THE TOTAL ECONOMIC VALUE OF ITALIAN FOREST LANDSCAPES*

Tiziano Tempesta – Department TESAF University of Padova (Italy)
Francesco Marangon – DSE University of Udine (Italy)

Abstract
A contingent valuation (CV) was used to estimate the Total Economic Value (TEV) of Italian forest landscapes. By means of a referendum simulation we attempted to measure the willingness of people to substitute tax cuts with action favouring forest fire prevention. We tested for embedding by carrying out a valuation of woodland for the Colli Euganei Regional Park, for the Veneto region and for Italy as a whole. Although attention should be paid to embedding, results would suggest that CV could help achieve sufficiently reliable estimates for TEV.

Keywords
Forest – Total Economic Value – Contingent Valuation

1. Introduction

Forest landscapes are composed of a variety of ecological systems that provide Man with many kinds of benefits. In the last ten years many surveys have been carried out in order to determine the monetary value of goods and services deriving from forest ecosystems (SCBD 2001).
An estimate of Total Economic Value (TEV) for woodland could be used in support of forest conservation policy and may also be able to indicate the social value of damage to woodland caused by illegal activity. Before action can be taken to increase forest surface area and prevent the destruction of woodland, the monetary value of all goods and services provided by woods needs to be quantified. Two methods can be used to estimate the TEV of forest landscapes (SCBD 2001). In the first, the various functions are estimated separately and the total gives an overall value by using both Continget Valuation (CV) and other traditional appraisal approaches. This was the method used in earlier national research projects (Gios and Goio 2003). Although this method has the advantage of using private sector valuation tools, it also has the double drawback of not being able to prevent counting the same value twice and being affected by a considerably subjective choice in the valuation methods used and in the costs included.
An alternative method could be to use only CV. Such an approach, which has been adopted in many international research projects (SCBD 2001; Vincent et al. 1995), would allow us to include nearly all the TEV components in a single estimate. In Italy CV has only been used to estimate

* This paper was included in the MIUR – PRIN 2003 project entitled "Landscape and environmental actions within the regional rural development policies".

the recreational value of woodland, but has never been used to obtain its TEV[1].
The aim of our research was to determine a methodological approach that would allow us to obtain a sufficiently reliable estimate of the value that people give to woodland conservation. In particular, the contingent market design aimed to test the presence of the "embedding" phenomenon. In fact it is well known that the estimation of non use values could be biased by such source of error (Kahneman and Knetsch 1992a e 1992b).

2 The benefits of woodland

The economic value of forests mainly results from the fact that they are able to supply a flow of products and services. Moreover, the benefits of forest ecosystems go beyond timber production. Indeed, from an economic view, woodland is a multifunctional good, since it is capable of producing numerous positive externalities. In an attempt to estimate the economic value of natural ecosystems on a global scale, Costanza et al. (1997) provided a complete review of the benefits generated by natural ecosystems, including forests. They identified 17 different benefit categories and analysed each one of them for every kind of biosystem by means of appropriate parameters. The study revealed that forests can provide various kinds of benefits.
The main benefit derives from value related to direct use. Forests are a source of timber, fruits and even ingredients used in the manufacture of medicines. However, the number of indirect benefits is even greater and they are connected to services provided by the whole ecosystem.
Moreover, forests reduce soil erosion by absorbing water, thus softening the impact of rain on the land. Excessive soil erosion not only interferes with water processes, but also lowers the soil's fertility, hence blocking the normal nutritive and hydrogeological cycles. In addition, forests purify the air by removing lead and other dangerous toxins from the atmosphere; they give protection from insect infestation and help ensure that water quality is good. Since trees are capable of absorbing water, they play an important role in its storage, thus limiting soil water loss through evaporation. Moreover, they are partly responsible for channelling water into natural underground reservoirs. As a result, water flows more regularly and, consequently, there is less danger of flooding in periods of heavy rainfall and water supply is more constant. What is more, forests help regulate both the local and global climate by transpiring and producing oxygen. They also give protection against the devastating effects of atmospheric agents such as wind and hail by acting as windbreaks and creating undulations in the land.

[1] A series of estimates regarding the recreational value of forest areas, which was compiled in Italy in the 1980s, can be found in Merlo, 1991 p.447. Numerous estimates were also made in the 1990s (Da Pozzo et al. 2003; Marangon et al. 2003; Scarpa et al., 2004, Tempesta, 1996; Tempesta and Thiene 2000).

