Is the valuation of water quality sensitive to external shocks? Evidence from political instability in Croatia.

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Is the valuation of water quality sensitive to external shocks? Evidence from political instability in Croatia.

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Abstract.

This paper examines the short run sensitivity of willingness to pay (WTP) estimates for groundwater quality and quantity in the presence of external shocks, using data from two choice experiments implemented in Zagreb, Croatia. To assess the sensitivity of WTP estimates we take advantage of a sudden deterioration in political stability, expressed by a series of public protests that took place in the city during the data collection and compare mean WTP estimates before and during the protests. We find that mean WTP for groundwater quality and quantity is sensitive to the occurrence of the protest. The result indicates that events unrelated to environmental quality and especially political instability can influence the valuation of environmental goods. We interpret the result as an indication that the choice experiment method is sensitive enough to capture changes in WTP that are a result of sudden changes in the state of the world.

Keywords: Choice Experiment, Political Instability, Temporal Stability, Water Quality, Water Quantity

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1. Introduction

Non market valuation is extensively used to derive passive use and non-use values of environmental goods and services. The majority of valuation studies describes environmental preferences at a given point in time and assumes that mean or median WTP remains constant over time for the purposes of cost-benefit analysis and benefits transfer. A crucial assumption for the validity of this approach is that preferences and consequently valuation estimates remain stable through time. Temporal stability of estimated WTP is therefore acknowledged as an important property for the reliability of non-market valuation estimates. Any observed time trend in WTP estimates should be treated as evidence of their weak reliability according to the NOAA panel, which recommends that sampling for non-market valuation studies should take place at various points through time. Nevertheless, the rationale for temporal averaging of WTP values as a means of improving estimate reliability is not clear (Carson et al. 1997). Furthermore, requiring temporal stability ignores the possibility that factors external to the environmental conditions or the particulars of the valuation scenario, which may nevertheless be important for respondents' preferences and valuation, may change over time (Loureiro and Loomis 2010). In fact, subject to changes that affect individual choice, individual valuation of an environmental good should change as well (Carson et al. 1997; Whitehead and Hoban 1999) and as a result there is no reason to assume that valuation should remain constant for extended periods (Brouwer and Bateman 2005). In this respect, an equally reasonable requirement for the reliability of non-market valuation is sufficient sensitivity of estimates to exogenous shocks or macroeconomic changes.

In this paper we test the sensitivity of WTP estimates to abrupt changes in conditions that are exogenous to the implementation of the survey and unrelated to the environmental resource under evaluation. In particular, we examine whether WTP estimates from non-market valuation studies are sensitive to changes in the prevailing political conditions and the emergence of political instability. We use data from two choice experiments conducted in Zagreb, Croatia in 2011 aiming to value groundwater quality and quantity improvements. We take advantage of an exogenous shock, unrelated to the topic of our valuation, in the form of a series of anti-public corruption and anti-government protests that began in the country halfway through our data collection and continued until its completion. To assess the relationship between the public protest, the ensuing political instability and stated valuation, we compare willingness to pay for water quality and quantity attributes before and during the event. We find that the mean WTP of respondents interviewed during the protest is significantly lower compared to that of individuals that were interviewed before the protest. The result is robust since the difference in WTP is confirmed in both choice experiments. Our results therefore support that non market valuation through choice experiments is sensitive to sudden changes in the state of the world in general, and the emergence of political instability in particular. The outcome of the study also points to the sensitivity of environmental valuation and the stability of environmental preference to the quality of the institutional environment. Given that we lack data after the protest, we cannot conclude whether the decrease in WTP is temporary and if the return to normalcy restores valuation to the pre-protest levels.

