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Willingness to pay more for water in a climate of confrontation: The case of Sucre, Bolivia

**Francisco González-Gómez, Jorge Guardiola and
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Abstract

Before setting out to improve an urban water service, utilities should ascertain user willingness to pay. This is particularly important in developing countries, where households are required to make a greater investment in relative terms to pay the water bill. In this study we apply the Contingent Valuation Method (CVM) to analyse the willingness to pay of the inhabitants of Sucre (Bolivia) for an improvement in the urban water supply system. One of the features of this research is that the study is undertaken in a climate of confrontation between the community, the local government and the company that manages the water service. The study finds that 56 per cent of households would be willing to pay for an improvement in the service. The factors that positively influence the amount of money paid for improvements to the water service include not having access to water at home, suffering water cuts and perceiving that water has a taste. In the region under analysis, authorities are recommended to invest in schemes aimed at raising awareness in order to reduce unwillingness to pay.

Keywords: Contingent Valuation Method (CVM); Willingness to pay; Urban water supply; Bolivia.

JEL classification: Q25, H31.

Resumen

Antes de iniciar mejoras en el servicio urbano de aguas es conveniente que el gestor conozca la disposición a pagar de los usuarios. Esto es especialmente importante en países en desarrollo donde los hogares tienen que hacer un mayor esfuerzo relativo para pagar la factura del agua. En esta investigación aplicamos el Método de Valoración Contingente para analizar la predisposición a pagar de los habitantes de Sucre, Bolivia, para mejorar el servicio urbano de aguas. Una particularidad de la investigación es que el estudio se hace en un escenario caracterizado por el enfrentamiento entre los ciudadanos, la municipalidad y la empresa gestora. En la investigación se obtiene que el 56% de los hogares estaría dispuesto a pagar por la mejora del servicio. No disponer de agua en el propio hogar, sufrir cortes de agua y percibir que el agua tiene sabor son los factores que aumentan la probabilidad de pagar por mejoras del servicio de aguas. En el contexto analizado se recomienda hacer un importante esfuerzo de concienciación ciudadana para reducir la resistencia a pagar.

Palabras clave: Método de Valoración Contingente; Disponibilidad a pagar; Abastecimiento urbano de agua; Bolivia.

Clasificación JEL: Q25, H31.

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1. INTRODUCTION

Considerable effort has been made in recent years to improve access to water worldwide (WHO and UNICEF, 2010). However, the situation is far from perfect, particularly in less developed countries. On the one hand, it is recognised that some 884 million people do not have access to an improved water source. On the other hand, the concept of access to improved water used by the World Health Organization (WHO) and the UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation to compile statistics includes sub-optimal access to water (Biswas, 2009; Guardiola et al. 2010). As a result, statistics consider that using improved water sources is the same as having access to healthy drinking water, despite recognising that not all improved sources actually provide healthy drinking water. Furthermore, although 84 per cent of the population in developing nations have access to improved water, only 49 per cent have water piped to the place where it is consumed.

In order to create a water supply system and maintain and improve the service, there must be sufficient financial resources. Regardless of how each country decides to meet cost of the investment to provide access to and improve the water supply system, the users of the service must contribute either partially or in full to the cost of the service through the water bill. The problem in developing countries is the extra effort that households must make in relative terms to pay the water bill. The problem is that due to the difficulty involved in recovering the cost of the service, uncertainty results in some water supply system improvement projects not actually getting underway. When projects do get up and running, companies encounter serious difficulties to recover costs.

Before making an investment, the local public and private authorities responsible for the urban water service will be interested in ascertaining users' willingness to pay for the service. The literature on this topic has focused on various issues: improving access to water (Raje et al., 2002; Casey et al., 2005; Pattanayak et al., 2006; Venkatachalam, 2006; Wang et al., 2010), service continuity (Reddy, 1999; Hensher et al., 2006; Genius et al., 2008), water quality (Cho et al., 2005; Vásquez et al., 2009; Bilgic, 2010; Polyzou et al., 2011) and wastewater treatment (Kontogianni et al., 2003; Genius et al., 2005).

