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Abstract

The contingent valuation (CV) method is a popular technique for valuing individuals' preferences for non-market environmental resources but very few attempts have been made to apply it to distant environmental goods of global importance. This paper reports the results of a recent CV survey conducted in the UK and Italy eliciting non-use values of residents for the funding of a proposed national parks program in Brazilian Amazonia. A main focus of the survey was the wealth of biodiversity in the region proposed for protection and the services provided by such areas. Taking both countries together, respondents were willing to pay, on average, £29.83 per household per annum to fund the implementation of a protection scheme covering 5% of Brazilian Amazonia and £39.16 to fund a 20% scheme. Aggregated across households, an annual fund to conserve 5% of Brazilian Amazonia as national parks could yield around £0.6bn in the UK and a similar amount in Italy. Further investigation revealed that the values which people hold for environmental resources such as Amazonia seem to largely be of the non-use or indirect-use type. Respondents appeared to show a high degree of uncertainty in the bid decision process for such an unfamiliar and distant good. As a result, strategic behaviour and sequencing and scope effects could not be ruled out and may have affected responses. Warm glow motives may also have been present in the values expressed. However, analysis revealed that willingness to pay bids were non-random and were systematically related to a range of socio-economic characteristics and attitudinal variables. The results suggest that initiatives such as international financial transfers from wealthy developed countries to support the protection of threatened areas of global significance could attract widespread support in those countries.

Key words: Biodiversity, Amazon forest, 'contingent valuation', conservation and 'willingness to pay'

1. Introduction

The Amazon basin contains the largest remaining area of tropical rainforest in the world and is the most biologically diverse region on earth (Commission on Development and Environment for Amazonia, 1994). Brazilian Amazonia alone constitutes over 40% of the world's total remaining tropical rainforest, making it by far the largest tropical forest region under the jurisdiction of a single nation. According to the WWF, Brazil is one of the five 'megadiversity' countries in the world, containing thousands of unique species (Fearnside, 1999). Figure 1 illustrates the size of the area concerned, considerably larger than the whole of Western Europe.

Figure 1: Location and relative size of Brazilian Amazonia

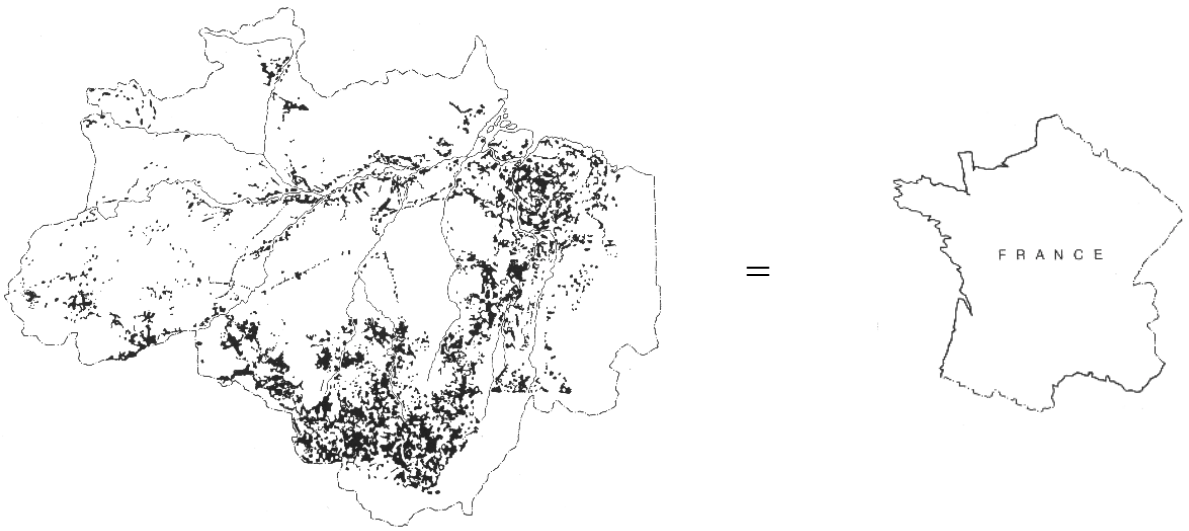
(Adapted from Time magazine, 1999)

Despite this richness, levels of deforestation in Brazilian Amazonia have become a source of national and international concern over the last 30 years or so. Between 1995 and 1999, deforestation rates in Amazonia averaged 1.9×10^6 ha yr^{-1} (INPE, 2000).[1] Nowhere else in the world is forest loss occurring

[1] It should be noted that this figure does not include clearings smaller than 6.25ha and extensive areas of forest disturbed by selective logging and ground fires. For example, in the aftermath of the 1997-98 El Nino event, an estimated 400,00 km^2 of Brazilian Amazonia (an area the size of Paraguay) lost its ability to resist widespread surface fires, although it remains unclear how much of this area actually burned (Peres, 2001).

faster in absolute terms, and the cumulative area cleared so far is conservatively put at 550,000 km^2 or 14% of the total forest cover of the region. The main causes of this were, and continue to be, commercial logging, fires, fuelwood gathering, mining and land clearing for agriculture and development (Commission on Development and Environment for Amazonia, 1994). These threats may become even more potent in the near future, given the government's plans under the 'Avanca Brazil' (Forward Brazil) development program. This program is worth around US$40 billion in infrastructural commitments over a seven year period and is designed to improve the productive sector of the region. It includes plans for paved roads, railways, pipelines, power lines, ports and hydroelectric power plants (MPOG, 2000), providing heavily subsidised access to many previously remote parts of the region for the timber, mining and agricultural sectors. This is expected to increase the population of Brazilian Amazonia significantly from its current 17 million and trigger further forest disturbance or conversion on a massive scale. A study by Brazil's National Institute of Amazonian Research predicts that, should Avanca Brazil go ahead, between 28% and 42% of the forests in Brazilian Amazonia would be destroyed by 2020 (Laurance *et al.,* 2001). This could further reduce the biodiversity, hydrological and carbon-retention value of the ecosystem quite drastically (Nepstad *et al.,* 1999). The scale of the deforestation issue can be seen in Figure 2, which shows those areas of Brazilian Amazonia which have been lost to date, a total area equivalent to the size of France.