Our study contributes to the literature on the sensitivity and temporal reliability of WTP in a number of ways. To our knowledge this is the first study to examine the impact of political instability on valuation. Contrary to previous work on temporal stability of valuation, the time period we investigate is short: instead of repeating the same survey some months or years later, we use the change in the general political climate that took place during the data collection. This way we decrease the likelihood that potential effects on valuation result from factors other than the change in the degree of political stability. Furthermore, we show that a significant change in stated WTP can take place in a matter of days when external conditions change suddenly. We present the results of two valuation studies on the same subject that took place simultaneously and differed slightly in design. This double test allows us to assess the robustness of our results. Finally, this is one of the few studies that examine temporal stability in the context of a choice experiment.

Following the NOAA panel guidelines on the design and implementation of non-market valuation, a substantial number of studies investigate whether estimates satisfy the temporal stability requirement. The majority of these studies test the stability of contingent valuation estimates using either test-retest approaches or independent samples. In the first case, researchers elicit the valuation of the environmental good at two points in time for the same sample of respondents and compare the values. The gap between the test and the retest surveys can vary from weeks to years. The drawback of test-retest approaches is the presence of recall effects that can bias responses to the retest survey towards the values of the test survey (McConnel et al., 1998). Testing temporal reliability using independent samples on the other hand may also result to incorrect conclusions primarily because of unobserved heterogeneity among respondents.

Overall, there is mixed evidence regarding the temporal stability of non-market valuation estimates[2]. In one of the first test-retest contingent valuation studies, Loomis (1990) reports that temporal stability fails for approximately 50% of respondents. Stevens et al. (1994) and Carson et al. (1997) on the other hand, report evidence supporting the temporal reliability of non-market valuation for surveys implemented three and two years apart respectively, after adjusting for inflation. Brouwer et al. (2009) in a test-retest contingent valuation study find that WTP for flood risk reduction in Bangladesh is stable over a period of 6 months. Some studies look at the impact of shocks relevant to the valued environmental resource on estimated WTP. Brouwer (2006) looks at the valuation of health risks relating to bathing water quality before and during extreme weather that resulted in the closure of bathing locations due to water quality deterioration. He finds no evidence that this extreme event influences valuation. Brouwer et al. (2008) examine the effect the advent of the bird flu had on the WTP for migratory birds' conservation using contingent valuation studies conducted over 3 years. Once again, they find that WTP is not significantly different over time. In one of the few choice experiments concerned with temporal stability, Burton and Rigby (2011) find that additional information made available in the time between the initial and repeat samples does not influence WTP for the attributes of a novel stem cell technology in cattle breeding. Bliem et al. (2012) use independent samples to value water quality and flood frequency in Austria and conclude

[2] Skourtos et al. (2010) review papers exploring temporal stability in the preference for biodiversity conservation.

that valuation remains stable over the period of one year. Nevertheless, there is evidence that valuation estimates are sensitive to the change of individual or aggregate socioeconomic conditions. Whitehead and Hoban (1999) find that WTP for environmental quality is sensitive to changing environmental attitudes, when implementing the same contingent valuation survey five years later on independent samples. More recently, Loureiro and Loomis (2010) repeat a 2006 survey in 2009 to value the effects from the Prestige oil spill in Spain, and find significantly different WTP. They attribute the result to the changing macroeconomic conditions in the country, and in particular to the fact that in 2009 Spain was in recession facing historically high unemployment.

The paper is structured as follows: In the next section we present the case study and surveys description. Section 3 documents the hypotheses and models. In section 4 we present the results while section 5 concludes.

2. The case study and survey description

To investigate the sensitivity of WTP estimates from stated preference valuation with respect to political instability, we use data from two choice experiments conducted in Zagreb, Croatia to value groundwater quality and quantity improvements. Groundwater is the exclusive source of potable water for the approximately 1 million residents of the city of Zagreb and its importance for the city is such that the Croatian government designates it as part of the country's strategic water reserves. The Zagreb Aquifer, where groundwater is naturally stored, is facing progressively increasing concentrations of pollutants as well as decreasing water quantity. The deterioration of the aquifer's status is predominately anthropogenic. In terms of quality, there is pollution from nitrates, agricultural chemicals and heavy metals. Nitrate pollution is a direct result of the aging residential sewerage network, which allows untreated wastewater seepage into the aquifer. Extensive agricultural activities in the surrounding rural area and the overapplication of fertilizers increase nitrate concentrations. The agricultural sector is also responsible for pesticides and other agricultural chemicals traced in the water supply. Finally, heavy metals traced in the aquifer are byproducts of the local industrial activity. Further to water quality, water quantity in the aquifer is also diminishing as a result of increased consumption due to population increase and decreased groundwater recharge due to changes in the flow regime of the River Sava.