The problem with ascertaining the willingness to pay for improving the urban water service is that no specific market exists in which users can show their preferences. In the absence of a market, there are two methodological approaches to estimating willingness to

pay.¹ Firstly, revealed preference methods are based on analysing user behaviour in surrogate markets. For example, willingness to pay for improving tap water quality can be inferred by the money households spend on bottled water or household treatment to purify water (Um et al, 2002). Furthermore, Yusuf and Koundouri (2005) perform a hedonic price analysis that relates property prices to water-related attributes in order to estimate a shadow price for those attributes.

Stated preference methods estimate willingness to pay by asking the users of the water service directly. The choice experiment method presents different levels of service associated to different prices so that survey respondents can choose the option they prefer. This methodology has been applied to the urban water service by Hensher et al. (2005, 2006) and Snowball et al. (2008). However, the most frequently used technique to analyse willingness to pay for urban water services is the Contingent Valuation Method (for example, Nallathiga, 2009 and Polyzou et al., 2011). This method asks survey respondents to state the maximum amount of money they would be willing to pay to improve the water service on the basis of a hypothetical situation for decision making.

This paper employs contingent valuation to study willingness to pay for an improvement in the water supply system in Sucre, the constitutional capital of Bolivia. The study is performed on information from 541 households. One of the features of this research is that we analyse household willingness to pay in a climate of confrontation between the community, the local government and the company that manages the water service. Will households be willing to pay for an improvement in the water service when they disapprove of the company that runs the service? The study is interesting because it explores current willingness to pay in a city where the urban water supply system is deficient and people are discontent with the company that manages the service. A priori, willingness to pay is expected to be lower. The reason for this is that if the population is dissatisfied with the company that manages the service, they will react negatively to an increase in the water bill. The people of Sucre could decide that the company should improve their management of the service before they pay more for it. Furthermore, the study reveals which groups are more willing to pay before the project is set in motion to improve the service and also provides information to be able to plan campaigns to raise community awareness aimed at reducing unwillingness to pay.

In order to achieve the goals established above, the paper is organised as follows. Section 2 analyses the causes behind the conflict in the management of the water service in Sucre that are influencing the decisions taken by the water utility. Section 3 explains the

¹ The various techniques for analysing willingness to pay and also the advantages and disadvantages of each methodology can be consulted in detail in Birol et al. (2006).

fieldwork, the data and the methodology used in the study. Section 4 presents the results, while the last section summarises and concludes.

2. CAUSES OF THE WATER MANAGEMENT CONFLICT IN SUCRE

Urban water supply management in Bolivia has been marked by two very recent cases of social conflict. Following the privatisation of the water service in Cochabamba and El Alto, these communities reacted negatively to the measures taken by the companies awarded the concession of the service. Increases in water tariffs sparked the reactions in the case of Cochabamba, a poorly conceived privatisation project (Nickson and Vargas, 2002; Wade, 2011), while the people in El Alto reacted to breaches of contract agreements (Laurie and Crespo, 2007). At present there is at least one more conflict over the management of the urban water service in Bolivia: in Sucre, a city in the south of Bolivia,² public disapproval of the water service is evident.

Empresa Local de Agua Potable y Alcantarillado de Sucre (hereafter referred to as ELAPAS) runs the water service in Sucre. The transfer of the management of the service was made official by a concession contract entered into by Autoridad de Fiscalización y Control Social Agua Potable y Saneamiento, an independent public body attached to the Ministry of the Environment and Water, and ELAPAS. The contract was signed in 1999 for a period of 40 years.

ELAPAS is a decentralised municipal company with operating and administrative independence. The president of the company is the City Mayor and there are four co-directors: a representative from the Mayor's Office, another from the Sociedad de Ingenieros de Bolivia (Bolivia Engineers' Association in English), one from the Ministry of the Environment and Water and another from the Government of the Department of Chuquisaca. The company secretary is the General Manager of ELAPAS.

The water service can clearly be improved (Guidi et al., 2012). However, one of the problems of implementing possible improvements is that at present the company is providing the service in a climate of confrontation. Several factors contribute to the tense relationship between the company, the local government and the people of Sucre.

In the first place, there is a dispute over the area where the service is provided. According to the contract entered into by the company and the Autoridad de Fiscalización y

² Sucre is the constitutional capital of the country and the Department of Chuquisaca and has an approximate population of 300,000 inhabitants.

