

Valuing government trust: a choice experiment application to forest fires

Phoebe Koundouri, Yiannis Kountouris and Kyriaki Remoundou*

*Department of International and European Economic Studies, Athens University of Economics and Business, Greece, kremoundou@aueb.gr, tel:6946867674

Preliminary Draft, Please do not Quote

Abstract

A choice experiment study is implemented in Athens, Greece to value the benefits from the restoration of the national park and the forest of Parnitha which suffered significant damages due to wildfires in 2007. We examine whether the institution that undertakes the fund collection and expenditure influences respondents willingness to contribute using a split sample approach. The results indicate that respondents are willing to pay for a restoration program that is undertaken by either the local government or the European Union since they derive positive and significant values from goods and services generated by the forest ecosystem under evaluation. We also find that the institutional body responsible for the implementation of the restoration project does not affect individuals' valuation. Conclusions in this paper can assist in policy formulation of and promotion of similar restoration projects in Southern Europe.

Keywords: choice experiment, forest fires, institution trust, long-run cost benefit analysis.

JEL codes: Q54, Q57, Q58

1. Introduction

Forests rank among the most important and diverse ecosystems harbouring varied ecosystem services that directly or indirectly translate to economic benefits (MEA 2005). In addition to marketable timber outputs, forest ecosystems are major habitats for biodiversity, regulate local and global climate through carbon sequestration, ameliorate weather events, regulate the hydrological cycle, protect watersheds and

their vegetation, water flows and soils and provide a vast store of genetic information and amenity values (CDD 2001, Willis et al 2003).

Internationally forest coverage has declined significantly during the last centuries while the risk of severe degradation is prominent in the remaining forests threatening their capacity to provide ecological goods and services that translate to economic goods and services. Globally, the rate of deforestation for all forests is some 9 million hectares per annum, or about 0.2% per annum (FAO 2001). Forest loss and forest ecosystem degradation are driven by a combination of economic, political, and institutional factors (MEA 2005). Among the main drivers of forest ecosystem degradation are population growth, agricultural expansion, unsustainable logging, fires as well as inadequate management and policy failures. Policy failures often result from the absence of markets for many forest goods and services which are public goods in nature and thus are non-marketed. As such there are no market forces to send the appropriate price signals to users of forest land that forests have economic value in conservation or sustainable use (CDD 2001).

To circumvent the absence of markets for environmental goods and services economists have developed a refined battery of techniques to capture the total economic value of natural resources which can be broadly classified into revealed and stated preference methods. Revealed preference approaches use information derived from actual markets related to the environmental good under evaluation while in stated preference techniques hypothetical markets are constructed in which consumers have the opportunity to pay or accept compensation for the environmental good or service in question. Economic valuation can thus play a significant role in revealing the importance of forest ecosystem goods and services and provide policy-makers with economic indicators and policy analyses to justify investment in forest conservation.

In this paper we apply the choice experiment method to investigate public preferences towards different forest restoration programs in Greece, a country that experienced a serious fire outbreak during the last summer. Environmental and social benefits associated with forest restoration with respect to reforestation of the burned area,

recreation, erosion reduction and biodiversity conservation are estimated to assist policy-makers and inform forest resources management.

2. Review of recent literature

There is currently significant interest in values derived from forest ecosystems and consequently, recent years have seen an increase in research aiming to value forest ecosystem services. Although substantial research has been undertaken on forest valuation worldwide (an extensive review of forest valuation studies can be found in Bishop (1999) and CDD (2001) among others) there is currently a very limited literature addressing losses in forest ecosystem goods and services resulting from forest fires and attempting a valuation of the relevant recovery policies. The first valuation study examining the impact of fires on forestry values was the one of Vaux et al (1984). They applied the contingent valuation method to demonstrate the detrimental effects of fires on recreational values. Based on the results of a hedonic analysis Loomis (2004) argues that forest fires shift upwards peoples' fire risk perception resulting in a significant reduction in property values in areas nearby burned forests. Kaval, Loomis and Seidl (2007) further showed that there are substantial values associated with fire risk reduction using prescribed burning in Colorado as highlighted by high WTP of respondents in a contingent valuation study. In a similar study, Loomis and Gonzalez-Caban (1998) evaluated different fire management plans aiming at protecting acres of old growth forests in California and Colorado. Results reveal significant benefits attached to fire management plans that justify their implementation for the preservation of the forests. Loomis, Le and Gonzalez-Caban (2005) reach similar conclusions regarding benefits from forest fire prevention programs in the states of California, Florida and Montana. Mediterranean countries have received relatively little attention in terms of valuation studies although wildfires are one of the main hazards Mediterranean forests face. Riera and Mogas (2004) implemented a contingent valuation study to evaluate a fire prevention program in Catalonia that would reduce the fire risk by 50%. The main conclusion is that the majority (63%) of the respondents declared willing to pay the extra amount for the implementation of the program aiming at reducing the forest fire risk. Riera et al. (2007) conducted a choice experiment to elicit Catalan citizens' willingness to pay for management programs to mitigate soil erosion, plant cover and fire risk as a result