Based on these facts and after extensive consultations with local geologists and ecologists, we considered the valuation of a conservation programme for the Zagreb aquifer that involved the long run improvement of water quality and water quantity. We characterised water quality in terms of the three main groundwater pollutant categories and their sources. Specifically, the attributes of the choice experiment relating to groundwater pollution were: pollution from urban sources, pollution from the agricultural sector and pollution from the industrial sector. For identifying the levels of groundwater quality attributes we relied on the characterization of "good water status" according to the EU's Water Framework Directive (WFD) and the Drinking Water Directive (DWD). The WFD and DWD set out explicit guidelines regarding the maximum safe pollutant concentrations in European water bodies. Based on these guidelines and the threshold pollutant concentrations, we defined three levels for all water quality attributes. The best attainable level for each of the water quality attributes was near-zero pollution. The second best level under intervention was pollution at the maximum safe level according to the EU directives. For all quality attributes, we specified the third level as the situation that would emerge if no measures were implemented. In this case, pollution from all sources would exceed the EU's permissible level within the next decade. Specific interventions to mitigate groundwater pollution included the replacement of a large part of the residential sewerage network, more expert advice to farmers on fertilizer and pesticide use, better monitoring of agricultural chemical use and application and stricter legislation and monitoring of industrial waste treatment.

We defined water quantity in terms of the potential restrictions in domestic water supply in days per year due to decreased water availability. In the case of no intervention, water service restrictions would take place for approximately 15 days during each summer. In the case of intervention, no water service restrictions would be imposed. To improve groundwater levels, the valuation scenario suggested the repair and replacement of parts of the water distribution network in order to improve efficiency.

The payment vehicle was an additional charge for water quality and quantity protection levied on the respondent's water bill. The relevant prices were 30,40,50,60,80 or 100 Croatian Kuna (HRK)[3]. In the case where no measures were implemented the additional cost to consumers would be zero. The additional charge would have to be paid for five years by all residential consumers and all the proceeds would be exclusively used for the implementation of the Zagreb aquifer conservation plan. The management and implementation of the plan were specified to be the exclusive responsibility of the central

[3] Approximately €3.9, €5.2, €6.5, €7,8, €10.4 and €13.

government. We selected the payment vehicle and the institutional setup described in the valuation scenario in order to maximize realism, credibility and reliability of the survey and to avoid cases of free riding as well as decrease protest rates. It is worth noting that in the period of survey development, there was no indication of mistrust towards the government either from focus groups or personal interviews. Table 1 describes the attributes and their levels.

Table 1 here

Based on these attributes we constructed two surveys that differed on the number of attributes, but were otherwise identical. Further to the monetary attribute, the first survey included all three water quality attributes and the quantity attribute while the second survey included two of the quality attributes (pollution from residential sources and pollution from agricultural sources) as well as the quantity attribute[4]. Henceforth we will refer to the four-attribute choice experiment as "A" and to the five-attribute experiment as "B". Given these attributes and their levels we constructed two D-efficient designs (Ferrini and Scarpa 2007). We specified each design to comprise of 12 choice sets, each containing two opt-in alternatives and a zero cost opt out alternative that specified attributes to attain their worst levels. To avoid systematic starting point bias we randomized the presentation order of the choice sets during data collection (Ladenburg and Olsen 2008).

