

## ***Interactive comment on “Non-market valuation supporting water management: the case study in Czestochowa, Poland” by Y. Kountouris et al.***

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We sincerely appreciate your time in reviewing our manuscript. In the following letter we attempt to reply to the comments made in the referee reports.

Referee comment 1.

From a methodological point of view, however, there is almost nothing new.

Response:

This study was not intended to offer new methodological insights on the design and application of choice experiments or the estimation discrete choice models. Our purpose was to monetize individual preferences for water quality in the context of the particular

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case study and supply estimates that could perhaps be used as reference by policy makers.

Referee comment 2.

For instance, it would be important to have a clue about potential protest responses and how they were specified and handled or to know if any issues of heterogeneity or/and IID/IIA conditions violation were detected so as to proceed with more rigorous econometric models.

Response

In response to this comment, we restructured the results section of the revised manuscript. We first estimate a Multinomial Logit model (MNL) with an alternative specific constant on the opt-out alternative. We test for the validity of the IIA assumption through Hausman tests. We reject the null hypothesis of IIA in one case while we fail to reject in two cases. In response to this result we estimate a Random Parameter Logit (RPL) model, to account for unobserved individual heterogeneity. In particular, we specify that all coefficients follow a normal distribution. The results are presented in tables 10 and 11 of the revised manuscript.

Referee comment 3.

As the authors rightly note, the Drinking Water Directive (98/83/EC) sets a maximum allowable concentration for nitrate of 50 mg/l and the Nitrates Directive (91/676/EEC) requires Member States to identify groundwaters that contain more than 50 mg/l nitrate. The authors described the “water pollution” attribute using the following levels: near no pollution, pollution at the safe level and pollution 20% higher than safe level. The term “near no pollution” is a little bit vague. Does it mean near zero pollution, concentration of nitrates equal to or lower than background concentrations (i.e. 10 mg/l)? Did the respondents understand the difference between the first two levels? For instance, the coefficients show that the marginal utility of the safe level is a little higher than that

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of the near no pollution. Moreover, setting the third level as “pollution 20% higher than safe level” is also problematic. It would more appropriate to set this level as “water inappropriate for human consumption and other uses”, or something like that. “Pollution 20% higher than safe level” may be regarded by respondents as “trivial”.

## Response

We appreciate the significance of the point here, as respondents understanding of the attributes and their levels are important for the validity of the valuation. The choice of the attributes, their levels and their presentation to respondents were determined after careful consideration of the objectives of the exercise along with the complications of communicating the impact of pollution on a group of non-experts.

Specifically, the aim of this study was to estimate individual willingness to pay for the improvement of environmental quality through the reduction of nitrate concentrations in the Czestochowa aquifer. Given this aim, as we mention in the manuscript, we based the definition of the attributes on the limits set by the water framework directive. The complication that arises now in terms of communicating water quality to the general public in terms of nitrate concentrations will probably not be understood. For example, referring to concentrations of 10mg/l or 50mg/l would probably be meaningless for the typical respondent in the survey. For this reason we chose to present the levels of pollution using some keywords that would reflect the provisions of the WFD and the perceptions of policy makers regarding the impact of nitrate pollution on the population and at the same time be comprehensible for the respondents. In this context when we state that pollution will be at the “safe level” as specified by the EU directives, we imply that nitrate pollution will exist, but at concentrations are generally deemed safe from experts given the current state of knowledge on the matter. The “near zero” level of pollution is meant to correspond to the general attitude of the directive regarding the chemical status of groundwater. In particular, as stated in the introduction to the WFD: “The presumption in relation to groundwater should broadly be that it should not be polluted at all. For this reason, setting chemical quality standards may not be the best

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approach, as it gives the impression of an allowed level of pollution to which Member States can fill up. A very few such standards have been established at European level for particular issues (nitrates, pesticides and biocides), and these must always be adhered to. But for general protection, we have taken another approach. It is essentially a precautionary one. It comprises a prohibition on direct discharges to groundwater, and (to cover indirect discharges) a requirement to monitor groundwater bodies so as to detect changes in chemical composition, and to reverse any antropogenically induced upward pollution trend. Taken together, these should ensure the protection of groundwater from all contamination, according to the principle of minimum anthropogenic impact.” ([http://ec.europa.eu/environment/water/water-framework/info/intro\\_en.htm](http://ec.europa.eu/environment/water/water-framework/info/intro_en.htm) ). In other words, the “near zero” level reflects a state in which ground water is uncontaminated. The levels were carefully explained to respondents. Pretesting revealed that the distinction was clear to potential respondents. Respondents heard descriptions on the origin of nitrate pollution and its potential influence of health and the environment. An alternative option would be to communicate the levels entirely in terms of health impacts. However this would change the focus of the study to a valuation of the health effects of pollution. Furthermore epidemiological data linking the incidence of illness with nitrate water concentrations in the area were scarce.

To examine whether respondents evaluated the “near zero” and the “safe” level of pollution differently we test for the equality of WTP using the method proposed by Poe et al. (2004). We cannot reject the equality of WTP between the two levels. This can imply some insensitivity to scope but may also suggest that respondents are only concerned about the improvement of pollution with respect to the status quo. To examine how this alters our results we estimate models that merge the two levels, and report the coefficient estimates along with the implied WTP.

Referee comment 4.

There is also a confusion regarding the “Time-to-improvement” attribute. In p. 7175, the authors note: “: : :lf no measure is implemented nitrate concentrations would

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exceed the maximum permissible level by 20% in 60 years: : :”. This sentence defines “time-to-deterioration”. Is this right? It would be more appropriate to set a long-term time scale for natural attenuation if no measures are implemented.

Response The card referred to time to deterioration at this cell. This has been amended in the table.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 7169, 2014.

## HESD

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