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# **Social factors influencing the decision to pay for the protection of biodiversity: A case study in two national parks of Northern Greece**

By

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## **Abstract**

The aim of this study is to investigate the effect of social factors (expressed as social norms, institutional and social trust and social networks) on the decision of individuals to pay for the protection of biodiversity. For this purpose an empirical study was carried out in two National Parks of Northern Greece. Three scenarios were proposed differing on the payment mechanism and the management actors (regulatory, market-based and community-based scenarios). Our empirical results show that social capital variables, especially social norms and social trust, have a strong influence both on the decision of individuals to pay and the specific amount stated. Specifically, we find that social norms have a positive influence for the willingness to pay (WTP) of individuals of a state-tax and an entrance fee (regulatory and market-based scenario respectively). Furthermore, social trust has a positive impact for the WTP through an entrance fee and a community tax (market-based and community-based scenario respectively). We also find a higher WTP of individuals towards the market based scenario where participation of citizens is higher compared to the current management status. Concerning the impact of demographic factors, we find that income does not influence the specific amount stated by individuals.

**Keywords:** Social factors; willingness to pay; biodiversity; Greece.

**JEL Classifications:** Q51, C52.

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## **1. Introduction**

Creating efficient policies for the protection of areas with high biodiversity value is a challenging task. An important difficulty while planning management plans for Protected Areas (PAs) is the collection of funds in order to assist in their implementation. In this context, economic valuation studies may significantly assist. Specifically, several studies estimate the value of biodiversity and the Willingness to Pay (WTP) of citizens for the protection of areas with high biodiversity value (Adams et al. 2008; Angulo-Valdes and Hatcher 2010; Jones et al., 2011; Thur 2010; Bernard et al., 2009; Amigues et al., 2002; Turpie, 2003). The information collected from these studies contributes in planning procedures and the identification of optimum payment mechanisms.

The most commonly applied technique for the estimation of WTP is the Contingent Valuation Method (CVM) (Mitchell & Carson, 1989). CVM refers to the distribution of a questionnaire where a hypothetical scenario and a hypothetical payment vehicle are presented to respondents (Hanely & Spash, 1993; Blamey, 1998; Garrod & Willis, 1999). Through the hypothetical scenario, respondents are asked to state whether they would be willing to pay some amount for the protection of a natural resource and also to specify this amount. Despite the wide implementation of the method several biases may occur connected either with the planning of the survey or the implementation process (Venkatachalam, 2004). One of the most important problem is the high level of refusals to pay (zero bidders) (Amigues et al., 2002; Jones et al., 2008; Oglethorpe & Miliadou, 2000; Damigos & Kaliampakos, 2003; Kontogianni et al., 2003; Birol et al., 2006; Pavlikakis & Tsihrintzis, 2005). A high percentage of these refusals are not regarded as true zeroes but they represent a protest of the respondent towards some part of the

hypothetical scenario (protest responses) (Jones et al., 2008; Meyerhoff & Liebe, 2005; Morrison et al., 2000). In order to distinguish protest responses from true zeroes adding debriefing questions has been proposed referring to the justification of the refusal from the individual (Meyerhoff & Liebe, 2007). However, this technique does not resolve the initial motive causing unwillingness to pay.

According to economic valuation studies, several factors may influence the decision of individuals to contribute money for the protection of natural resources and the occurrence of protest responses. The most commonly mentioned are environmental behavior and awareness (Martin-Lopez et al. 2007), demographic variables (Baral et al. 2008; Adams et al. 2008) and the type of local use of natural resources (Asafu-Adjaye and Tapsuwan 2008). Furthermore, the role of additional factors has been underlined (Polyzou et al., 2011; Jones et al., 2011; Krystallis & Chrysohoidis, 2005; Johnston et al., 1999) referring to cognitive and structural elements constituting social capital of a community (Polyzou et al., 2011; Jones et al., 2008). The most indicative elements of social capital are social trust, institutional trust, social norms and social networks (Putnam, 2000; Coleman, 1990). Each of these elements may significantly influence the tendency of individuals to contribute an amount for the protection of biodiversity. However, depending on the policy proposed, it is expected that different factors of social capital may also have a different influence on citizens' perceptions (Jones et al., 2009).

The aim of the present study is to investigate the influence of social factors on the decision of individuals to contribute an amount for the protection of biodiversity and the specific amount stated. For this purpose an empirical study was conducted in two

National Parks (NPs) of Northern Greece. Specifically, the following issues were investigated:

- a. citizens' willingness to contribute an amount for 3 alternative management scenarios for the NPs,
- b. whether there are differences on citizens' perceptions depending on the management scenario proposed and
- c. factors influencing the decision of individuals to pay and their monetary valuation.

In order to explore the above issues we first employ a Probit model followed by a Tobit and then we apply the Heckman sample selection and the two hurdle models assuming that the WTP and its intensity are two distinct decisions. Various different sets of factors affect the decisions at each level and they are explored analytically in our paper. Our findings show which factors affect the probability of participating and being willing to pay for the protection of the environmental areas under consideration.

