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Exploring the Value of Clean and Safe Drinking Water to Northern Irish Adults

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Abstract: Unlike many other countries, Northern Ireland residents do not pay separate water charges and there has been significant political and social controversy about their introduction. Therefore, this paper explores how Northern Ireland residents value access to clean, safe drinking water. Using the open-ended contingent valuation method, 205 adults were asked to provide their annual willingness-to-pay to maintain their current level of service provision, their willingness-to-accept to have it taken away, and their willingness-to-give to ensure similar service provision in a developing country. The results show that the value of clean, safe drinking water to Northern Irish adults is £120 per year, far less than both the real cost of provision, or the nominal amount paid through other combined charging instruments, demonstrating that said level of access to water is significantly undervalued by the Northern Irish people. Education levels and gender were found to be statistically significant predictors of willingness-to-pay and willingness-to-accept, respectively. Participants appeared to value their own access slightly more than that of people in developing countries, but not significantly more. The protest zeros observed throughout this study identified participants' resistance to change. The results suggest introducing water charges in NI will continue to be a fraught process, with significant difficulty accepting rates set.

Keywords: Northern Ireland, Water Charges, Contingent Valuation Method, Willingness-to-pay, Willingness-to-accept, Willingness-to-give

1. Introduction

This paper seeks to explore the value of access to clean, safe drinking water among residents of Northern Ireland (NI). A review of relevant media shows that, at present, NI residents contribute towards the cost of water through their domestic rates charges. However, this contribution is not enough to cover the total cost (£460 million in 2018/19) and the NI Executive must contribute almost £300 million annually to subsidize this [1]. Rates bills in NI have not been itemized since 1999 and residents are unaware of their actual contributions towards water costs [2] which may result in a lack of appreciation for how much water is worth. Despite repeated attempts to introduce water charges, the main political parties in NI are opposed to the introduction of separate domestic water charges similar to those paid by businesses in the country [3].

McKibbin [4] notes that free water leads to waste and inefficient use, so to achieve sustainable water consumption in NI, as set by the Water Framework Directive [5], NI Water must educate the public about effective water consumption in place of suitable incentives through water pricing charges [6].

Every developed country pays for their water provision through domestic water charges [7], with the exception of NI and the Republic of Ireland [8], and so there is little literature examining WTP for water provision in these countries. Research has instead focused on the economic value of water to those in developing countries where access can often be restricted [9-11]. People living in these countries are most likely to be willing to pay more than they currently do to improve their access to a safe and reliable water supply. Those that focused on developed countries investigated WTP for improving the quality of water bodies rather than domestic water [12-14].

To the best of the authors' knowledge, there have not been any similar studies to date investigating the economic value of water in NI to domestic household residents. In order to better understand and plan for the introduction of water charges, it is also important to examine the influence of certain socio-demographic characteristics.

People in developing countries have a higher willingness-to-pay (WTP) to improve their access to their water service, as well as improving the quality of the water provided. In many low/middle-income countries, a safe and reliable water supply is not guaranteed even if a basic water delivery service exists [15]. Residents are therefore often more willing to pay for private water provision or utilize other sources such as bottled water to guarantee their access [15].

Age, gender and education may also be relevant in understanding WTP for access to clean, safe drinking water. Studies have shown women are often more risk adverse than men [16], so would be likely to pay more to avoid the risks posed by losing this access. Studies have also indicated younger generations are often willing to pay more for a good or service than their older counterparts which can be attributed to the shorter planning horizons of older populations, i.e. the duration of time into the future that an individual has accounted for [17]. Having a higher level of education often increases WTP for a service/good [18] and may increase WTP for access to clean, safe, drinking water given that it may also enhance appreciation of the costs and effort required to achieve sustainable service provision [19].

Given this background, this paper aims to value how much Northern Irish residents would be willing-to-pay for access to their current standard of clean, safe drinking water, how much they would be willing-to-accept if it were taken away, and how much they would be willing-to-give to those in developing countries to provide a similar level of access. It also hopes to examine the relationship between socio-demographics and these values. This was achieved through an application of the Contingent Valuation Method (CVM) deployed through an online survey using a volunteer sample of Northern Irish adults. Northern Ireland provides a unique opportunity to determine true WTP as there is no pre-existing values to anchor to.

The paper has commenced with a literature review detailing the current situation of water safety, access and charging in NI contrasted with other countries, previous studies on the value of access to clean safe drinking water, and the methods that can be used to derive the economic value to individuals of abstract services such as water access. The use of CVM is presented, followed by the results of the CVM and possible justifications for these findings. The paper concludes with a discussion of the limitations of this study and future directions for such research.

