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Urban Water Restrictions: Attitudes, Information and Willingness to Pay

Bethany Cooper
School of Business, La Trobe University, Albury-Wodonga Campus, Wodonga, Vic, 3689, Australia. Tel: +61 2 60249842, Fax +61 2 60583833, E-mail: b.cooper@latrobe.edu.au

Lin Crase
School of Business, La Trobe University, Albury-Wodonga Campus, Vic, 3689, Australia.

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Bethany Cooper[a*] and Lin Crase[a]

[a]School of Business, La Trobe University, Albury-Wodonga Campus, Wodonga, Vic, 3689, Australia. Tel: +61 2 60249842, Fax +61 2 60583833, E-mail: b.cooper@latrobe.edu.au
*Corresponding author.

In most urban cities across Australia, water restrictions remain the dominant policy mechanism to restrict urban water consumption. The extensive adoption of water restrictions over several years means that Australian urban water prices have consistently not reflected the opportunity cost of water (Edwards 2008). Given the generally strong political support for water restrictions and the likelihood that they will persist for some time, there is value in understanding householders' attitudes in this context. More specifically, identifying the welfare estimate associated with avoiding urban water restrictions entirely would be a non-trivial contribution to our knowledge of the costs that attend them. This paper employs the results from the stated preference technique contingent valuation to investigate consumers' willingness to pay to avoid urban water restrictions. It also investigates the influence that cognitive and exogenous dimensions have on utility gain associated with avoiding water restrictions. Accordingly, discussion provides some salutary insights into the impact of this policy mechanism on economic welfare.

Key words: Urban water restrictions, water policy, contingent valuation

1. Introduction

In most urban cities across Australia, the level of rainfall is the key variable in determining the extent that water can be harvested for the urban population. Water restrictions remain the dominant policy mechanism to restrict urban water consumption when rainfall falls short. Economists are generally of the view that this type of allocation mechanism does not achieve economic efficiency. Using water efficiently in an urban context requires that it be allocated to those users whom gain the highest marginal social value. This is often not given priority in an urban water economy, with social and political objectives generally dominating decision making.

Political constraints remain to be a barrier to improving economic efficiency of urban water use. Notably, water restrictions constrain particular uses of water, but they do not require households to reduce the amount of water they use. Therefore, water restrictions do not directly address the fundamental issue of 'total use of water' and furthermore they restrict householders' freedoms regarding how they use their water. Understandably, there is substantial conjecture about the positive and negative consequences of restrictions in the eyes of consumers. Thus, increasing our knowledge of consumers' preferences in regards to urban water restrictions appears to be important in developing effective policy responses.

Politicians in support of water restrictions commonly try to gain the support of the public through playing the 'moral suasion' card. Appeals are often made using the concept of 'intergenerational equity', i.e. use less water to ensure water for your children. In addition, the save every drop mentality campaign is often "used to beat urban consumers over the head" (Watson 2005, p.7). Politicians claim that the public generally supports water restrictions and the punitive measures that attend them. A useful contribution may be to challenge the context of these claims. For instance, are they being made on the assumption that the general public is attentive and knowledgeable about the national distribution of the resource and able to avail themselves of important information? Often, consumers are ignorant toward options and opportunities and this is apparent not only among the poor or the uneducated (Shafir 2007). Arguably, there is ample evidence in the press and elsewhere that consumer knowledge of water is far from complete (see, for instance, Crase 2009).

The seminal theoretical work on information highlighted that asymmetric information distorts the market equilibrium away from the first best (Akerlof 1970; Rothschild and Stiglitz 1976). Stemming from the seminal works of Akerlof (1970) and Rothschild and Stiglitz (1976), a comprehensive body of literature has emerged that emphasizes the negative welfare consequences of adverse selection and the potential for welfare-improving government intervention (Chiappori and Salanie 2000; Finkelstein and McGarry 2006).

Consideration of water restrictions in the context of legal governance is also important when making political assumptions about the public in general and developing urban water policy. For instance, urban water restrictions are legally binding in the states of Victoria and New South Wales (NSW), Australia. However, the jurisdiction governing

this restriction mechanism largely differs between these two states. For example, the fining process associated with a water restriction breach is less complex in NSW compared to that of Victoria. This has lead to a greater number of householders in NSW's capital city being fined compared to Victoria's capital city. Moreover, in Victoria the degree of punishment, as a consequence of a water restriction breach, becomes more severe as the restrictions tighten, whereas the punishment remains uniform in NSW across all stages of water availability. In terms of the enforcement regime surrounding water restrictions, the number of water patrol officers per household in NSW is much greater than Victoria. Thus, those who do not comply have a higher likelihood of getting 'caught' if they are a NSW resident.

