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Water Resources: Second Stage Research
Stated Preference Report 2017
by
ICS Consulting & eftec

Review by

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Newcastle University
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Introduction

The purpose of the research, by ICS and eftec on water resources, is to (1) identify customers' priorities for water use restrictions, (2) identify customers' priorities for water resource options, and (3) estimate the benefit customers would derive from maintaining and improving service levels.

The research is based on stated preference (SP) methodology. ICS and eftec recognized that there needed to be innovation in the PR19 SP methodology compared to the SP approach used in PR14; and that customers are not homogeneous in their preferences.

Qualitative insights

The research followed good practice. The draft survey instruments developed by ICS and eftec, in collaboration with Anglian Water (AW), for both the water resource options survey and the water use restrictions survey, were systematically tested through cognitive interviews. This was followed by Hall tests in which respondents completed one of the questionnaires and then participated in debriefing interviews to probe understanding and motivation for choices. The revised questionnaires were then subject to a pilot survey to thoroughly test the questions and SP methodology prior to the main sample survey.

This process resulted in the PR19 survey instruments having a clear simple language, a questionnaire survey design which was visually engaging and interesting to respondents, and which the vast majority of respondents could easily complete. This initial qualitative development of the survey instrument in the research is commendable.

Survey design

The questionnaire structure followed good practice, with screening questions, followed by background questions on awareness and experience of water services (e.g. taste and smell of tap water, interruption to supply, low pressure, leaks near home, sewer flooding, hose

pipe bans, etc.), before SP questions on customer preferences, with follow up questions about motivations for choice and to assess validity, and finally socio-economic and demographic information about the household respondent or information about the firm.

SP choice formats

The SP choice formats are clearly identified in the report (Box 3.1). A minor stated point on which I would disagree with is on contingent rating / ranking. I agree that contingent rating is not consistent with estimating customer values, but contingent ranking is. In a sense it is simply an extension of a discrete choice experiment (DCE) to rank 3 or more alternatives.

The DCEs for the water resource options survey, and the supply restrictions survey, presented customers with a pair of alternative scenarios. Respondents had to choose their preferred scenario from each. Six choice cards is a sensible number of choice cards to present, to gather a reasonable amount of information from each respondent, without the respondents become bored with the SP exercises.

The package experiment as designed as a dichotomous choice contingent valuation (DCCV) question. It outlined, on a choice card, two alternative scenarios: the current situation and an alternative scenario. The scenarios comprise 7 service measures (preventing drought restrictions; look and taste of tap water; reducing leakage; introducing smart water meters; reliability of water supplies; preventing sewer flooding; quality of rivers) plus price (bill increase for the improvement in the service measures from the current situation to that in the alternative scenario).

Seven attributes is about the maximum number respondents can weigh up and trade-off against each other, without adopting some simplifying heuristic. If respondents adopt a simplifying heuristic, then this leads to attribute non-attendance, and possible bias in the econometric estimation of the coefficients.

Sampling

The sampling strategy was carefully constructed. The sample size of over 1000 household customers, split between to the two SP surveys, was, a priori, sufficient to produce statistically significant results. A sample size of 400 for non-household customers is low, given the diversity in industrial categories, and probable greater heterogeneity in customers' water requirements compared to households. Smaller sample sizes for non-households would be expected to produce models with poorer fits and less statistically significant results. However, a non-household sample of this size would still be expected to provide statistically significant the bill coefficients in the package DCCV models and in the DCE models. And this proved to be the case.

The household customer sample rightly followed the Office for National Statistics 2015 Population estimates for the AW area, supplemented by CAPI for hard to reach customers. The on-line survey for the majority of customers gives people more time to think than with interview surveys. Giving people time to think has been shown to result in more accurate

estimates of WTP than those from face to face interview surveys. The non-household sample was also expertly drawn from ONS labour market statistics.

Econometric estimation

The value of an improvement can be estimated from DCCV data in two ways, either non-parametrically [simply tabulating the proportion of respondents willing to pay a stated price (as illustrated graphically in Figures A8.4.1 and A8.4.20); or as a Turnbull smoothing estimator], or parametrically (using a logistic model).