Control Social Agua Potable y Saneamiento, ELAPAS must provide the service to five of the eight districts in the city, which account for close to 94 per cent of the population. The remaining 6 per cent of the population who do not reside in the districts covered by the service area, oblivious to those who signed the contract, demand that the local government and ELAPAS provide them with access to water. This conflict must be settled with the Autoridad de Fiscalización y Control Social Agua Potable y Saneamiento, but meanwhile the local government of Sucre is solving the problem by distributing water in tankers.

The second cause for conflict is related to the supply cuts suffered by the neighbourhoods in the higher part of the city, which are home to approximately 25 per cent of the population. The water supply is mainly based on a gravity system. As a result, service regularity to these neighbourhoods depends on the water level of the 8 storage tanks located in the highest part of the city. When there is a shortage of water in the upper part of the city, the solution provided by the company is to distribute water in tankers.

Another cause of frequent tension between the people of Sucre and ELAPAS is that due to the supply network being old and the lack of investment in improving it, pipes burst frequently also producing supply cuts in the lower part of the city. The solution once again is to distribute water using tankers until the pipe is repaired.

The lack of dialogue and understanding between ELAPAS and the community has already produced significant confrontations and social conflicts in the city. In fact, three conflicts have already been recognised in the Department (Unidad de Análisis y Conflictos, 2010). Such conflicts have already given rise to demonstrations outside the ELAPAS main office.

Apart from managing the water supply inefficiently, another cause of conflict is the deficient financial management of ELAPAS. In June, 2011 the Brigada Parlamentaria de Chuquisa reported the poor financial management of ELAPAS to the Autoridad de Fiscalización y Control Social de Agua Potable y Saneamiento Básico. In doing so, the former submitted an institutional report stating that by 2010 the company had accumulated a deficit of 49.6 million pesos bolivianos (Bs). Furthermore, that same report highlighted that the company charged 4.40 Bs per cubic metre of water a user consumes, while the cost of supplying that quantity is 6.09 Bs. That is, the company loses 1.69 Bs per cubic metre of water it sells to the final consumer. In addition, the fact that the company only receives 74.6

per cent of the amount it bills further aggravates the delicate financial situation of the company.³

The current situation the company is in has also been a cause for disputes within the company itself. In this sense, the Director of ELAPAS, in representation of the Ministry of Water and Basic Sanitation, has filed several lawsuits at the Public Ministry in regard to irregularities and signs of corruption and has attempted to contest the presidency of ELAPAS.

In short, the company is in a delicate situation and must confront two main problems: on the one hand, the problems related to the technical management of the service caused mainly by a shortage of infrastructure and, on the other hand, the problem of the financial management of the company.

In this difficult situation, apart from improving the percentage of bills the company actually receives income from, ELAPAS could opt for raising the price of water. An increase in the tariff would balance average income and average costs. Furthermore, an increase in the water tariff could generate sufficient income to improve the service. The question we raise is what would happen if the company decided to increase the price of water bearing in mind the current climate of confrontation described above. Would the people of Sucre be willing to pay more for water if the company promised to improve the service in the current climate of conflict?

3. FIELDWORK, DATA AND METHODOLOGY

3.1. Fieldwork and variables

The fieldwork was conducted in the six urban districts of the city of Sucre that ELAPAS must supply water to. We did not take into account districts 7 and 8, which are predominantly rural and where approximately 16,000 people live on farm and handcraft activity.

In the first stage of the fieldwork, we selected the sample to obtain representative information on the city at district level. Each district was divided into sub sectors, indexed on the map of the city of Sucre, in order to complete the number of surveys estimated to obtain a representative sample of the various sub sectors of each district. According to INE, there are

³ The Plan Nacional de Saneamiento Básico (National Plan for Basic Sanitation in English) 2008-2015 (Ministry of the Environment and Water, 2009) had already documented the poor financial management of ELAPAS. The report stated that ELAPAS only collected 76.6% of the amount it invoiced and that the gap between average income and average cost was -1 Bs per cubic metre of water.

49,979 households in the city of Sucre, of which 723 were surveyed. The database used in this research comprises 541 households, due to the missing values on certain key variables for the objectives of this paper.

