Article

Urban Water Pricing and Private Interests' Lobbying in Small Rural Communities

Fernando Alguacil-Duarte [1], Francisco González-Gómez [2,]* and Salvador del Saz-Salazar [3]

[1] Department of Applied Economics, Faculty of Economic and Business Sciences, University of Granada, 18071 Granada, Spain; faldua@gmail.com

[2] Department of Applied Economics and Water Research Institute, Faculty of Political Science and Sociology, University of Granada, 18071 Granada, Spain

[3] Department of Applied Economics II, Faculty of Economics, University of Valencia, 46022 Valencia, Spain; salvador.saz@uv.es

* Correspondence: fcojose@ugr.es

Abstract: It is difficult for small municipalities to ensure their urban water cycle complies with the principle of cost recovery established in the European Union (EU) Water Framework Directive. Unlike more populous municipalities, small municipalities face higher average production costs. However, at least in Spain, the price of water is, on average, lower in small municipalities. We question whether the low price of water in rural areas is due, at least in part, to people linked to agriculture, i.e., do farmers constitute a special interest group that hinders increases in the price of water? The main hypothesis was tested with data taken from Torre-Cardela, a municipality in southern Spain with close to 800 inhabitants. In the research a contingent valuation analysis was carried out to analyze respondents' willingness to pay in the event of a hypothetical increase in the price of water to help cover the service costs. Contrary to expectations, the study yields no evidence that the agricultural population is more resistant to price rises than the rest of the citizens surveyed. In fact, results show that people involved in the agricultural sector would be willing to accept a hypothetical increase in water tariffs in between 15% and 25% over the current tariff, while for the rest of the population this same increase would be lower (in between 9% and 20%).

Keywords: water price; rural areas; contingent valuation; willingness to pay; lobby; water framework directive; comparative analysis

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1. Introduction

There is a growing concern about resource management, in the face of the threats of climate change and increased water demand for different uses [1,2]. The EU Water Framework Directive (WFD) aims to ensure efficient and sustainable management of water resources. To achieve this, it calls for the application of economic principles and instruments [3]. According to Article 9 of the WFD, Member States should place more emphasis on the principle of cost recovery and water-pricing policy to achieve better management of water resources [4].

In terms of residential water supply, the application of the cost recovery principle means that users must finance the total costs of the urban water cycle. The population must therefore cover the full cost of having a high quality water service and to contribute to the conservation of the environment. Article 9.4 of the WFD states that Member States shall not violate the principle of cost recovery. However, the same article also contemplates the possibility of non-compliance, provided that neither the purposes nor the achievement of the objectives of the WFD are compromised. It is thus acknowledged that the application of efficient water prices can have a negative impact on social

welfare. The strict implementation of the cost recovery principle would compromise affordability, mainly in low-income groups and rural communities [5].

Specifically, one of the reasons for non-compliance with the complete recovery of costs in the urban sphere is the principle of equity. It is generally accepted that complete cost recovery is not possible in small municipalities, mainly due to the higher average costs. Such municipalities cannot take advantage of the economies of scale and density existing in the industry [6–9]. A case in point is that of Spain since it is common for Spanish river basin plans to include justifications for breaching the principle of cost recovery of the urban water cycle in rural areas. Such justifications include territorial cohesion in depressed areas, social reasons or the inability to exploit economies of scale.

Recently, the Government of Spain has expressed concern about the situation regarding water services in rural areas, particularly in terms of the quality of service provision and the financial deficit associated with the urban water cycle. In meetings promoted by the Ministry for Ecological Transition throughout 2019, prior to the drafting of a Green Paper on Water Governance in Spain, the management of the complete urban water cycle in small municipalities was denoted a core topic. It is a problem on a large scale since 77% of the 8116 Spanish municipalities have fewer than 3000 inhabitants [10]. In these meetings, the need to create optimal areas of exploitation was highlighted in order to make better use of economies of scale and reduce unit production costs.

A complementary measure could be to increase revenue by raising the price of water. The price of water is comparatively low in Spain [11,12]. In addition, within Spain, water prices are, on average, lower in small municipalities [13], which means that less revenue is generated per cubic meter of water consumed in the home. The low price of water may be due, at least in part, to the fact that complete urban water cycle services are not provided in these municipalities, or that the provision of these services is of lower quality. However, it may also be due to greater difficulty in updating water prices in rural areas. In fact, it is not uncommon to find current rates that were approved in the 1990s and still quoted in pesetas, the official currency before the introduction of the euro.

In the absence of national regulation and monitoring agencies, small rural municipalities may still be setting excessively low water prices. Within the framework of Public Choice Theory [14], there are different explanations for why the prices set may be lower than socially desirable, mainly in municipalities where the management of the service is handled by the local council itself. In this research, we focus on one explanation: the existence of lobbyists. Specifically, we question whether the population linked to agricultural activity forms a pressure group that helps keep water prices low in rural areas. If this is indeed the case, for the sake of economic efficiency and cost recovery public authorities should implement educational and awareness-raising training campaigns targeted at this group, in order to reduce their resistance to possible increases in the price of water for residential uses.