Figure 2: Areas of Brazilian Amazonia which have been deforested to date



(Adapted from Time magazine, 1999)

There have of course been attempts to slow down or reverse the deforestation process. The 1992 Rio Earth Summit led to the adoption of major conventions on biodiversity and climate change. The management, conservation and sustainable development of forests were identified in the Biodiversity Convention as crucial in terms of economic and social development and for the planet's life support systems. The objectives included "the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources" (United Nations Conference on Environment and Development, 1993).

For such conservation to take place effectively, it is necessary to examine the underlying reasons, which lead to deforestation. Principally, due to the public good nature of many of the functions associated with tropical forests and the lack of clearly defined property rights in the region, some of their (particularly environmental) benefits are not reflected in any market and have therefore been implicitly assigned low, or even zero, value. In addition, the external costs associated with destructive timber extraction, such as nutrient loss and soil erosion, have not generally been borne by those who exploit the resources (Sharma, 1992). This situation has been exacerbated by policies such as Brazilian government subsidies to forest conversion for livestock during the 1980's. These have distorted values still further and prevented the true scarcity of many non-timber functions from becoming apparent, leading to levels of deforestation and overexploitation which many believe is not socially optimal.[2]

It is also the case that many of the effects of deforestation are not confined to forests themselves. As well as being maintaining biological diversity, watershed protection and nutrient cycling, they are important in terms of climate regulation and the provision of pharmaceutical products. Once lost, many of these functions are essentially irreversible, and biodiversity loss in particular is non-substitutable.

This combination of factors means that their protection requires some level of intervention. One idea that many believe is practicable is a network of publicly owned parks (Kramer *et. al.,* 1996). At present there exists, on paper, 99 National Parks, State and Federal Biological Reserves, Ecological Reserves, National Forests, Extractive Reserves and Environmental Protection Areas in the Legal Brazilian Amazon (a politically defined region of 5mn km^2). Whilst the existence of even such 'paper parks' can be effective in reducing local deforestation rates (Bruner *et al.,* 2001), a recent WWF report indicates that 85% of Brazilian conservation units are not effectively implemented, largely

[2] The choice of social welfare function is not made explicit here, but a rule based on potential Pareto improvements is one that could be imagined.

due to a lack of funds (Fearnside, 1999). As a result, large-scale illegal activity is common. The costs of the program to successfully implement the protection of these areas have been calculated at US$524mn (Espirito Santo & Faleiros, 1992).[3] However, since most of those who would derive (the considerable) non-use benefits from the creation of such parks are far removed from them physically, financial mechanisms would be necessary to transfer funds from the beneficiaries to the areas concerned. Indeed, such international financial transfers were one of the recommendations of the Brundtland report (World Commission on Environment and Development, 1987). For this to take place, more complete estimates of the values attached to these areas are required.

With this in mind, this paper uses the results of a recent survey conducted in the UK and Italy to estimate the non-use values of residents for the preservation of parts of Brazilian Amazonia. Values derived from such surveys can be used to calculate the total economic value (TEV) of a good.[4] These can then be input into a cost benefit analysis (CBA), the applied side of modern welfare economics. The results could be used to help determine whether preservation of these areas is a viable economic option.[5] After a brief review of the theory in the area of environmental valuation, the methodology of the survey is outlined. The results are then presented and discussed before some conclusions are reached.

[3] This includes the costs of land purchase (82% of all costs), demarcation, management plans, infrastructure and equipment. Operating costs, including staff salaries, are estimated at US$29.5mn for the first five years and $27.1mn for subsequent years (Peres & Terborgh, 1995).

[4] Strictly speaking, the TEV of a good is the price paid plus any consumer surplus that may accrue to the individual (Dixon & Sherman, 1991). Some have argued that TEV may not necessarily be equal to total value since there may be other 'primary use' value of many environmental goods (e.g., Turner, 1993).

[5]Such a perspective effectively imposes one particular view of the world, whilst accepting that many others may exist. The main implications of this are an emphasis on economic efficiency as opposed to distributional issues, and the acceptance of consumer sovereignty. Of course, a full CBA would also need to include the opportunity costs of foregone development as well as social and other costs. It is also important to note that the result of a CBA need not necessarily be consistent with the desirable social or political outcome.

2. Theoretical Perspective

2.1 Valuation techniques

One method of attempting to capture the benefits of a good accruing to those who are physically distant from it is the contingent valuation (CV) method. In fact, CV is now the most widely used approach to valuing public goods and is frequently the only method applicable to certain environmental public goods (Johansson *et. al.,* 1995). This is because, unlike travel cost and other methods, it can potentially measure a larger proportion of economic value, including indirect, option, bequest and existence values. When public goods have few substitution possibilities, as is the case with Amazonia, existence values are likely to be substantial and might even dominate use and indirect use values (Pearce, 1998). Of course, we cannot measure intrinsic values which are the subject of much debate (e.g., Mitchell & Carson, 1989) and are categorically different from, and may be additional to, human values. This area is beyond the scope of this study and we concentrate on anthropocentric values as the basis for all practical decision making.

The CV method elicits individuals' preferences for non-market environmental goods by asking them to state their willingness to pay (WTP) or willingness to accept (WTA) compensation for a specified change in the level of provision of the good in question. Most CV surveys have concentrated on WTP measures, and WTP is the most appropriate measure in this case since respondents do not hold the property rights of the good.[6]

2.2 Biodiversity valuation

Biological diversity is the product of 3 billion years of evolution and includes diversity within species, between species and of entire ecosystems (OECD, 1994). In addition, it constitutes an incomparable global information bank, information that allows improvements in agricultural crops as well as in medical research. For example, there is a one-in-four chance that prescribed drugs have their origins in genetic materials found in tropical forests. Tropical rainforests are the most biologically diverse areas on earth and contain over 50% of all plant and animal species in the world (United Nations Conference on Environment and Development, 1993). The distinctive feature of biodiversity is its peculiarity and hence its non-substitutability.

[6] In addition, Turner (1993) considers three other arguments for eliciting WTP in preference to WTA. Firstly, survey designs that generate 'conservative' figures are preferable, and WTA is generally substantially greater than WTP. Secondly, WTA has a greater variance and results are therefore less reliable, and thirdly, WTA is a less accurate predictor of actual buying/selling decisions.