The structure of the paper is the following. The next section comments on the effect of social capital on WTP reviewing the relative literature while section 3 discusses the sample framework, the data used and the proposed econometric methodologies. Section 4 presents the extracted empirical results. The last section comments on these results and concludes the paper.

## **2. The influence of social capital on WTP**

Social trust refers to trust in other people, either in general (generalized trust) or in specific social groups (particularized trust) (Uslaner & Conley, 2003). It is regarded that communities where higher levels of social trust exist will also be more willing to act in a

collective manner for the protection of natural resources (Pretty, 2003). In the case of WTP, it is expected that citizens who tend to trust their fellow citizens will also be more positive in contributing some amount for the protection of the environment due to their belief that their fellow citizens will act in a similar manner (Polyzou et al., 2011; Jones et al., 2011; Wiser, 2007).

Furthermore, social norms refer to formal or informal rules assisting in the protection of the common benefit (Coleman, 1990). The tendency to comply with social norms is also expected to influence citizens' perceptions in a similar manner as social trust. In particular, in communities where citizens regard that their fellow citizens will comply with social norms they will be more willing to assist in the protection of the environment (Pretty, 2003) and thus will be more easily contributing an amount for its protection.

Regarding institutional trust, this is highly connected with the tendency of individuals to contribute some amount for the protection of natural resources. Specifically, trust in institutions is closely linked with the perceived level of effectiveness of proposed policies (Kim, 2005; Jones et al., 2009; Beierle and Cayford 2002). As a consequence, individuals who tend to trust institutions responsible for the management of PAs will also have a more positive stance concerning the effectiveness of a proposed policy and are also expected to be more positive in contributing an amount (Krystallis & Chryssohoidis, 2005; Johnston et al., 1999). These assumptions are also connected with the occurrence of protest responses. A high level of unwillingness to pay is attributed to the belief that a proposed scenario will be ineffective due to the involvement of certain actors (Jones et al., 2008; Meyerhoff & Liebe, 2006; Jones et al., 2008; Yoo, 2000; Whitehead & Cherry, 2007). Finally, social networks refer to formal and informal connections developed in a

community (Putnam, 2000). Higher density of social networks is usually accompanied with a higher level of environmental awareness for environmental issues and also with higher levels of environmental activation (Jones, 2010; Wakefield et al. 2006). Consequently, it is expected that citizens who are more informed of environmental issues and are more active will be more positive in contributing an amount for the protection of biodiversity.

### **3. Survey, data and proposed econometric methods**

#### **3.1. Description of research areas**

The two National Parks (NPs) selected were the Evros Delta National Park (*Evros Delta*) established in 2007, situated in the eastern border of Greece and the National Park of Axios-Loudias-Aliakmonas Delta (*ALA Delta*) which was established in 2009 and is situated near Thessaloniki, the second largest city of Greece. The specific sites were selected due to their high biodiversity value (Troumbis and Dimitrakopoulos, 1998). Furthermore, although monetary valuations have been implemented in other Parks of Northern Greece (Jones et al., 2011; Pavlikakis & Tsihrintzis, 2006; Oglethorpe & Miliadou, 2000; Machairas & Hovardas, 2005) no economic valuation studies have been conducted so far in the specific areas.

Regarding the management framework of NPs in Greece, an attempt has been conducted in recent years to establish more participatory management frameworks (Papageorgiou and Vogiatzakis 2006). However, the role of the state remains very strong and the level of participation of local communities in decision-making processes is very low (Dimitrakopoulos et al., 2010). In this context, management boards have been

created in the two NPs, where the survey was conducted, consisting of representatives from different stakeholders (government, local authorities, local community, NGOs) responsible for environmental planning and management. The state is responsible for the creation of new regulations for the protection of the NPs and the enforcement of these regulations.

### **3.2. Description of the questionnaire**

In order to investigate the main aims of the study a questionnaire was created, as part of a larger survey conducted in the research areas. The questions may be divided in two main parts: Firstly, citizens' perceptions on three management scenarios and their willingness to pay, and secondly, factors which may influence their decision to pay, such as the level of environmental awareness of citizens and local social capital. Demographic data were also collected through the questionnaire.

#### *3.2.1. Management scenarios and WTP questions*

Three management scenarios were presented to respondents. Each scenario included different payment mechanisms and different management actors. Specifically, in the first scenario (*state-based*) the state was responsible both for the financial and environmental management of the areas:

*Imagine that a new management framework is established in the area. An entrance in the park is permitted only in designated areas and the current legal framework concerning the activities that can take place in the park remains. Environmental management of the area is solely the responsibility of the state and the Ministry of Environment. Funds for the management of the area will be provided from state taxes. Control for illegal activities is the responsibility of the state (Ministry of Environment) and the police.*

The second scenario (*market-based*) proposed the application of entrance fees in the areas:

*'Imagine that entrance in the park is permitted only with a ticket. Visitors pay a daily fee while permanent residents of the area pay a monthly fee (of reduced value compared to visitors' daily fee). The current legal framework concerning the restrictions of activities remains. The management of the area is the responsibility of the local authorities. Every 3 months a council takes place in which citizens may express their opinion for the improvement of the management of the area. Revenue from the entrance fees will be used for environmental protection of the area and financial management will be conducted from the local authorities. Control mechanisms and penalties are also the responsibility of local authorities'.*