In the current context, understanding the value that consumers place on avoiding water restrictions would offer some insight into the welfare costs that are inflicted by water restrictions. Moreover, investigating the influence that psychometric and exogenous variables have on the value estimates of avoiding water restrictions would be a useful contribution.

This paper considers the welfare estimates associated with avoiding water restrictions by presenting the results of a contingent valuation (CV) study drawing data from NSW and Victoria. The research also embodies data from water-rich and water poor communities and draws from regional and metropolitan settings. Accordingly, the influence of these variables over the preferences of consumers can be considered.

The paper itself is divided into four parts. Section two explores several aspects of choice behaviour covering economic, sociological and psychological dimensions. In section three, we briefly consider the theoretical groundings of CV and present the design and results of this study. More specifically, we report the empirical estimates of respondents' willingness to pay (WTP) to avoid urban water restrictions. The final section addresses the core findings before offering some brief concluding remarks.

2. An insight into economics: A traditional and behaviourist perspective

The concept of relative scarcity has been seen to be the key factor underlying economics. Consumers' unlimited wants and universally limited means with which to satisfy those implies the need for efficiency in their use (Wallis and Dollery 1999). Efficiency, therefore, is a core consideration in the allocation of our resources. Essentially, economic efficiency is thought to decrease the economic burden of scarcity across consumers. In the current context, the achievement of economic efficiency is seen as reducing the relative scarcity of water and redistribute the burden of scarcity by controlling the allocation of water between consumer groups. Behavioural economics develops this traditional perspective to improving allocative efficiency by considering the role that attitudinal variables play across consumer groups. In essence, behavioural economics builds on the foundations established by neo-classical economics by incorporating a focus on the underlying psychological cognitions and, in turn, improve predictions of field phenomena and policy.

It is important to note that this differing school of thought does not dismiss conventional economics where equilibrium, efficiency, and utility maximisation are central. The traditional approach remains useful in that its theoretical framework provides us with refutable predictions. Behavioural economics develops traditional economics in that it offers a greater psychological dimension and often simply relaxes basic assumptions that are not key to the economic field (Camerer *et al*. 2004). Thus, it appears that considering psychological variables in the establishment of welfare estimates of avoiding water restrictions is, hypothetically at least, a key factor associated with calculations of expected utility.

2.1 Choice behaviour: Attitudinal and exogenous factors

Stern (2000) has developed an outline of causal variables for environmental behaviour. These include attitudinal factors, external or contextual forces, personal capabilities, and habit or routines. Attitudinal factors include values, norms, beliefs, and attitudes. These particular variables may affect the general behaviour of individuals or their specific behaviours. There are a number of theories that underpin behavioural variance. Namely, the cognitive dissonance theory of Festinger (1957), the norm-activation theory of Schwartz (1977), the new environmental paradigm (NEP) scale of Dunlop and Van Liere (1978), and the theory of planned behaviour[1].

Secondly, the external or contextual forces are variables that are exogenous to individuals. For instance, financial constraints, legal structures, regulations, a constrained physical environment, and community expectations are all influencing factors that are exogenous to the individual. Notably, the way in which these factors impact on individuals' behaviour is dependent on their beliefs and attitudes (Stern 2000). Therefore, it appears that the way in which water restrictions impact on an individual's behaviour will be dependent on their beliefs and attitudes, at least in part.

Thirdly, personal capabilities refer to the knowledge and skills that are required for certain behaviours. A number of authors suggest that the explanatory power of socio-demographic variables is relatively limited in the context of environmental behaviours (see, for instance, Bateman *et al*. 2002; Dietz et al. 1998; McFarlane and Boxall 2003). However, Stern (2000) claims that variables such as income, gender, age and educational level may be proxies for personal capacities.

Finally, habits or routines also provide a set of variables that influence behaviour. Stern (2000) acknowledge that habits and routines may need to be altered in order for behaviour to change. However, this particular set of variables does not require substantial analysis in the current context as the focus of this study centres on rational, conscious choice behaviour.

According to Stern (2000), these causal factors are not independent of each other, and environmental behaviours are dependent on a wide range of causal factors, both general

[1] Armitage and Conner (2001) regard the theory of planned behaviour (TPB) of Ajzen (1991) and the theory of reasoned action (TRA) of Fishbein and Ajzen (1975) as the most widely researched model of the relationship between attitudes and behaviour.

and behaviour-specific. In addition, the literature suggests that attitudinal factors appear to demonstrate the greatest predictive power when behaviours are not extensively limited by context or personal capacities (see, for instance, Stern 2000; Tyler *et al*. 1982; Ajzen 1991; Bamberg 2003).