The fieldwork was carried out during the months of November, 2010 and January 2011. Before conducting the interviews, a pre-test was performed to be able to improve the final questionnaire. The questionnaire includes 52 questions and is divided into two sections. In the first section, respondents are asked about the socioeconomic characteristics of their household. In the second section, they are asked about their access to water at home and their relative level of satisfaction with their access to water. This section includes the valuation component of the survey.

In the part of the questionnaire designed to ascertain user willingness to pay for an improvement in the service, a broad scenario was considered:

Imagine that ELAPAS announced it was going to invest in improvements to the urban water service. As a result of the investments made, all the people of Sucre would be guaranteed access to tap water in their homes. Furthermore, the water would not smell, would be colourless and would not taste of anything and could be consumed directly from the tap without any danger to people's health.⁴

As regards the method for ascertaining willingness to pay using CVM, there are three possibilities. In the first place by using open-ended questions, whereby the interviewer asks interviewees how much they would be willing to pay for an improvement in the service. See, for example, Majumdar and Gupta (2009) and Polyzou et al. (2011). In the second place, by using closed-ended questions that interviewees are expected to respond "yes" or "no". Cho et al. (2005) applied the WTP response format of a closed-ended question with a checklist to the urban water service. In the third place, by using bidding games whereby the interviewer makes a proposal and asks interviewees whether or not they would be willing to pay that amount. If the answer is "yes", the figure is raised to a predetermined amount. If the answer is "no", the interviewer makes a lower proposal. The process stops when the interviewer chooses an amount. McPhail (1993) and Al-Ghuraiz and Enshassi (2005) applied this technique to the urban water service.

⁴ Due to the way the contingent valuation question is written, it is possible to believe that the current conditions of the water service are not consistent with the proposed project. The questionnaire should have expressly mentioned that interruptions in supply would be eliminated. Nevertheless, this flaw was partially corrected by the interviewer, who received instructions on the explanations to give respondents so they would understand the improvement in the service. In this vein, the interviewer has a sheet of paper on which emphasis was placed on the questions that later appeared on the questionnaire, related to access to water, continuity of the service and different water characteristics.

In a similar way to Kontogianni et al. (2003) and Polyzou et al. (2011), we posed two questions to ascertain user willingness to pay. The first question was the following:

- *Would you be willing to pay more for the water service?*

1. Yes: ____ 2. No: ____

Following this, those who responded they would be willing to pay more to improve some aspects of the service were posed an open-ended question on maximum willingness to pay. The open-ended WTP question was worded as follows:

- *How much more would you be willing to pay for water a month in exchange for an improvement in the service? _____*

This last variable is included in the analysis performed later as the variable *WILLINGNESS_TO_PAY*.

The questionnaire included another series of questions that are used as variables in this study. In reference to respondents' socioeconomic characteristics, we have introduced the variable *GENDER*, which takes a value of 1 if the person interviewed is female and 0 if the person is male. We have also included the variable interviewee *AGE* and a variable called *EDUC*, which takes a value of 1 if the interviewee cannot read or write. Taking into account the research conducted by other authors, these variables representing the individual characteristics of the interviewee can influence the decision to pay more for an improvement in access to water.

We also include two variables referring to expenditure on water, the first considering the water service, both through the supply network and tankers –*WATER_BILL*– and the second referring to the money spent on bottled water –*COST_BOTTLE*. Both variables are measured in pesos Bolivianos. We also include an indicator of household income in the analysis. Interviewees were asked to group household income in different categories. More specifically, interviewees were asked to consider the earnings of each member of the household that sleeps at home, or who receives government benefits or those who do not live at home and then posed the question: how much money does the household have to cater for the consumption and savings of all members per month? In this case we decided to make this variable continuous by taking the Neperian logarithm of the average value of each category, as in McBride (2001). The resulting variable is called *INCOME*. Finally, we incorporated dummy variables to indicate the district where each survey was conducted. Districts 1 to 5 account for most of the population and economic and retail activity, while district 6 covers the peri-urban area that surrounds the nucleus of the city.