of climate change in the Mediterranean shrublands. Soil erosion was found to be the attribute that most concerned the population, followed by fire risk and then plant cover.

To the best of our knowledge this is the first attempt to address trust to national and international institutions in a choice experiment valuation study although existing literature has showed that the institutional body responsible for the implementation of the project under question significantly influences individuals' valuations. In a working paper, Adaman et al. within a contingent valuation framework using a split-sample approach showed that valuation differ under the different funding schemes and confirmed the literature that participation, trust and materialism are positively correlated with WTP. Motivated by their results our study examines whether trust in institutions influences valuation within a choice experiment.

3. The choice experiment method

Choice experiments have been widely applied in recent years to estimate both use and non-use values associated with environmental goods and services (Bateman et al. 2003). The approach has a theoretical grounding in Lancaster's attribute theory of consumer choice, and an econometric basis in models of random utility (McFadden, 1974). Lancaster proposed that consumers derive satisfaction not from goods themselves but from the attributes they provide and thus in a choice experiment application the environmental good is defined in terms of its attributes and levels these attributes would take with and without sustainable management of the good. One of the attributes is a monetary one, which enables estimation of WTP. Experimental design theory is used to construct profiles of the good in terms of its attributes and attribute levels. Two or three alternative profiles are then assembled in choice sets and presented to respondents, who are asked to state their preferred profile in each choice set (Bateman et al., 2003). Boxall et al. (1996) argue that choice experiments have important advantages over other valuation methods since they allow for trade-offs between the attributes of the situation to be made and they solve many of the biases associated with other valuation techniques.

4. Study Area

Parnitha mountain is a large land mass covered by forest area of 390 square kilometres, 10 km northwest of Athens (Figure 1) which includes the national Nature Reserve of Parnitha. Its wild vascular flora boasts 1100 different recorded taxa which account for the 1/6 of Greek flora. 90 among them are Greek endemic plant species, i.e. they are only met in Greece, with the most noteworthy being the forest of the endemic Greek fir *Abies cephalonica*. The wildfire burned the 2/3 of their forest that will need many decades to restore. In 1961 the entire mountain (around 2,000 hectares) was declared a National Park and most of the activities, except for scientific research, were prohibited in its core zone.

Figure 1: the case study area



The core zone of the Park comprises the high peaks of Parnitha, an area of c. 380 hectares, and most of that area (90%) is covered with fir forest (*Abies cephalonica*). Around the core lies the peripheral or buffer zone, which includes the rest of the mountain and is covered with pinus forest (*Pinus halepensis*) (Forest Service of Parnitha)

Because of the valuable habitats and species that the mountain hosts it belongs to the NATURA 2000 network. The area's fauna includes many endangered species and is primarily noted for the population of the red deer (*Cervus elaphus*). It is estimated that 500 individuals existed before the wildfire (Forest Service of Parnitha). According to the WWF around 30-50 deer were burned in the wildfire.

Further to its great ecological value the mountain provides recreational values for the citizens of Athens and tourists. The number of visitors is almost 270.000 annually (Amorgianiotis 1997).

5. The sample- Data collection

The attributes and levels, which were employed in the choice experiment, were chosen in consultation with the scientists from the Forest Service of Parnitha and are presented in table 1. Respondents were presented with different forest management programs each described in terms of area of reforested land, biodiversity, flood risk and recreation and were asked to choose their preferred given its cost. To allow for welfare changes to be estimated a monetary attribute was also included. The flood risk attribute refers to the predicted risk of flooding in the area in the next 10 years. At present, the risk of flooding is high. If, however, surface barriers are established, the flow of water will slow down and the risks of flooding will be reduced. The material proposed for this improvement is wood that would not spoil the aesthetic beauty of the forest.