To determine whether the population engaged in agricultural activity helps keep water prices low, the methodological approach used is contingent valuation analysis [15]. The declared preferences will allow us to determine whether people linked to agriculture are more reluctant to pay to finance the public water service. The existence of such a relationship would be an indication that this group constitutes a lobby that hinders the setting of water prices at levels that contribute to cost recovery. The research has been carried out with data from 468 interviews conducted in Torre-Cardela, a municipality in southern Spain that runs large deficits in its urban water cycle accounts. Contrary to expectations, the findings show that the agricultural population is not more reluctant than the population as a whole to pay more to help ensure the recovery of service costs. In fact, those people in the agricultural population who were willing to pay more for water stated that they would be prepared to assume a greater increase in the amount of the water bill than the rest of the population.

The paper is structured as follows. After this introduction, the second section presents some theories to explain why water prices for residential uses may be abnormally low in rural areas. The third section explains the empirical strategy used in the investigation. The fourth section shows the main results obtained. Finally, the paper concludes with a discussion, conclusions and recommendations section.

2. Why Might Prices Be Abnormally Low in Rural Areas? An Explanation within the Framework of Public Choice Theory

The management of the urban water cycle in Spain falls under the jurisdiction of the municipalities. However, the local government may assign the management of the service to a public company, a private company or a public-private joint venture. In small municipalities it is relatively more common for the municipality to directly manage the urban water cycle [16–18]. Indeed, the management is carried out by the town council in approximately 75% of the municipalities with fewer than 2000 inhabitants (own estimates based on data extracted from the Survey of Infrastructures and Local Equipment: https://ssweb.seap.minhap.es/descargas-eiel/ (accessed on 16 November 2020).

Additionally, pricing is the responsibility of the local government. The local government decides when the prices are reviewed, the design of the tariff and the price level. In Spain there is no regulation that establishes uniform pricing criteria. Nor is there a regulatory authority in Spain such as the Water Services Regulation Authority (Ofwat) in England and Wales or a water observatory such as ONEMA (L'Office national de l'eau et des milieux aquatique) in France. In Spain, only the approval of the regional administration is necessary for the new price proposals requested by local governments. In practice, this approval is no more than an administrative procedure [19,20].

Therefore, as regards the water pricing decision, there is an excessive concentration of competencies in local governments, as well as a practical absence of control over the decision taken in the municipalities. This concentration of competencies can lead to low-priced water in rural areas, where the municipality normally handles the management. According to García-Valiñas et al. [13] and González-Gómez and García-Rubio [21], when the management is carried out by the municipality, prices are lower than when the service is outsourced. This is probably an ideal scenario for some public sector failures; it would explain, at least in part, why prices in rural areas are lower than would be socially desirable.

According to Public Choice Theory, consumers of a good, in this case water users, aspire to make the price as low as possible [22]. In rural areas, the agricultural population can act as a lobby influencing local governments' water pricing decision. According to Becker [23], the size of the group is an important factor in the pressure put on local politicians. In small rural areas, a high percentage of the population is engaged in agricultural activity, so it could be an influential lobby.

Traditions and customs in Spain may have contributed to the agricultural population's role as a pressure group [24]. Historically, the use of water has been free for agriculture. Currently, water for agricultural uses is heavily subsidized [25,26]. Moreover, until a few decades ago, water for residential uses was collected directly from rivers and wells [27,28]. Hence, the population in rural areas is used to paying little or nothing for water. In addition, the fact that farmers can easily compare what they pay for water for agricultural uses and what they pay for residential uses can also contribute to the population's greater resistance to paying more for water for residential uses.

This resistance to paying more for water in rural areas can also be reinforced by the political opportunism of the current local government. According to Nordhaus [29], political agents act rationally when they deliberately manipulate the economy to achieve electoral advantages. Although the literature analyzing political opportunism focuses on fiscal instruments, other instruments may also be used, such as the levels of regulated prices [30–32]. Regarding the public water service, the local politician would ideally seek to keep a paradoxical promise to set low prices and improve infrastructure at the same time [33]. Water price increases are unpopular, which can influence local government decision-making [20,34,35]. Predictably, this political interference in the pricing of water is greater when the water service is managed by the city council [36]. In addition, there may be more interference in small population centers, since these institutions are less developed and media scrutiny is weaker than at national or regional level, or even than in larger municipalities [37]. Additionally, it could be expected that this effect would be more noticeable in small municipalities where there is closer contact between politicians and the population, and the relationships between them are shaped by family and friendship ties.

In addition, the expected effect of lobbying on the price of water, which will also be facilitated by political opportunism, can be maintained over time if the service costs are permanently financed through grants from other administrations. Generous subsidies compensate for diseconomies of scale and tend to perpetuate situations of inefficiency [38]. In the Spanish case, provincial councils, regional governments and the national government provide complementary subsidies for the activity of small rural municipalities. According to Agency Theory, in the context analyzed, the local authority has more information on costs and production processes than the subsidizer, which could be used to the advantage of the former. Additionally, as Peacock [39] maintains, the perception of subsidies allows the cost structure to move upwards. Grants could eliminate incentives for efficient management, which would aggravate the financial balance issues affecting the service.