The third scenario (*community-based*) promoted the higher involvement of the local communities in decision-making and management processes:

*'Suppose that entrance in the park is permitted only in permanent residents of the surrounding area while visitors will have to pay an entrance fee. Current legislation concerning the activities permitted in the national park remains. Management of the park is the responsibility of a new management board consisting of elected representatives from the local community (citizens), NGOs, local authorities and the Ministry of Environment. Funds for the protection of the park will be managed by the new management board and will derive from visitors' fee and a monthly community tax paid from the local community to the management board. Control mechanisms for illegal behavior and imposing of penalties will also be the responsibility of the new management*

*board. The new management board will conduct monthly meetings in order to decide on the environmental and financial issues of the park’.*

Respondents were asked to declare the level of restriction they perceived on their everyday activities from the proposed scenarios (measured on 10 point Likert scale, with higher ratings indicating higher restrictions). Furthermore, social and environmental benefits were investigated for each proposed scenario (measured on a 10 point Likert scale, with higher values representing higher perceived benefits).

In addition, different WTP questions were presented depending on the management scenario presented. Specifically, in the state-based scenario, respondents were asked to state if they would be willing to pay a monthly state tax for the protection of the NP and to specify this amount. In the market-based scenario citizens were asked if they would be willing to pay a monthly ticket of entrance in the NP and to specify this amount. In the third scenario citizens were asked to state if they would be willing to pay a monthly community tax paid at the new management board and indicate a specific amount.

### *2.3.2. Factors influencing WTP*

A number of questions were introduced in the models in order to investigate their influence on the tendency of individuals to pay for the protection of the NPs. These questions may be divided in three main categories:

- a. questions concerning environmental concern of citizens and their level of awareness for the NP
- b. questions concerning social capital issues and c. demographic data.

### ***Environmental concern and awareness***

A first question was general and concerned the level of interest for environmental issues of the respondents (10 point Likert scale, higher values representing higher concern). A second set of questions asked respondents 'How important do you regard the protection of the specific area' and 'How important do you regard the NP for your community' (10 point Likert scale, higher values revealing higher importance). Furthermore, respondents were asked to state if they are aware of the current legal protection framework and if they have participated in some kind of voluntary activity for the protection of the NP (dichotomous format questions).

### ***Social issues***

A set of questions were introduced in the questionnaire concerning social capital. They can be divided in four main parts:

- a. Social trust measured through 3 questions “Most people can be trusted or you can’t be too careful”, ‘Most people are fair or try to take advantage of you’, and ‘how much do you trust your local community’ (Beugelsdijk and van Schaik, 2005; Newton and Norris, 2000). All questions were measured on a 10 point Likert scale with higher values representing higher levels of trust.
- b. Institutional trust was measured for 4 actors (van Oorschot et al., 2006) which are connected with the management of NPs in Greece: the government, the national Ministry of Environment, local authorities and the current Management Board of each NP. Similarly, to social trust, these questions were measured on a 10 point Likert scale with lower valuations representing lower levels of trust.

- c. Social networks were measured through two questions which are the most commonly used in the social capital literature (Newton & Norris, 2000; van Oorschot et al., 2006): ‘Have you been a member of NGOs in the past 12 months’, ‘Have you contributed through voluntary work in an NGOs in the past 12 months’.
- d. Finally, the tendency to comply with social norms was also investigated through 4 questions. Specifically, respondents were asked to state how justifiable they regard the following actions: ‘tax evasion’, ‘bribing of civil servants’, ‘illegal disposal of construction waste’, ‘illegal constructions’. The former two questions refer to general social norms while the latter refer to specific environmental behaviors which reveal the tendency to comply with environmental social norms (Jones et al., 2011).

### ***Demographic data***

In the final part of the questionnaire demographic data were collected. These referred to income level (divided in categories), gender (male/female), educational level (divided in categories) and age (year of birth).

### **3.3. Sample**

The questionnaire was distributed to local communities in the two research areas. The survey was conducted during Summer and Autumn of 2010. For each research area, local communities affected by the NP were identified and the number of respondents needed for a representative sample from each community was determined. The final sample frame size was estimated including only individuals between 18-80 years of age

(Sampling frame Evros: 8,133, Axios: 32,000). Due to the lack of lists of the local population, experienced researchers approached every fifth occupied house in the communities so as to cover as far possible all parts of the communities. Questionnaires were administered through face-to-face interviews. In total, 501 questionnaires were completed (240 questionnaires from the Evros study area, 261 from Axios; response rates were approximately 80% and 60% respectively).

The sample characteristics are presented in Table 1. The relatively equal representation reflects the distribution of the larger Prefectural population according to the 2001 census, where the communities are situated (Axios: Male 50.63%, Female 49.36%; Evros: Male 52.2%, Female 47.79%). Concerning income level, although there are no available data for the specific research areas, the income level of the sample is close to the national average income per household (€23,394.73) (Hellenic Statistical Authority, 2010). Regarding educational level, an increase is presented in the higher education category compared to available data from 2001 on the total population. This difference was expected, as the educational level in Greece has significantly increased in the past decade (OECD, 2010). Furthermore, the higher educational level presented in the ALA Delta sample can be attributed to the proximity of the area to Thessaloniki and the better opportunities for higher education studies for the local population. Finally, the average age of respondents was 42 years. By comparing age categories with those of the total population in the two research areas (Hellenic Statistical Authority, 2001) revealed no important differences. However, a higher average age was presented in the Axios delta.