The reforested area attributes refers to hectares of reforested land that the restoration program implies. To provide an understandable indication of the co2 sequestration capacity of the new forest equivalent number of cars producing the same annual co2 pollution is stated. No reforestation action has currently been undertaken. The proposed program would either imply the reforestation of the whole forest area mountain before the fire (3.600 hectares) or the half (1.800 hectares).

The recreation attribute refers to facilities for public access. The wildfire destroyed the existing facilities and current infrastructure is low.

The biodiversity attribute refers to the number of different species of flora and fauna, their population levels, number of different habitats and their size in the forest ecosystem in the next ten years. As a result of the wildfire biodiversity levels have significantly decreased. Consequently current biodiversity level is characterised as low. Under the proposed project action will be undertaken to protect current biodiversity by establishing a protected area for feeding and curing endangered species. As a result, biodiversity levels will reach a higher level in the next ten years.

The monetary attribute to finance the proposed policy was decided to be a one-off taxation for the citizens of Athens.

Table 1. Forest management attributes and their levels that were used in the choice experiment

Forest management attribute	Definition	Levels
Biodiversity	Population of different species	High Low (sq)
Flood risk	Risk of flooding disasters	High (sq) Low
Reforestation program	Hectares of proposed reforested land and equivalent number of cars generating the co2 that this area can sequester.	3.600 hectares (3000 cars) 1.800 hectares (1500 cars) 0 hectares (sq) (0 cars)
Recreation	Infrastructure supporting recreation in the mountain	High Low (sq)
Monetary attribute	One-off taxation for the citizens of Athens in euros	0 (sq) 25 50 100

*sq: corresponds to status quo-current situation.

Using experimental design techniques (Louviere et al., 2000) an orthogonalization procedure was used. This procedure resulted in a simple choice experiment design which consisted of 32 pair-wise comparisons of forest management plans. These were randomly blocked into four versions, each containing eight choice sets consisting of two forest management plans and an opt-out alternative, which represented the status quo, in which case no management actions would be undertaken and tax rates would not change. A cyclical procedure was followed to avoid strict dominance between choices. An example of a choice set is given in table 2.

Table 2: Example of a choice set

Assuming that the following three management strategies were the only choices you had, which one would you prefer?			
Management strategy Characteristics	Management strategy A	Management strategy B	Management strategy C: Status Quo /Present situation
Reforestation	1800 hectares (1500 cars)	3600 hectares (3000 cars)	0 hectares (0 cars)
Flood risk	High	Low	Low
Biodiversity	Low	High	High

Recreational capacity	Low	High	Low
Tax	25 €	50 €	0 €
I prefer (Please tick as appropriate)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

A split sample approach was followed to examine whether trust in the body responsible for the implementation of the restoration project influences valuation. Consequently the first sample (232 respondents) was informed that the national government would undertake the restoration of the mountain while the other (147 respondents) was informed that the EU would be responsible. The choice experiment survey was implemented in March and April 2009 in the city of Athens, using face-to-face interviews.

6. Econometric results

6.1 Survey Design

The questionnaire for both samples comprised of three parts. The first part aimed to explore respondents' attitudes towards goods and services from the forest ecosystem and elicit their perceived threats the ecosystem faces. Further respondents were asked to state their degree of agreement with political statements to elicit an indication of their political views and to declare their degree of trust to state and European Union institutions for environmental management. In the second part the valuation scenario was presented. The current situation was initially described regarding biodiversity, flood risk, co2 sequestration and recreation. Subsequently respondents were presented with a description of the attributes used in the choice experiment and they were asked to state their preferred forest management plan among three such plans in eight choice sets. The last part ascertained respondents' socio-demographic information, such as gender, age, level of education, household income and the possibility of being flooded. Table 3 presents the results of the attitudinal questions whereas table 4 summarizes the socio-demographic characteristics of both samples. Both samples are highly representative of the population of the city of Athens as implied from examination of the socio-economic variables.

6.2 Descriptive Statistics

EE sample

Respondents' perception towards different goods and services generated by the forest ecosystem were elicited by asking respondents to state their significance on a five point Likert scale ranging from "1" to "5" with 1 implying total insignificance and 5 implying strong significance.