2.2 A closer look at the psychology of choice behaviour: The theory of planned behaviour

The theory of planned behaviour is a model developed by Ajzen and Fishbein (1970) to predict an individual's behaviour. This model is embedded in a framework of learning theories and builds on the theory of propositional control (Dunlany 1967) and the theory of reasoned action (Ajzen and Fishbein 1970). The theory of planned behaviour has proved effective in predicting behavioural intention and behaviour in a wide range of situations, including donating blood, safer sex behaviours, alcohol use and voting (Ajzen and Fishbein 1977; Bryan, Ruiz and O'Neill 2003; Sheppard, Hartwick and Warshaw 1988). The theory suggests that the intention to engage in a particular behaviour is a function of three antecedents: the attitude toward the behaviour, social norms, and perceived behavioural control. The following discusses these in more detail.

2.2.1 Attitudes

D'Astous *et al*. (2005, p.292) defines attitudes as "an evaluative predisposition toward the behaviour as a function of its determinant personal consequences". That is, the individual's attitude toward a particular behaviour is operationalised by the beliefs about the negative consequences and rewards associated with performing that behaviour (Ajzen and Fishbein 1970; Harrell 1991; Tolman, Edleson and Fendrich 1996). The anticipated gain and loss related with a certain behaviour is measured against one another to aid in choosing the behaviour that minimises loss and maximises gain.

The conclusions drawn from existing research into attitudes vary. For instance, Aitken *et al*. (1994) suggests that attitudes have limited explanatory power regarding water consumption behaviour, although this result must be reviewed in relation to methodological concerns (see, for instance, Watson *et al*. 1999). Moore *et al*. (1994) study of changes in community water conservation attitudes, knowledge, and behaviour intentions found significant correlation between reported behaviour attitudes, and intentions. Thus, improving our understanding of knowledge, attitudes and intentions regarding urban water restrictions may potentially lead to an improvement in policy in the current context.

2.2.2 Social norms

Subjective norms are defined as "the perceived social acceptability of behaviour" (Kernsmith 2005). Norms are usually limited to the social acceptability of the behaviour to people that are most significant to the individuals, however they may also include expectations by the society in general. Social norms related to the acceptability of domestic water usage have been addressed in primary prevention campaigns involving television and radio commercials, billboards, and education efforts in schools that attempt to convey the message that excessive water use is unacceptable (DSE 2004). In the context of water usage, social norms are evolving. Put simply, it is becoming

increasingly unacceptable for consumers not to take responsibility for their own water consumption. Arguably, the merit in this type of thinking is questionable.

2.2.3 Perceived behavioural control

Perceived behavioural control is an individual's perception of the extent to which they believe they have the capacity (i.e. resources and opportunities) to achieve a behaviour in a successful way (d'Astous *et al*. 2005). These expectations vary in their magnitude, generality and strength. Basically, the theory proposes that an individual's confidence in their ability differs across situations, with magnitude referring to the degree of difficulty to perform the behaviour, generality to the scope of situations that the behaviour may be necessary and strength refers to the individual's degree of confidence (Kernsmith 2005). In the current context, the perception that individuals have of their perceived behavioural control regarding compliance with water restrictions may potentially impact on their preferences toward avoiding them.

This discussion suggests that there is scope to address wider politico-economic considerations associated with urban water restrictions. More specifically, it is plausible to identify individuals' WTP to avoid restrictions and investigate how this interacts with psychological and exogenous variables and information about water management generally.

3. Contingent valuation

To further investigate householders' preferences surrounding water restrictions, data were collected to specifically uncover the preference for avoiding restrictions entirely. These data are considered in the context of the CV methodology.

3.1 Bid design

Amongst the stated preference techniques the most extensively used approach is the contingent valuation (CV) method, which has been commonly employed to value preferences for environmental goods across numerous countries (Carson *et al*. 1995; Carson 2001). In a CV method study, respondents are asked questions to elicit their maximum WTP or minimum willingness to accept compensation for a predetermined change. A number of contingent valuation studies have used the multiple-bounded discrete choice (MBDC) response format as an alternative to the dichotomous choice format (Loomis and Ekstrand 1997; Welsh and Poe 1998; Poe *et al*. 2001; Cameron *et al*. 2002; Roach *et al*. 2002; Alberini *et al*. 2003; Evans *et al*. 2003; Vossler *et al*. 2003). The MBDC approach increases the number of possible intervals to k+1 (where k is the number of bids shown to a respondent). This approach improves the efficiency of the welfare estimate. This research employed a payment card (MBDC) with an exponential response scale design that contained 13 cells. The value given to respondents in the first cell was \$0. The values in the second cell through to cell twelve were computed by equation (1),