There have been a number of studies which have attempted to value programmes to preserve individual species (see e.g. Pearce & Moran, 1994, Pearce, 1998). These have generally found that non-use values exceed use values when goods have no direct substitutes. However, despite the growing consensus that it is preferable to move away from individual species and concentrate on the wider notions of habitat and biodiversity, there have been relatively few attempts to put economic values on preferences for these important concepts. One attempt to apply the CVM to tropical rainforest protection was undertaken by Kramer et al (1996). This survey was conducted by mail and found that the mean one-time WTP of US citizens for protection of 5% of the world's tropical forests was $31 per household when bids were elicited using payment cards.[7] Aggregated across US households, this amounts to $2.8bn which, if households in other industrialised countries are willing to make similar sized donations, could create a substantial global fund. The paper concludes that, "for both methodological and policy information purposes, it would be of interest to replicate this study in other countries with similar income levels to determine if the WTP for global environmental goods varies across countries for cultural or other reasons" (Kramer *et. al.,* 1996, p.192).

2.3 Scope sensitivity

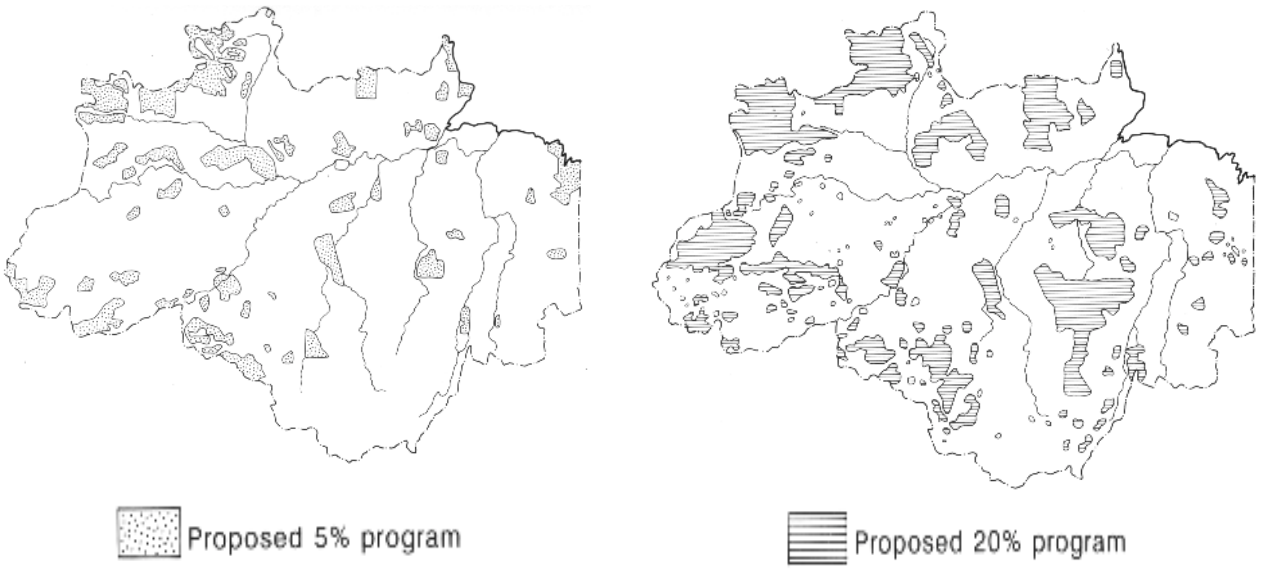
One of the main problems that can afflict CV surveys is an embedding effect (Kahneman & Knetsch, 1992). Perfect embedding occurs when the same WTP is found for an inclusive good and for nested commodities (subsets) within that good (Hoevenagel, 1996). This may occur where respondents are insensitive to the scope of the good and state similar WTP amounts regardless of the amount under consideration. If embedding is a serious problem, then the results of a survey may be inconsistent with standard models of consumer theory.[8]

We attempted to minimise the possibility of embedding effects by clearly defining the good to be valued (see Section 3.1). In addition, a split sample design was used with one scenario outlining a scheme to protect 5% of Brazilian Amazonia as national parks and reserves, and the other a 20% scheme. These two different areas (which were shown to respondents on maps) are shown in Figure 3.

[7] However, the study asked respondents how much they would be willing *contribute* to an UN-managed fund, and there is evidence (Carson, Groves & Machina, 2000) that, by using such voluntary payment mechanisms, considerably lower average responses are obtained than those that use a coercive vehicle such as taxation.

[8] On the other hand, Carson & Mitchell (1995) point out that, very often, what appears to be scope insensitivity may arise from poor survey design, and embedding may therefore be an empirical as well as a theoretical problem.

Figure 3: Two scenarios for the implementation of the National Parks program



(Adapted from Time magazine, 1999)

These areas were qualitatively identical in terms of their importance and the degree of protection to be given. Therefore, only the magnitude of one argument in the respondents' multivariate utility function would change as a result of being shown the two schemes, as long as standard non-satiation assumptions are incorporated (Bateman *et al.,* 2001). As a result, only quantitative nesting (how preferences change as the scale of the good changes) is considered here. This strategy also meant that we were able to test for scope effects by comparing the different samples.[9] We also emphasised to respondents that any money they said they would be WTP would imply a reduction in their spending on other goods and therefore a change in their consumption patterns.

[9] However, one potential danger in such a strategy which should be borne in mind is that increasing the scope of a good may be difficult without changing the perceived probability that the good can actually be provided (Carson, 1998).

3. Methodology

3.1 Survey design[10]

The questionnaire was divided into six sections. Sections A and B asked several questions regarding perceptions of and attitudes towards environmental issues in general, and rainforests and biodiversity in particular. These were designed to motivate respondents into thinking about the issues involved, to consider their preferences, and for the researchers to gauge the extent of people's existing knowledge about these concepts.

In section C information was presented to respondents which specified:

- The geographical location and extent of the areas involved (maps shown in Figures 1 & 2 provided);
- The parts of Amazonia included in the program (5% then 20% or vice versa, maps shown in Figure 3 provided) and the proportion of all the world's remaining tropical rainforest it covered;
- Details of the area's typical landscape, flora and fauna (photos provided);
- The present extent and condition of the national parks program;
- The degree of protection to be given;
- Likely future impacts of deforestation if the program was not implemented;
- Who would be responsible for the implementation and maintenance of the parks;
- Who would be required to pay for the proposals if implemented.