**Table 1:** Sample characteristics

	<b>Category</b>	<b>Total sample</b>	<b>Evros Delta</b>	<b>ALA Delta</b>	<b>Comparison of samples</b>
<b>Gender</b>	Male	49.7	50.4	49.6	Fisher's exact test=0.094, P>0.05
	Female	50.3	49.6	51.0	
<b>Education</b>	Illiterate	3.8	2.1	5.4	X <sup>2</sup> =44.291, P<0.01
	elementary	13.9	10.5	17.1	
	High School	19.8	24.8	15.2	
	Secondary (full)	28.9	39.1	19.5	
	Post-Secondary	9.7	6.7	12.5	
	HEI	21.2	14.3	27.6	
	Master/PhD	2.6	2.5	2.7	
<b>Income</b>	No income	10.8	10	11.6	χ <sup>2</sup> =2.97, P>0.05
	Up to 12,000	40.0	36.8	43.0	
	12,000-30,000	44.8	48.5	41.4	
	30,000-60,000	4.0	4.3	3.6	
	Over 60,000	0.4	0.4	0.4	
<b>Age</b>	(mean)	41.65	38.57	44.35	t=4.81, P<0.05

## 2.4 Data used in the analysis

Table 2 presents the basic descriptive statistics of the variables used in our analysis. As we observe, a high level of zero responses was presented in all scenarios. Specifically, only 194 individuals stated an amount in the first scenario, 266 in the second and 229 in the third. We may see the WTP ranges €6.2 to €7.6 if we consider only the positive answers (*WTP\_Positive*). However, we further analyze zero responses by identifying protest responses and including in the WTP measures true zeroes. This was conducted through the use of a debriefing question. Citizens who stated that they were

not willing to pay due their disbelief in the management of the PA from the proposed actor concerning both environmental and financial issues were regarded as protest responses (Jones et al., 2008). This further analysis in WTP answers caused significant changes in the WTP estimations. By excluding protest responses and including true zeroes we may see the WTP ranges from almost €4 to €5.2 (*WTP\_No\_protest*) (Table 2).

**Table 2:** Descriptive statistics of the main variables

Variable		Observations	Mean	Std. Dev.
Dependent variables (WTP)	WTP1_Positive	194	7.601031	11.15071
	WTP1_No_Protest	335	4.401791	9.272146
	WTP2_Positive	266	7.485338	9.849998
	WTP2_No_Protest	384	5.185156	8.893164
	WTP3_Positive	229	6.148908	6.846767
	WTP3_No_Protest	360	3.908611	6.210267
Environmental concern and awareness	General environmental interest	501	8.007984	2.108065
	Importance of protecting the NP	501	8.742515	1.936897
	Voluntary participation	501	.1616766	.3685219
	Awareness of regime	501	.4011976	.4906308
	Importance of the NP for the local	498	8.526104	7.481454
Demographic	Age	491	41.64969	15.50443
	Education	500	4.958	9.579968
	Gender	501	1.502994	.5004908
	Income	486	3.623457	10.70062
Perceptions on scenarios	Constraint S1	500	3.16	6.795495
	Social Benefits S1	500	5.036	2.989411
	Environ. Benefits S1	498	6.114458	6.706925
	Constraint S2	500	3.772	5.373804
	Social Benefits S2	501	5.401198	2.94291
	Environ. Benefits S2	501	5.928144	3.038228
	Constraint S3	501	3.467066	3.223882
	Social Benefits S3	501	5.824351	7.837926
Social capital (aggregate indicators from EFA)	Environ. Benefits S3	501	6.139721	6.686437
	Social Norms	493	-2.03e-07	1
	Institutional Trust	493	1.01e-07	.9999997
	Social Trust	493	2.86e-07	.9999999
	Social Networks	493	-1.23e-07	.9999998

Furthermore, in order to minimize the amount of independent variables utilized in the WTP models, an Exploratory Factor Analysis was conducted in order to extract aggregate indicators of the four social capital indicators (KMO Measure of Sampling Adequacy: 0.729). Specifically, four new factors were created representing SOCIAL NORMS (Cronbach a= 0.792), INSTITUTIONAL TRUST (Cronbach a=0.807), SOCIAL TRUST (Cronbach a= 0.722) and SOCIAL NETWORKS (Cronbach a=0.597) combining the relevant social capital variables in each factor.

## 2.5 The proposed econometric models

The usual approach to cope with cases of data with many zeros is the Tobit model formulated by Tobin (1958). We apply the Tobit model as

$$Y^* = X'\beta + \varepsilon \quad \varepsilon \sim N(0, \sigma^2) \quad (1)$$

Tobit is used in order to avoid endogeneity bias

$$Y = \begin{cases} Y^* & \text{if } Y^* \geq 0 \\ - & \text{if } Y^* \text{ missing} \end{cases} \quad (2)$$

where Y is an unobserved continuous dependent variable.