$$B_n = B_1 (1 + k)^{n-1} \qquad (1)$$

In this case, B_n is the bid amount, where B_1 equals 1 and k is determined by the range selected for the payment card. The value of k is selected so that $(1+k)^{11}$ equals the largest value on the payment card i.e. $(1.86)^{11}= 921$[2]. Appendix A illustrates the bid design used for this study. The bids range from $0 to $900 and have a k value of 0.86. For ease of respondent review, the actual values listed on the payment card were rounded. Expressing a value of $900 instead of $921, or $40 instead of $41, is less distracting to respondents when they review the payment card, rarely has this had a significant effect on WTP summary statistics, and is not likely to be within the reporting precision of respondents (Rowe *et al*. 1996). In this study, the MBDC format required respondents to indicate their voting certainty on a proposed policy referendum at each of the possible dollar values specified on the payment card (bids) by choosing from "definitely no", "probably no", "not sure", "probably yes", and "definitely yes" response alternatives.

3.2 Data collection

Six cities were selected to draw the sample for conducting the main survey, which was distributed on-line to a random sample of households. These cities provided scope for analysis on several dimensions, including comparisons between water rich and water poor cities; Victorian and NSW cities; and regional and metropolitan cities. Complete and valid information was gathered from 512 respondents (Wodonga: 54; Albury: 94; Melbourne: 106; Sydney:102; Goulburn: 51; Bendigo:105). Notably, the surveys were framed differently where half included information outlining the percentage of national water usage per sector and the remaining did not[3]. Sampling was completed during April 2008. The characteristics of the sample are presented in Table 1.

Table 1. Sociodemographics of the Survey Respondents

Metropolitan (Sydney, Melbourne)	40%
Rural or Regional Centres (Albury, Wodonga, Goulburn, Bendigo)	60%
New South Wales	48%
Victoria	50%
Average age	42 yrs
Average household income before tax	$978 per week
Own their home	30%
Male	40%
Female	60%

[2] The value k equals the percent increase between adjacent cells before smoothing of the values. Cell 13 includes the text 'More than the above,' which implies more than B_{12}.

[3] The significance of this is investigated later in the paper by including the variable FACTS into the models.

The questionnaire consisted of four parts. The first part contained questions regarding respondents' attitude toward water restrictions. A choice-experiment was also presented to respondents in the second section and questions regarding the respondents' socio-economic status were presented in part three[4]. The final section was used to probe respondents about their WTP to avoid water restrictions. The focus of the remainder of this paper will be on the results and findings of the respondents WTP to avoid water restrictions.

3.3 Ordered probit model

There are a number of ways that have been proposed to retrieve the WTP from this form of data. Here we applied an ordered probit model[5] (see, for instance, Cameron *et al*. 2002; Horna et al. 2007). The central concept of an ordered probit model is that there is a latent continuous metric underlying the ordinal responses observed by the analyst. Thresholds partition the real line into a series of regions corresponding to the various ordinal categories. The latent continuous variable, y^* is a linear combination of some predictors, $\mathbf{x}$, the bid amount plus a disturbance term that has a standard Normal distribution:

$$y^*_i = \mathbf{x}_i \boldsymbol{\beta} + \beta_o \mathbf{Bid} + e_i, \qquad e_i \sim N(0, 1), \forall\, i = 1, \ldots, N.$$

y_i, the observed ordinal variable for individual i, takes on integer values 0 through m according to the method below:

$$y_i = j \quad \Leftrightarrow \quad \mu_{j-1} < y^*_i \leq \mu_j,$$

where j =0,…,m, and $\mu_{-1} = -\infty$, and $\mu_m = +\infty$, and the μj are defined as the 'cut values'.

To determine how changes in the predictors translate into the probability of observing a particular ordinal outcome consider the following:

$$P[y_i = 0] = P[\mu_{-1} < y^*_i \leq \mu_0],$$

$$= P[\infty 1 < y^*_i \leq \mu_0],$$

$$= P[y^*_i \leq \mu_0],$$

substituting from (1),

$$= P[\mathbf{x}_i \boldsymbol{\beta} + \beta_o \mathbf{Bid} + e_i \leq \mu_0],$$

$$= P[e_i \leq \mu_0 - \mathbf{x}_i \boldsymbol{\beta} - \beta_o \mathbf{Bid}],$$

[4] See Cooper and Crase (forthcoming) for a review of the choice-experiment analysis conducted with this data.