As regards the variables referring to access to water, households were asked if they had sufficient water to cover their basic drinking, cooking and hygiene needs, the information from this question being used to create the variable *SUFIC_WATER*, which takes a value of 1 if respondents answer affirmatively and 0 otherwise. Furthermore, as a proxy of the quality of access, we include a variable that takes a value of 1 if the household is supplied regularly only by piped water and 0 otherwise (*PIPE*). In regard to the quality of supply, households were also asked if they suffered water cuts. As a result, a variable called *CUT* was also included, which takes a value of 1 if this is the case and 0 otherwise. Four variables indicating the perceived quality of water are also included in the analysis, namely *COLOUR*, *SMELL*, *TASTE* and *TURBID*. In each case, the variable takes a value of 1 if the aspect referred to is valued as bad – or the water is cloudy in the last case – and 0 if it is considered good – or the water is not cloudy in the last case. Finally, we introduce a subjective variable that indicates interviewee satisfaction with their access to water –*SATISFY*, which takes a value of 1 if the interviewee is not unsatisfied with their access and zero otherwise. That is, equals 1 if he/she feels very satisfied, satisfied or normal satisfied, and 0 if unsatisfied and very unsatisfied.

3.2. Data and methodology

Table 1 presents the descriptive statistics of the variables explained in the previous section. One of the first aspects that is worth drawing attention to is that 33 per cent of the sample stated they did not have sufficient water to meet their basic needs and that almost half suffered cuts in supply. As regards the type of access to water, 91 per cent responded that they only receive piped water. The rest mainly obtain water from tankers and a marginal number from a public drinking fountain or the river. Average satisfaction with access to water is not very high at 1.8 on a 0 – 4 scale. In reference to user perception of water quality, paying attention to colour, smell, taste and cloudiness, approximately three quarters of respondents stated they are satisfied. The aspects that receive the most complaints are cloudiness and the presence of solid particles in suspension.

Bearing in mind their situation in regard to access to water, 56.2 per cent of the people surveyed stated they would be willing to pay more for the service. That is, 304 households declared that they were willing to make a financial effort. Interviewees were not asked their reasons for refusing to pay. Some possible causes could be that users believe they are already paying enough for water, that the company is inefficient or that it is the responsibility of the public sector. Respondents state they are willing to pay an average of 10.62 pesos bolivianos more a month to improve the water service (1.52 US dollars). Taking into account that the average water bill amounts to 88, this means that on average, the population of Sucre would be willing to pay 12 per cent more for their water bill.

Table 1: Descriptive Statistics

Variable	Mean / %	Std. Dev.	Min.	Max.
<i>WILLINGNESS_TO_PAY</i>	10.62	16.87	0	100
<i>GENDER (%)</i>	0.40	0.49	0	1
<i>AGE</i>	38.84	15.16	18	80
<i>EDUC (%)</i>	0.04	0.20	0	1
<i>WATER_BILL</i>	64.95	89.15	0	1500
<i>COST_BOTTLE</i>	5.22	11.26	0	100
<i>INCOME</i>	6.82	1.13	5.01	9.21
<i>DISTDUM1 (%)</i>	0.17	0.37	0	1
<i>DISTDUM2 (%)</i>	0.38	0.49	0	1
<i>DISTDUM3 (%)</i>	0.17	0.38	0	1
<i>DISTDUM4 (%)</i>	0.13	0.34	0	1
<i>DISTDUM5 (%)</i>	0.13	0.34	0	1
<i>DISTDUM6 (%)</i>	0.02	0.15	0	1
<i>SUFIC_WATER (%)</i>	0.67	0.47	0	1
<i>PIPE (%)</i>	0.91	0.28	0	1
<i>CUT (%)</i>	0.51	0.50	0	1
<i>COLOUR (%)</i>	0.80	0.40	0	1
<i>SMELL (%)</i>	0.73	0.44	0	1
<i>TASTE (%)</i>	0.71	0.45	0	1
<i>TURBID (%)</i>	0.68	0.46	0	1
<i>SATISFY (%)</i>	0.69	0.46	0	1

Note: This table includes the mean of each variable in the first column, except when the variable is quantitative, in which case the percentage is presented and indicated by the (%) symbol next to the name of the variable.