Table 3: Classification of the forest goods and services (EU sample)

Forest goods and services	Ranking	Percentage of respondents that consider it significant
Recreation	5	38.5
Biodiversity	2	76.1
Co2 sequestration	1	88.9
Flood risk reduction	3	72.5
Aesthetic values	4	47.4
Timber products	6	20.2

As illustrated in table 3, among the goods and services presented co2 sequestration capacity and subsequent micro-climate stabilization for the surrounding areas was considered the most significant by the majority. Biodiversity sustainance and flood risk reduction follow whereas aesthetic value, recreation and provision of timber products were not perceived as important. Regarding perceived threats for the forest ecosystems the majority (58.71%) indicated wildfires as the most significant threat. Institutional trust was also assessed on a five point Likert scale ranging from "1" to "5" with 1 implying least trust and 5 implying strong trust. Results are summarized in table 4.

Table 4: Trust in institutions (EU sample)

Trust in institution to undertake the restoration	Ranking	Percentage of respondents declaring absolute trust (%)
Government	4	44
Local government	3	52.3
NGO (Greenpeace, WWF)	1	66.9
European Union	2	55.9

To further investigate trust in institutions, respondents were also asked to indicate their degree of trust to the national government and the European Union with regards to environmental decision-making and management. Results enhance previous findings with a majority of 40.3% declaring trust in the European Union and only 10% declaring trust to the state government. Table 5 presents the socio-demographic info of the sample.

Table 5: Socio-demographic characteristics of the EU sample

Socio-economics	Mean	Standard Error
Age (years)	40.45	13.34
Gender (1=male,0=female)	0.58	0.49
Household size	3.49	1.21
Children (1=child under 18 in household, 0=otherwise)	0.37	0.68
Education (1=tertiary education and higher, 0=otherwise)	0.62	0.48
Employment (1=in full time employment, 0=otherwise)	0.66	0.47
Household income (€ per month)	3252	1540
Visit (1= has visited the mountain, 0=otherwise)	0.89	0.38
Flooded (1= have been flooded, 0=otherwise)	0.064	0.24

The mean age of the sample is 40.45 years while 58% of the sample is male. The average household size is 3.49 individuals while 37% of the respondents declare there is a child (under the age of 18) living in the household. 62% of the respondents have completed or are in the process of completing a university or postgraduate degree. Regarding employment, 66% of the respondents are in full time employment. The mean household monthly income is € 3252. Only 6.4% of the respondents have been flooded. 89% state that they have been visited the Parnitha Mountain.

Government sample

Equivalent to the European Union sample, results for the State sample regarding assessment of the different goods and services associated with the forest and trust to institutions responsible for the restoration project are presented in tables 6 and 7 respectively.

Table 6: Classification of goods and services from the forest (State sample)

Forest goods and services	Ranking	Percentage of respondents that consider it significant
Recreation	5	41.4
Biodiversity	2	72.84
Co2 sequestration	1	77.15
Flood risk reduction	3	68.96
Aesthetic values	4	51.72

Timber products	6	17.24
-----------------	---	-------

Table 7: Trust in institutions (EU sample)

Trust in institution to undertake the restoration	Ranking	Percentage of respondents declaring absolute trust (%)
Government	4	37.83
Local government	3	45.29
NGO (Greenpeace, WWF)	1	64.78
European Union	2	49.52

Results suggest that preferences for goods and services as implied by the ranking as well as trust towards institutions are the same for both samples. Therefore attitudinal questions imply that samples are equivalent and thus differences in valuation can be attributed to institutional framework. Socio-economic information is provided in table 8.

Table 8: Socio-demographic characteristics of the State sample

Socio-economics	Mean	Standard Error
Age (years)	39	12
Gender (1=male,0=female)	0.51	0.51
Household size	3.64	1.14
Children (1=child under 18 in household, 0=otherwise)	0.58	0.84
Education (1=tertiary education and higher, 0=otherwise)	0.68	0.46
Employment (1=in full time employment, 0=otherwise)	0.55	0.49
Household income (€ per month)	3.275	1665
Visit (1= has visited the mountain, 0=otherwise)	0.84	0.48
Flooded (1= have been flooded, 0=otherwise)	0.12	0.34

The mean age of the state sample is 39 years with 51% of the sample being male. The average household size is 3.64 individuals while 58% of the respondents declare there is a child (under the age of 18) living in the household. Regarding education 68% of the respondents have completed or are in the process of completing a university or postgraduate degree. 66% of the respondents are in full time employment and the mean household monthly income is € 3252. 12% of the respondents have been

flooded and 84% state that they have been visited the Parnitha Mountain with the great majority indicating recreation as the primary reason for visiting.

6.2 Multinomial Logit Model Estimation.

Table 9 displays the utility coefficients associated with the forest management plan attributes.