2. Materials & Methods

The methodology can be described as an online contingent valuation questionnaire using a volunteer sample of Northern Irish adult residents.

The target population was a "Northern Ireland adult resident" defined by the study as an individual of either gender, aged over eighteen, and currently living in Northern Ireland. It was decided not to limit the study to respondents born or having lived in NI for an arbitrary amount of time, as all NI residents will have to pay water charges should they be introduced. Additionally, limiting residence time would introduce bias regarding awareness over the ongoing debate about water charges. The target sample was calculated at 91, with medium sized effect ($f^2 = 0.15$), a statistical power level of 0.8 and a probability level of 0.05, using a multiple regression model with five *a priori* predictors.

Respondents were recruited primarily through convenience sampling. Links to the questionnaires were distributed through the researchers' social networks and through email distribution within the home university and partner organizations. Respondents were asked to share the questionnaire with their own social networks, also constituting snowball sampling [20].

Snowball and convenience sampling were used as this creates a large sample size [21] very quickly and at no cost. People do commonly share research participation opportunities with those who have similar characteristics to themselves [22], possibly increasing the risk of a homogenous sample [23]. While this may have limited the representativeness of the sample [20], this was countered through the online deployment, which increases both the participation rate and the diversity of participants [24, 25], and initial respondents contacted were deliberately varied in their ages, genders, and education levels.

The continent valuation method (CVM) was chosen as water is a public good in Northern Ireland as the charges included in domestics rates do not reflect the full cost of providing the service or its true market value [9]. The CVM has been successfully used to estimate the value of commodities not exchanged in regular markets or when transactions cannot be observed under the desired conditions due to the hypothetical situations it creates [26].

The CVM requires people to state their WTP for a specified good or service and their willingness-to-accept (WTA) to be compensated give up the good or service. CVM typically employs questionnaires to create a realistic but hypothetical market for respondents to state their WTP for a good or service [9, 27].

The CVM risks *protest zero* responses from respondents whereby they value the service/good yet state its economic value to them is zero [28]. Here, these protest zeros were anticipated given the contentious nature of the topic, but were not discounted, to avoid selection bias [29]. Respondents were allowed to remain anonymous to increase both participation rate and truthfulness in their responses [24].

Following ethical approval, data collection took place over a period of four weeks from January to February 2020. Potential respondents were emailed or had their attention drawn to a link to the online questionnaire. No incentives were offered for participation in the study. When the link was clicked, respondents were presented with an online

information sheet and consent form. Once consent was signified, they were taken to the questionnaire proper.

For each question, context of the topic was provided to ensure the respondent would understand what they were being asked about, such as the meaning of clean, safe, drinking water. The term 'hypothetically speaking' was purposely included so to avoid reification fallacy, whereby people may believe an abstract concept is reality [30] and thus assume that a water charge was being imminently introduced. Participants were first asked to provide their WTP:

Access to safely managed clean drinking water is defined as a source of drinking water located on the premises, available when needed and free of contamination [31]. In Northern Ireland the cost of this access is built into the domestic rates of each household, as set by the Northern Ireland Assembly and local councils.

Imagine a separate annual charge was introduced. Hypothetically speaking, how much would you be willing to pay per year to keep your current level of access to clean, safe drinking water? Please give your answer in pounds.

Respondents were then asked about their WTA:

Water is abundant in Northern Ireland, so it is hard to imagine restricted access to this resource. Northern Irish residents have access to safely managed water resources, meaning they have access to clean, safe water wherever and whenever they want. But what would happen if this access was removed?

Hypothetically speaking, how much would you be willing to accept as annually paid compensation to have your current level of access to clean, safe drinking water removed? Please give your answer in pounds.

Lastly, respondents were then asked about their willingness-to-give (WTG), a variation of WTP related to donations:

Access to clean drinking water is not even as it is often those living in poor rural regions who are the worst affected. In 2017, 785 million people lacked even a basic water service where a water source is located within 30 minutes of their house [31]. Now imagine, as part of the aid provided by the United Kingdom to developing countries, a compulsory annual fee or tax is introduced in which you pay for other people's access to clean, safe drinking water in these countries.

Hypothetically speaking, how much would you be willing to pay per year to provide similar access to clean, safe drinking water as your own in developing countries? Please give your answer in pounds.