In addition, the potential effects of global warming due to the limited absorption of carbon are common knowledge. Lastly, forests provide a suitable environment for the generation and harmonious cohabitation of various species. Therefore, they have an important role in the conservation of biodiversity, which not only benefits science but also tourism, forest culture and folklore.
However, the economic value of woodland does not just depend on the production of the above-mentioned products and services. It also results from the importance that is given to its conservation and the perception of it being a strategic resource for the survival of humanity. In other words, forests not only possess use values, but also conservation (or non-use) values.
According to the indications of the Secretariat of the Convention on Biological Diversity (SCBD 2001), woodland TEV can be divided into the following components:

Use values	direct	extractive
		non-extractive
	indirect	
Non-use value	inherent values	
	stewardship	
	vicarious	

Non-use values are mainly dependent on altruistic behaviour, and differ from use values in so much as there is no physical interaction with the environmental resource. In other words, non-use values will exist if moral satisfaction is the only benefit gained from conserving the resource. Use values can either be direct (when there is willing interaction with the environmental resource) or indirect (when interaction does not result from a deliberate choice). For example, benefits related to the hydrogeological function of woodland are indirect because they are dependent on place of residence. On the contrary, direct use value results from a deliberate individual choice both as regards allocating production factors (land, capital, work) to various business activities, and allocating relaxation time to various recreational activities, thus spending part of one's income.
TEV is the sum of all the items mentioned above. In theory, CV can capture both use and non-use values. With reference to forests, since very few people gain direct benefit from forestry or from the gathering and sale of products from the undergrowth, the value obtained by using the CV approach is the sum of direct non-extractive use values, indirect use values and non-use values.

3. Research method

In order to estimate TEV a pre-election poll of a referendum was simulated in which voters were asked if they wished to abrogate a law that helped prevent forest fires at a small cost to the taxpayer[2]. In this way it is easy to comprehend the contingent market: a YES vote would simultaneously lead to an increase in the number of forest fires and a reduction in tax paid to cover the cost of preventing fire. On the contrary, should voters vote NO, the law would be maintained and forests would be conserved, but income would be lower.

Given the hypothetical market structure, in order to estimate the demand function for forest landscape conservation we used the dichotomous choice method. We proposed five different tax reductions to five different groups: €51, €154, €258, €361 and €516.

Although the respondent is only asked to express their "willingness to accept" (WTA) and not their "willingness to pay" (WTP), the proposed hypothetical market is sufficiently clear. By voting YES the respondent would accept monetary compensation in the form of lower tax in exchange for less woodland availability. Given the method of payment involved (annual income tax) it is quite unlikely that WTA will regard the acquisition of moral satisfaction, rather than benefits resulting from woodland conservation. Moreover, in principle, embedding should be absent.

It should be said, however, that in the proposed political market willingness to accept is different from that described in literature. This is because in fact the taxpayer is already paying for the benefit, and therefore it would be a case of returning their own money and not increasing income to compensate for the loss of environmental benefits. In other words, since the current level of environmental quality is the result of taxpayer spending, it is evident that lower quality will lead to reduced public spending and less tax. Moreover, the opposite is also true. In this case, respondents will be asked to reallocate their total income (including tax paid) between private goods purchased on the market and public goods produced by the State (the conservation of forest landscapes in this particular case). Since the term "willingness to accept" (WTA) is widely used in literature, we will continue to refer to it in our exposition.

In order to verify if, and to what extent, respondents were able to differentiate their WTA in relation to the amount of forest protection, three split samples were created. The respondents were asked to determine WTA for the prevention of forest fires in:

a) the Colli Euganei Regional Park (approx. 4,000 ha.),
b) the Veneto region (271,000 ha.),
c) Italy as a whole (6,570,000 ha.).

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[2] Such an approach produced good results in a previous evaluation of hilly vineyard landscapes (Marangon and Tempesta 2001).

It was also interesting to verify if giving more information about the effects of forest fire prevention policy would modify the interviewees' WTA. As a result three different questionnaires were used for each area describing the possible effects of abrogation in more or less detail.
During the survey 534 interviews were carried out according to NOAA Panel guidelines (Arrow et al. 1993). Face-to-face interviews took place in the city and province of Padua between February 2000 and April 2001. Just one interviewer was used so as to ensure homogenous data collection.