The distribution free (non-parametric) results illustrated in Figures A8.4.1 and A8.4.2 show the data conforms to economic theory: as the bill amount increases the proportion of respondents saying "yes" to the improvement declines. There are one or two blips in the downward sloping demand curves but this is quite common, and partly reflects the smaller number of responses in each of the (8) payment amounts in the DCCV experiment.

The analysis concentrates on a parametric estimation of willingness-to-pay (WTP) for service improvements, using regression of model choice acceptance (yes or nor) to a bid amount. The parametric models for the restrictions survey, for both households and non-household samples, fit the data quite well (pseudo-R^2 around 0.10 of higher) with bill amounts always being negative and highly statistically significant. The models for the options survey for households are also good, and fit the data well, although less so for non-household customers. Nevertheless, the statistical significance of the bill effect in all of the models ensures that WTP values can be estimated.

The DCE analysis of water restrictions (hosepipe ban, non-essential use bans, rota cuts, no tap water) rightly uses both a conditional logit (CL) model, and a mixed logit (MXL) model to account for heterogeneity in customers' preferences; and also linear and non-linear versions of these two types of model.

The goodness-of-fit of the linear CL and MXL models is excellent, with all the coefficients except hosepipe ban (hpbf) being statistically significant. The MXL model reveals customer heterogeneity with respect to non-essential use bans (neuf), no tap water (nwt), and bill amount (bill).

The non-linear coded CL and MXL models also provide a very good fit to the data. More variables (i.e. levels of each variable) are not statistically significant in these non-linear models, but this is not uncommon in this type of analysis. As the number of explanatory variables grows, proportionately more variables will not be statistically significant. However, crucially the bill coefficient remains negative and highly statistically significant in all the models.

Validation

ICS and eftec assess the soundness of the results through content validity (the validity of the survey instrument: do respondents understand the survey material, are the tasks credible, and responses non-biased); construct validity (are results in line with economic theory and

expectations); and triangulation (through post survey focus groups to test the finding wit customers).

Respondents in the main survey provided legitimate answers as to why they had made the choice they did for the package improvement. Some respondents indicated illegitimate reasons for not being willing to pay for improvements (Figure 4.10 main report). It would be helpful to have Figure 4.9 and Figure 4.10 clarified, so that the reader can easily see the proportion of respondents in the sample who provided legitimate reasons for WTP, legitimate reasons for not being willing to pay, and the proportion who provided illegitimate reasons for not being willing to pay.

The use of post focus groups is exceptional: it is rarely undertaken in SP studies, despite being an extremely useful tool to corroborate and endorse the findings in the SP survey of customers' preferences WTP for changes in service.

The focus group script guide was excellent, designed to thoroughly probe the issues. The participants' comments and focus group findings were as might be expected, to a large extent determined by how the individual customers would be affected. Where two broad options are on offer, e.g. demand management and water supply options, each with advantages and disadvantages, respondents typically opt for a balance between the two (Annex 9, page 12). In economic terms this is a rational approach. The focus groups also raised the issue of trust: reassurance that AW would actually allocated the WTP amount towards improving the level of service on standpipes (Annex 9, page 28). Lack of trust can be a major factor in downwardly biasing WTP values.

Whilst focus groups of eight people cannot provide statistically representative results, the qualitative information provided, by both the pre survey tests (cognitive interviews and Hall tests) and post survey focus groups, corroborate and support the results derived from the quantitative survey and econometric analysis, e.g. in terms of acceptability of restrictions, etc. AW can therefore be assured of the robustness of the estimates.

Package values

The package values are calculated according to standard practice. The share of the package value for each service improvement is estimated by the proportion of total utility of attributable to each service. The total value for each service improvement is then determined by the proportion or the degree of change in service relative to that in the package as a whole. These customer (household or non-household) values can then be multiplied by the number of customers to determine a regional aggregate value.

Package value exercise seems to have been adroitly undertaken.

Conclusion

The *PR19 Water Resources Second Stage Research Stated Preference Study* by ICS and eftec is a meticulous piece of research.

The methodology, and questionnaire, follows good practice. The vast majority of customers could clearly understand the tasks required. The survey was skilfully implemented, and the analysis derived statistically significant estimates of customers' preferences for the majority of water supply measures, and for water use restriction options.

Anglian Water can have confidence in the results.