[4] The reason for this distinction was to investigate the whether preferences for water quality as assessed in a discrete choice experiment display scope sensitivity. We do not analyze the issue of scope sensitivity here since it is outside of the paper's scope.

The surveys started by introducing the participating institutions and the purpose of the research and then proceeded to present to respondents the significance of Zagreb aquifer for the city's water supply and explain its status as part of the country's strategic water reserves. After questions aiming to capture the perceptions of respondents with respect to water quality and quantity, the surveys presented the valuation scenario that described the current status regarding water quality and quantity as well as the forecasted situation in the next 10 years and the exact measures to be implemented in order to achieve the improvement in terms of the attributes. After presenting the valuation scenario and assuring the confidentiality of responses, subjects were asked to respond to the valuation questions while keeping in mind their budget constraints, financial obligations and other payments they make for similar goods and services (Kotchen and Reiling 1999). Following the presentation of choice sets we asked a series of debriefing questions aiming to identify the motives behind individual choice and especially identify potential protest responses. The survey closed by collecting standard socioeconomic information including age, household income, employment, education and marital status.

We pretested both surveys on samples of 30 respondents each, one week before the actual data collection and revised the valuation scenario and surveys accordingly. The pretests did not reveal signs of protest to the concept of government management of the conservation program. Data collection took place using face-to-face interviews from trained interviewers. To avoid survey specific interviewer biases, all interviewers collected data for both surveys. Furthermore, data collection for both surveys was simultaneous and took place during February and March 2011. We collected a random sample of 200 responses for each of the surveys. The response rates for surveys A and B was approximately 61% and 62% respectively. We used debriefing questions to identify protest responses and excluded those from the sample. Overall for survey A we identified 9 protestors (4.5% of the sample) while for survey B we found 7 protestors (3.5% of the sample).

3. Hypothesis and models

During our data collection, a series of anti-public corruption and anti-government protests took place in Zagreb and other major Croatian cities. The protests started in Zagreb on the 22nd of February 2011 and continued almost daily until the end of March 2011. The most violent demonstration on the 26th of February resulted to the injury of over 30 people. We use this shock, which is exogenous to the valuation of groundwater quality and quantity, to assess the effect of political instability on environmental valuation and investigate the short run time sensitivity of non-market valuation to changes in the state of the world. Our assumption is that the beginning of the protest marked a sudden deterioration in political stability increasing uncertainty and insecurity while decreasing the population's trust to the government. We use the timing of the start of the protest to discriminate between those individuals that respondent to the survey in the relatively stable period and those that responded during the relatively unstable period.

Our null hypothesis is that the change in the state of the world brought about by the protests is neutral to the valuation. We therefore test for WTP equality between the before-protest and during-protest samples for each attribute. Rejecting the null will indicate that stated environmental preference is sensitive to the environment where valuation takes place. Specifically, different WTP in the before-protest and during-protest samples would suggest that the political instability has significant effect on environmental preference and that the valuation method is sensitive enough to capture the change. There are a number of reasons to expect the sensitivity of WTP estimates, relating to the uncertainty induced by instability, income expectations and the realignment of individual preferences with respect to the relative ranking of environmental goods.

Political instability can have significant effects macroeconomic conditions and especially on income (Alesina et al. 1996; Dupas and Robinson 2012) and investment (Alesina and Perrotti 1996; Bohn and Deacon 2000). It is not unreasonable to assume that the negative impact of instability on macroeconomic conditions can be understood and predicted by consumers and therefore induce negative income expectations. This in turn may result to increase in precautionary saving, leading to lower expressed valuation for the environmental good.