Table 9: Estimation results

	European Union CE	State CE
Attributes	Coeff. (St. Err.)	
Co2 sequestration	0.016***(0.0021)	0.018***(0.0029)
Flood Risk	0.59*** (0.053)	0.68***(0.07)
Biodiversity	0.44***(0.052)	0.66***(0.07)
Recreation	0.12**(0.052)	0.22***(0.068)
Tax	-0.0024***(0.0008)	-0.0058***(0.0012)
ASC	-2.01***(0.16)	-2.363***(0.243)
Log likelihood	-1488.79	-873.9137
ρ^2	0.13	0.14
No. of obs	1848	1136

All coefficients are statistically significant at the 5% level and have the expected signs. Respondents in both samples prefer those forest management plans which provide lower levels of flood risk and higher biodiversity, co2 sequestration and recreational capacity. The magnitude of the estimates indicates that among the binary attributes, flood risk reduction is the most important determinant influencing individuals' choice for both samples. The coefficients on ASC are also both significant and negative, whereas the coefficient on tax is negative for both samples and significant as expected a priori.

To identify and exclude protestors after the choice experiment respondents were asked to motivate their responses if they had chosen the status quo option in any choice set. In total 5 persons were excluded from the state sample and 3 from the eu

sample as protestors with the main reason for rejecting the program being their belief that more than the half of the respondents will not accept to pay the proposed amount.

6.3. Willingness to Pay Estimations

The implicit prices that respondents in both samples assign to each one of these attributes can be calculated as the ratio of coefficient on each attribute to the coefficient on the monetary attribute, which represents the marginal rate of substitution between price and the plan attribute in question, or the marginal willingness to pay (WTP).

Table 10 reports the implicit prices, or marginal WTP values, for each of the forest management plan attributes for the eu and state choice experiments, estimated using the Wald procedure (Delta method) in NLOGIT 3.0.

Table 10: Willingness to Pay Estimates

Attribute	EU respondents WTP	State Respondents WTP
CO2 sequestration	3.142*** (0.81)	6.76** (2.67)
Flood risk	117.6*** (26.33)	250.35***(93.53)
Biodiversity	115.25*** (24.3)	187.46***(70)
Recreation	37.68*** (13.92)	51.92* (28.49)

The table reports that an average respondent in the EU sample is WTP € 3.142 (in the form of one-off taxation) per hectare of reforested land, € 117 in order to adverse the current high flooding levels, €115 to increase the biodiversity levels from low that are currently to high and €37 to restore the recreational capacity of the forest. An average respondent in the state sample is WTP € 6.76 per hectare of reforested land, € 250 to hedge against the flood risk, € 187 to protect the biodiversity and € 52 for the establishment of facilities for public access.

To examine whether the institution responsible for the implementation of the proposed project significantly affects the estimates of preferences an LR test (Hanley et al., 2005) is performed. Under the null hypothesis of parameters equality the statistic, $LR = 2 \{ LL_{POOLED} - (LL_{STATE} + LL_{EU}) \}$, is χ^2 distributed with the degrees of freedom equal the number of parameter restrictions. The null hypothesis of equality of

the coefficient estimates from the two samples **cannot** be rejected in 95% confidence interval as illustrated in table 11.

Table 11: LR test

Model	Likelihood value	Critical Value for χ^2 statistic at 5%
State Sample	-1488.7987	12,592
EU Sample	-873.9137	
Sum of State and EU Samples	-2363	
Pooled	-2365.1229	

Results therefore suggest that preferences in the two samples are not statistically different and thus the institution responsible for the delivery of the public good does not affect the valuation of the good. This is an interesting result adding to the existing literature on hypothetical bias resulting from non-credible scenarios with regards to payment and delivery conditions. Our results suggest that the choice of institution responsible for the implementation of a public project does not create any hypothetical bias since estimate results and willingness to pay are not found to be sensitive to the institution responsible for funds collection and management. We however remain conservative over the transferability of our results since this is the first choice experiment exercise addressing trust in institutions and results may differ in other countries with different cultural backgrounds as well as in different public goods.

7. Conclusions

In this study we apply the choice experiment method to examine for differences in the valuation of reforestation, flood control, recreation and biodiversity conservation depending on the institution that undertakes the funding and management of the forest restoration project. In this respect we use a split-sample approach to examine whether the institution responsible for the collection and management of the funds that will be allocated to the forest management project influences respondents willingness to contribute. To our knowledge this is the first attempt to address trust to national and international institutions in a forest restoration valuation study. Results suggest that the institutional body responsible for the implementation of the project under question does not significantly influences individuals' valuations.