Respondents then completed a short demographic questionnaire to obtain their gender (Male/Female/Other), their highest level of education (GCSES/A-Levels/Bachelor's Degree/Master's Degree/PhD or equivalent), their age in years, and if their first language was English or not. These questions were compulsory, but there was also an optional question to provide their postcode. This was intended to be mapped to the Northern Ireland Multiple Deprivation Measures to give an indication of socio-economic status. The questionnaire concluded with a debriefing sheet and a final opportunity to withdraw participation.

3. Results

There were 288 respondents in total. 83 respondents were removed, having withdrawn their consent or failed to complete the entirety of the required questions, leaving a realized sample size of 205 and a completion rate of 71.18%, which exceeded the minimum power requirement.

The make-up of the sample is described in Table 1. Gender was roughly evenly balanced between male (47.32%) and female (52.68%), with no respondents identifying as a gender other than these two categories. The majority spoke English as a first language (87.8%) and were educated to undergraduate level (35.12%), with an even spread of educational achievement. The mean age was 44. Very few respondents provided their postcode, so this variable was discarded from further analysis.

Table 1. *Sample Characteristics.*

Variable		n	%
Gender	Male	97	47.32
	Female	108	52.68
First Language	English	180	87.80%
	Other	25	12.20
Level of Education	GCSEs or equivalent	27	13.17
	A-Levels or equivalent	34	16.59
	Bachelor's Degree or equivalent	72	35.12
	Master's Degree or equivalent	43	20.98
	PhD or equivalent	29	14.11

Variable	Mean	SD
Age (Years)	44.02	16.03
Willingness to Pay (GBP)	165.58	206.78
Willingness to Accept (GBP	2343.20	8636.77
Willingness to Give (GBP)	100.38	179.26
$N = 205$		

Table 2. *Respondents' Willingness to Pay for Access to Clean Safe Drinking Water.*

Willingness to Pay (GBP)	Number of Respondents
0	23
1-100	98
101-200	34
201-300	19
301-400	10
401-500	14
501-600	2
601-700	1
701-800	0
801-900	0
901-1000	2
1001-1100	0
1101-1200	1
1201-1300	0
1301-1400	0
1401-1500	1
1501-1600	0
Mean: £165.58	

A Tobit model was estimated to examine the relationship

between the predictor variables and WTP (Model I, Table 3). Women, people who do not speak English as a first language and older people are willing to pay more to maintain their current level of access, though none of these predictors were statistically significant. Education was the sole statistically significant variable in predicting WTP ($p < 0.01$) and so a more parsimonious model was estimated with education alone (Model II, Table 3). In this model, as education increased, so did WTP. An individual with a PhD was willing to pay £183.50 more than someone educated to GCSE level. Despite the significance of the respondents' level of education, the low Pseudo R^2 values imply there are variables which were not tested which influence a respondent's WTP.

Table 3. *WTP Tobit Model Specification.*

	Dependent variable: WTP (GBP)	
	(I)	**(II)**
Constant	15.097 (75.8801)	32.433 (46.161)
Gender: Female (ref = Male)	37.533 (33.311)	
Age	0.008 (1.063)	
Education: A Levels (ref = GCSEs)	124.899** (60.871)	132.165** (60.107)
Education: Bachelor's (ref = GCSEs)	123.899** (54.152)	127.906** (53.112)
Education: Master's (ref = GCSEs)	127.946** (66.074)	119.076** (57.489)
Education: PhD (ref = GCSEs)	208.538*** (66.074)	183.501*** (61.979)
English as First Language: No (ref = Yes)	-45.641 (54.479)	
Observations	205	205
Log Likelihood	-1260	-1261
Pseudo R^2	0.0047	0.0039

Note: *p<0.1; **p<0.05; ***p<0.01

Table 4 displays how much respondents are willing to accept as compensation for the removal of their current access to clean safe drinking water. Protest zeros were most clearly evident within this question as the respondents reject the removal of the service and answer with £0 despite valuing the amenity/service [28, 32]. The mean WTA was calculated to be £2,342.20. The majority of respondents indicated their WTA between £1-2000 per annum, with some respondents expecting much larger sums in compensation.