Fredriksson and Svensson (2003) show that the stringency of environmental regulation decreases with increasing political instability. Overall, instability can cause divergence between the policy as originally designed and as actually implemented. From the consumers' perspective, this induces uncertainty over the eventual provision of the good in the future and decreases demand for groundwater quality and quantity improvement. This link is even more probable in our case since the valuation scenario in both surveys specifies the government as the party responsible for the implementation of the groundwater conservation programme. In particular, the government would design the conservation programme, impose the conservation regulation, build the necessary infrastructure, collect and manage the required funds. Political instability induces uncertainty regarding the government's ability to remain in power and hence uncertainty on its ability to meet the programme's aims and requirements. Given the political turmoil and the potential differences between the objectives of current and future governments the continuity of policy and the implementation of the project by another authority cannot be guaranteed.

An important feature of the Zagreb 2011 protests was their anti-public corruption focus. Regardless of the actual level of corruption, increasing awareness of public corruption can decrease trust on the political establishment and further deteriorate the perceived probability of success of the conservation program. It can also highlight the potential for misallocation of funds designated for the environmental improvement and the efficiency of the implementing mechanism, further lowering the stated WTP for improvement.

Finally, it is not unreasonable to assume that the public protest may change the relative ranking of public goods and services or the priorities of respondents. In a period of unrest it is possible for consumers to rank environmental goods and services that will be enjoyed in the future lower relative to goods and services that can contribute towards immediate consumption. A valid valuation method should ideally capture these effects and reflect them to the derived values.

We analyze the data using Multinomial Logit models (MNL). In addition to MNL models we also estimated Error Components Multinomial Logit models (ECM) that account for the panel nature of the respondents' choices, and Random Parameter Logit (RPL) models. The ECM estimates are almost identical to the MNL estimates, while the evidence does not support the use of RPL models. We therefore present only the MNL results. To examine the sensitivity of WTP estimates to political instability we compare WTP before the protest against WTP after the protest using the complete combinatorial approach described in Poe et al. (2005).

4. Results

In table 2 we report the sociodemographic characteristics for the full and part samples. Mean age is 44 years in both choice experiments. Mean annual household income is HRK103,597 (€13,467) and HRK119052.3 (€15,476) for survey A and survey B respectively. Approximately 34% of the respondents in CE A have completed tertiary education while 55% of them are in full time employment. For CE B, the corresponding shares are 29% and 59% respectively. WTP for environmental goods and services may depend on observable socioeconomic characteristics. Furthermore, it is possible that individuals participating in the survey during the period of instability were self selected. To ensure that differences in WTP for groundwater quality and quantity attributes before and during the protest are not due to systematic differences in the before and during the protest sample characteristics, we test for the equality of mean age, income, share of male respondents, share of respondents with tertiary education, and share of respondents in full employment. Columns 4 and 8 of table 2 report the test results for surveys A and B respectively. The results indicate the before-protest and during-protest samples are equivalent with respect to these observable socioeconomic characteristics. In addition, the response rate and protest responses where not significantly different before and during the protest. The equivalence of the two samples suggests that there was no self-selection at least with respect to the observable characteristics.

Table 2 here

We now turn to the results of the MNL models for the two choice experiments. Table 3 reports the estimates for choice experiment A. The first column reports the estimates for the full sample, while columns 2 and 3 report the estimates for the before-protest and during-protest samples respectively.

Table 3 here

The estimates for experiment A have the expected signs for the full as well as for the part samples. The coefficients on the quantity and quality attributes are positive for all samples, indicating that respondents are more likely to select alternatives with no water service restrictions and better water quality. On the other hand, more expensive alternatives are relatively less desirable as indicated by the negative coefficient on the monetary attribute for all samples. The coefficient estimates are generally statistically significant. The exception is the coefficient on the water service restrictions attribute for the during-protest sample.

In table 4 we report the results of the five-attribute experiment for the full and the part samples. The coefficients for all attribute levels are statistically significant and have the expected signs: better water quality and water availability carry a positive sign while higher additional payment has negative effect on individual choice of alternatives.