Results from the econometric analysis of both samples indicate that Parnitha forest ecosystem is associated with significant use and non-use values which substantially contribute to human welfare. Co2 sequestration, flood risk mitigation and biodiversity protection are the most significant attributes determining individuals' willingness to contribute to the restoration program and these attributes should be priorities for the development of a restoration policy. Imputing a monetary value to different goods and services from the forest ecosystem allows for a cost-benefit analysis to be conducted in order to guide the choice among different restoration policies to ensure efficiency, sustainability and equity. To that end, future work will perform a long-run cost-benefit analysis to relate estimated benefits with associated costs to provide policy guidance as to the economic efficiency of the restoration taking into account the long-run nature of the project. Since we assess the willingness to pay for a program with immediate costs and distant benefits a declining social discount rate (DDR) will be used in the cost-benefit analysis.

8. References

Adaman F., Karali N., Kumbaroğlu G., Or I., Özkaynak B., Zenginobuz U. Willingness to Pay of Urban Households in Turkey for CO₂ Emission Reductions: A Contingent Valuation Survey, working paper.

Amorgianiotis G., 1997. Management plan of the National Park of Parnitha, vol. A-I. Forest Service of Parnitha (in Greek).

Bateman, I.; Carson, R.; Day, B.; Hanemann, W.M.; Hanley, N.; Hett, T.; Jones-Lee, M.; Loomes, G.; Mourato, S.; Ozdemiroglu, E.; Pearce, D.W.; Sugden, R.; Swanson, S. *Guidelines for the Use of Stated Preference Techniques for the Valuation of Preferences for Non-market Goods*, Edward Elgar, Cheltenham, 2003.

Bishop, J.T. (Ed.), 1999. Valuing Forests: A Review of Methods and Applications in Developing Countries. Available on-line at: <http://web.worldbank.org/servlets/ECR?contentMDK=20486370&sitePK=407255S>.

Boxall P.C., Adamowicz W.L., Swait J., Williams M., Louviere J., 1996. A comparison of stated preference methods for environmental valuation. *Ecological Economics* 18, 243-253.

Brey R., Riera P., Mogas J., 2007. Estimation of forest values using choice modeling: An application to Spanish forests. *Ecological Economics* 64: 305-312.

Convention on Biological Diversity ,2001. The Value of Forest Ecosystems. Montreal, SCBD, 67p. (CBD Technical Series no. 4).

FAO (Food and Agriculture Organisation), 2001. *Forest Resources Assessment 2000*, Rome: FAO

Hanley N., Adamowicz W., Wright R.E., 2005. Price vector effects in choice experiments: an empirical test. *Resources and Energy Economics* 27:227-234.

Kaval P, Loomis J., Seidl A., 2007. Willingness-to-pay for prescribed fire in the Colorado (USA) wildland urban interface. *Forest Policy and Economics* 9: 928–937.

Loomis J., Gonzalez-Caban A., 1998. A willingness-to-pay function for protecting acres of spotted owl habitat from fire. *Ecological Economics* 25 : 315–322.

Loomis j., Trong Le H., Gonzalez-Caban A., 2005. Testing transferability of willingness to pay for forest fire prevention among three states of California, Florida and Montana. *Journal of Forest Economics* 11:125–140.

Loomis J., 2004. Do nearby forest fires cause a reduction in residential property values? *Journal of Forest Economics* 10:149–157.

Louviere, J. J., Hensher, D. A., Swait, J. D., Adamowicz, W. L., 2000. *Stated Choice Methods: Analysis and Applications*, Cambridge: Cambridge University Press.

McFadden, D., 1974. Conditional logit analysis of qualitative choice behaviour. In: P. Zarembka, (Ed), *Frontiers in Econometrics*, New York: Academic Press

Riera P., Mogas J., 2004. Evaluation of a risk reduction in forest fires in a Mediterranean region. *Forest Policy and Economics* 6:521– 528.

Vaux, H., Gardner, P., Mills, T., 1984. Methods for assessing the impact of fire on forest recreation. Gen. Tech. Rep. PSW-79. Pacific Southwest Forest and Range Experiment Station, USDA Forest Service, Berkeley, CA.

Willis K.G., Garrod G., Scarpa R., Powe N., Lovett A., Bateman I.J., Hanley N., Macmillan D.C, 2003. The social and environmental benefits of forests in Great Britain. Report to the Forestry Commission, Edinburgh.