The scenario was designed to be as understandable, plausible and meaningful to respondents as possible using simple language, a logical sequence, and a combination of narrative and questions so as to involve the respondent. The goal was to ensure that respondents shared a common basic understanding of tropical rainforests prior to the payment questions. Whilst we would expect the outcomes of the survey to reflect the type and amount of information given to respondents, what is important is that such informational effects are taken into consideration when analysing the results.

Respondents were then asked how much they would be WTP each year to ensure the implementation of *both* programs, half the sample starting with the 5% program (part-whole subsample) and half with the 20% program (whole-part subsample). Respondents *did not* have full prior information about the

[10] The first version (5% then 20% program) of the questionnaire is included in Appendix A. The second version (20% then 5% program) was identical except for the difference in the ordering of questions in Section C. Those parts which varied in the second version are shown in Appendix B.

valuation process, i.e., they were unaware that, after the first valuation question, they would be asked another valuation question regarding the larger or smaller program.[11] At the end of the interview however, respondents were given the opportunity to revise their stated WTP.[12]

Section D elicited respondents' opinions and beliefs about the proposals which they had been asked to value and about environmental issues more generally and Section E examined socio-demographic characteristics. These were left to the end of the interview "when the respondent is more relaxed and less likely to take offence at having the interviewer probe into his private life" (Mitchell & Carson, 1989, p.109). Finally, Section F recorded the circumstances of the interview, how attentive the respondent was and whether they seemed to understand the questions and appeared confident in their responses.

The survey was re-drafted several times to minimise the possibility of ambiguity in question wording and unnecessary complexity, and to improve the clarity of information provided. The survey was also pre-tested and piloted allowing question and interview technique to be improved and reducing the average completion time to 15-20 minutes.

3.2 Elicitation method

The current trend in CVM surveys is towards referendum style formats when eliciting WTP responses. This is also the method recommended by the NOAA panel (Arrow *et al.,* 1993) since truth telling is the optimal strategy and it is therefore incentive compatible (Hoehn & Randall, 1987). It also accurately reflects a market decision on whether or not to pay an exogenous specified amount (Kristrom, 1993) and has been found to generate a higher response rate (Johansson *et. al.,* 1995). Such an approach also goes some way to satisfying those who criticise OE-type methods on the basis that they reflect 'consumer' rather than 'citizen' values (Sagoff, 1988).

However, when considering goods for which preference valuation is unfamiliar, referendum style formats can lead to strong anchoring effects and starting point bias. In addition, recent research has found that the DC method is likely to result in an overestimate of true value (Balistreri *et al.,* 2001). We therefore opted for a payment ladder approach (Rowe *et al.,* 1996). Respondents were presented with a range of monetary amounts and asked to tick those they would be WTP to ensure the implementation of the program, leave blank those amounts which they are uncertain about, and to cross the first amount they definitely would not

[11] It has been suggested by some (e.g., Bateman *et al.,* 2001) that such a 'stepwise' information process in a CV may yield different results to an 'advance' information process.

[12] This is because preferences may well evolve and adapt to new information as the interview develops (Smith, 1993).

pay. This method is based on a version developed by Welsh & Poe (1998) and has the advantage of taking into account the uncertainty in bid levels, which we expected to be fairly prominent in this study, much more effectively than other methods.

The bid levels on the ladder were determined by pre-testing using an open-ended (OE) question and were easily comprehensible round numbers. Both surveys used 30 payment amounts on an exponential interval scale. The UK payment ladder ranged from 50p to £500, and the Italian ladder from the comparable amounts of L.500 to L.2mn. The lowest/highest amounts led to almost 100% acceptance/rejection amongst those who stated a positive WTP amount. It has been observed that the location of any benchmarks may influence payment ladder responses. For example, Boyle & Bishop (1988) find that payment cards anchored to household expenditure result in higher valuations than unanchored cards, and such benchmarks were therefore avoided in our survey.

Theoretically, this method is closer to the OE approach.[13] Generally studies have found that, due to the free riding incentive associated with the OE method and 'yea saying' associated with the DC method, WTP is higher when the DC method is used (Bateman *et al.,* 1995).[14] This may be a further reason why we might expect our results to represent an underestimate of true WTP.

After listening to the scenario but prior to the introduction of the payment ladder, respondents were asked whether they were prepared to pay at least some amount in extra taxation to ensure the program in question was implemented. This 'payment principle' question enabled respondents to register a protest bid, by listing 'refusal to value the good' as an explicit option amongst reasons for refusing to pay. The question was also intended to validate true zero bids without respondents feeling uneasy or intimidated about doing so.[15] For analytical purposes, both positive and negative responses to the payment

[13] The open-ended method was not used in this case since the unfamiliarity with payment for the good and the uncertainty respondents were likely to experience with a straightforward OE question meant that this method would have been undesirable and would have led to excessive variability of bids.

[14] However, some have argued that there is no significant difference (e.g., Loomis *et al.,* 1997). In this study, whilst free riding behaviour might be a problem, "there are important factors which militate against strategic behaviour, such as information costs and adherence to social norms of altruism and truthfulness" (Mitchell & Carson, 1989, p.128).

[15] This also takes into account the potential for lexicographic preferences, whereby respondents believe the good should be protected irrespective of the costs (Shyamsundar & Kramer, 1996). If found to be significant, these would pose serious problems for the ability of CBA to contribute to the decision-making process, since the continuity axiom of utility theory would be violated (Common *et al.,* 1997; Spash & Hanley, 1995).

principle question were followed up by attempts to discover the motivation behind responses.

3.3 Payment vehicle

The most important criterion for the method of payment is that it should be believable (Kahneman & Knetsch, 1992). Whilst the Kramer *et al.,* (1996) study used contributions to a UN managed fund, a more credible vehicle, which is less susceptible to strategic behaviour and which was recommended by the 'blue ribbon' panel, is taxation. Whilst the effects of a tax can be non-neutral, it was felt that, given the more serious problems of other approaches and the necessity to maintain a consistent approach in both countries, an EU wide tax was most appropriate. The increased realism associated with taxation also tends to reduce the zero bid rate and bid variability (Bateman *et al.,* 1993).