Table 4. *Respondents' Willingness to Accept for Removal of their Access to Clean Safe Drinking Water.*

Willingness to Accept (GBP)	**Number of Respondents**
0	27
1-2000	149
2001-4000	5
4001-6000	6
6001-8000	1
8001-10000	2
10001-12000	0
12001-14000	0
14001-16000	0
16001-18000	0
18001-20000	1
20001-30000	1
30001-40000	1
40001-50000	0
50001-60000	1
60001-70000	0
70001-80000	0
80001-90000	0
90001-100000	1
Mean: £2343.20	

A Tobit model was estimated for each of the variables possibly predicting WTA (Model I, Table 5). Older people, better educated people, and people who do not speak English as a first language are willing to pay more to maintain their current level of access, though none of these predictors were statistically significant. Gender was the only significant predicator of an individual's WTA ($p<0.01$), so the model was re-estimated with it alone (Model IV, Table 3). Here, women were willing to accept £1,037.84 less in compensation than men. ($p < 0.001$). Despite the significance of the respondents' gender, the low Pseudo R^2 values imply there are variables which were not tested which influence respondents' WTA.

WTA and WTP converged at £120, indicating that the value of access to clean, safe drinking water to Northern Irish adults is £120 per annum.

Table 5. *WTA Tobit Model Specification.*

	Dependent variable: WTA (GBP)	
	(I)	**(II)**
Constant	190.939** (887.284)	1594.755*** (275.089)
Gender: Female (ref = Male)	-940.152** (399.339)	-1037.840*** (382.969)
Age	-2.920 (12.748)	
Education: A Levels (ref = GCSEs)	-751.029 (718.526)	
Education: Bachelor's (ref = GCSEs)	-181.949 (625.499)	
Education: Master's (ref = GCSEs)	-243.8789 (707.049)	
Education: PhD (ref = GCSEs)	100.4696 (769.384)	
English as First Language: No (ref = Yes)	-54.610 (653.937)	

	Dependent variable: WTA (GBP)	
	(I)	**(II)**
Observations	205	205
Log Likelihood	-1682	-1683
Pseudo R^2	0.003	0.002

Note: *p<0.1; **p<0.05; ***p<0.01

Respondents' WTG per annum to those in developing countries to provide access similar to their own is displayed in Table 6. The mean WTG was £100.38. WTG was clustered around the lower end; as the amount being paid increased, less people were willing to pay it.

Table 6. *Respondents' Willingness to Give to Provide Access to Clean Safe Water in Developing Countries.*

Willingness to Give (GBP)	Number of Respondents
0	25
1-25	64
26-50	28
51-100	44
101-150	16
151-200	9
201-250	2
251-300	3
301-350	0
351-400	1
401-450	1
451-500	7
501-550	0
551-600	1
601-650	0
651-700	0
701-750	0
751-800	1
801-850	0
851-900	0
901-950	0
951-1000	0
1001-1100	1
1101-1200	2
	Mean: £100.38

A Tobit model was estimated for each of the variables that could possibly affect WTG (Model V, Table 3). Language was determined to be the only significant predictor ($p<0.001$) and so the model was re-estimated as a parsimonious model (Model VI, Table 3). Those who spoke English as their second language were willing to give £133.18 more than someone whose first language is English. Despite the significance of the respondents' first language, the low Pseudo R^2 values imply there are variables which were not tested which influence respondents' WTG.

Table 7. *WTG Tobit Model Specification.*

	Dependent variable: WTG (GBP)	
	(I)	**(II)**
Constant	27.654 (66.317)	67.919*** (15.529)
Gender: Female (ref = Male)	34.130 (29.357)	
Age	0.025 (0.937)	
Education: A Levels (ref = GCSEs)	14.839 (53.039)	
Education: Bachelor's (ref = GCSEs)	32.359 (46.765)	
Education: Master's (ref = GCSEs)	11.494 (52.7438)	
Education: PhD (ref = GCSEs)	34.544 (57.639)	
English as First Language: No (ref = Yes)	131.722** (47.101)	133.167** (41.559)
Observations	205	205
Log Likelihood	-1220	-1222
Pseudo R^2	0.005	0.004

Note: *p<0.1; **p<0.05; ***p<0.01

4. Discussion

This paper investigates attitudes of adults in Northern Ireland to clean safe drinking water by exploring their valuation of their current provision using a contingent valuation model. This is the first study of its kind in a Northern Irish context and represents a significant contribution to the lack of literature published about WTP for clean safe water in developed countries. Northern Ireland is unique in its lack of domestic water charges, making it the ideal study area for this line of research.