Therefore, in the described model, both the lobby composed of the agricultural population and the political agent seeking re-election will have an interest in keeping water prices low. Thus, the population of medium and large municipalities could be subsidizing water in rural areas, without such subsidies being justified by the size of the municipality or, ultimately, socially desirable.

In this context, we focus our attention on one of the explanations proposed. We question whether the agricultural population really is reluctant to pay more for water, which would suggest that the group acts as a lobby to keep the price of water low. In part, this would explain the low price of water in small rural population centers. However, the relationship may not be so clear cut; it is possible that the traditional vision of water users in the agricultural field is outdated, or that they do not form a well-organized group. In light of the above, we test the following hypothesis:

H1: *The agricultural population is more reluctant to pay more for water for residential uses.*

If the hypothesis is confirmed, it would suggest that there is need to apply measures in the rural environment that allow the price of water to rise, while minimizing public opposition. If the hypothesis is rejected, it would suggest that there is a need for a more in-depth examination of the relationship between political opportunism and low water prices, as well as the possibility of incorporating measures that reduce local politicians' power to set the prices of water for residential uses in rural areas.

3. Empirical Strategy

3.1. Case Study

In order to test the main hypothesis, research was carried out in Torre-Cardela, a small municipality in southern Spain. Torre-Cardela has 782 inhabitants and its main economic activity is based on agriculture. It is located in the Guadalquivir River Basin, a highly water-stressed area. Water for urban uses is extracted from wells and has a high nitrate concentration due to the use of fertilizers in agriculture. Until 2012, when a water treatment plant using reverse osmosis technology was built, water from the public supply was not drinkable.

As mentioned above, the management of the urban water service is carried out by the municipality. According to the 2017 local government budgets, the tariff and non-tariff revenues only allow 40% of the total costs of the service to be recovered. The average price of water for residential uses is 1.56 euros/m^3; this price includes supply, sewerage and treatment. The price is low in comparison with the published data for the whole of Spain, which also includes large and medium-sized municipalities. According to INE [40], the price of water for residential uses in 2016 was 1.95 euros/m^3. According to the Spanish Association of Water Supply and Sanitation [17], in 2016 the price of a cubic meter of water was 2.34 euros.

The question we ask ourselves is whether there is any relationship between the agricultural population and resistance to paying more for water for residential uses. This association would explain, at least in part, why rural areas show greater difficulty in complying with the principle of cost recovery.

This explanation would be complementary to the fact that small municipalities cannot take advantage of the economies of scale of the industry.

3.2. Methodology

3.2.1. Contingent Valuation, Protest Responses and Censoring

Traditionally, economists have addressed the valuation of water resources using stated preference methods, among which the Contingent Valuation Method (CVM) stands out (see, for example, [41–43]). CVM is a survey-based approach used to place a monetary value on public and environmental goods that are not commonly bought and sold in the marketplace [44]. However, the absence of a market does not necessarily imply the absence of value. Hence, in order to determine the value of such goods, a representative sample of the population is usually asked about their willingness to pay (WTP) for an improvement in the quality or quantity of this public good, and less often about their willingness to accept (WTA) an amount of compensation for a reduction in the supply or quality of the good [45]. Whether WTP or WTA is the appropriate measure depends on how property rights to the environmental good are allocated [46].

Nevertheless, despite its prevalence over recent decades in the non-market valuation context, CVM is not without its flaws. For example, Johnson and Whitehead [47] point out that for many policy issues CVM surveys generate a considerable number of zero responses. True zeros are responses in line with expressions of economic preference whereby the respondent rejects the amount offered either because of income constraints or just because the good that is being valued is of no value to the respondent. On the other hand, protesters are respondents who, although their true WTP is greater than zero, reject the amount offered because they object to some aspects of the valuation scenario, such as lack of information or the payment vehicle, or even because of ethical beliefs [48,49].

It can be deduced from the above that the definition and treatment of protest zero responses is a major concern in the CVM literature. Indeed, since the pioneering work by Lindsey [50], it seems that no clear consensus has been established about the most appropriate procedure for differentiating between true zero WTP and protest responses and, crucially, about how to treat protest responses in the subsequent analysis. Regarding the treatment of protest responses, it is common practice in the CVM literature to delete them from the sample on the grounds that they are illegitimate choices, i.e., they do not represent true economic values [51]. In this respect, Szabó [52] claims that, when valuing unfamiliar and complex environmental goods, the use of deliberative techniques from political sciences significantly reduces the rate of protest responses while increasing the validity of the stated preference methods.

Censoring protest responses may not be the correct procedure since it can lead to a non-response bias or selection bias [53], i.e., when the preference structure of the group of protesters systematically differs from the rest of the sample. If this is the case, these individuals are self-selecting when protesting. Accordingly, the estimated WTP values will not be representative of the entire population and it will be not possible to extrapolate them and make accurate inferences about the target population based on the sample [54].