The method used is full information maximum likelihood (FIML) permitting for the correlation in the normally distributed error terms with the exogeneity test to present a test of  $\rho=0$ . Variables in the vector  $X_{2i}$  are the identifying variables and are not in the  $X_{1i}$  vector. They are expected to have high explanatory power in the instrumenting equation and to be uncorrelated (or with low correlation) with WTP as well as the disturbance term (Awad and Hollander 2010).

The marginal effect of a variable like  $X_1$  on the expected value of WTP is

$$\text{calculated as } E(WTP) = \frac{\partial E(WTP)}{\partial X_1} = \beta\Phi(Z) \quad (3)$$

where  $Z$  is calculated at the mean values of all variables.

This model uses a censored dependent variable without examining the sources of zero responses and thus ignoring the zero responses due to non-participation decisions. Heckman (1979) suggested a model to tackle the problem with zero responses coming from non-participation of the respondents, claiming that censored estimation with selected sub-samples leads to sample selection bias. Instead, Heckman proposes a two-stage estimation procedure.

In the first stage, the probability of a positive outcome occurring is estimated with a Probit estimation in the full sample (selection or participation equation). We start our econometric formulation by using dichotomous choice variables. The probit model identifies the conditional probability as

$$P = \Phi(X'\beta) = \int_{-\infty}^{X'\beta} \phi(Z)dZ \quad (4)$$

Where  $\phi(Z) = \left(\frac{1}{\sqrt{2\pi}}\right)e^{-\frac{Z^2}{2}}$  is the cumulative density function of the standard normal distribution and  $\Phi(Z)$  is the standard normal distribution. The probit MLE first order conditions (FOCs) are

$$\sum_{i=1}^N \phi(X'_i\beta) / [\Phi(X'_i\beta)(1 - \Phi(X'_i\beta))] \quad (5)$$

With the weight  $w_i$  to vary across observations (Cameron and Trivedi, 2009). The marginal effects in the probit formulation are given as

$$\frac{\partial P_i}{\partial X_{ij}} = \phi(X_i' \beta) \beta_j = \phi\left(\frac{P_i}{\Phi}\right) \beta_j \quad (6)$$

This is followed by a censored estimation on the selected sub-sample of participation conditioned on observed positive values (conditional estimation). The Heckman also known as heckit model can be considered as a generalization of the Tobit model as it allows the independent variables to be part of both estimation stages.

If we consider two latent variables  $Y_i^*$  and  $d_i^*$  as functions of observable explanatory variables  $X_i$  and  $Z_i$  the Heckman model then becomes

$$d_i^* = z_i' \delta + \varepsilon_{1i}$$

$$\text{With } (\varepsilon_{1i}, \varepsilon_{2i}) \sim N\left(0, \begin{bmatrix} 1 & \rho\sigma_\varepsilon \\ \rho\sigma_\varepsilon & \sigma_\varepsilon^2 \end{bmatrix}\right) \quad (7)$$

$$Y_i^* = x_i' \beta + \varepsilon_{2i}$$

Where the disturbance terms are independently and jointly normally distributed with covariance  $\rho\sigma_\varepsilon$ . Then we have two equations in the form

$$d_i = \begin{cases} 1 & \text{if } d_i^* > 0 \\ 0 & \text{otherwise} \end{cases} \quad (8)$$

$$Y_i = \begin{cases} Y_i^* & \text{if } d_i = 1 \\ - & \text{otherwise} \end{cases}$$

Where the first shows if an observation is in the sample or not while the second determines the value of  $Y_i$ . In terms of the Tobit setup  $Z_i = X_i$ ,  $\delta = \beta$ ,  $\sigma_{\varepsilon_{1i}} = \sigma_{\varepsilon_{2i}}$  and  $\rho = 1$ .

Cragg (1971) modified the Tobit model to tackle the problem with too many zero responses proposing the “double hurdle” model. Specifically, Cragg suggests the estimation of two hurdles with the first referring to the participation decision and the second to the level of participation. Hurdle models can be presented as

$$Y_i = \begin{cases} Y_{2i}^* & \text{iff } Y_{2i}^* > 0 \text{ and } Y_{1i}^* > 0 \\ 0 & \text{otherwise} \end{cases} \quad (9)$$

Although the double hurdle and the heckit models are similar the latter allows the existence of zeros in the second hurdle. In the heckit model WTP depends on a selection equation deciding if a positive WTP is recorded while in the double hurdle WTP is determined in the participation equation.

As the Tobit model is nested in the double hurdle model formulation we can test the use of the double hurdle model against Tobit using a Likelihood Ratio (LR) test as (Humphreys, 2010)

$$LR = -2(LL_{DH}^* - LL_{TOBIT}^*) \sim \chi_p^2 \quad (10)$$

Where p the degrees of freedom equal to the number of parameters restrictions in the Tobit formulation. In the same lines and as the Heckman model is a non-nested in the double hurdle, Vuong (1989) suggested a modified likelihood ratio test in cases on non-nested maximum likelihood estimators as

$$Vuong \text{ test} = \sqrt{n} \left( \frac{LL_{DH}^* - LL_H^*}{\left(\frac{1}{n}\right)(LL_{DH}^* - LL_H^*) - \left[\left(\frac{1}{n}\right)(LL_{DH}^* - LL_H^*)\right]^2} \right) \sim N(0,1) \quad (11)$$

#### 4. Results

The probit model used the binary variable WTP(0,1) as dependent variable while the Tobit model and the Heckman model used as dependent variable the open-ended one with positive and true zero responses giving us a mean estimated WTP.