[5] The ordered probit model was estimated using the data collected from the main survey instrument.

$$= \Phi(\mu_0 - \mathbf{x}_i \boldsymbol{\beta} - \boldsymbol{\beta}_o \mathbf{Bid});$$

$$P[y_i = 1] = P[\mu_0 < y^*_i \leq \mu_1],$$

$$= P[\mu_0 < \mathbf{x}_i \boldsymbol{\beta} + \boldsymbol{\beta}_o \mathbf{Bid} + e_i \leq \mu_1],$$

$$= P[\mu_0 - \mathbf{x}_i \boldsymbol{\beta} - \boldsymbol{\beta}_o \mathbf{Bid} < e_i \leq \mu_1 - \mathbf{x}_i \boldsymbol{\beta} - \boldsymbol{\beta}_o \mathbf{Bid}],$$

$$= \Phi(\mu_1 - \mathbf{x}_i \boldsymbol{\beta} - \boldsymbol{\beta}_o \mathbf{Bid}) - U(\mu_0 - \mathbf{x}_i \boldsymbol{\beta} - \boldsymbol{\beta}_o \mathbf{Bid}).$$

Therefore, generically:

$$P[y_i = j] = \Phi(\mu_j - \mathbf{x}_i \boldsymbol{\beta} - \boldsymbol{\beta}_o \mathbf{Bid}) - \Phi(\mu_{j-1} - \mathbf{x}_i \boldsymbol{\beta} - \boldsymbol{\beta}_o \mathbf{Bid}).$$

For j = m (the 'highest' category) the generic form reduces to:

$$P[y_i = m] = \Phi(\mu_m - \mathbf{x}_i \boldsymbol{\beta} - \boldsymbol{\beta}_o \mathbf{Bid}) - \Phi(\mu_{m-1} - \mathbf{x}_i \boldsymbol{\beta} - \boldsymbol{\beta}_o \mathbf{Bid}),$$
$$= 1 - \Phi(\mu_{m-1} - \mathbf{x}_i \boldsymbol{\beta} - \boldsymbol{\beta}_o \mathbf{Bid}).$$

A maximum likelihood estimation (MLE) is used to estimate the model, thus initially a log-likelihood function is generated. This is achieved by defining an indicator variable Z_{ij} , which equals 1 if $y_i = j$ and 0 otherwise. The log-likelihood is simply[6]:

$$\ln \mathcal{L} = \sum_{i=1}^{N} \sum_{j=0}^{m} Z_{ij} \ln[\Phi_{ij} - \Phi_{i,j-1}],$$

where $\Phi_{ij} = \Phi[\mu_j - \mathbf{x}_i \boldsymbol{\beta} - \boldsymbol{\beta}_o \mathbf{Bid}]$ and $\Phi_{i,j-1} = \Phi[\mu_{j-1} - \mathbf{x}_i \boldsymbol{\beta} - \boldsymbol{\beta}_o \mathbf{Bid}]$.

(Greene 1990)

In the context of the current study, a further adjustment is required to account for the panel nature of the data: each respondent contributes 12 observations (associated with the 12 bid amounts). This can be dealt with by estimating a random effects ordered probit model, where the error term is modified such that:

$$y^*_{ki} = \mathbf{x}_i \boldsymbol{\beta} + \boldsymbol{\beta}_0 \mathbf{Bid}_\mathbf{k} + \zeta_i + e_{ki}, \qquad e_{ki} \sim N(0, 1), \ \zeta_i \sim N(0, 1)$$

where ζ_i is an individual specific random effect, and k indicates the bid within the panel. The implication is that the responses are correlated for an individual, but are independent across individuals (Alberini *et al*. 2003).

[6] The variance parameter was set to equal 1.

3.4 Ordered probit results

An ordered probit model was estimated for all respondents. Table 2 summarizes the results of model 1, where significant socioeconomic and attitude items have been included in an attempt to improve model fit[7].

[7] Refer to Appendix B for a description of the interaction variables.

Table 2. Ordered Probit Model

Model 1		
	Coefficient	t-ratio
BID	-0.0046 ***	43.46
FACTS	0.2082 ***	3.29
STATES	0.4147 ***	6.56
WATER	-0.2632 ***	3.51
INCOME	0.0002 ***	4.31
AGE	-0.0094 ***	2.40
EDUCATION	-0.0879 ***	2.75
NUMBER CHILDREN	-0.0972 ***	2.21
POOL	-0.1631 **	2.03
INTENTION	-0.2137 ***	3.68
ATTITUDE	0.3140 ***	3.57
SOCIAL NORMS	0.1669 ***	4.37
VALUES	-0.1294 ***	2.56
PBC	-0.3593 ***	7.19
μ_1	-1.2201 ***	5.07
μ_2	-0.7557 ***	3.15
μ_3	-0.2346	0.98
μ_4	0.4376	1.83
N	6132	
Log Likelihood	-6267.202	