Table 4 here

The overall conclusion from both choice experiments is that respondents approve the aquifer management plan. There is a strong preference for improving groundwater quality and quantity and respondents are more likely to select alternatives with higher water quality and quantity in both experiments. The positive stance of the public is robust to political instability. The result is not unexpected, given the significance of the aquifer for the local communities. It is worth noting that for both choice experiments the coefficient on the monetary attribute appears to be larger in absolute value in the during-protest sample compared to the before-protest sample. This indicates that during the period of instability, individuals are relatively more sensitive to higher prices. This is consistent with our assumption of negative income expectations resulting from political instability.

We now turn to our primary hypothesis and examine the WTP values for each of the levels of the non-monetary alternatives for the before and during-protest samples for both choice experiments. In table 5 we report mean WTP estimates along with the 95% confidence interval calculated using the Krinsky-Robb (1986) method for experiment A. Column 1 reports WTP estimates before the protest while column 2 reports WTP estimates during the protest. Before the protest, respondents are WTP HRK53.8 to avoid restrictions in their water service; HRK57.18 for near zero pollution from urban sources and HRK80.79 for limiting pollution from the residential sector at the EU designated safe limits. Finally, respondents are WTP HRK236.78 and HRK317.54 for near zero and safe concentrations of agricultural pollutants respectively. After the protest respondents are WTP HRK12.32 for avoiding limited water service. They are WTP HRK49.79 for minimal and HRK44.09 for safe concentration of urban pollutants. Finally, respondents are WTP HRK 101.11 for near zero and HRK155.83 for safe pollution from agricultural chemicals.

WTP estimates during the protest are markedly lower compared to those before the protest. WTP for avoiding water use restrictions is more than four times higher before the protest relative to during the protest, while WTP for controlling agricultural pollutants before the protest appears to be almost twice the WTP during the protest. To test whether this apparent difference is statistically significant, we use the complete combinatorial approach of Poe et al (2005) and report the results in the third column of table 5. The test results reject the null of equivalent WTP in 4 of the 5 cases. Examining the result closely, WTP for unrestricted water service and control of agricultural pollutants is significantly lower in the sample collected after the initiation of the protest. On the other hand examining mean WTP for residential pollutants, the test rejects marginally the equivalence of WTP in the case of safe concentrations and cannot reject in the case of near zero concentrations.

Table 5 here

In table 6 we report the WTP estimates for the before and after the protest samples for survey B. Estimated WTP for unrestricted water service is HRK107 before the protest while this drops to HRK 46 during the protest. This change is statistically significant as indicated by the Poe et al (2005) test. Similarly, WTP for avoiding pollution from urban sources halves from HRK236.6 to 109.45 for near zero pollution and from HRK160.25 to HRK86.02 for safe concentrations respectively. Once again, the difference between the before- and during-protest values is statistically significant. The impact of instability is less obvious but still significant for improvement to near zero pollution from agricultural sources: mean WTP is HRK164.4 before the protest but only HRK118.30 after the protest. Nevertheless, we cannot reject the null of equivalent WTP in the case of safe concentrations of agricultural chemicals. Turning to the WTP for mitigating industrial pollution, the pattern of statistically significant decrease is resumed: mean WTP for near zero industrial pollution drops from HRK205.88 to HRK124.34 while for safe industrial pollution from HRK190.65 to HRK115.34. The pattern of the results is very similar to that of experiment A. Estimated mean WTP for avoiding water service restrictions before the protest the is more than double the WTP during the protest. This is also the case for reducing pollution from urban and industrial sources. Overall 6 out of 7 tests reject the equality of estimated WTP indicating the impact of political instability on environmental preference.

Table 6 here

These results support the idea that environmental valuation through the use of stated preference methods is sensitive to the state of the world in general, and to the political situation in particular. Estimates that are derived in the relatively more peaceful environment are greater reflecting more expected disposable income and relatively lax budget constraint. The shock on the apparent political stability brought about by the series of protests significantly lowers values for water quality and quantity. This is possibly due to lower expected income and increased uncertainty regarding the successful implementation of the proposed policy changes. It is worth noting however that the overall appreciation of the program remains positive. Irrespective of political instability, mean WTP is generally positive, indicating a strong environmental preference.