3.2.2. Econometric Specifications

First, we want to test whether or not people involved in agricultural activities are more likely to protest. This is done by fitting a maximum-likelihood bivariate probit model with sample selection. Accordingly, two binary dependent variables are modeled jointly as a function of some explanatory variables using the "heckprob" command in Stata 15 software [55]. The variable y_j^{probit} takes the value of 1 if the respondent protested and 0 otherwise, while $Y_j^{selection}$ takes the value of 1 if the respondent is somehow involved in the agricultural industry (the respondent owns agricultural land or works in the agricultural industry, or both), and 0 otherwise. Therefore, the two binary outcomes may be correlated, i.e., the probability of protesting may be correlated with involvement in the agricultural industry.

The probit model with sample selection [56] assumes that there is an underlying relationship, known as a latent equation:

$$y_j^* = x_j\beta + \varepsilon_{1,j} \tag{1}$$

where x_j is a vector of variables that explain the protest decision and β are the parameters to be estimated. However, we observe only a binary outcome (probit equation) such that:

$$y_j^{probit} = y_j^* > 0 \tag{2}$$

The dependent variable, however, is not always observed. It is observed if:

$$y_j^{selection} = z_j\gamma + \varepsilon_{2,j} > 0 \tag{3}$$

where z_j is a vector of variables that explain involvement in the agricultural industry and γ the parameters to be estimated, and:

$$\begin{aligned} \varepsilon_1 &\sim N(0,1) \\ \varepsilon_2 &\sim N(0,1) \\ corr\,(\varepsilon_1,\ \varepsilon_1) &= \rho \end{aligned} \tag{4}$$

When $\rho \neq 0$, i.e., when the two error terms are correlated, then the standard probit model will produce biased results. The "heckprobit" procedure is intended to correct for selection bias and to provide consistent, asymptotically efficient estimates for all the parameters in the model.

Second, again fitting a bivariate probit model with selection, we investigate the potential non-response bias than can arise when protest responses are removed from the sample. In this case, the two binary outcomes to be jointly explained are the decision whether to participate or not in the hypothetical market created and the decision whether to protest or not, as in Ramajo-Hernández and Saz-Salazar [57] and Saz-Salazar et al. [58]. Therefore, let d_j be a dichotomous variable that takes the value of 1 if the respondent decides to participate in the market, and 0 otherwise, while d_j^* represents the latent dependent variable of the participation equation. Hence:

$$d_j^* = A_j\beta + x_j\gamma + \varepsilon_{1,j} \tag{5}$$

where A_j is the payment offered to the individual and, in this case, x_j is a vector of variables that explain the decision to participate, while β and γ are the parameters to be estimated. However, again we observe only a binary outcome (probit equation) such that:

$$d_j^{probit} = d_j^* > 0 \tag{6}$$

Hence, the dependent variable is observed if:

$$y_j^{selection} = z_j\delta + \varepsilon_{2,j} > 0 \tag{7}$$

where z_j is a vector of variables that explain the protest decision and δ the parameters to be estimated, and:

$$\begin{aligned} \varepsilon_1 &\sim N(0,1) \\ \varepsilon_2 &\sim N(0,1) \\ corr\,(\varepsilon_1,\ \varepsilon_1) &= \rho \end{aligned} \tag{8}$$

3.3. Survey Design and Data Collection

In contingent valuation studies the use of focus groups and pilot surveys is crucial to test the comprehension of the information provided in the questionnaire and also to develop information on the offer amounts (bids) used to elicit WTP [59]. A pilot survey is a small-scale test of the draft survey materials and implementation process [60] while a focus-group is a research technique that

collects data through group interaction on a topic determined by the researcher [61]. In this particular case, the group discussion, led by a skilled moderator, was conducted several times with 8 to 10 participants. For the pilot survey a group of 50 households were surveyed, approximately 10% of the final sample. The final survey instrument was administered in 2019. Since the municipality is small, the researchers knocked on the door of all the homes. In the end, 468 completed questionnaires were obtained. Users were informed during the interview that the research was funded by the European Union and had the approval of the local government, and that the results could inform further action taken; the intention was to convey that the research was rigorous and to emphasize the importance of the responses [62].

The questionnaire was divided into three parts. The first contained questions to determine the respondents' concern about the state of the environment. Respondents were also asked about their perception of the quality of the municipal water service. These questions were useful for two reasons. First, they served as an introduction to the valuation scenario; second, some of the information obtained in this section was subsequently used as a predictor of the WTP.

In the second part of the questionnaire, respondents were shown the assessment scenario to determine their WTP to maintain the financial balance of the municipal water service. To reinforce the credibility of the hypothetical market constructed and to prevent the free ride behavior typical of voluntary payments [63], the payment mechanism proposed was an increase in the water bill paid on a quarterly basis since respondents were familiar with it. The elicitation method used was the single-bounded dichotomous choice format [64] since it closely mimics market situations while being incentive compatible [65]. However, the respondents were first asked a binary question with the aim of determining whether or not they were in the market, thus allowing a Spike model to be estimated [66].