Although it is difficult to compare studies due to the differences in the scenarios under analysis and the methodologies used, we can say that willingness to pay for an improvement in the water service is low in comparison to the results of similar research. In this sense, Casey et al. (2006) found that only 8 per cent of the population of Manaus (a rural area in Brazil) said they were not willing to pay for an improvement in the service. Genius et al. (2008) obtained that 29.4 per cent of the sample interviewed in the Municipality of Rethymo (island of Crete) would not be willing to pay more to improve the water service. Al-Ghuraiz and Enshassi (2005) found that 82.8 per cent of their sample of the Gaza Strip were willing to pay for improved services. Nevertheless, there are also cases in which willingness to pay is lower. In the city of Mytilene, capital of Lesbos Island (Greece), Polyzou et al. (2009) find that “regarding the intention of individuals to contribute some amount to the improvement of water quality, only 40 per cent of the sample stated a positive answer”. En Raje et al. (2002)

nearly 50 per cent of respondents were ready to pay partially more than their current bill amounts.

The explanation for this relatively low willingness to pay could be the climate of confrontation. If users are dissatisfied with the company, they can be expected to provide greater opposition to an increase in the water bill. They could decide that the company should improve their management of the resources available before increasing the water bill. In any case, it must be said that the research provides no conclusive evidence of this relationship. This is because the questionnaire did not include questions aimed at capturing the 'degree of conflict' from the respondent in relation to the water management company. However, as Whittington (2002) states, the lack of willingness to pay obtained in the research could be due to a poor design of the contingent valuation scenario. Another reason that could explain low willingness to pay is that respondents were not accurately transmitted the improvements in water access, supply continuity and the quality of water for users.

In order to analyse individual willingness to pay, the literature has frequently employed specific models for censored variables. The Tobit model is particularly suited to variables such as willingness to pay, which takes values greater than zero for a number of cases and values equal to zero for another considerable number of cases. These models assume that willingness to pay depends on a series of independent variables. Using maximum likelihood in logarithm form, these models estimate whether the variables are significant and the value of their coefficients (Wooldridge, 2001, Greene, 2008). In this study we implement a Tobit model to analyse the influence of the variables described above on willingness to pay. In order to perform the estimations, we use the Stata software package. See Cameron and Trivedi (2009) for estimation specifications.

4. Results and discussion

Table 2 presents the results of the Tobit analysis in which the dependent variable is the amount of money that the people of Sucre would be willing to pay for an improvement in the water service.⁵ We perform three analyses, the first two separating each group of variables and the third including all of them. Although all the models are globally significant, the pseudo R^2 indicators for goodness-of-fit are quite low, the highest R^2 being recorded by the

⁵ In the estimation of the models, the expenditure variables *WATER_BILL* and *COST_BOTTLE* could be expected to be correlated. In addition, one could expect those factors to be correlated with income. We have therefore performed a Variance Inflation Factor (VIF) analysis of each variable. If any of the variables record a value greater than 10, there could be a problem of collinearity. However, the results of the VIF for the three variables are lower than 1.2.

third model. It is worth highlighting that there are no differences in the significance of the variables or the sign of their coefficients between models. Consequently, their interpretation does not depend on each model estimated. The only exception is that of the variable *TASTE*, which is significant in the last model. As that model is the most complete, we focus on it in our interpretation and discussion of results.

As regards the set of socioeconomic variables, *AGE* is the only variable found to be significant. The fact it has a negative sign indicates that the older the person, the less willing he or she is to pay more for water, a result that has also been obtained by previous studies (Um et al., 2002; Soto and Bateman, 2006; Vásquez et al., 2009). One possible explanation is that older users are more aware of the improvements the water service has experienced during their lifespan. As a result, and unlike younger users, older users assign greater value to their current access to water. It must be taken into account that 40 years ago practically all the oldest users had to go to public drinking fountains and the river for water.

However, other variables that provide information about the situation of households are not significant. The data employed do not give evidence of greater willingness to pay on behalf of women (Genius et al., 2008; Mugabi and Kayaga, 2010) or respondents with a higher level of education (Kayaga et al., 2003; Majumdar and Gupta, 2009). The variables representing household income and expenditure on the water service and on bottled water are not significant either. The variable income is found by other authors to be the key to explaining differences in the likelihood of people being willing to pay. Bilgic et al. (2010), Mugabi and Kayaga (2010) and Wang et al. (2010) are some examples of recent studies that ratify this relationship. It seems timely to clarify that the result obtained does not imply that income and expenditure are not important variables in the willingness to pay more for an improvement in the service, but that user preferences are established taking into account other criteria. Being rich or poor or spending more or less on water does not differentiate one group of users from another.