To eliminate temporal embedding, it is also important to specify the number of payments to be made and how long the commitment is expected to last for. In this case, respondents were told that payments would have to be made every year. Whilst some suggest that multi-year payments should be avoided if possible (Johansson *et al.,*1995), it was made explicit in the survey that annual payments would be required to ensure the long-term maintenance of the reserves. Respondents were reminded of this commitment just prior to the WTP question.

In summary, we believe that the scenario presented was easily understandable and believable. Combined with the design of the survey, the payment vehicle used and the high prior information levels held by respondents regarding the resource, this substantially enhanced the credibility and validity of the study.

3.4 Sampling

The sampling strategy had two main aims:

- To detect any relationship between nationality of respondents and WTP
- To detect any relationship between socio-economic variables and valuation

A total of 407 interviews were conducted in the UK and Italy during July and August 1999. A further 35 people refused to participate in the interview process (this excludes those who stated that they would like to take part but who didn't have time). Respondents were selected at random and interviews were conducted face to face, mainly in locations such as parks and gardens where people had sufficient time to reflect and give considered responses. In general, people were receptive to and interested in the survey.

The UK survey was conducted in Norwich and the Italian survey at various locations in the regions of Lazio, Lombardy, Abruzzo and Tuscany. The idea of using two different European countries was to facilitate comparison with the Kramer *et al.,* (1996) study and examine whether WTP and perceptions relating to what is a well-known area of international importance and concern varied due to cultural or other reasons. In addition, the two countries were broadly representative of Northern and Mediterranean Europe respectively.

4. Results and Discussion

4.1 Sample characteristics

Comparison of our sample with national statistics showed that levels of income and education of respondents in our survey were significantly higher than the national average in both countries. For example, average annual net household income was 30% higher than the national average in the UK section of our survey (Office for National Statistics, 1999) and some 25% higher in the Italian section (Italian National Statistical Institute, www.istat.it, Sept. 1999). There are several possible explanations for this. It may be because our sample largely consisted of those of working age, with fewer elderly and retired people than the general population. Alternatively, it may be that some respondents mis-calculated their income levels, or gave gross rather than net amounts. Or it could be that average earnings were higher because slightly more males were included in the survey. Or it may simply be a reflection of the fact that the areas surveyed are relatively affluent compared to the countries as a whole. Alternatively, there may have been some interviewer selection or self-selection by respondents when accepting/refusing to participate in the interview process.

Whatever the case, the respondents in our sample were not representative of the wider population and, whilst this does not invalidate the findings, the results cannot be seen as consistent. Furthermore, we need to take great care when using the results to produce meaningful aggregation estimates.

4.2 Attitudes

Table 1 shows the main findings from Sections A and B of the questionnaire.

Overall, 98% of respondents claimed to have some knowledge of tropical rainforests. This compares with 91% in the Kramer *et al.,* (1996) study. When asked about the reason for their importance, most people seemed to have some understanding, with many people giving more than one response. The figures from the UK and Italy showed no significant differences in this respect. However, when asked about the causes of deforestation, there was less consensus and a greater diversity of replies. Respondents in the Italian sample tended to give more than one cause (in some cases several), and were significantly more likely to state nearly every possible threat than their UK counterparts. The most likely reason for this, and one that was mentioned by many respondents in the Italian survey, is that, just prior to the survey, Italian state television had shown a series of short documentaries about the problems of tropical deforestation and biodiversity loss in the Amazon. This therefore seems to have been an issue of considerable current national interest and at the forefront of many people's minds. It may explain why the Italian results in

particular demonstrate a high familiarity with a site that is geographically remote and which only one person in the whole sample had visited.

Table 1: Responses to some of the main attitudinal questions in our survey

Percentage of respondents in each sample claiming:	**UK**	**ITALY**	**Combined**
1. to have read about, heard about or seen TV programs about tropical rainforests	100	96	98
2. that tropical rainforests are important	98	97	98
3. that the reason for their importance is:			
- regulation of global climate	83	92	87
- biodiversity and habitats	52	30	42
- cultural diversity/indigenous peoples	13	5	9
- economic resource	8	2	5
- pharmaceutical research	5	4	4
4. that tropical rainforests are under threat as a result of:			
- commercial logging	50	89	69
- multinational corporations clearing the land	33	37	35
- internal policies in the rainforest countries	20	20	20
- international trade and globalisation	20	81	49
- pollution	11	70	39
- fires	1	73	35
- overpopulation	19	82	49
5. that developed countries should help pay for the costs of preserving tropical rainforests	92	95	93
6. and % of these costs which respondent believes should be borne by developed countries (mean)	47	58	52

A very high proportion of the sample (93%) said that developed countries should help to pay the costs of preserving tropical rainforests. When asked what percentage of these costs should be borne by developed countries, the mean response (including those who said zero) was 51.7% (median = 50%). The same question in the study by Kramer *et al.,* (1996) elicited a median of 41%.

4.3 Payment principle

A total of 45 people (11%) said they were not prepared to pay any amount in extra taxes towards the costs of the programs. Of these, 19 people either said that they could not afford to pay or that taxes were too high already. A further 11 said that this was a problem for the Brazilian government, 6 said that the area under consideration was too small to be of importance and 6 people said that the issue was not important to them. There was very little evidence of people withholding their true WTP values due to pure free riding behaviour or due to a lack of trust in either the tax raising or the program implementing authorities. Significantly, only one person objected to the fundamental principle of valuing the preservation of Amazonia.

The impact of variables which might affect the likelihood of accepting the payment principle was analysed by modelling the discrete yes/no response to the question using a logit transformation where;

$$\text{LOGIT (yes)} = \ln\left[\frac{\pi_i}{1-\pi_i}\right]$$

where π_i = probability of answering positively to the payment principle question

$$\text{LOGIT (yes)} = \underset{(-4.43)}{-3.60} + \underset{(3.46)}{0.61}\text{protect} + \underset{(5.21)}{0.05}\text{richpay} + \underset{(3.04)}{1.43}\text{gender} + \underset{(2.61)}{0.71}\text{car} \quad (1)$$

protect = importance to the respondent of protecting the areas in question
richpay = % of program costs respondent says should be borne by developed countries
gender = 1 if female, 0 if male
car = number of cars in the respondents household
Figures in brackets are t-statistics, all variables are significant at the 99% level.