Based on the results from the pre-test of the survey and following the model for optimal bid selection proposed for Cooper [67], for the discrete choice question 8 different bids were considered (€3, €6, €9, €12, €15, €18, €21 and €24). As pointed out by Schläpfer [68], in determining the number of values the challenge is to achieve the proper balance between probing a sufficiently wide range of cost figures and keeping these cost figures within a credible range.

More specifically, they WTP questions were asked as follows:

Question 1: Currently, the amount you pay for water is below the real cost of the service provided by the Town Council. In fact, the Town Council only covers approximately 40% of the costs of the service with the income it collects from the water bill. In order to contribute to the economic sustainability of the service and to increase water quality, would you be willing to pay more in your water bill? Please answer "yes" or "no" considering what you currently pay for your water bill, that you have a limited available budget, and that at some point the public administration may also ask you to pay to finance other public services. Question 2: Considering your positive answer to the previous question, would you willing to pay an extra amount of € *A* in your quarterly water will in order to benefit from the proposed improvement in water quality? Yes, No, Don't know.

In contingent valuation surveys, where follow-up questions are used, "anchoring" or starting point bias occurs when the bid mentioned in the initial question has a noticeable effect on the subsequent response [69–71]. This is usually the case of the double-bounded dichotomous choice format, hence that, in order to avoid this problem, in this study we have opted for the single-bounded dichotomous choice format. In this respect, as respondents were informed that the town council covers about 40% of the cost of the water service, it could be though that respondents could have anchored their valuation to this information. However, we believe that is not the case since no information about the cost of the service in euros was provided to the respondents.

For the purpose of our investigation, it was key to determine how many people were not willing to pay more for the water bill, even after being informed of the financial imbalance of the service, as well as the reason for their non-willingness to pay. A true zero reflected non-willingness to pay due to an insufficient level of income. A protest response indicated that the non-willingness to pay was due to the conviction that the service should be financed through public subsidies, or simply because

respondents believed they had the right to enjoy the service without having to contribute more to ensure its financial balance.

The questionnaire concluded with a third block of validation questions, intended to obtain socioeconomic, attitudinal and behavioral information about the individual (Table 1). For example, respondents were asked about political ideology, membership of environmental associations, family size, sex, level of personal and family income, and educational level. This last block of the questionnaire contained another question that was key to the investigation: the respondent was asked if their income depended directly on farming. In order to test the main research hypothesis, those in the protest response group who were linked to agricultural activity were identified as the pressure group.

Table 1. Shows the variables constructed from the information collected through the questionnaire, which are used in the estimations reported in the results section.

Variable	Definition
INCOME	1 if respondent's income is equal or greater than €900, 0 otherwise.
H_ECONCERN	1 if the respondent is highly environmentally concerned, 0 otherwise. Highly environmental concerned means that the respondent, on a scale from 1 to 5 stated a value equal or greater than 4 when asked about his concern for the environment.
EXPENSIVE	1 if the respondent when asked about the price of water using a scale from 1 to 5 (1 = very cheap and 5 = very expensive) stated a value equal or greater than 4, 0 otherwise.
TURBIDITY	Respondent's perception of the turbidity of the water from the tap before the construction of the current treatment plant on a scale from 1 to 5 (1 = never; 5 = always).
SMELL	Respondent's perception of the smell of the water from the tap before the construction of the current treatment plant on a scale from 1 to 5 (1 = never; 5 = always).
BAD_TASTE	Respondent's perception about the bad taste of the water from the tap before the construction of the current treatment plant on a scale from 1 to 5 (1 = never; 5 = always).
BOTTLED_W	1 if the respondent states that she drinks bottled water, 0 otherwise.
SATISFIED	1 if the respondents, when asked about her satisfaction related to the quality of the water from the tap, stated a value > 5 on a scale from 0 to 10 (0 = totally dissatisfied; 10 = totally satisfied), 0 otherwise.
WQ_CONCERN	Respondent's level of concern about water quality on a scale from 1 to 5 (1 = not at all concerned; 10 = extremely concerned).
CHILDREN	Number of children in the family unit
INACTIVE	1 if the respondent is economically inactive (student, pensioner and housewife), 0 otherwise.
RIGHT_WING	1 if the respondent has right-wing ideology, 0 otherwise.
INVOLVE_AGR	1 if the income of the interviewees depend directly on farming, 0 otherwise.

4. Results

4.1. WTP Estimates

Almost 60% of the respondents stated that they were not willing to pay any extra money in their water bill in order to guarantee water supply reliability while maintaining quality standards. This is a fairly high rate of zero responses although considerably lower than the 77%, 65% and 75% obtained respectively by Kriström [64], Dziegielewska and Mendelsohn [72] and Lee and Yoo [73]. Even though some zero bids are a true reflection of individuals' preferences—40% of all zero responses in this research—others may be motivated by protest behavior, as mentioned before. The usual way of differentiating between a true zero WTP and a protest response is to present those respondents that are not willing to pay with a set of debriefing questions [49]. Accordingly, Table 2 shows the reasons behind a "no" WTP response. The proportion of protest responses was 35.7%, which is close to the upper limit of what is considered acceptable in CVM studies: from 20% to 40% according to Carson [74].