The mean WTP for access to clean, safe drinking water was calculated to be £165.58 per annum. This WTP was significantly predicted by the individual's level of education ($p<0.01$). and the better educated a respondent was, the higher their WTP. This confirms the findings that of Kayaga *et al.,* [19] that increased education also increases appreciation of the cost of sustainable service provision. Those who have higher educational backgrounds may be more aware of the steps involved in getting the water from source to tap and as a result, they are willing to pay more for their water. Alternatively, education may have acted as a proxy for income as higher levels of education are often linked with better economic outcomes [33] and WTP

generally increases as income does [18].

The mean WTA as compensation for the removal of their access to clean, safe drinking water was estimated to be £2,342.20 per year. This question had significant number of protest zeros, when respondents state their economic value to be zero despite valuing the good/service in actuality [28], as evidenced by the fact that many justified their responses, despite it not being requested in the question. Many implied that they did not agree with removal of this service provision in any form and others stated that they "would not voluntarily give up their access". Given the ease of access to clean, safe drinking water in Northern Ireland, it may be ingrained in participants as a fundamental human right [34], or purely the responsibility of public authorities, regardless of the cost [35]. Some of these zero answers may not be protest zeros, but an inability to actually imagine a NI without this level of access. It was still important to retain these zero responses to avoid any form of selection bias [28, 29].

WTA was significantly predicted by the gender of the respondent, with female participants willing to accept £1037.84 less per annum in compensation than men. These findings contrast with a study by Wieland *et al.* [36] which concluded that gender differences do not exist in risk aversion when discussing WTA; women will not accept less in compensation than men. The findings of this study may be attributed to their different reactions to their property rights potentially being infringed, or that the risks associated with water supply interference are valued differently. It may also be that male respondents were more assertive and reactive to the perceived infringement of their rights of access [37].

The mean WTG to provide a similar level of access was calculated to be £100.80 per annum. The only significant predictor of WTG was first language, with those whose first language was not English willing to give £133 more per annum than those whose native language is English. Language here may operate as a proxy for nationality or ethnicity, where participants may have lived in countries where service provision was poor and so had a better understanding of the needs of those in developing countries.

Altruism may have had a role here. Altruism is defined as the desire to benefit someone else for their sake rather than one's own [38] and often impacts WTP/WTG [39]. Given that it had no tangible benefit to them, the less altruistic participants may have chosen to give less or nothing in donation when compared to more altruistic participants [39]. Some respondents explicitly stated that they "would prefer to pay to maintain/upgrade our own water system here" whereas others provided information regarding their donation history e.g. "I already donate each month to WaterAid". The discrepancies indicate they value their own access far greater than that of others.

As this was a hypothetical exercise, many participants may have offered amounts that they would not have given in real life, constituting hypothetical bias [40]. Additionally, participants may have offered large amounts to benefit from "warm-glow" [41, 42] or as a form of "virtue signaling" [43].

It would logically follow that if respondents were giving their true value, there would be no difference between WTP and WTA. This was the case for some participants (n = 47) but, largely, participants expected far more in compensation that they would be willing to pay for the same good. It is clear people value their access to clean safe water by the high compensation amount required for them to give up their access yet, conversely, they are unwilling to pay even a quarter of that in charges to ensure that access. This disparity between WTP and WTA is one of the most commonly observed phenomena in behavioral economics [44]. In the context of this study the WTP/WTA disparity could be due to the endowment effect [45] which suggests that individuals value goods more when they have ownership of them [46]. This is also known as loss aversion [47, 48] whereby when required to give up a good/service, individuals require more in compensation than they would be willing to pay for it in the first place [49]. As water is a nonmarket good, the significant divergence between WTP and WTA is to be expected as there are no close substitutes for a safe and reliable water service [50].

In order to provide clean, safe, drinking water, NI Water conducts over 500 water quality tests a day, spending around £480 million annually, of which businesses contribute only £79.2 million. The householder contribution via rates bills is only £101.9 million, leaving the NI Executive to pay a subsidy of £299.9 million to cover the excess balance [1]. Based on the value of £120 found here, across the 487,850 households in NI, that would decrease the householder contribution to £58.5 million, further increasing the subsidy required. Introducing the suggested fees of around £400 per household per year, which are in line with the charges currently implemented in the UK, would greatly reduce the subsidy required and better reflect the true cost of this water provision.