4 Results

In order to interpret WTA correctly, we first of all estimated a logistic model whose function was to verify whether the information given in the questionnaire and the amount of protected forests influence the WTA (Table 1)[3].
Surprisingly neither the amount of information given, nor the area evaluated seemed to have any effect on the likelihood that a respondent would accept the return of a specific sum of money[4]. The WTA response for the Veneto region as a whole was generally greater than that for the Colli Euganei Park, which is located in the same region.

Table 1. Relationship between WTA for the conservation of forest landscapes, conservation area considered (woodland in Veneto and Italy) and information contained in the questionnaire.

-2 Log Likelihood	449,05
Nagelkerke - R^2	0,49
CHI squared	223,69
% responses estimated correctly	76,75

Variable	coefficient	signif. coefficient
Constant	2,5095	0,0000
bid (thousands of Lire)	- 0,0056	0,0000
dummy estimated area Veneto	0,2365	0,4119
dummy estimated area Italy	-0,1501	0,6007
dummy questionnaire with average degree of information	-0,1516	0,5939
dummy questionnaire with high degree of information	0,2469	0,3946

[3] The approach used to investigate the effect of embedding and to see if, and to what extent, an improved description of the good would eliminate embedding is similar to the one suggested by Bennett et al. (1998) and by Blomquist and Whitehead (1998).
[4] Brown et al. (1995) obtained a similar result, while Blomquist and Whitehead (1998) found that the degree of information given altered the estimates resulting from CV considerably.

However, the WTA response for the whole of Italy was lower than for both the Colli Euganei Park and the Veneto region. On the other hand, there was little difference in the average and median WTAs for the areas examined. For example, the median WTA was €235.9 a year per family for woodland in the Colli Euganei, €250.3 for woodland in Veneto and €219.3 for woodland in the whole of Italy. These values are not statistically different (p = 0,05). Therefore, we can suppose that the respondents were not able to differentiate their WTA in relation to changes in the surface area of protected forests and to the size of the potential benefits deriving from forest conservation, especially in the case of the small forest area in the Colli Euganei Regional Park.

In order to understand such evidently incoherent behaviour, we estimated a logistic function that would verify if, and to what extent, WTA was correlated to the aptitude and socio-economic characteristics of the respondents (Table 2).

All the variables are significant (p=0,05) and have the expected sign. WTA increases in relation to income, living or spending one's holiday in the Colli Euganei area, membership of an environmental conservation association and living in the suburbs (in which demand for nature is certainly higher). On the contrary, WTA decreases for people with a low educational level.

We may also note that the correlation among all the variables indicated by Carson et al. (2001) to verify the so-called construct validity was correct and significant.

Table 2. Model interpreting the factors that affect forest landscape conservation WTA.

-2 Log Likelihood	416,92
Nagelkerke - R^2	0,54
CHI squared	255,81
% responses estimated correctly	77,57

variable	coefficient	Standard Error	Sign. Coeff.
Constant	1,6377	0,3302	0,0000
Bid (thousands of Lire)	-0,0064	0,0006	0,0000
dummy holidays in the hills	2,0994	0,7738	0,0067
dummy residence in the suburbs	0,5663	0,2559	0,0269
dummy primary school education	-1,3291	0,7250	0,0630
income (millions of Lire)	0,0202	0,0058	0,0005
dummy members of environmental conservation associations	1,2705	0,4816	0,0083

Hypothesising that the respondents may have referred WTA in general terms to all forests in Italy, and that they may have been unable to give correct estimates for specific Italian forest areas, an estimate of TEV was made for Italian woodland as a whole. Average and median WTA was calculated using the logistic function shown in table 2. In this way, we could correct to a certain extent any distortions resulting from the peculiarity of the sample. The model included average national values for: family income; the percentage of people over 20 having only completed primary school education; the percentage of people who are members of environmental conservation associations; and the percentage of people living in the suburbs (a cautious figure of 40%). As a result of this estimate, the median WTA was €202.5 per family a year (95% confidence interval: 174.5 ÷ 248.6), while the average was €208.8 per family a year (95% confidence interval: 179.9 ÷ 256.3). These figures were therefore lower than those obtained for the sample of respondents. The total WTA for all Italian families (thus representing total benefits resulting from woodland conservation) would be €4507.9m/year, corresponding approximately to €665.8/year per hectare of woodland.