The main reasons for protesting were that "it is my right to expect clean water without paying extra" (16.4%) and that "the local government should fund the proposed policy aimed at improving water quality" (12.4%).

Table 2. Reasons for a "No" WTP response.

Reason	Number (%)
True zero responses	
I cannot afford to pay (income constraints)	100 (21.4)
Water quality is not the most important problem	13 (2.8)
Protest responses	
The local government should fund the proposed improvement in water quality	58 (12.4)
It is my right to expect clean water without paying extra	77 (16.4)
Lack of trust in the local government, to much waste	32 (6.8)

Note: percentages are calculated over the full sample (468 interviews).

For the purpose of the research, it is interesting to determine the protest response rate in each of the identified groups: those linked to agricultural activity and those without links to agriculture (Table 3). The results of the survey show that around 36% of the interviewees gave a protest response when asked about willingness to pay. In addition, contrary to the hypothesis raised, it was found that the protest response rate is not higher in the group of people whose income depends on agricultural activity.

Table 3. Percentage of protest responses among respondents according to their link to the agricultural industry.

	All Responses (1)	Protest Responses (2)	(2)/(1) %
Involved in agricultural industry	293	104	35.49%
Non involved in agricultural industry	175	63	36.00%
All the sample	468	167	35.68%

Table 4 shows the coefficients of the parametric models estimated in order to determine how much the average respondent is willing to pay to enjoy the welfare increase resulting from improved water supply reliability and quality. As we used two dichotomous choice questions in the valuation scenario, it is feasible to estimate a Spike model [75] in addition to the more usual probit model. Therefore, respondents who answered "yes" to the first dichotomous question, i.e., indicating that they were in the market for this environmental good, were asked a second dichotomous question, offering them a bid. As expected, the higher the bid offered, the lower the probability of accepting it, i.e., the percentage of "yes" responses is monotonically decreasing (This implies that the coefficient of the bid should be negative and statistically significant. However, this does not hold for the Spike model since in this particular case, as noted by Kriström [66], this coefficient (beta) should be positive, i.e., the marginal utility of money must be positive in order for the mean to exist. Thus, mean WTP is given by the following expression: ln [1 + exp (alpha)]/beta. The probit model yields a mean WTP for the whole sample of €3.02, while the Spike model—which assigns a positive probability to zero responses, unlike the previous model—yields a higher mean WTP (€7.09), as in Saz-Salazar and García-Menéndez [75]. In both cases, protest responses have been excluded from the sample since, as will be shown below, there is no selectivity problem caused by excluding protesters. Nevertheless, when protest bids are included, the probit model yields an estimated mean WTP of −€2.17. This result is explained by the high rate of zero responses obtained and by the fact that the probit specification allows WTP to be negative. Considering the current tariff paid by the average city dweller (€34.8), the proposed policy would imply a hypothetical increase in water tariffs of between 8.7% and 20.4%, depending on which positive mean WTP estimate is chosen.

Table 4. Estimated models and mean WTP.

	Including Protest Responses				Excluding Protest Responses			
	All the Sample		Involved in Agricultural Industry		All the Sample		Involved in Agricultural Industry	
	Probit	Spike	Probit	Spike	Probit	Spike	Probit	Spike
Constant [a]	0.1912 (−1.30)	−0.8802 *** (−8.63)	−0.0848 (−0.47)	−0.8643 *** (−6.72)	0.2387 (1.39)	−0.1679 (−1.44)	0.4256 ** (1.98)	−0.1504 (−1.02)
Bid (A) [a]	−0.0694 *** (−5.91)	0.0733 *** (8.23)	−0.0690 *** (−4.91)	0.0595 *** (6.06)	−0.0790 *** (−5.88)	0.0863 *** (8.62)	−0.0829 *** (−5.06)	0.0713 *** (6.33)
Mean WTP (€) and 95% confidence interval [b]	−2.75 [−9.95–1.14]	4.74 [3.46–6.00]	−1.23 [−10.02–2.97]	5.90 [3.79–8.01]	3.02 [−1.72–5.79]	7.09 [5.36–8.83]	5.13 [0.14–7.94]	8.70 [5.87–11.51]
Log likelihood	−182.9290	−349.4914	−125.1067	−218.8886	−147.2424	−273.6019	−97.822	−171.001
LR chi2(1) [c]	39.38	67.79	26.81	36.77	39.01	74.24	28.64	40.02
Prob > chi2	0	0	0	0	0	0	0	0
Pseudo R^2	0.098	-	0.097	-	0.117	-	0.128	-
N	468	468	293	293	301	301	189	189

[a] t-statistic in parentheses. [b] Krinsky and Robb (95%) confidence interval for WTP measures (number of repetitions 40,000). [c] For the Spike model instead of the LR chi2(1) it is shown the Wald chi2(1). ***, ** significant at 1% and 5%, respectively.