The authors acknowledge the following limitations of the paper. Time and financial constraints associated with this study restricted the size and representativeness of the sample population. While the questionnaire yielded results of sufficient statistical power, it is possible that certain demographics were not represented. The mode of distribution may have hindered the collection of a representative sample. There were many eligible people who do not have access to or use the internet, typically older generations, and could not complete the survey [51] as was reflected in the demographics of the sample population (12.68% were aged 61 and above). Overall, online surveys typically have lower response rates than other modes of distribution; on average 11% lower [52], and CVM is usually expected to have between 300 -1000 participants. Additionally, it is evident that other explanatory variables were not collected.

While this study has provided effective exploratory work, the authors recommend future research with a larger, more representative sample, possibly sampled using probability methods, which aims to collect omitted variables such as deprivation measures and household income. CVM is

particularly prone to the overstating or understating of WTP [53], so more incentive-compatible, demanding revealing methods such as experimental auctions could be used.

5. Conclusion

In conclusion, it is clear that people in NI are unaware of the true cost of providing their water and would be particularly resistant to the introduction of even minimal charges as evidenced by the protest zeros and high WTA values provided. Studies employing the CVM have traditionally focused on developing countries where service provision is restricted. NI is unique in its lack of domestic water charges, which has provided the study with a unique opportunity to study the previously unexplored WTP of the residents without pre-existing values to anchor to.

The value of £120 per year derived here would not be feasible in reducing the strain placed on the NI Executive in paying the annual subsidy to NI Water. Concurrently, previous attempts at introducing separate domestic water charges have been blocked by the NI Executive and residents [3]. Policy makers are thus faced with a lengthy battle to educate the people of NI and arrive at a rate of charge that would amenable to many different sectors of the population. In Northern Ireland, they greatly value their water, but not enough to pay for it.

Conflict of Interests

The authors declare that they have no competing interests.

References

[1] Northern Ireland Water, 2019. *Delivering What Matters: Annual Report 2018/19*. Northern Ireland Water Limited. Belfast, Northern Ireland. Viewed: 27 January 2020. Available at: https://www.niwater.com/annual-report-2019/

[2] BBC News. 2007. Why doesn't Northern Ireland have water bills? Who, What, Why? *BBC News Magazine*. Available at: http://news.bbc.co.uk/1/hi/magazine/6498983.stm Accessed: 3/2/2020.

[3] McAdam, N., 2016. SF and DUP unite to prevent introduction of water charges in Northern Ireland. *Belfast Telegraph*. Available at: https://www.belfasttelegraph.co.uk/news/northern-ireland/sf-and-dup-unite-to-prevent-introduction-of-water-charges-in-northern-ireland-35050248.html Accessed: 3/2/2020.

[4] McKibbin, D., 2010. *Water Pricing in Europe*. Research and Library Service Briefing Note 91/11. Northern Ireland Assembly. Belfast, Northern Ireland. Viewed 03 February 2020. Available at: http://www.niassembly.gov.uk/globalassets/documents/raise/publications/2011/regional-development/9111.pdf

[5] European Commission, 2000. Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000: Establishing a framework for community action in the field of water policy. *Official Journal of the European Communities, 327* (1), pp. 12–13.

[6] Lazaridou, D. and Michailidis, A., 2020. Valuing users' willingness to pay for improved water quality in the context of the water framework directive. *International Journal of Sustainable Development & World Ecology*, *27* (5), pp. 424-434.

[7] Global Water Intelligence, 2019. Water and Wastewater Tariffs by Country. *The List, 20* (9).

[8] Mac Guill, D., 2016. Fact Check: Does every other country in Europe have water charges? *The Journal*. Available at: https://www.thejournal.ie/what-countries-in-europe-have-water-charges-facts-3002075-Oct2016/ Accessed: 3/2/2020

[9] Mitchell, R. C. and Carson, R. T. (2005) *Using Surveys to Value Public Goods: The Contingent Valuation Method*, 4th edn., Washington, D. C.: Resources for the Future.

[10] Whittington, D., Briscoe, J., Mu, X. and Barron, W., 1990. Estimating the willingness to pay for water services in developing countries: A case study of the use of contingent valuation surveys in southern Haiti. *Economic Development and Cultural Change*, *38* (2), pp. 293-311.

[11] Casey, J. F., Kahn, J. R. and Rivas, A., 2006. Willingness to pay for improved water service in Manaus, Amazonas, Brazil. *Ecological Economics*, *58* (2), pp. 365-372.

[12] Brouwer, R., 2008. The potential role of stated preference methods in the Water Framework Directive to assess disproportionate costs. *Journal of Environmental Planning and Management*, *51* (5), pp. 597-614.