*** indicates significance at the 1 percent level. ** indicates significance at the 5 percent level.

Model 1 indicates that the STATES, FACTS and INCOME parameters are positive and significant, which imply a number of relationships. Firstly, respondents residing in NSW are WTP more to avoid water restrictions than Victorian respondents and implying they gain greater utility from avoiding regimes in that jurisdiction, *ceteris paribus* of course. Secondly, those respondents who received information (FACTS) regarding national water usage on their survey were inclined to offer a higher WTP. Thirdly, higher income earners have a higher WTP to avoid water restrictions than lower income earners. Conversely, the WATER, AGE, EDUCATION, POOL and NUMBER CHILDREN parameters are negative and significant. This suggests that participants from cities that have been on severe water restrictions for a long period of time are less WTP to avoid water restrictions compared to those respondents from cities that have a shorter history of water restrictions. In addition, respondents that are younger, have a lower level of education, do not own a pool and have a lower number of children residing in their

household are more WTP to avoid water restrictions and therefore gain a higher utility from avoiding them. These results support Syme and Nancarrow's (1991) general observation that concerns surrounding perceptions of water restrictions are likely to be related to socio-economic status, age and household size, which may prompt strong emotions among water users.

Attitude components were also included in the ordered probit model[8] in an attempt to increase our understanding of the cognitive, and perhaps more profound, influences over behaviour. Model 1 indicates that INTENTION, VALUES and PBC have negative and significant coefficients, which has several implications. Firstly, respondents that indicated a low intention to comply with water restrictions appear to be more inclined to pay to avoid water restrictions relative to those with higher intentions to comply. Secondly, respondents that expressed relatively low environmental values are generally more WTP to avoid water restrictions. Thirdly, participants that scored low in terms of perceived behavioural control were also more inclined to use a monetary vehicle to avoid water restrictions. Put differently, those that believe that the actions of their individual household will not influence the overall water situation are generally more WTP to avoid water restrictions. On the other hand, ATTITUDE and SOCIAL NORMS[9] have positive and significant coefficients. Perhaps controversially, respondents with a favourable attitude toward complying with water restrictions appear more WTP to avoid them than those with a less favourable attitude. The SOCIAL NORMS variable attempts to act as a proxy for participants' ranking of social norms i.e. the extent to which the respondent views compliance as 'appropriate behaviour' in a social context. The data thus support the view that those who scored higher in terms of SOCIAL NORMS were more inclined to pay to avoid water restrictions.

3.5 WTP to avoid water restrictions

The definition of the median WTP is complicated if the central category is unsure. In such cases one can only say that the median WTP lies within a bound. These are defined in this case as:

$$WTP_l = (\mathbf{x}_i \boldsymbol{\beta} - \mu_3)/\beta_o$$

and

$$WTP_u = (\mathbf{x}_i \boldsymbol{\beta} - \mu_2)/\beta_o$$

where l and u indicate lower and upper bounds respectively. Given the inclusion of the respondent-specific exogenous variables x_j, the WTP values can be evaluated either at the means, or at specific values. One view of these bounds is that they represent alternative interpretations of the value needed to achieve a majority in a referendum: the lower assumes that the majority can include only those who say "definitely yes" and "probably yes", while the upper bound considers those who respond both "yes" and "uncertain".

[8] Six attitude components were estimated from 30 scale items included in the survey, where the extraction method employed was principal axis factoring. Refer to Appendix B: Table 2 for a description of these variables.

[9] For a more detailed explanation of the derivation of these items see Cooper (forthcoming).

The median WTP for all respondents was estimated from the sample data and the estimated coefficients from Model 1. This range is not a statistical significance concern, rather the WTP of -$4.86 represents the conservative estimate and the WTP of $107 represents a liberal estimate (see Table 3).

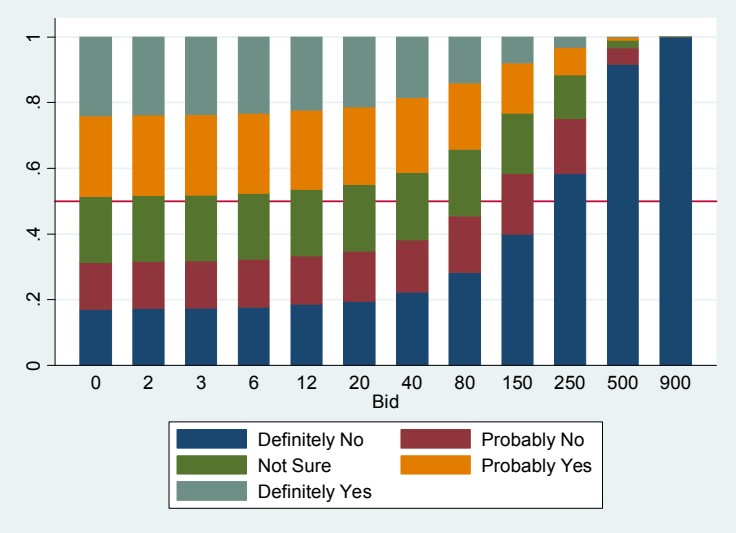
Table 3. WTP per annum All Respondents

	WTP	t-ratio
Lower bound (Conservative)	-$4.86	-0.64
Upper bound (Liberal)	$107.06	14.55***