The same mean WTP estimates are now calculated for those respondents that are involved in the agricultural industry. In this case, the mean WTP is between €5.13 and €8.70, depending on the model chosen. Now the hypothetical increase of tariffs would lie in between 14.7% and 25% since these WTP estimates are respectively 70% and 23% higher than the corresponding estimates for the whole sample. Hence, contrary to expectations, it seems that respondents involved in the agricultural industry have a higher WTP.

4.2. Selection Models and WTP Determinants

In addition to comparing WTP estimates, this study explains the probability of being willing to pay the proposed increase in water tariffs as a function of different variables. In doing so, using two bivariate probit models with selection, we test whether or not people involved in agricultural activities are more likely to protest, and we also test for the presence of sample selection bias. The explanatory variables used and their main descriptive statistics are shown in Table 1, while the two models are shown in Tables 5 and 6, respectively.

Table 5. Probit selection model and protesting determinants.

Variable	Selection Equation (Involve_Agr = 1)	Protest Equation (Protest = 1)
CONSTANT	1.9564 *** (3.21)	−0.1539 (−0.23)
INCOME	−0.7561 ** (−2.07)	−0.9891 ** (−2.39)
INNACTIVE	−0.8023 (−1.93) *	−0.5131 (−1.19)
RIGHT_WING	0.8147 ** (2.25)	0.7648 ** (2.31)
CHILDREN	0.2681 *** (3.56)	0.1557 ** (2.18)
H_ECONCERN	−0.8391 * (−1.74)	0.2623 (0.25)
EXPENSIVE	0.6755 *** (2.45)	0.4860 * (1.79)
TURBIDITY	−0.3870 * (−1.73)	0.1384 (0.69)
SMELL	−0.0961 (−0.64)	0.0020 (−0.01)
BAD_TASTE	−0.1127 (−0.84)	−0.2514 * (−1.85)
BOTTLED	−0.0746 (−0.31)	
Number of observations	156	
Log likelihood	−141.9109	
Wald Chi-squared (9)	23.59 ***	
LR test of indep. eqns. (r = 0)		
Chi-squared (1)	2.2	

Note: Z- statistic between parentheses. For the model to be well identified, the selection equation should have at least one variable that is not in the probit (participation) equation. * 10% significance level, ** 5% significance level and *** 1% significance level.

Table 6. Probit selection model and participation determinants.

Variable	Selection Equation (Do not Protest = 1)	Participation Equation (Enter = 1)
CONSTANT	−1.3347 * (−1.78)	−2.4004 ** (−2.11)
INCOME	0.7077 ** (2.32)	0.2671 *** (3.09)
RIGHT_WING	−0.6500 ** (−2.20)	
H_ECONCERN	0.5459 (1.37)	
EXPENSIVE	−0.5005 ** (−2.20)	−0.4772 (−1.34)
TURBIDITY	0.0531 (0.33)	0.7206 *** (3.32)
SMELL	−0.0797 (−0.62)	−0.0449 (−0.29)
BAD_TASTE	0.1154 (0.96)	−0.2357 (−1.53)
WQ_CONCERN	0.0582 (0.67)	0.1571 (1.48)
SATISFIED	0.0681 (0.29)	−0.8007 *** (−2.67)
CRISIS	0.2997 ** (2.35)	
Number of observations	207	
Log likelihood	−192.196	
Wald Chi-squared (8)	26.77 ***	
LR test of indep. eqns. ($\rho = 0$)		
Chi-squared (1)	0.01	

Note: Z- statistic between parentheses. For the model to be well identified, the selection equation should have at least one variable that is not in the probit (participation) equation. * 10% significance level, ** 5% significance level and *** 1% significance level.

Regarding the first model (Table 5), the LR test for independent equations ($\chi^2 = 2.20$ and not statistically significant) shows that it is not possible to reject the null hypothesis that the two equations are in fact independent. It can thus be seen that the respondents involved in the agricultural industry are no more likely to protest than the other respondents.

The selection equation shows that the probability of being involved in the agriculture industry (INVOLVE_AGR) is negatively and significantly related to the respondent's income (INCOME), her environmental awareness (H_CONCERN), her perception that the water from the tap is cloudy (TURBIDITY) and being economically inactive (INACTIVE). On the other hand, having a right-wing ideology (RIGHT_WING), the number of children in the family unit (CHILDREN) and the belief that water is expensive (EXPENSIVE) are positively and significantly related to this outcome.

The protest equation (second column) shows that, as expected, the higher the respondent's income, the lower the probability of protesting. On the other hand, right-wing respondents, those that think water is expensive, and those with more children have a higher probability of protesting. Finally, the only organoleptic property of water that is related to the probability of protesting is its turbidity. However, the negative result is counterintuitive since we would have expected a positive relationship, i.e., the higher the turbidity of the water, the higher the probability of protesting.