Equation (1) details the best model of payment principle responses. Those for whom protection of the areas in question was particularly important and who felt that rich countries should pay more to help with the costs of the programs were more likely to answer positively to the payment principle question. This is indicated by the positive sign on the highly significant *protect* and *richpay* variables. Female respondents were less likely to decline the payment principle question although analysis of other responses could reveal no particular reason as to why this was the case. The number of cars in a household was positively related to response, perhaps indicating a (theoretically expected) income effect. Neither nationality nor whether people were asked about the 5% or the 20% scheme first was found to be significant.

4.4 Motivations for responding positively to the payment principle

Those who responded positively to the payment principle question were asked why they were willing to pay some amount for the proposed change. Table 2 shows the results of this analysis, which found that direct and option use values were almost completely absent. Only 2 people said they may want to visit the area in the future, 9 people mentioned preservation of genetic diversity and 2 people said they would receive some personal benefit from paying. However, indirect, existence and bequest values were all found to be important. Much of the value that people derive from this good seems to stem from the non-market services provided by tropical rainforests (or at least perceived to be provided), such as carbon sequestration and global warming reduction. For example, 86% of the sample said that either Brazilian Amazonia was a globally important area, or specifically mentioned the threat to the planet from climate change. These could be interpreted as indirect use values, and may in this case dominate strictly non-use values such as bequest (33% of people said they would like to help preserve the area for future generations) or existence values (17% mentioned a desire to maintain the biodiversity, habitat and other functions of the resource). However, there was a substantial degree of overlap in responses, with many people stating more than one reason. Many respondents therefore seem to derive a variety of values from the resource. Again, no significant differences between the two nationalities were detected in this respect.

Table 2: Reasons respondents gave for accepting the payment principle

Reason	% of respondents who gave reason
I think the future of Amazonia is a globally important issue	59
I am very concerned about climate change	48
I am very concerned about biodiversity loss	17
I may want to visit the rainforest at some time in the future	0.6
We should protect this area for future generations	33
In order to preserve the genetic diversity	2.5
I would receive some personal benefit from paying	0.6

4.5 WTP per annum

Using an exchange rate of £1 = L.3000 for all calculations[16] and including, as zeros, those respondents who refused the payment principle, the WTP question elicited a whole sample mean of £29.83 per annum for the 5% scheme and £39.16 for the 20% scheme[17]. Table 3 decomposes these bids between the UK and Italy and between those who were asked to value the 5% scheme first and those who were asked about the 20% scheme first. Three bids were treated as outliers and excluded from the analysis as they represented excessively high amounts given the income of the individuals.

Table 3 shows that mean WTP is higher for the more inclusive program in each subsample, and the second responses are therefore *internally* consistent in each case. However, in each subsample confidence intervals overlap due to the high variability of bids. In addition, the results are not *externally* consistent since for the Italian sample the first WTP question for the 5% scheme elicited a higher mean response than the first question for the 20% scheme. Whilst testing showed these differences were not significant, this does create problems interpreting the results. Whilst the UK results are correctly ordered and wholly consistent with economic theory (Carson & Mitchell, 1995), results from the Italian survey suggest that, since there were no reference points, respondents may have experienced uncertainty when stating their bids. This may be an indication of insensitivity to the scope of the good, perhaps because bids were subject to a 'warm glow' effect (Andreoni, 1990). Whilst embedding effects cannot be ruled out, recent research suggests that, had respondents been provided with complete information about all the valuation questions which they were to be asked before the first response was elicited, this apparent anomaly would almost certainly have been eliminated (Bateman *et al.,* 2001).

Table 3 also shows that the means from the Italian survey are significantly larger than UK means, and some possible explanations for this are worth investigating. The main reason is likely to be the higher profile of these issues in Italy due to the recent extensive media coverage mentioned in Section 4.2. In addition, the average level of education of respondents was higher in the Italian survey (27% had a university education compared with less than 20% in the UK) and the Italians may therefore have had a greater understanding of the importance of the area. Analysis of other socio-economic, such as income, and attitudinal/knowledge characteristics showed no significant differences between the two samples. However, responses may have been affected by reasons which

[16] This was the purchasing power parity exchange rate at the time the surveys were undertaken.

[17] For simplicity in presentation, these means were calculated from the midpoints of the intervals given by respondents on the payment ladder.

Table 3: Mean WTP per annum per household for each sub-sample

	UK				ITALY				COMBINED			
	Part-whole		Whole-part		Part-whole		Whole-part		Part-whole		Whole-part	
	5%	20%	20%	5%	5%	20%	20%	5%	5%	20%	20%	5%
Mean	£12.94	£20.65	£24.23	£18.16	£49.54	£61.36	£40.41	£29.63	£31.67	£41.49	£31.18	£23.10
95% confidence interval	£9.57 - £16.31	£14.77 - £26.53	£16.46 - £31.99	£11.92 - £24.41	£40.54 - £58.54	£49.93 - £72.79	£30.96 - £49.85	£21.88 - £37.39	£26.22 - £37.13	£34.45 - £48.52	£25.13 - £37.24	£18.20 - £28.00
Standard deviation	£17.25	£30.10	£41.08	£33.04	£47.17	£59.93	£43.23	£35.53	£40.18	£51.82	£42.67	£34.51
Median	£10.00	£10.00	£10.00	£8.00	£33.33	£50.00	£25.00	£16.67	£16.67	£25.00	£15.00	£10.00
N	103	103	110	110	108	108	83	83	211	211	193	193

the surveys do not reveal, such as cultural differences, interview location, interviewer bias or differences due to translation.

4.6 Truncation effects

In the case of continuous data, truncation refers to the omission of a certain percentage or number of the highest bids. Table 4 shows a sensitivity analysis of several truncation strategies, including no truncation [18]. The purpose of this was to guard against possible charges of protest bidding exclusion or inclusion of unreasonably high bids.[19] We also wanted to observe whether there was a reduction in the difference between the mean and median, since the mean in particular tends to be very sensitive to the right tail of the WTP bid distribution (Hanemann, 1994).