*** indicates significance at the 1 percent level.

In addition, Graph 1 is derived from the estimated coefficients from Model 1 and illustrates the predicted probabilities for each class (definitely no; probably no; unsure; probably yes; definitely yes) of the latent variable for each of the bid amounts. Framing this information as a referendum, we can also determine the range where the WTP will fall for the median respondent.

Graph 1: Predicted Probabilities



A number of unconditional median WTP values were estimated along situational dimensions in order to make meaningful comparisons within the sample data. Table 4 below presents the range for the unconditional Median WTP across three dimensions. Firstly, the WTP range is presented for NSW respondents compared to Victorian respondents. As observed earlier, NSW participants are generally more WTP to avoid water restrictions than Victorians, where, even from the conservative perspective, NSW respondents are WTP $45. Notably, this may, in part, be explained by the vastly different enforcement regimes associated with water restrictions across the two states. For instance, Victoria has a less stringent regime and therefore Victorian respondents may not

perceive there to be as much value in paying to avoid water restrictions as they are not as heavily enforced as those in NSW.

Secondly, Table 4 enables us to compare the WTP range for water rich cities with water poor cities. That is, those cities that have a history of severe water restrictions compared to those that have been faced with less severe restrictions or restrictions more recently. Respondents from water poor cities have a lower WTP range. This may, in part, be explained by the notion that consumers adapt to changing circumstances (Seligman *et al.* 1996). Thus, residents in water poor cities may have invested in gardens that demand less water or alternative water supplies, and hence might be expected to gain a lower utility from avoiding water restrictions. Moreover, Krannich *et al*. (1995) suggests that severe and long-term scarcity can seriously strain the response capabilities of individuals. Therefore, the notion of 'water restriction fatigue' may also contribute to the explanation of this result[10] where, in some instances, consumers in water poor cities have developed an indifferent attitude toward water restrictions altogether.

Finally, the WTP range is presented for those respondents who received information pertaining to national water use compared to those who did not. The data reveals that those who received this information had a higher WTP. Notably, participants that received this information indicate a WTP value of $21 from the conservative perspective, with the upper bound estimating a WTP of $133. This suggests that there may be merit in further investigating whether differing amounts of information will alter people's preferences to tolerate water restrictions. For instance, 'to what extent are the people who generally support water restrictions decisions cognizant of the national distribution and use of the resource?'

[10] This concept became apparent during interviewing residents from cities that had been on severe water restrictions for a long period of time (i.e. Bendigo, Goulburn). A number of interview participants revealed a diminishing enthusiasm for water restrictions due to the extensive length of time they had been inflicted upon them.

Table 4. Unconditional Median WTP Ranges

	States			
	NSW	t-ratio	Vic	t-ratio
Lower bound	$45.09	4.84***	-$55.80	-5.10***
Upper bound	$157.02	16.78***	$56.13	5.35***
	Water			
	Water Rich	t-ratio	Water Poor	t-ratio
Lower bound	$19.76	2.39**	-$63.22	-4.35***
Upper bound	$131.69	16.12***	$48.71	3.45***
	Facts			
	No	t-ratio	Yes	t-ratio
Lower bound	-$8.29	0.76	$21.17	2.11**
Upper bound	$103.63	9.69***	$133.11	13.47***

*** indicates significance at the 1 percent level. ** indicates significance at the 5 percent level. All other exogenous variables held constant at mean levels.

4. Discussion and concluding remarks

People's sensitivity to water restrictions across a number of dimensions appears to differ between groups within the population. Being able to identify the segments within the population who are most enthusiastic about paying to avoid water restrictions is an important element to developing effective policy.