[13] Ramajo-Hernández, J. and del Saz-Salazar, S., 2012. Estimating the non-market benefits of water quality improvement for a case study in Spain: A contingent valuation approach. *Environmental Science & Policy*, *22* (1), pp. 47-59.

[14] Buckley, C., Howley, P., O'Donoghue, C. and Kilgarriff, P. 2016. Willingness to pay for achieving good status across rivers in the Republic of Ireland. *The Economic and Social Review*, *47* (3), pp. 425-445.

[15] Vásques, W. Mazumder, P. Hernández-Arce, J and Berrens, R. 2009. Willingness to pay for safe drinking water: Evidence from Parral, Mexico. *Journal of Environmental Management. 90* (11), pp. 2291-3400.

[16] Sapienza, P. Zingales, L. and Maestripieri, D. 2009. Gender Difference in Financial Risk Aversion and Career Choices are Affected by Testosterone. *Proceedings of the National Academy of Sciences of the United States. 106* (36), pp. 15268-15273.

[17] Wondium, S. and Bekele, W. (2012) 'Determinants of individual willingness to pay for quality water supply: the case of Wonji Shoa Sugar Estate, Ethiopia ', in Pepper, D. W. & Brebbia, C. A. (ed.) *Water and Society.* Southampton, Boston: WIT Press, pp. 59-72.

[18] Surendran, A. and Sekar, C. 2010. An economic analysis of willingness to pay (WTP) for conserving the biodiversity. *International Journal of Social Economics, 37* (8), pp. 637-648.

[19] Kayaga, S., Calvert, J. and Sansom, K. 2003. Paying for water services: effects of household characteristics. *Utilities Policy*, *11* (3), pp. 123-132.

[20] Sharma, G., 2017. Pros and cons of different sampling techniques. *International Journal of Applied Research*, *3* (7), pp. 749-752.

[21] Rowley, J. 2014. Designing and using research questionnaires. *Management Research Review*, *37* (3), pp. 308-330.

[22] Etikan, I., Alkassim, R. and Abubakar, S., 2016. Comparison of snowball sampling and sequential sampling technique. *Biometrics and Biostatistics International Journal*, *3* (1), pp. 6-7.

[23] Emerson, R. W. 2015. Convenience Sample, Random Sampling and Snowball Sampling: How does Sampling Affect the Validity of Research? *Journal of Visual Impairment and Blindness, 109* (2), pp. 164-168.

[24] Kayam, O. and Hirsch, T., 2012. Using social media networks to conduct questionnaire based research in social studies case study: Family Language Policy. *Journal of Sociological Research*, *3* (2), pp. 57-67.

[25] Desai, S. C. and Reimers, S., 2019. Comparing the use of open and closed questions for Web-based measures of the continued-influence effect. *Behaviour Research Methods*, *51* (3), pp. 1426-1440.

[26] Alberini, A. and Cooper, J., 2000. *Applications of the contingent valuation method in developing countries: A survey*, FAO Economic and Social Development Paper, no. 146. Rome, Italy. Food & Agriculture Organisation of the United Nations.

[27] Loomis, J., Kent, P., Strange, L., Fausch, K. and Covich, A., 2000. Measuring the total economic value of restoring ecosystem services in an impaired river basin: results from a contingent valuation survey. *Ecological Economics*, *33* (1), pp. 103-117.

[28] Rankin, J. and Robinson, A., 2018. *Accounting for protest zeros in contingent valuation studies: A review of literature*. HEG Working Paper, No. 18-01, Norwich: University of East Anglia, Health Economics Group (HEG).

[29] Grammatikopoulou, I., Olsen, S. B. and Pouta, E., 2012. Does exclusion of protest zeros and warm-glow bidders cause selection bias in Contingent Valuation?: An empirical case study in a Natura 2000 wetland area. *European Association of Environmental and Resource Economists*.

[30] Bennett, B., 2017. Logically fallacious: the ultimate collection of over 300 logical fallacies (Academic Edition). Massachusetts: EBookIt.com.

[31] World Health Organisation & UNICEF Joint Monitoring Programme, 2019. *Progress on household drinking water, sanitation and hygiene (2000-2017)*. Special Focus on Inequalities. New York. United Nations Children's Fund (UNICEF) and World Health Organization.

[32] Fonta, W. M., Ichoku, H. E. and Kabubo-Mariara, J., 2010. The effect of protest zeros on estimates of willingness to pay in healthcare contingent valuation analysis. *Applied Health Economics and Health Policy*, *8* (4), pp. 225-237.

