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Assessing the effects of "appeal to authority" in the evaluation of environmental goods. Evidences from an economic experiment in Mt Etna, Italy

In this study we aim to assess how public opinion perceives the value of dry-stone walls in the terraced vineyards of Mt Etna (Italy), recently named intangible cultural heritage of Humanity by UNESCO because they are an "example of human manufacture realized in perfect harmony with the environment". We referred to the concept of "appeal to authority" that is a form of defeasible argument in which a claimed authority's support is used as evidence for an argument's conclusion. By a Contingent Valuation approach, we showed that the authoritative role of UNESCO affected people's willingness to pay to preserve dry-stone walls in the terraced vineyards in Mt. Etna. The role of the Institutions dedicated to the protection of environmental goods appears relevant in promoting the preservation of environmental resources for future generations.

1. Introduction and research goals

Dry-stone walls are one of the most surprising elements that characterize the agricultural landscape especially in the steeply sloping areas, and the terraced agricultural landscapes amaze for the complexity of the walls and for their perfect integration with the surrounding environment. (Baldeschi et al., 2005; Balbo and Puy, 2017). On November 28, 2018, dry-stone walls were named intangible cultural heritage of Humanity by UNESCO because they are an "example of human manufacture realized in perfect harmony with the environment". Dry-stone walls characterize terraced agricultural landscapes across most rural areas. Unfortunately, in recent decades many terraces have been destroyed to increase the cultivable area, to facilitate access to agricultural machinery, to reduce labour and to reduce production costs. Furthermore, due to the strong migration of rural populations to urban areas, dry-stone walls in many areas have been abandoned and gradually degraded over time (Wei et al, 2016). Removing dry-stone walls could have negative implications since they could prevent landslides, fight erosion and desertification, and create microclimate conditions useful to safeguard biodiversity. In the framework of cultural ecosystem services provided by agricultural sector, agricultural heritage features and traditional agricultural production practices among which the dry-stone walls, can play an important role by improving aesthetic values of the agricultural landscape (Quétier et al., 2010; Alampi et al., 2018). This can

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help researchers, managers, and public planners in the management efforts to increase the visual quality of the agricultural landscape (Tempesta and Vecchiato, 2017; Alampi et al., 2019).

The present study aims to assess how public opinion perceive the issue of conservation of dry-stone walls, and for this purpose we conducted an economic experiment to evaluate the value of dry-stone walls in the terraced vineyard in Mt. Etna. A Contingent Valuation approach was used since this approach is widely used among scholars for environmental goods evaluation (Cicia et al., 2010; Tinch et al., 2015; Visintin et al., 2016, Tempesta and Vecchiato, 2017). Estimating the value linked to the preservation of dry-stone walls is, in our opinion, an essential element in assessing any options to stop the abandonment of dry-stone walls. In fact, every possible action aimed at safeguarding the terraced agricultural landscape can be evaluated based on the loss of value that the disappearance of it would entail. Despite UNESCO's decision, a low public perception of the value of dry-stone walls would not justify any action to safeguard them. Vice versa, a positive perception of public opinion helps to achieve the objective of preserving environmental resources such as dry-stone walls.

Although many benefits are recognized, the protection of environmental resources is often compromised because of the low perception that public opinion assigns to them. The causes that can positively influence the public's perception on environmental goods are not yet fully explored. To this end, in our study we used for the first time, to the authors knowledge, the concept of *appeal to authority* to explore whether the role of well-known Institutions can influence public opinion perception on environmental goods. *Appeal to authority is a form of defeasible argument in which a claimed authority's support is used as evidence for an argument's conclusion (*Lewiński, 2008; Walton, 2008). The concept of *appeal to authority has its roots in psychological cognitive biases, and it is based on the idea that a perceived authority must know better and people should conform to their opinion (*Sheldon and Macdonald, 2010). Historically, opinion on the *appeal to authority has been controversial with some scholars holding that it is a strong argument (Underwood, 1994) and others that it is weak or an outright fallacy (*Sadler, 2006; Quick et al, 2010). The *appeal to authority could influence people's preferences for environmental goods increasing their knowledge about ecosystem benefits. For example, UNESCO's decision to declare the dry-stone walls a World Heritage Site has potential to increase the public's awareness of the ecosystem services provided by dry-stone walls.*

In our survey, we investigated whether people perceive the value of dry-stone walls in the terraced vineyard in Mt Etna (Italy) by referring to the *appeal to authority* concept through a Contingent Valuation (CV) approach. We randomly assigned respondents to treatments that included a control group and a treated group receiving the *appeal to authority*. We assumed that participants' willingness to pay (WTP) would be larger for those participants that receive detailed information on the recent UNESCO's decision on dry stone walls. Currently, no legislation prohibits the destruction of dry-stone walls except for the recent decision by UNESCO that has qualified dry-stone walls as a historical and cultural resource recommending their conservation. According to the *appeal to authority* approach,

UNESCO decision can influence people's perception on dry-stone walls preservation making the current practice of removing them defeasible to increase the productivity of vineyards in Mt. Etna.