As regards the series of variables referring to access to water in the household, *PIPE*, *CUT* and *TASTE* were found to be significant. One initial and overall valuation we can make on the basis of these results is that the willingness to pay of the people of Sucre is more sensitive to water access conditions than, as we have just seen, to their socioeconomic situation.

Users value greatly the possibility of having water supplied to their house if we take into account that users that do not have this access to water are more willing to pay for an improvement in the water service. The community would be willing to pay more for not having to go outside to get water or to carry bottles of water. Users therefore value the opportunity cost of having to go outside to obtain water.

Table 2: Explanatory factors of willingness to pay for an improvement in access to water in Sucre

Variable^a	Socioeconomic	Access	All
<i>GENDER</i>	3.3259261 (0.1677)		2.0260135 (0.3989)
<i>AGE</i>	-0.23104083*** (0.0048)		-0.22473582*** (0.0052)
<i>EDUC</i>	0.82712953 (0.8937)		-0.65013024 (0.9151)
<i>WATER_BILL</i>	-0.01404561 (0.3601)		-0.01034197 (0.4837)
<i>COST_BOTTLE</i>	0.12944631 (0.214)		0.14273833 (0.1642)
<i>INCOME</i>	1.4542321 (0.1897)		1.3410067 (0.2308)
<i>DISTDUM1</i>	-9.0753652 (0.2636)		-3.8314046 (0.6393)
<i>DISTDUM2</i>	-5.4428949 (0.4766)		-1.3319258 (0.8606)
<i>DISTDUM3</i>	3.6587297 (0.6435)		9.7494728 (0.2195)
<i>DISTDUM4</i>	-7.5602744 (0.3481)		-1.6483168 (0.8378)
<i>DISTDUM5</i>	-2.4809617 (0.7579)		4.2039258 (0.6021)
<i>SUFIC_WATER</i>		-1.9642044 (0.5133)	-2.1061484 (0.4808)
<i>PIPE</i>		-7.9625725* (0.0712)	-9.3341724** (0.0326)
<i>CUT</i>		7.9457724*** (0.0021)	7.5750531*** (0.0029)
<i>COLOUR</i>		-0.95750321 (0.7791)	-2.0586299 (0.5394)
<i>SMELL</i>		2.2888909 (0.4565)	3.0334691 (0.3164)
<i>TASTE</i>		4.2819532 (0.1762)	5.0250991* (0.0987)
<i>TURBID</i>		-0.65083769 (0.8177)	0.05604614 (0.9842)
<i>SATISFY</i>		1.6470782 (0.5961)	2.6951704 (0.3813)
CONSTANT	4.0593976 (0.6938)	1.7050727 (0.7620)	-0.23895808 (0.9833)
N	541	541	541
Pseudo R ²	0.0086	0.0062	0.015
Chi ² (p-value) ^b	27.25 (0.0042)	19.85 (0.0109)	47.76 (0.0003)

* Significant at 10%, ** significant at 5% and *** significant at 1%.

^a This table shows the magnitude and sign of every coefficient in the variable with their p-values in brackets.

^b Probability of non-significance of the model in brackets.

Water supply regularity is also key aspect for users (Um et al., 2002). The users that recognise they suffer the most water supply cuts are willing to pay more to improve the service. Supply cuts in Sucre are due to different causes and affect the entire city. The upper neighbourhoods suffer cuts because water storage tanks have insufficient capacity during periods of little rainfall, while lower neighbourhoods suffer strategic cuts in order to supply higher neighbourhoods at the times during the year when the city suffers the most shortages. Furthermore, the water supply is frequently interrupted due to breakages in the supply network. Networks are obsolete due to the city lacking financial resources to invest in their renovation and pipes burst quite frequently.

In relation to willingness to pay, no differences are observed to depend on individuals having a different perception of the *COLOUR*, *SMELL* or cloudiness (*TURBID*) of the water. The only variable of those proxying water quality that is significant is *TASTE*. When an interviewee responds that the water does not taste nice, he or she is more willing to pay.