#### **4.1 Dichotomous WTP**

Table 3 presents the results of the Probit model formulation. As can be observed the importance of the parks existence for the local community and the three of the four factors of social capital (social norms and institutional and social trust) are statistically significant in all levels of statistical significance. Regarding demographic variables, income, educational level and gender are also statistically significant explanatory variables. Finally, the variable concerning awareness of the current protection regime is statistically insignificant in the first scenario but it is significant in the other two scenarios for a level of 10%. In all cases we find negative effects of all variables but knowledge of protection regime.

It is interesting to mention that the marginal effects differ even for the same variable between scenarios. Differences in magnitude appear in the cases of parks' importance, institutional trust and gender. There is also difference in the knowledge of protection regime between scenario 1 and the other two scenarios. The marginal effect in the case of knowledge of protection regimes is 0.292 implying a 29.2% higher probability for a WTP participation. Similarly in the case of social norms there is an almost 14% probability for reducing WTP participation. Similar conclusions can be extracted from the rest of the marginal effects.

**Table 3:** Probit results

	WTP1		WTP2		WTP3	
	Estimates	Marginal Effect	Estimates	Marginal Effect	Estimates	Marginal Effect
Constant	-4.0165 [0.0000]		-4.88173 [0.0000]		-2.8198 [0.0000]	
Importance of resource existence	-0.11512 [0.0000]	-0.3507	-0.04733 [0.0000]	-0.01888	-0.2994 [0.0000]	-0.10222
Social Norms	-0.45278 [0.0000]	-0.1392	-0.51554 [0.0000]	-0.20566	-0.5692 [0.0000]	-0.2016
Institutional Trust	-0.63715 [0.0000]	-0.19606	-0.4473 [0.0000]	-0.17844	-0.2676 [0.0000]	-0.09055
Social trust	-0.55325 [0.0000]	-0.1699	-0.6024 [0.0000]	-0.2403	-0.57296 [0.0000]	-0.21013
Income	-0.34194 [0.0030]	-0.10474	-0.34774 [0.0040]	-0.13872	-0.59461 [0.0000]	-0.1989
Education	-0.02458 [0.0090]	-0.00764	-0.01779 [0.0070]	-0.0071	-0.01736 [0.0100]	-0.00526
Gender	-0.85379 [0.0000]	-0.2619	-0.24891 [0.0760]	-0.09929	-0.4963 [0.0000]	-0.15013
Knowledge of protection regime	0.0944 [0.505]	0.29214	0.27337 [0.0610]	0.10872	0.26936 [0.0570]	0.1098
N	473		476		476	
Wald $\chi^2_8$	443.09 [0.0000]		229.57 [0.0000]		1676.63 [0.0000]	
Log Likelihood	-1069.8		-898.74		-953.95	
Obs. P	0.389		0.5336		0.4559	
Pred. P	0.297		0.456		0.3772	

#### 4.2. Open-ended WTP

Table 4 presents the results derived by the Tobit and the Heckman models formulation. In the tobit model the importance of protecting the area is significant (at 10% significance level) in the case of scenario 3. Income is important in scenarios 1 (at all levels) and 3 (at 10%) while age is significant in all scenarios and gender in scenarios 1 and 3. The marginal effect of protecting the area is 0.2344 and 0.1987 for scenarios 1 and 3 respectively. This implies that a change from one interval class to the other will decrease WTP by 23.4% and 20% accordingly.

Similarly the marginal effects of income are -0.162 and -0.611 for scenarios 1 and 3 respectively. This means that a change from one interval class to the other will reduce WTP by 0.162 and 0.611 respectively for scenarios 1 and 3 respectively. The marginal effect in the case of age and in the second scenario is 0.0014 showing that older respondents give a lower WTP and a lower priority and preference to pay for protecting the parks.

Looking at the sample selection model we see that in the first hurdle (selection equation) the determinants of the true WTP are the social norms, the institutional and social trusts in all scenarios. Age is positively influential in scenarios 1 and 3 as well as education in scenarios 1 and 2. Gender is negatively affecting WTP in all scenarios. In the second hurdle (intensity equation) the statistically significant variables are the environmental interest, the importance of protecting the area, the knowledge of protection regime, the importance of the resource existence in all scenarios and the volunteer participation in protecting the area in the case of scenarios 1 and 3.

Besides income seems to be influential in all cases and it is worth mentioning that in the case of scenario 1 the influence is positive. For scenario 1 the variables social and environmental benefits seem to be very influential as well as the social norms factor. At the same time the inverse Mills ratio variable is statistically significant in all scenarios showing that the selection model must be used in order to avoid inconsistencies. The estimates are quite high implying that the two hurdles lead to different coefficient estimates.