Contrary to the implied value of 'saving water' that dominates popular thinking, discussion reveals that particular segments within society actually value not being subject to water restrictions. More specifically, attitudinal variables (e.g. attitudes toward social norms) and particular value sets (e.g. environmental values) were proven to play some part in influencing an individual's WTP to avoid water restrictions. Similarly, respondents that differ across socio-demographic variables such as age, income and education also appear to receive differing levels of utility from avoiding water restrictions. In addition, exogenous factors such as a respondents' state jurisdiction, the severity and duration of water restrictions imposed within their city and whether the respondent received information about overall national water usage were shown to have an influence on the respondent's WTP to avoid water restrictions. Interestingly, across some of these situational dimensions it appears that respondents do not *prima facie* gain

utility from avoiding water restrictions and across others the impact of water restrictions on human welfare is self evident.

The policy implications of this analysis are significant. Presently, state jurisdictions impose a range of constraints to limit household water use with little account for individual preferences or use. Clearly, this approach is not unanimously supported by the population, although many would appear to be in favour of more rigorous application across the populous simply for the sake of it (see Cooper and Crase forthcoming). By way of contrast, the CV data show that more rigorous enforcement- such as that applied in NSW- is also linked to a greater inclination to pay to avoid restrictions. Moreover, when individuals have access to information about national water consumption trends they are more inclined to seek to 'buy their way out' of the restriction regime. All of these topics are worthy of greater scrutiny in a policy context and provide a useful basis for future research.

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Appendix A: Bid Design

Given your household's income and other expenses, we would like you to think about whether or not you would be willing to make an annual payment so your household would not be subject to water restrictions. This amount would be listed as a separate item on one of your water bills for the year.

For each of the amounts below, please indicate your willingness to pay to avoid water restrictions.

	Willingness to Pay?				
Amount (each year)	**Definitely No**	**Probably No**	**Not Sure**	**Probably Yes**	**Definitely Yes**
0	A	B	C	D	E
$2	A	B	C	D	E
$3	A	B	C	D	E
$6	A	B	C	D	E
$12	A	B	C	D	E
$20	A	B	C	D	E
$40	A	B	C	D	E
$80	A	B	C	D	E
$150	A	B	C	D	E
$250	A	B	C	D	E
$500	A	B	C	D	E
$900	A	B	C	D	E
More than the above	A	B	C	D	E

Appendix B: Interactions Variables

ATTRIBUTES/ VARIABLES	DESCRIPTOR	LEVELS/CODING
AGE	4 stage scale	18 to 24=1 25 to 54=2 55 to 64=3 65+ =4
WATER	Do respondents live in a water poor or water rich city	Water rich=0 Water poor=1
FACTS	Did respondents receive facts outlining national water usage on their survey	Yes=1 No=0
STATES	Which state do respondents live in	NSW=1 Victoria=0
INCOME	Total household income per week	<$200=1 $200-$299=2 $300-$399=3 $400-$499=4 $500-$599=5 $600-$699=6 $700-$799=7 $800-$999=8 $1,000-$1,499=9 $1,500+ =10
EDUCATION	Highest level of education completed	Year 10 at secondary college=1 Year 12 at secondary college=2 Diploma or certificate=3 Tertiary degree=4
NUMBER OF CHILDREN	The number of children in their household	None=0 1 or 2=1 3 or 4=2 5+ =3
POOL	Do respondents have a pool	Yes=1 No= -1

ATTITUDE VARIABLE	DESCRIPTOR	EXAMPLE QUESTION	CODING
INTENTION	Intention to comply with water restrictions: where increased intention implies greater intention to comply with water restrictions.	"I intend to follow water restrictions in the future"	Factor Score: 4 intention questions (5 stage Likert scale) were reduced to a single INTENTION variable.
ATTITUDE	Attitude toward water restrictions: where an increase in this variable implies a more favourable attitude toward complying with water restrictions.	"I think it is a good idea to comply with water restrictions"	Factor score: 11 Attitude questions (5 stage Likert scale) were reduced to 2 variables- ATTITUDE and SOCIAL NORMS Factor score (5 scale items).
SOCIAL NORMS	Respondents attitude toward social norms: where increased social norms implies a greater concern for behaving 'appropriately' according to society's norms.	"Most members of my family think I should comply with water restrictions" x "Generally speaking, I want to do what most members of my family think I should do"	
VALUES	Environmental values: where increased environmental values implies stronger values for the environment.	"It makes me sad to see natural environments destroyed"	Factor score: 8 Attitude questions (5 stage Likert scale) were reduced to 2 variables- VALUES and COMPLIANCE VALUES 3 items
COMPLIANCE VALUES*	Compliance Values in general: where increased compliance values implies stronger values for complying with the law in general.	"Generally, I feel that I have a duty to comply with the law"	
PBC	Perceived behavioural control over the national water situation: where higher PBC implies higher perceived control.	"It won't make any difference if my household does not comply with water restrictions"	Factor Score: 7 intention questions (5 stage Likert scale) were reduced to a single PBC variable.