In order to estimate the TEV of Italian woodland, the extractive direct benefits of forests would need to be added to this sum, i.e. the addition of timber and undergrowth products. According to the Italian Central Statistics Institute (ISTAT) in 2000 the added value of Italian woodland was €326.2m giving a figure of €46.5/ha. Moreover, it has been estimated that the value of undergrowth products in the Region of Trentino-Alto Adige (Gios and Goio, 2003) and the Region of Friuli Venezia Giulia (Marangon and Gottardo, 2001) is between €17.2/ha. and €14.4/ha. The use value from extraction would therefore be €61.9/ha. per year.

The TEV of Italian forest landscapes would be €722.6/ha. per year. However, this figure is higher than that obtained by adding up the value of the different forest functions. Gios and Goio (2003) estimated a TEV of €166/ha. per year for the Trentino-Alto Adige region, while Marangon and Gottardo (2001) estimated a value of €373.7/ha. per year for Friuli Venezia Giulia. Clearly, it is particularly difficult to establish whether the CV estimate is more correct than estimates obtained by other methods. Nevertheless, since the values recorded by Gios and Goio are very different from those of Marangon and Gottardo we probably cannot say a priori that using CV is better or worse than using other approaches.

5 Conclusion

To a certain extent the results of our research can be said to be contradictory. The convergence between the WTAs of woodland in the Veneto region and Italian woodland as a whole is correct: the two simulated referenda refer to two different geographical and administrative contexts. If the referendum takes place at a regional level, only woodland located in that

region is evaluated, hence in the case at hand only residents in the Veneto region take part. If the referendum takes place nationally, all Italian woodland is evaluated and it is the whole Italian population that has to pay. Therefore, the WTA of regional residents should be similar in both contexts. Any difference between regional and national evaluation of forest landscapes should only result from the absence of non-extraction direct use value. It is evident that residents in the Veneto region are less likely to be able to use forests in other regions for recreational purposes.

On the contrary, it is far more difficult to explain perfect embedding in the Colli Euganei area. In the questionnaire it was made clear that the referendum involved the Veneto population as a whole, and not just those living in the Colli Euganei. The estimate is clearly wrong because the value per hectare of woodland for the Colli Euganei area, which was obtained after aggregating the WTA of all residents in the Veneto region, is not plausible.

A possible explanation could be linked to the mental accounting phenomenon suggested by Thaler (1985): the respondents may believe that the money already set aside for a specific environmental project through tax corresponds to a sum that they assign for that purpose (or that is allocated by the public authorities on their behalf). According to Thaler, this sum is fixed and does not correspond to the quality and quantity of the goods. The effect of mental accounting could be increased by fairness. In this case a proportion of the respondents may have considered that the sum proposed in the referendum was fair and therefore corresponded to the amount that every citizen should actually pay in order to protect the forests of the Colli Euganei. Consequently, CV should be used to estimate local goods with extreme caution since factors such as perfect embedding are more common in these cases, especially if the goods are of a very symbolic or evocative nature. In order to estimate the TEV of these kinds of goods it would be more appropriate to carry out a wide-scale evaluation and then divide the value obtained for the whole category among all the components of the good.

In conclusion, the results were partly positive and partly negative. A sum of €722.6/ha. per year was obtained for woodland TEV. This figure is higher than the estimates achieved in other studies using private-sector valuation methods (Gios and Goio 2003; Marangon and Gottardo 2001). Although the relationship between recreational benefits, non-use value and indirect use value is in line with similar studies in international literature, the fact that the use of CV may have led to overestimated values cannot be excluded[5]. In any case, we believe that these methods should be experimented at national

[5] Murphy et al. (2003) stressed that in experimental research the ratio obtained between hypothetical WTP and actual WTA was on average 2.5. NOAA Panel authors (Arrow et al. 1993) themselves recommend using a calibration factor of 2. It should be noted that using such a factor results in the same figure as proposed by Marangon and Gottardo (2001).

level, thus reducing the large gap that separates, the Italian experience from the international context in this field.

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