2. Background on dry-stone walls in the terraced vineyards on Mt Etna

Dry-stone walls in the terraced vineyards in Mt. Etna were created by winegrowers and they contribute to the characterization of the agricultural landscape in that area (Figure 1) (Di Vita et al, 2013). Terraced vineyards landscape is the result of economic and cultural developments that have often prevailed over natural factors. Dry-stone walls in the terraced vineyards in Mt Etna go up to an altitude of 1.500 meters above sea level contrasting the desolate landscape of lava flows and the steepness of the territory (Barbera et al., 2015). They are built with local lava stone, more or less worked with stones of increasing size at the base, stone on stone without any glue (Barbera et al., 2015; Balbo and Puy, 2017). Dry-stone walls are erected by placing two rows of shaped stones on the inside and outside of the wall, the space between the two rows of stones is filled with smaller and unworked stones.

The municipalities of Mt. Etna where there is the greatest presence of dry-stone walls are Piedimonte Etneo with 1,068 ha of terraced surface, Linguaglossa with 1,128 ha, Randazzo with 1,669 ha and Castiglione di Sicilia with 2,204 ha (Barbera et al., 2015) (Tab.1).

Comparing the total municipal area with the terraced area of the four municipalities listed in the Table 1, we observe that the municipality of Piedimonte Etneo has the largest incidence of terraced area equal to 43.7% of its total area. In the other municipalities, the terraced area varies from 10.4% of Randazzo to 19% of Linguaglossa and Castiglione di Sicilia.

These data show that the abandonment of dry-stone walls could have negative consequences not only for the hydrogeological risk and loss of biodiversity but also for the integrity of the agricultural landscape of Mt Etna.

Table 1. Surface and percentage of terraced areas in the municipalities of Mt Etna.

Municipalities	Municipal surface (ha)	Terraced surface (ha)	Percentage (%)
Piedimonte Etneo	2,441	1,068	43.7
Linguaglossa	5,799	1,128	19,4
Castiglione di Sicilia	11,581	2,204	19.0
Randazzo	16,063	1,669	10.4
Totale	35,884	6,069	16.9

Source: Barbera et al., 2015

Figure 1. Example of dry-stone walls in the terraced vineyards on Mt. Etna.

3. Methods

Data for our analysis were collected via a face to face survey. Survey development included collaborative scoping meetings held in 2019 with stakeholders of the area such as farmers unions, municipalities, and environmental associations. These preliminary meetings helped to identify the specific types of information that might be collected through a survey of residents in the province of Catania where the volcano is geographically located. From the gathered input, we constructed a questionnaire for use in the survey. To assess the effects of appeal to authority on consumers' WTP for preserving dry-stone walls, we chose a Contingent Valuation approach since it is a well-established method to assess WTP for environmental goods (e.g. Egan et al., 2015; Tinch et al., 2015; Voltaire, 2017; Wang and He, 2018). We followed Johnston et al. (2017) to ensure best practices in the stated preference questionnaire.

The first section of the questionnaire included questions on the agricultural landscape, Etna volcano and vineyards around the volcano. In addition, the interviewees were asked some preliminary questions about the landscape of the terraced vineyards and its importance for the development of tourism in that area. Finally, respondents were asked whether allocating public money to protect the agricultural landscape of Etna's terraced vineyards is useful or useless or whether public funds should be allocated for other goals.

Before asking participants' willingness to pay, we introduced a module to increase the perceived consequentiality of survey answers and asked respondents to commit to providing truthful answers. Subsequently, the participants' willingness to pay was assessed by hypothesizing the following payment scenario: "*Given the limited public funds granted to winegrowers to compensate them for the reduced profit due to the presence of dry-stone walls, we hypothesize the creation of a specific fund, managed by a hypothetical non-profit agency, in which the monetary amounts voluntarily paid by citizens will converge. The funds collected in this way will be donated to the winegrowers who undertake to keep the dry-stone walls. The protection of the terraced vineyards landscape can take place if farmers undertake to preserve the existing agricultural landscape, to treat it according to tradition, to cultivate existing vines according to good agricultural practices handed down over time. Given this scenario, are you willing to pay voluntarily and una tantum a monetary amount to this fund?*".