Table 4 shows that each successive truncation leads to a marked decrease in both mean bids and standard deviations in both countries, although the extent of this is no more drastic than many other CV studies (Bateman *et al.,* 1995). It is also apparent that the Italian sample generated a higher variability of bids with more bids towards the top end of the payment ladder. This is another reason for the difference in the means between the two countries shown in Table 3.

Considering the combined results, omission of the four highest bids in this case (1% of the sample), caused mean WTP to fall by over 8.6%. Truncation of the highest 5% of bids led to a reduction of 25.3%, and of the highest 10% by 38.6%. Whilst this may provide some evidence of strategic overbidding, such a positively skewed distribution may simply be a reflection of the preferences and characteristics of the sample. Indeed, apart from the 3 outliers, no bids were an excessively high proportion of income, and responses to other questions suggested that most respondents were taking into account their incomes when stating their WTP bids. A cautious conclusion would therefore be that strategic overbidding was not a major problem in this survey.

[18] Due to space limitations, this was applied only to the first WTP bid given by respondents. The second bids manifest analogous behaviour, which is obvious given the widely observed anchoring effect.

[19] These could arise where respondents experience mental accounting problems, or as a result of strategic behaviour.

Table 4: Truncation effects in Amazonian WTP study [a]

	UK				ITALY				COMBINED			
% of upper tail truncated	0%	1%	5%	10%	0%	1%	5%	10%	0%	1%	5%	10%
No. of upper tail truncated	0	2	11	21	0	2	10	19	0	4	20	41
N	213	211	202	192	194	192	184	175	407	403	387	366
Mean WTP [b]	18.77	16.58	12.81	10.82	50.02	47.07	40.24	35.16	33.66	30.77	25.15	20.68
Median WTP	10.00	10.00	10.00	10.00	33.33	33.33	33.33	33.33	16.67	16.67	15.00	12.00
S.D.	32.29	22.69	13.55	10.60	57.58	50.01	36.84	29.60	48.63	39.16	27.64	20.85
Maximum Bid [c]	300.00	150.00	60.00	50.00	333.33	333.33	166.67	166.67	333.33	233.33	116.67	83.33
Lower Quartile	3.50	3.00	2.88	2.50	16.67	16.67	8.33	8.33	5.00	5.00	5.00	5.00
Upper Quartile	20.00	20.00	20.00	15.00	66.67	66.67	66.67	50.00	40.00	33.33	33.33	33.33

[a] All figures, excluding the first 3 rows, are given in £

[b] Includes, as zeros, those who refused to pay anything at all

[c] Minimum bid = 0 throughout

4.7 Bid function analysis

Having established the WTP-scale relationship outlined in Section 4.5, the combined bids were then regressed against a number of socioeconomic and attitudinal variables. As a result of the high variation in WTP bids across the sample, a few relatively high bids led to a positively skewed distribution. To facilitate bid curve analysis, this skew was controlled for by modelling the natural logarithm of WTP. Tables 5 to 8 show the results of OLS and Tobit regressions on WTP bids. Tobit analysis was undertaken since it explicitly incorporates the fact that we cannot get negative bids in our WTP responses, and was therefore a more accurate reflection of the survey. However, since very few zero bids were received, both OLS and Tobit models gave very similar results. In the tables, two models are presented for each of the subsamples used. The first model includes all explanatory variables whilst the second, estimated using stepwise regression techniques, shows the best fitting model in each case. In addition, Tables 5 and 7 include (for the second WTP question) the first WTP bid as a predictor of the second bid, whilst Tables 6 and 8 exclude bids for the first scheme from analysis of bids for the second scheme in each subsample. This was undertaken to investigate whether, once the expected anchoring effect of the first on the second bid had been taken into account, other variables became significant in explaining WTP.

Table 5: Full and best OLS models of explanatory variables in determining WTP

	ALL VARIABLES INCLUDED				BEST FITTING MODEL			
Explanatory Variables	**Part-whole subsample**		**Whole-part subsample**		**Part-whole subsample**		**Whole-part subsample**	
	5%	**20%**	**20%**	**5%**	**5%**	**20%**	**20%**	**5%**
Constant	**1.30****	**0.70*****	**0.95***	**-0.66*****	**1.21*****	**0.51*****	**1.22*****	**-0.44*****
	(2.24)	(3.15)	(1.74)	(-3.12)	(2.99)	(5.39)	(3.69)	(-5.77)
(log)wtp1	**-**	**0.92*****	**-**	**1.03*****	**-**	**0.90*****	**-**	**1.02*****
(log of 1st bid)		(32.24)		(33.76)		(41.98)		(42.63)
envrank	**0.13**	**0.01**	**0.10**	**0.76E-02**	**0.16***	**-**	**-**	**-**
	(1.47)	(0.34)	(1.03)	(0.21)	(1.92)			
biorank	**0.05**	**0.07**	**-0.08**	**0.02**	**-**	**-**	**-**	**-**
	(0.34)	(1.24)	(-0.44)	(0.28)				
envgroup	**0.33***	**0.07**	**0.30**	**0.03**	**0.32***	**-**	**-**	**-**
	(1.85)	(0.98)	(1.59)	(0.37)	(1.90)			
protect	**0.07**	**-0.08****	**0.06**	**0.03**	**-**	**-0.06****	**-**	**-**
	(0.86)	(-2.45)	(0.70)	(0.96)		(-2.15)		
richpay	**0.98E-02****	**-0.51E-03**	**0.01*****	**0.37E-03**	**0.01*****	**-**	**0.01*****	**-**
	(2.59)	(-0.35)	(2.86)	(0.23)	(2.87)		(4.14)	
education	**0.21*****	**-0.24E-02**	**0.24*****	**0.02**	**0.23*****	**-**	**0.25*****	-
	(3.03)	(-0.89)	(3.49)	(0.68)	(3.57)		(3.82)	
age	**-0.09**	**0.03**	**-0.06**	**0.03**	**-**	**-**	**-**	**-**
	(-1.38)	(1.12)	(-0.88)	(0.99)				
gender	**-0.35****	**-0.10***	**-0.53*****	**0.03**	**-0.35*****	**-0.10***	**-0.46*****	-
	(-2.38)	(-1.84)	(-3.45)	(0.52)	(-2.41)	(-1.76)	(-3.04)	
car	**0.04**	**-0.02**	**0.12**	**-0.02**	**-**	**-**	**-**	**-**
	(0.40)	(-0.52)	(1.03)	(-0.52)				
income	**0.08****	**0.03**	**0.09**	**-0.02**	**0.08*****	**0.02***	**0.12*****	-
	(1.96)	(1.62)	(1.62)	(-0.99)	(2.22)	(1.93)	(2.86)	
nation	**-1.30*****	**0.02**	**-0.51****	**-0.17E-02**	**-1.30*****	**-**	**-0.54*****	**-**
	(-6.98)	(0.30)	(-2.29)	(-0.02)	(-8.68)		(-3.57)	
R^2 (adj)	**0.43**	**0.91**	**0.31**	**0.91**	**0.43**	**0.91**	**0.31**	**0.91**
N	**187**	**187**	**175**	**173**	**187**	**187**	**175**	**173**