**Table 4:** Tobit and Heckman results

	WTP1			WTP2			WTP3		
	Tobit I	Tobit II		Tobit I	Tobit II		Tobit I	Tobit II	
		First Hurdle	Second Hurdle		First Hurdle	Second Hurdle		First Hurdle	Second Hurdle
Constant		-7.107 [0.000]			1.2945 [0.673]			-6.89733 [0.000]	
Environmental interest		-0.0982 [0.000]			-0.8684 [0.042]			0.21173 [0.000]	
Protection Importance	0.656 [0.120]	-0.3898 [0.000]			0.6932 [0.042]		0.4989 [0.074]	-0.4785 [0.000]	
Volunteer participation		3.6145 [0.000]		-0.4295 [0.042]			-0.0934 [0.000]	-0.0933 [0.000]	
Protection regime		1.665 [0.000]			3.55223 [0.005]	1.8475 [0.086]		0.5921 [0.0000]	
Existence importance of resource		-0.0394 [0.000]		-0.0355 [0.001]			-0.00021 [0.000]		
Social Norms	-2.0723 [0.019]	-0.0271 [0.000]	-1.9295 [0.024]	-0.7266 [0.256]	-0.1661 [0.035]			-0.0066 [0.000]	
Institutional Trust		0.00253 [0.000]		1.074 [0.085]	-0.3692 [0.000]			-0.0876 [0.000]	
Social Trust		-0.1157 [0.039]			-0.7415 [0.000]			-0.0734 [0.000]	
Income	-0.4522 [0.000]	-0.0269 [0.739]	0.00397 [0.000]		-0.488 [0.178]	-1.2357 [0.000]	-1.5341 [0.059]	-0.49515 [0.000]	
Age	-0.0039 [0.083]	0.00026 [0.000]		-0.0016 [0.000]	-0.00414 [0.369]		-0.00244 [0.077]	.00047 [0.000]	
Education		0.00013 [0.000]			-0.01678 [0.0190]				
Gender	-2.83 [0.082]	-0.0861 [0.000]			-0.43211 [0.002]		-2.1578 [0.028]	-0.15853 [0.000]	
Social Benefits		0.6182 [0.000]							
Environmental Benefits		-0.6124 [0.000]							
Inverse Mills Ratio		1.9317 [0.000]			1.088 [0.000]			10.858 [0.000]	
n censored	467			466			471		
uncensored	284			218			257		
	183			248			214		
Log Likelihood	-830.53		-928.78	-1071.24		-1754.89	-844.964	-975.35	
LR (rho=0)		159.54 [0.000]			3.84 [0.000]			125.45 [0.000]	

Moving on to table 5 and the double hurdle extracted results we see that at the first hurdle (selection equation) the determinants of the true WTP are the institutional and social trust in all scenarios and the social norms in scenario 1. The importance of

protection seems statistically significant in scenarios 1 and 3, while the knowledge of protection regime seems statistically significant in scenarios 2 and 3. Education and gender seem very influential variables in all scenarios while Age is influential in scenario 1. In the second hurdle (intensity of use equation) the significant variables are the importance of protecting the area in scenarios 1 and 2, the knowledge of protection regime in scenarios 2 and 3 while the importance of the resource existence is insignificant in all scenarios. Besides social trust is significant in all scenarios and social norms in scenarios 1 and 2. Age seems to be influential in scenario 1.

**Table 5:** Double hurdle results

	WTP1		WTP2		WTP3	
	First Hurdle	Second Hurdle	First Hurdle	Second Hurdle	First Hurdle	Second Hurdle
Constant	6.5418 [0.017]	-9.8626 [0.000]	3.0999 [0.097]	3.5049 [0.020]	-3.9911 [0.181]	2.9768 [0.000]
Protection Importance	-0.2219 [0.004]	1.2503 [0.000]	-0.1072 [0.192]	0.1906 [0.099]	0.6759 [0.024]	
Protection regime			4.2748 [0.065]	-2.4997 [0.013]	2.2589 [0.036]	-3.6602 [0.000]
Existence importance of resource			-0.06184 [0.313]	-0.02213 [0.081]		-0.09754 [0.000]
Social Norms	-0.6991 [0.097]	1.497 [0.000]		1.4892 [0.099]		
Institutional Trust	-0.5887 [0.000]		1.5620 [0.002]		1.386 [0.000]	
Social Trust	-0.9254 [0.000]	-1.5198 [0.062]	-0.5238 [0.068]	1.002 [0.015]	-1.0917 [0.014]	1.1246 [0.000]
Age	-0.0005 [0.059]	-0.00175 [0.035]				
Education	-0.0869 [0.384]		-0.02107 [0.093]		1.2301 [0.000]	
Gender	-2.944 [0.059]	0.1413 [0.199]	-2.1291 [0.036]		-2.4962 [0.014]	
n censored	482		489		489	
uncensored	290		228		263	
	192		261		226	
Wald LR (rho=0)	0.02 [0.8804]		0.04 [0.8475]		0.03 [0.8728]	
Log Likelihood	-934.693		-1144.75		-972.793	

Some variables were omitted from both hurdles due to lack of convergence.