After describing the scenario, we specified that the survey results could influence the policy actions to preserve the dry-stone walls. To promote consequentiality, we followed an ex ante approach (Loomis, 2011) and reminded respondents that they could concretely contribute to the dry-stone walls preservation. After that's, respondents were asked if they were willing to pay to protect the dry-stone walls in the terraced vineyard of Mt Etna and to this end the Open-Ended valuation format was used to elicit the willingness to pay in case of affirmative answers. In a situation like this where the good is familiar, experience shows that open-ended questions function in a satisfactory manner (Bateman et al. 1995; Mitchell and Carson, 1989; Hansen, 1997). In addition, the lack of previous studies on the assessment of willingness to pay for dry-stone walls preservation and the result-

ing lack of WTP's reference values has made it difficult to apply other elicitation methods such as close-ended methods. Using the open-ended approach, we assumed that associated biases, such as those associated with lack of incentive compatibility, would be neutral with respect to scope issues (Heberlein et al., 2005; Hakansson, 2008; Khong et al., 2019).

In the last part of the questionnaire the main socio-economic characteristics of the participants were acquired.

In order to verify the comprehension of the questions contained in the questionnaire, we conducted a preliminary test. The results of the pre-test showed an acceptable comprehension of the questions both in form and in content.

To test the effect of "Appeal to Authority", we interviewed two independent groups of people adopting a between-subject experimental structure to avoid the potential bias that can result from individuals behaving differently if they knew that they would participate in more than one purchasing scenario as it might happen in within-subject set up. A total of 500 subjects all residing in Sicily were recruited, including residents in the study area, but only 442 completed the survey. Participation in the survey was totally voluntary and no payment was provided to respondents for their participation in the survey. The subjects were randomly assigned into two groups: "control" and "treated" (Table 2). The treatment for the participants in the "control group" was carried out without providing any information on the recent UNESCO decision on dry-stone walls, whereas participants in the "treated group" received detailed information on the aforementioned UNESCO decision. We conducted our study in Sicily (Italy) in January-March 2019. At the end of the experiment, participants that were not willing to pay for preserving dry-stone walls since they were not interested in the issue, were excluded from the analysis. Among participants initially recruited in the Control group, 21 declared not interest in the preservation of dry-stone walls, whereas in the Treated group the number of indifferent was 37. Consequently, the total number of participants included in the subsequent analyses was 229 in the Control group and 213 in the Treated group.

We captured the effects of the treatments on participants' WTP for dry-stone walls by pooling the data from the two treatments carried out by participants in the control and treated groups. We estimated an Ordinary Least Square (OLS), but since using least squares analysis may provide incorrect estimates of coefficients for explanatory variables, we also estimated a Tobit regression since the Tobit analysis provides more theoretically correct estimate for willingness-to-pay (WTP) data sets with large numbers of zero bids. The set of variables included in the models is described in Table 3.

Table 2. Experimental treatments.

Treatment	WTP question	Information on UNESCO Decision
Treat 1 (sample size: 229 units)	Open Ended	NO
Treat 2 (sample size: 213 units)	Open Ended	YES

Table 3. List of variables.

Dependent variable	Description
WTP	The individual i's WTP for dry-stone walls preservation
Independent variables	**Description**
CTDum	= 0 if in Control group and 1 if in Treated group
Gender	= 1 if female, = 0 otherwise
Age	Age in years
Education	=1 if Elementary, =2 if middle school, =3 if high school, =4 if degree, =5 if post-degree
Member of environmental associations	= 1 if Yes, = 0 No
Previous donations to environmental associations	= 1 if Yes, = 0 No
Owner of vineyards on Mount Etna	= 1 if Yes, = 0 No
Income	= 1 if less than 20.000 euro, =2 if from 20.000 to 29.999 euro, = 3 if from 30.000 to 49.999 euro, = 4 if more than 50.000 euro

4. Results

4.1 Descriptive analysis

We have totally collected data on 442 units from the two subsamples of which 229 from control groups and 213 from treated group. Summary statistics of the participants are shown in Table 4. The average age of the subjects was 39.59 years in the control group and 40.14 years in the treated group. Most of the subjects were male. The yearly average household income ranged from €20,000 to €30,000. Most of the participants in the control group (76.4%) indicated that they are not members of environmental associations and did not do donations in favour of them in the past (52.8%). On the other hand, in the treated group, most of the participants are not members of environmental associations (73.2%) and did previous donations (53.5%). Moreover, most of the subjects declared that they are not owner of vineyards in the study area. As shown in the column of p-value of t-test, no significant differences were found between the control and treated groups in regard to the variables used in our analysis except for "owner of vineyards" and "income".