We now check for the presence of sample selection bias as a result of excluding protest responses from the sample. The validity of the WTP estimates will only be unaffected by the exclusion of these response if there is no sample selection bias. Otherwise, depending on the sign of the sample selection bias, the estimates will be upward or downward biased [76]. As shown in Table 6, the correlation ρ between the error terms in both equations accounts for the presence of selection bias in the estimates of the parameters of the model. In this particular case, the LR test for independent equations ($\chi^2 = 0.10$) is not statistically significant, so it is not possible to reject the null hypothesis that that the decisions on whether to protest and on whether to enter the market are not independent. Accordingly, protest responses can be removed from the sample and WTP estimates will not be biased.

The selection equation shows that the higher the respondent's income, the lower the probability of protesting. However, respondents that have a right-wing ideology and that think that tap water is expensive have a higher probability of protesting, as in the previous model estimated. In addition, respondents that claim to have been more affected by the recent financial crisis, which in the particular case of Spain had a severe, lasting impact resulting in increased inequality, are more willing to protest. Finally, neither of the organoleptic properties of water affects this probability.

Regarding the participation equation, results show that the higher the respondent's income, the higher the probability of entering the market, as expected. On the other hand, those respondents that stated that they were satisfied with the current quality of the water from the tap are less willing to enter the market as they do not consider it necessary to implement the proposed policy aimed at improving water quality.

5. Discussion, Conclusions and Recommendations

The Government of Spain is seeking to improve water management in Spain. In the last quarter of 2018, it opened discussions with different actors with the aim of preparing a Green Paper on Water Governance to serve as the basis for the future drafting of a new National Hydrological Plan [77].

Among other issues under discussion in this process, there has been particular concern about the urban water cycle in small municipalities [78]. Many small population centers are still far from achieving full cost recovery. In the consultations carried out, emphasis has been placed on promoting the aggregation of municipal processes to reduce production costs. However, the possibility of raising the price of water in rural areas has been left out of the debate.

The starting point of this research is the idea that financial imbalances in rural municipalities can also be reduced by raising the price of water. In this context, we question whether people linked to agriculture form a lobby that tends to curb possible increases in the price of water. If this were the case, it would be advisable for public authorities to implement specific actions aimed at overcoming the possible resistance of the agricultural population.

However, contrary to expectations, the research carried out does not allow us to confirm the hypothesis that the agricultural population behaves significantly differently when faced with a hypothetical increase in the water bill. In fact, the percentage of protest responses against the possibility of raising the price of water is practically the same among all respondents. Indeed, the results show that the low rate of support for an increase in the water bill is mainly due to interviewees' budget constraints. Low income is a determinant of higher probability of true zero, protest responses and less willingness to pay in case of market entry.

In any case, it is striking that, among those willing to pay more to cover the costs of the water service, and given equal purchasing power, the agricultural population shows a greater willingness to pay. This may be due to the fact that, in a scenario of water scarcity, both the marginal utility of water and the value assigned to water are greater for people linked to agriculture. The agricultural population shows greater concern in situations of water stress and poor water quality [79]. As water is of great value to them in their main economic activity, this group is likely to transfer that value to the residential area.

The first conclusion that can be drawn from the results obtained is that, at least regarding water for residential uses, there is no evidence that people linked to agriculture form an interest group representing an obstacle to raising water prices for residential uses in rural areas. A second conclusion is that, despite the low proportion of users willing to pay more for water in rural areas, which is mainly due to low income levels, there is some scope for raising the price of water for residential uses. The findings of this study suggest that any such raises would be modest, but would contribute to improving cost recovery.

The main recommendation is that public authorities should study increases in the price of water in each municipality. However, considering the average income in rural areas, particularly in agricultural activity, any increases in the price of water should be accompanied by discounted rates for low-income families. In Spain, low-income discounts can be found in almost all large municipalities, but not in small municipalities [19,80]. Additionally, in order for water price increases to be accepted in low-income settings, information, communication and education campaigns should be implemented [33].

A limitation of the research is that the main hypothesis has been tested using data from a single municipality. It would thus be desirable to replicate the research in other population centers. In any case, the results obtained provide sufficient evidence to support the recommendation to study possible increases in the price of water in each municipality. On the other hand, an interesting line of research could focus on local government politicians as the main actor. On the demand side, we conclude that a low level of income, rather than links to agricultural activity, is the main limiting factor in urban water prices; on the supply side, it is worth asking whether local politicians contribute to keeping water prices low in order to enjoy the support of their local electorate. Local politicians may be the main obstacle to water price increases in in rural areas. Kayaga et al. [81] recently identified a paradoxical situation in Ethiopia, whereby citizens are willing to pay more to enjoy a quality public water service while governments appear unwilling to charge citizens more for water, a situation that could also occur in developed countries.

Finally, although contingent valuation provides a good basis for informed decision-making when environmental values are involved as it is the case in this study, we cannot overlook that the estimated WTP values are somewhat "uncertain" because they are heavily dependent on the assumptions made about the implicit consumer preferences and the different empirical models used in the WTP inference process [82].

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