Finally, Table 6 presents the likelihood ratio results for comparing the appropriateness of using double hurdle against Tobit and Heckman models. In all cases double hurdle model formulations are in favor.

**Table 6:** Likelihood ratio tests

Likelihood ratio DH vs Tobit	Likelihood ratio DH vs Heckman
208.326	-1710.4
147.02	-3.4767
255.658	4006.117

## 5. Discussion and conclusions

The present paper aimed to explore willingness to pay of local communities for the protection of two National Parks of Greece. Three different scenarios were presented to a sample of locals representing different payment vehicles. Through the study, social factors influencing the decision of individuals to contribute some amount were explored. Furthermore, the influence of these factors on the specific WTP amount was also investigated. Several interesting results came out from the analysis, which are discussed next.

Regarding the intention to pay of individuals, the highest percentage of positive answers was presented for the market based scenario, introducing the entrance fee as a payment vehicle. The lowest level of intention to pay was presented for the first scenario where the payment vehicle was a state tax. The high level of refusals presented in the study has also been observed in previous national studies (Menegaki et al., 2007; Polyzou et al., 2011; Jones et al., 2009). Regarding the specific amount stated by respondents, the highest WTP was declared for the market-based scenario (€5.18) and the lowest for the state tax (€4.40). By comparing citizens' responses in the three scenarios, the low level of intention and willingness to pay in the regulatory scenario is possibly connected with the

low level of trust towards state institutions. Citizens are reluctant to pay taxes to the state due to their belief that these will not be managed in an efficient manner (Jones et al., 2011). The fact that the market-based instrument is perceived in a more positive way is possibly due to the fact that the economic burden for environmental conservation is been distributed both to visitors and the local community and also that the specific scenario promotes the participation of non-state actors in the management procedures.

According to the results of the Probit analysis, conducted for each scenario, most social capital variables are connected with the decision of individuals to state an amount in all scenarios. These refer to social norms, social trust and institutional trust. It is interesting to note that there is a negative influence of social capital variables which comes in contrast with recent findings (Polyzou et al., 2011; Jones et al., 2011). This means that citizens who tend not to trust their fellow citizens and institutions of their community and also tend to regard that it is justifiable not to comply with social norms are more positive in stating a specific amount. A possible explanation is that people with lower levels of trust in institutions and their fellow citizens regard that only through their personal contribution it is possible to resolve environmental issues in their area. Furthermore, income, education and gender also influence the decision of individuals to contribute some amount. Specifically, citizens who intend to give some amount are of lower income and educational level. This result can be explained taking into consideration the social characteristics of the specific local communities. Citizens who are more concerned for the protection of the park are those who are involved in agricultural activities and thus are included in lower educational and income level social group.

Regarding factors explaining the specific amount stated by individuals for the protection of the national park, a diverse influence is presented depending on the scenario analyzed. From the social capital variables, social norms have a positive influence for the regulatory and the market based scenario. This means that citizens who regard that it is unjustifiable to disobey social norms are willing to pay a higher amount. This finding is in accordance with the relevant literature (Pretty, 2003; Jones et al., 2011) and can be explained taking into consideration the fact that the specific scenarios have a higher 'need' for citizens' compliance with regulations in order to be effective (Jones et al., 2009). Concerning social trust, a positive impact was presented for the WTP of the market based and the participatory scenario. This result confirms previous findings (Jones et al., 2011) underlining that citizens who tend to trust their fellow citizens develop a stronger belief that their community will act in favor of the collective benefit (Pretty, 2003) and incidents of free-riding will remain to a minimum (Jones et al., 2011).

However, an opposite influence of social trust is presented in the first scenario where citizens with higher levels of trust are willing to pay a lower amount. A possible explanation for this result is that there is an influence from 'negative' social capital (Adler & Kwon, 1999). This implies that further research should be conducted in order to interpret this result. Concerning the influence of citizens' perceptions and awareness, the importance of protecting the area is positively connected both with the regulatory and the market based scenario. Thus, citizens with higher environmental concerns for the area are more willing to pay for its protection. It is also interesting to note that citizens who are not informed on the current protection regime are more willing to pay in the context of the market based and the participatory scenario. Thus, unawareness is connected with a

higher tendency to support alternative management scenarios, such as the second and third proposed scenario of the study. Finally, concerning the impact of demographic factors, it is interesting to observe that income does not influence the specific amount stated by individuals.

In conclusion, an important finding of the study concerns the higher WTP of individuals towards the market based scenario where participation of citizens is promoted. This result is in accordance with the general tendency in current environmental policy, where there is a need to shift in less regulatory instruments and increase citizens' participation in decision-making and management processes (Bogaert et al., 2009; Clark and Clarke 2011; Gerhardinger et al., 2009; Moreno-Sanchez and Maldonado, 2010). A second important finding of the study concerns the impact of social capital parameters. A general conclusion is that social capital variables, especially social norms and social trust, have a strong influence both on the decision of individuals to pay and the specific amount stated. However, this influence is differentiated depending on the scenario presented. Some explanations have been presented in the analysis for this finding, however, further research is necessary in order to better understand the diverse influence of these social factors.

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