[33] Yarnold, P. R., 2019. Regression vs. Novometric Analysis Predicting Income Based on Education. *Optimal Data Analysis*, *8*, pp. 81-83.

[34] Bieler, A., 2020. Fighting for public water: The first successful European Citizens' Initiative, "Water and sanitation are a human right". *Interface: A Journal For and About Social Movements*, *9* (1), pp. 300-326.

[35] Doorn, N., 2017. Allocating responsibility for environmental risks: A comparative analysis of examples from water governance. *Integrated Environmental Assessment and Management*, *13* (2), pp. 371-375.

[36] Wieland, A., Sundali, J., Kemmelmeier, M. and Sarin, R., 2014. Gender differences in the endowment effect: Women pay less, but won't accept less. *Judgment & Decision Making*, *9* (6), pp. 558-571.

[37] Hon-Snir, S., Kudryavtsev, A. and Cohen, G., 2012. Stock market investors: Who is more rational, and who relies on intuition. *International Journal of Economics and Finance*, *4* (5), pp. 56-72.

[38] Baston, C. D. (2011) *Altruism in Humans*, Oxford, UK: Oxford Scholarship Online.

[39] Lusk, J. L., Nilsson, T. and Foster, K., 2007. Public preferences and private choices: effect of altruism and free riding on demand for environmentally certified pork. *Environmental and Resource Economics*, *36* (4), pp. 499-521.

[40] Schmidt, J. and Bijmolt, T. H., 2020. Accurately measuring willingness to pay for consumer goods: A meta-analysis of the hypothetical bias. *Journal of the Academy of Marketing Science*, *48* (3), pp. 499-518.

[41] Andreoni, J., 1990. Impure altruism and donations to public goods: A theory of warm-glow giving. *The Economic Journal*, *100*, pp. 464-477.

[42] Massarutto, A., Marangon, F., Troiano, S. and Favot, M., 2019. Moral duty, warm glow or self-interest? A choice experiment study on motivations for domestic garbage sorting in Italy. *Journal of Cleaner Production*, *208*, pp. 916-923.

[43] Bartholomew, J. 2015. Easy Virtue. *The Spectator*. Available at: https://www.spectator.co.uk/article/easy-virtue Accessed: 10/7/2020.

[44] Georgantzís, N. and Navarro-Martínez, D., 2010. Understanding the WTA–WTP gap: Attitudes, feelings, uncertainty and personality. *Journal of Economic Psychology*, *31* (6), pp. 895-907.

[45] Thaler, R., 1980. Toward a positive theory of consumer choice. *Journal of Economic Behaviour & Organization*, *1* (1), pp. 39-60.

[46] Qin, B., 2019. Endowment effect and the gap between WTP and WTA. *Munich Personal RePEc Archive.*

[47] Tversky, A. and Kahneman, D., 1991. Loss aversion in riskless choice: A reference-dependent model. *The Quarterly Journal of Economics*, *106* (4), pp. 1039-1061.

[48] Koetse, M. J. and Brouwer, R., 2016. Reference dependence effects on WTA and WTP value functions and their disparity. *Environmental and Resource Economics*, *65* (4), pp. 723-745.

[49] Kahneman, D. and Tversky, A. (2013) 'Prospect Theory: An analysis of decision under risk', in Maclean, L. C. & Ziemba, W. T. (ed.) *Handbook of the Fundamentals of Financial Decision-Making: Part I.* Singapore: World Scientific Publishing, pp. 99-127.

[50] Shogren, J. F., Shin, S. Y., Hayes, D. J. and Kliebenstein, J. B., 1994. Resolving differences in willingness to pay and willingness to accept. *The American Economic Review*, *84* (1) pp. 255-270.

[51] Couper, M. P., Kapteyn, A., Schonlau, M. and Winter, J., 2007. Noncoverage and nonresponse in an Internet survey. *Social Science Research*, *36* (1), pp. 131-148.

[52] Lozar Manfreda, K., Bosnjak, M., Berzelak, J., Haas, I., & Vehovar, V. 2008. Web Surveys Versus other Survey Modes: A Meta-Analysis Comparing Response Rates. *International Journal of Market Research,* 50 (1), pp. 79–104.

[53] Harrison, G. W. and Rutström, E. E., 2008. Experimental evidence on the existence of hypothetical bias in value elicitation methods. *Handbook of Experimental Economics Results*, *1*, pp. 752-767.