Table 5 shows the average WTP by treatment type and seems to suggest that treatment type is a candidate for predicting the value of WTP, our outcome variable, because the mean value of the outcome appears to vary by treatment. This

Table 4. Participants' socio-economic characteristics.

Variables	Categories	Control group (229 Units)		Treated group (213 Units)		*p*-value
		Mean	%	Mean	%	
Age		39.59		40.14		0.6987
Gender	- Male		57.2%		54.9%	0.6309
	- Female		42.8%		45.1%	
Education	- Elementary		1.3%		0.5%	
	- Middle school		4.4%		7.5%	
	- High school		49.3%		45.5%	0.8565
	- Degree school		41.9%		42.3%	
	- Post-degree		3.1%		4.2%	
Member of environmental associations	- Yes		23.6%		26.8%	0.4423
	- No		76.4%		73.2%	
Previous donations to environmental associations	- Yes		47.2%		53.5%	0.1557
	- No		52.8%		46.5%	
Owner of vineyards on Mount Etna	- Yes		4.4%		8.9%	0.0535
	- No		95.6%		91.1%	
Income	- less than 20.000 euro		29.7%		33.3%	
	- from 20.000 to 29.999 euro		31.9%		37.1%	0.0631
	- from 30.000 to 49.999 euro		24.5%		20.7%	
	- more than 50.000 euro		14.0%		8.9%	

Note: *, ** and *** denote significance at 10%, 5% and 1%v levels, respectively.

means that participants' willingness to pay for financially support the hypothetical non-profit agency described in the payment scenario for preserving dry-stone walls in the terraced vineyards of Mt Etna is affected by UNESCO decision. In fact, participants' WTP is higher in the "treated group" rather than in the "control group" showing that people tend to attribute greater accuracy to the opinion of an authority like UNESCO. This result could mean that the *appeal to authority* of UNESCO could be able to make defeasible the current practice of destroying dry-stone walls and preserve the terraced vineyard landscape in Mt Etna. More specifically, the mean value of WTP in the control group was 12.11 Euros whereas in the treated group we registered an average WTP of 17.06 Euros. The values of WTP is statistically different between control and treatment group.

The frequencies of WTP values in the two treatments were reported in Table 6. We observed that in both treatments the values with the highest frequencies were € 5.00, € 10.00, € 15.00, € 20.00 and € 25.00.

Table 5. Summary statistics of WTP.

Treatment	Mean	St. Dev.	Number of observations	*p*-value
Control group	12.11	20.76	229	0.0937*
Treated group	17.06	39.00	213	

Note: *, **, and *** denote significance at 10%, 5%, and 1% levels, respectively.

Table 6. Frequencies of WTP values across the treatments.

WTP	Control group (229 units)		Treated group (213 units)	
	Frequencies	%	Frequencies	%
€ 0.00	76	33.2	36	16.9
€ 1.00	1	0.4	6	2.8
€ 2.00	1	0.4	6	2.8
€ 2.50	0	0.0	1	0.5
€ 3.00	2	0.9	1	0.5
€ 5.00	48	21.0	38	17.8
€ 10.00	47	20.5	56	26.3
€ 15.00	9	3.9	15	7.0
€ 20.00	16	7.0	14	6.6
€ 25.00	10	4.4	11	5.2
€ 30.00	3	1.3	9	4.2
€ 40.00	0	0.0	4	1.9
€ 50.00	6	2.6	7	3.3
€ 60.00	1	0.4	0	0.0
€ 100.00	9	3.9	8	3.8
€ 500.00	0	0.0	1	0.5
Total	**229**	**100.0**	**213**	**100.0**

4.2 *Effects of the "appeal to authority" on participants WTP for dry-stone walls*

Given that the descriptive statistics and unconditional tests do not completely reveal the effect of the *appeal to authority* on participants' willingness to pay, we further analyze the data at the individual level by estimating conditional regression models.

Results from OLS regression models again suggest that the *appeal to authority* positively affected participants' WTP for preserving dry-stone walls in the terraced vineyards of Mt. Etna between control and treated groups (Table 7). The

dummy variable "CTDum" shows that participants' WTPs in the treated group is significantly affected by the information provided to participants on UNESCO decision on dry-stone walls.