5. Conclusions

In this paper we examine the sensitivity of valuation estimates from choice experiments to the emergence of political instability. As a case study we use two choice experiments conducted in Zagreb Croatia to value groundwater quality and quantity attributes. We use the sudden increase in political instability generated by a series of anti-government and anti-public corruption demonstrations to discriminate our samples between respondents interviewed in the period of relative stability and respondents interviewed in the period of relative instability. Comparing mean WTP between these groups we find significant difference: mean WTP before the protest was at least twice the mean WTP after the protest for all levels and attributes.

With respect to the practice of non market valuation, our result adds to the literature suggesting that external conditions are important determinants of the demand for environmental preference. In our case, the environment where the valuation takes place changes suddenly inducing uncertainty that influences consumer choice. It is also evident that WTP can change dramatically in a very short period. Unfortunately due to the lack of data after the completion of the public process we are unable to determine whether this fall is temporary or relatively permanent. Nevertheless, given the degree of sensitivity we observe, we speculate that the shock is not permanent and that the return to stability should restore valuation to its original levels.

We view our result as supporting the validity of non market valuation using choice experiments. The sensitivity to external shocks resembles the fluctuation of demand for marketed goods as the macroeconomic or political environment changes.

Finally, our result has implications for the practice of benefit transfer and cost-benefit analysis. The general institutional and political environment, to the extent that it is not captured by macroeconomic measures, should be accounted for when transferring values across time periods

6. Aknowledgment

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8. Tables and Figures

Table 1: Attributes and Levels

Attribute	Levels
Pollution from Urban Sources	1. Near Zero Pollution 2. Pollution at the maximum safe level *3. Pollution 10% higher than the safe level*
Pollution from the Agricultural Sector	1. Near Zero Pollution 2. Pollution at the maximum safe level *3. Pollution 10% higher than the safe level*
Pollution from the industrial Sector	1. Near Zero Pollution 2. Pollution at the maximum safe level *3. Pollution 10% higher than the safe level*
Water service restrictions	1. No water service restrictions *2. Water service restrictions for 15 days per year*
Price	*1. 0 HRK* 2. 30 HRK 3. 40 HRK 4. 50 HRK 5. 60 HRK 6. 80 HRK 7. 100 HRK

Status quo levels in italics

Table 2: Socioeconomics Characteristics

	Survey A				Survey B			
	1	2	3	4	5	6	7	8
	Full Sample Mean (St Dev)	Before Mean (St Dev)	After Mean (St Dev)	t-stat	Full Sample Mean (St Dev)	Before Mean (St Dev)	After Mean (St Dev)	t-stat
Age	44.335	45.078	43.653	0.592	44.425	43.819	45.338	-0.678
	(16.467)	(17.825)	(15.174)		(15.216)	(15.701)	(14.508)	
Income	103,597	109576.8	97182.35	1.298	119052.3	116000.5	123696.2	-0.733
	(1087.79)	(53047.53)	(48560.48)		(55222.59)	(57310.53)	(52158.34)	
Male	0.508	0.505	0.510	-0.064	0.487	0.474	0.506	-0.438
	(0.501)	(0.503)	(0.502)		(0.501)	(0.501)	(0.503)	
Tertiary education	0.340	0.356	0.327	0.418	0.293	0.310	0.234	1.159
	(0.475)	(0.481)	(0.471)		(0.450)	(0.465)	(0.426)	
In full time employment	0.554	0.522	0.583	-0.835	0.597	0.621	0.56	0.832
	(0.498)	(0.502)	(0.496)		(0.492)	(0.487)	(0.500)	

