Protest bid	Objections to being asked to complete a questionnaire
	Zero valuation	No preferences
Meyerhoff *et al*., (2012)	Protest bid	Ethical concerns

	Protest bid Protest bid	Fairness aspects Scepticisms towards the hypothetical scenario
Mitchell and Carson (1989)	Protest bid	Refusal to play the game
Shackley and Donaldson 2001:10)	Zero valuation Zero valuation Protest bid Protest bid Protest bid	"The programme is of no value to my household" "I can't afford it" "Other public sector budgets should be cut" "The users should pay" "The health service should be more efficient"
Loomis *et al*., (1996:7)	Zero valuation Zero valuation Protest bid Protest bid Protest bid Protest bid	"This program is not worth anything to me" "I cannot afford to pay at this time" "I do not think program would work" "It is unfair to expect me to pay" "I am opposed to new government programs" "Fire is natural and benefits forest"
Jakobsson and Dragun (2001:215)	Zero valuation Protest bid Zero valuation Zero valuation Protest bid Protest bid Protest bid Zero valuation	"The amount given is too high, but I would pay $_ per year" "I did not want to put a dollar value on protecting plants and animals (or Leadbeater's possum)" "Society has more important problems than protecting plants and animals (or Leadbeater's possum" "Protecting plants and animals (or Leadbeater's possum) is not worth anything to me" "The government should protect plants and animals (or Leadbeater's possum) using taxes already paid" "Not enough information is given" "I object to the way the question is asked" "I can't afford to pay anything"
Mørkbak and Nordström (2009)	Protest bid	Respondents who supported animal welfare but did not think he or she as a consumer should pay for these attributes
Barrio and Loureiro (2010:29)	Protest bid Protest bid Protest bid	"These actions are interesting, but nowadays I can't afford this payment" "I don't like the actions to be undertaken" "It is not fair that I have to pay to protect the Biosphere Reserve, because I pay enough taxes already"
Morrison *et al*., (2000:415)	Protest bid	"I support the proposal but not if it requires a levy of any amount"
Ready *et al*., (2004:149-150)	Protest bid Protest bid Zero valuation Zero valuation	"I think the whole idea of paying to avoid illness is unrealistic" "I would like to avoid this illness episode, but I can not (sic) say how much it would be worth to me to do so" "I cannot afford to pay anything" "I don't think the episode is bad enough to pay to avoid it."

Dalmau-Matarrodona (2001:112)	Protest bid Protest bid Protest bid Zero valuation Zero valuation	"I think the government should pay, not me" "I pay taxes" "I am not generally positive about the project" "I do not have money to pay" "If I had to pay, I would prefer the alternative project"
Halstead (1992:163)	Zero valuation Protest bid Zero valuation Protest bid	"The amount is too much; I would donate $_ per year over the next five years (please write in the maximum dollar amount that you would contribute)" "The bald eagle should be preserved in New England but the money should come from taxes and license fees (from game species) instead of donations" "The bald eagle is not worth anything to me" "Bald eagle preservation is important to me but I refuse to place a dollar value on it"
Osiolo (2017)	Protest bid	Respondents who are not willing to pay for the proposed program and they may also include outliers (those that state a willingness to pay value either higher or lower than the average willingness to pay value
Domınguez-Torreiroa and Solino (2016:563)	Protest bid Protest bid Protest bid Protest bid	"I refuse to put a price to the rural environment" "The government should cut public spending on other things and use taxes already paid" "Not enough information is given on the proposal" "I don't believe in the success of the proposal"
Gyrd-Hansen et al., (2016:7)	Protest bid Protest bid	"on principle grounds I do not want to pay more in tax" "on principle grounds I do not want to buy a private insurance as it increases inequity in society"
Sun et al., (2016)	Zero valuation Zero valuation Protest bid Protest bid Protest bid	Air quality is good enough; therefore, there is no need to pay an extra amount of money Household income is too low to afford it The government should be responsible for it I have paid enough costs and taxes, and therefore I do not want to pay more Polluters should pay for it
Kim et al., (2016)	Zero valuation Protest bid	Respondents who place a genuine zero value on an improvement in supply security of oil and gas via the governmental support for overseas oil and gas E&P projects or is indifferent to the change. Respondents who refuse to bid associated with the process of valuation or considers a proposed change either good or bad, or is indifferent to the change.