In addition, due to the high frequency of zero values (33.2% and 16.9% in the control and treated group respectively), we also estimated a Tobit model by truncating WTP values to zero. However, the results of the Tobit model confirm that the *appeal to authority* still positively influences participants' WTP to protect dry stone walls. In fact, the dummy variable "CTDum" is positively correlated to the WTP and this means that the participants in the treated group who received information about UNESCO's decision to protect dry stone walls showed a higher WTP than the participants in the control group who received no information about UNSCO's decision.

Both regression models show that "gender" influences participants' WTP and men are more willing to pay than females. In addition, "income" positively influences the willingness to pay for the protection of the terraced vineyards landscape of Mt Etna. Participants with higher level of income are more willing to pay than people with lower level of income. Among the other socio-demographic variables, being "member of environmental association" and having made "previous donations" to environmental associations positively influences the willingness to pay. All other socio-demographic variables were not statistically significant except for "education" in the Tobit model.

Table 7. Regression models results.

Variables	OLS		Tobit	
	Coefficient	*p*-value	Coefficient	*p*-value
Control-Treated (CTDum2)	5.33	0.06*	10.36	0.00***
Gender	-6.22	0.03**	-7.56	0.03**
Age	0.047	0.67	-0.02	0.86
Education	3.67	0.14	5.76	0.06*
Member of environmental associations	6.44	0.07*	11.25	0.01**
Previous donations to environmental associations	5.55	0.08*	9.49	0.02**
Owner of vineyards on Mt. Etna	3.48	0.54	7.32	0.29
Income	6.01	0.00***	7.36	0.00***
Cons.	-17.29	0.04**	-37.08	0.00***
	Adj R-squared = 0.21 Number of observations: 442		Number of observations: 442 Uncensored: 330 Censored (0): 112 LR chi2 = 79.42	

Note: *, **, and *** denote significance at 10%, 5%, and 1% levels, respectively.

5. Conclusions

In our survey we tested the effect of the *appeal to authority* on the evaluation of environmental goods. We showed that the authoritative role of UNESCO in the appeal to authority treatment lead to increased WTP for preserving dry-stone walls. The role of Institutions dedicated to the protection of environmental resources appears relevant in promoting greater sensitivity to public opinion and facilitating the preservation of environmental resources for future generations.

According with UNESCO decision, the results of this study may have important implications for wine growers in Mt. Etna since the remuneration of the qualitative services provided by farmers through the maintenance of dry-stone walls can increase farms profitability and maintain this important environmental and cultural resource also for future generations. Moreover, the findings of this study show that the protection of dry-stone walls around Mt. Etna implies the development of an environmental awareness and an appropriate environmental education. The awareness of the social and economic benefits that dry-stone walls can have for local communities will contribute to make the agricultural landscape of the terraced vineyards of Mt Etna a niche place that preserves historical and cultural values, and where individuals are willing to pay to preserve it.

However, the findings of our study should be interpreted with caution due to relatively small sample size and potential sensitivity to the way information was transmitted on the benefits of dry-stone walls and the elicitation method used in this study. Open-ended format may induce respondents to overlook their budget constraints, consequently overestimating their stated WTP. Nevertheless, the evaluation format used in this survey could provide a framework within which the willingness to pay to preserve the dry-stone walls in the terraced vineyards of Mt. Etna is placed. This may be useful for future evaluation studies on dry stone walls with other more reliable WTP elicitation methods such as close-ended formats.

Another feature that needs to be further explored concerns the effect of the *appeal to authority on willingness to pay. The confidence value of slightly less than 10% that we obtained in our survey, indicates that this aspect needs to be further investigated before we can state that the willingness to pay for agro-environmental goods is influenced by recognised authorities. Moreover, being an owner of vineyards on Mt. Etna was not significant in both models, but exploring any competition effects between being or not vineyard owners or between residents in the province where the assessed environmental good is located and residents in other provinces might be useful in future similar surveys.*

In addition, given that this study is specific to the case of the Mt. Etna region, future research should test the robustness of our findings by assessing the effect of *appeal to authority* in other contexts, e.g., for other environmental or cultural resources characterized by high environmental and cultural values and also with a broader population. Moreover, other studies are needed to test the appeal to authority effect with other institutions other than UNESCO. Finally, future studies should also explore in more depth what factors are related to the environmental and cultural goods upon which the *appeal to authority* oc-

curs. Knowing which types of factors can arise *appeal to authority* effects can help managers and marketers enhance the hedonic and symbolic value of environmental and cultural goods.

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