One important issue that must be taken into consideration is that just because some variables are not significant does not necessarily mean that water service users are indifferent. Variable non significance could be due to the situation identified by the variable causing contrary reactions on behalf of the people of Sucre. For example, when users are not satisfied with their access to water, they are expected to be willing to pay more to improve the service. However, users might be discontent with the water utility, which they hold responsible for the poor service, and therefore not be willing to pay more for the water bill. There are examples in the literature that support this explanation for interpreting unexpected results. For example, Wang et al. (2001) also fail to obtain a relationship between satisfaction with the water service and willingness to pay. Johnson and Baldolano (2004) used a dummy variable to distinguish between households with and without access to drinking water that turned out not to be significant. Genius et al. (2010) found those who were affected by water cuts were willing to pay less on average. Additionally, we should highlight that the non-significance of some relationships could be caused by the design of the questionnaire. According to Whittington (2002), a badly designed contingent valuation scenario could affect results. This could be why income and water expenditures were not found to be significant.

Finally, the district dummy variables, after adjusting for the effects of the rest of variables that make up the model, are not significant. This indicates that the people of Sucre are equally satisfied or dissatisfied with the water service regardless of where they live in the city. While it is true that water access problems do differ from one district to another, all neighbourhoods suffer from dysfunctions related either to not having access to water at home, supply cuts or the colour or taste of water.

5. Conclusions

Water service deficiencies in many cities are due, among other things, to a lack of infrastructure. In such cases, it is necessary to obtain financial resources to cover the cost of improving the service. Regardless of whether or not the public sector contributes to funding the improvement, users must bear the costs of improving the service by paying a larger water bill. The question the water utility should consider is whether or not users are willing to pay more for an improvement to the water service.

This study presents the results of analysing the willingness to pay of the users of the water service in the Bolivian city of Sucre. In order to do so, we conducted a survey involving 541 households. The water service in Sucre is clearly deficient due to a lack of infrastructures. Furthermore, one of the features of the case of Sucre is that there is currently a conflict between the community and the company over the water service. One of the contributions this paper makes is to analyse willingness to pay in a climate of confrontation.

One initial conclusion is that socioeconomic variables are less important than the series of variables representing access to water. That is, it is a household's access to water at a given time rather than its socioeconomic characteristics that most influences the decision to pay more for the water service. In this sense, the households that are most willing to pay are those which have no access to water inside their homes and those which suffer supply cuts. Households that receive water that tastes bad are also more willing to pay.

It is true that the lack of significance of a large number of the variables included in the model is striking. The literature on this issue has already explained unexpected results in this type of analysis, attributing them to contrary reactions that one same socioeconomic or access to water situation can generate among different users. The community can take a request for more money in order to improve the service with resignation, but this can also generate outrage as many find it difficult to understand why they have to pay more for the poor water service provided at a given time by the water utility. Taking due caution, as it is difficult to compare the results of studies carried out in different scenarios and which use different methods of analysis, we can say in the case of Sucre that there is a low relative level of willingness to pay for an improvement in the service. This situation could be due to the conflict that exists between the community, the company and the local government, which probably increases citizen unwillingness to pay. In fact, a high percentage of water bills in Sucre are not actually paid. The fact that some variables in the model are not significant can be interpreted as an indication of the difficult situation the water utility faces, as this suggests that it would not even be easy to strike an agreement to make improvements to the water service among citizens due to the risk of their water bill increasing. Some citizens are

resigned to paying more to improve the water service, while others feel outrage at the possibility of the water utility increasing the water bill.

Nevertheless, we should be aware that the results obtained could be conditioned by the inherent limitations of the research. On the one hand, it would have been desirable to introduce questions that could establish a more direct relationship with the conflict between the user and the company. In this vein, it should be clear that we find signs of a relationship between the climate of conflict and willingness to pay, but no conclusive evidence. On the other hand, it is possible that the design of the contingent valuation scenario were incapable of transmitting the improvements that the user could benefit from by paying more for the water service.

While it is clearly possible to improve the water service in Sucre, the climate of confrontation that currently exists between the community and the water utility makes it difficult to fund an improvement of the service by raising the water bill. In this situation of conflict, and also bearing in mind the percentage of bills that are not actually paid, it would be recommendable to take steps to reduce unwillingness to pay, apart from introducing possible improvements in management, which are not studied in this paper. This issue undoubtedly calls for more detailed analysis in the future.

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