P-values refer to the test of equality between before and after samples

Table 3: Choice Experiment A

	(1) Full Sample	(2) Before	(3) During
Water service restrictions			
No water service restrictions	0.465***	0.484**	0.187
	(0.173)	(0.219)	(0.175)
Pollution from urban sources			
Near Zero Pollution	2.106***	0.515**	0.767***
	(0.160)	(0.212)	(0.171)
Pollution at the safe limit	1.951***	0.728***	0.680***
	(0.161)	(0.230)	(0.194)
Pollution from agricultural sources			
Near Zero Pollution	1.751***	2.135***	1.565***
	(0.169)	(0.217)	(0.192)
Pollution at the safe limit	1.660***	2.855***	2.402***
	(0.136)	(0.204)	(0.178)
Price	-0.012***	-0.0089**	-0.0154***
	(0.0025)	(0.0035)	(0.0028)
Observations	1145	551	636

***, **, * = Significance at 1%, 5%, 10% level.

Table 4: Choice Experiment B

	(1) Full sample	(2) Before	(3) During
Water service restrictions			
No water service restrictions	0.977***	0.978***	0.967***
	(0.145)	(0.181)	(0.248)
Pollution from urban sources			
Near Zero Pollution	2.186***	2.166***	2.264***
	(0.184)	(0.235)	(0.300)
Pollution at the safe limit	1.565***	1.467***	1.781***
	(0.153)	(0.193)	(0.258)
Pollution from agricultural sources			
Near Zero Pollution	1.819***	1.503***	2.449***
	(0.187)	(0.227)	(0.344)
Pollution at the safe limit	1.131***	0.848***	1.728***
	(0.199)	(0.246)	(0.362)
Pollution from industrial sources			
Near Zero Pollution	2.109***	1.882***	2.571***
	(0.164)	(0.201)	(0.294)
Pollution at the safe limit	1.962***	1.744***	2.389***
	(0.121)	(0.147)	(0.217)
Price	-0.0133***	-0.00914***	-0.021***
	(0.0021)	(0.0026)	(0.0034)
Observations	1158	696	462

***, **, * = Significance at 1%, 5%, 10% level.

Table 5: WTP estimates, Choice Experiment A

	Before	During	P-value
Water service restrictions			
No water service restrictions	53.800	12.317	0.0364
	(10.056-125.521)	(-12.985-30.877)	
Pollution from urban sources			
Near Zero Pollution	57.181	49.793	0.374
	(16.880-152.200)	(31.324-74.242)	
Pollution at the safe limit	80.797	44.090	0.099
	(34.386-252.826)	(21.887-72.156)	
Pollution from agricultural sources			
Near Zero Pollution	236.779	101.111	0.009
	(141.446-827.194)	(74.584-149.409)	
Pollution at the safe limit	317.542	155.836	0.017
	(189.664-1114.356)	(121.589-224.725)	

Standard errors are calculated using the Krinsky-Robb (Krinsky and Robb 1986) procedure with 10000 draws. P-values refer to the null hypothesis of equality of before and after

Table 6: WTP estimates, Choice Experiment B

	Before	During	P-value
Water service restrictions			
No water service restrictions	107.097	46.650	0.021
	(59.667-245.631)	(23.366-79.769)	
Pollution from urban sources			
Near Zero Pollution	236.603	109.455	0.020
	(135.988-573.117)	(71.074-177.259)	
Pollution at the safe limit	160.259	86.020	0.052
	(90.389-387.696)	(55.292-138.596)	
Pollution from agricultural sources			
Near Zero Pollution	164.401	118.302	0.084
	(114.008-317.099)	(92.067-157.103)	
Pollution at the safe limit	92.476	83.418	0.361
	(51.375-164.121)	(56.921-113.603)	
Pollution from industrial sources			
Near Zero Pollution	205.879	124.343	0.030
	(137.721-432.018)	(95.982-172.676)	
Pollution at the safe limit	190.648	115.342	0.044
	(122.727-419.338)	(87.215-166.446)	

Standard errors are calculated using the Krinsky-Robb (Krinsky and Robb 1986) procedure with 10000 draws. P-values refer to the null hypothesis of equality of before and after