Table 6: Full and best OLS models of explanatory variables in determining WTP ('wtp1' excluded)

	ALL VARIABLES INCLUDED				BEST FITTING MODEL			
Explanatory Variables	**Part-whole subsample**		**Whole-part subsample**		**Part-whole subsample**		**Whole-part subsample**	
	5%	**20%**	**20%**	**5%**	**5%**	**20%**	**20%**	**5%**
Constant	**1.30****	**2.60*****	**0.95***	**1.43**	**1.21*****	**2.02*****	**1.22*****	**0.87***
	(2.24)	**(2.95)**	(1.74)	(1.48)	(2.99)	(6.01)	(3.69)	(1.96)
Envrank	**0.13**	**0.20*****	**0.10**	**0.14**	**0.16***	**0.28*****	**-**	**0.16***
	(1.47)	**(2.74)**	(1.03)	(1.53)	(1.92)	(4.12)		(1.75)
Biorank	**0.05**	**0.14**	**-0.08**	**0.30***	**-**	**-**	**-**	**0.43****
	(0.34)	**(1.02)**	(-0.44)	(1.65)				(2.37)
Envgroup	**0.33***	**0.31****	**0.30**	**0.34**	**0.32***	**-**	**-**	**-**
	(1.85)	(1.99)	(1.59)	(1.58)	(1.90)			
Protect	**0.07**	**0.09**	**0.06**	**0.14**	**-**	**-**	**-**	**-**
	(0.86)	(1.39)	(0.70)	(1.55)				
Richpay	**0.98E-02****	**-0.88**	**0.01*****	**-0.64**	**0.01*****	**-**	**0.01*****	**-**
	(2.59)	(-1.37)	(2.86)	(-0.83)	(2.87)		(4.14)	
Education	**0.21*****	**0.17*****	**0.24*****	**0.19****	**0.23*****	**0.19*****	**0.25*****	**0.20****
	(3.03)	(3.00)	(3.49)	(2.47)	(3.57)	(3.49)	(3.82)	(2.57)
Age	**-0.09**	**0.05**	**-0.06**	**-0.01**	**-**	**-**	**-**	**-**
	(-1.38)	(0.92)	(-0.88)	(-0.24)				
Gender	**-0.35****	**-0.38*****	**-0.53*****	**-0.35****	**-0.35*****	**-0.39*****	**-0.46*****	**-**
	(-2.38)	(-2.97)	(-3.45)	(-1.99)	(-2.41)	(-3.02)	(-3.04)	
Car	**0.04**	**0.00**	**0.12**	**-0.09**	**-**	**-**	**-**	**-**
	(0.40)	(-0.04)	(1.03)	(-0.72)				
Income	**0.08****	**0.04**	**0.09**	**0.11****	**0.08*****	**0.04***	**0.12*****	**0.12****
	(1.96)	(1.08)	(1.62)	(2.16)	(2.22)	(1.44)	(2.86)	(2.58)
Nation	**-1.30*****	**-1.28*****	**-0.51****	**-0.94*****	**-1.30*****	**-0.36*****	**-0.54*****	**-0.72*****
	(-6.98)	**(-7.43)**	(-2.29)	(-4.07)	(-8.68)	(-4.09)	(-3.57)	(4.06)
R^2 (adj)	**0.43**	**0.47**	**0.31**	**0.20**	**0.43**	**0.42**	**0.31**	**0.19**
N	**187**	**187**	**175**	**173**	**187**	**187**	**175**	**173**

* p<0.10 ** p<0.05 *** p<0.01

Table 7: Full and best Tobit models of explanatory variables in determining WTP

	ALL VARIABLES INCLUDED				BEST FITTING MODEL			
Explanatory Variables	**Part-whole subsample**		**Whole-part subsample**		**Part-whole subsample**		**Whole-part subsample**	
	5%	**20%**	**20%**	**5%**	**5%**	**20%**	**20%**	**5%**
Constant	**-54.45***	**-45.17*****	**-59.76****	**-18.90****	**-24.26***	**-12.06**	**-45.38****	**-3.72*****
	(-1.87)	(-3.25)	(-2.12)	(-2.23)	(-1.86)	(-1.58)	(-2.14)	(-3.10)
(log)wtp1	**-**	**1.24*****	**-**	**0.80*****	**-**	**1.22*****	**-**	**0.82*****
(log of 1st bid)		(35.12)		(34.84)		(38.78)		(39.90)
envrank	**6.18***	**2.26**	**0.94**	**0.29**	**6.4***	**-**	**-**	**-**
	(1.66)	(1.05)	(0.80)	(0.25)	(2.00)			
biorank	**3.41**	**1.03**	**5.36**	**0.85**	**-**	**-**	**-**	**-**
	(0.53)	(0.81)	(1.08)	(0.38)				
envgroup	**12.63***	**0.83**	**9.61***	**2.18**	**10.64***	**-**	**-**	**-**
	(1.77)	(0.21)	(1.93)	(0.84)	(2.02)			
protect	**2.31**	**0.65**	**2.50**	**0.46**	**-**	**1.94***	**-**	**-**
	(0.89)	(0.39)	(1.08)	(0.42)		(1.27)		
richpay	**7.80***	**14.15***	**39.79****	**6.79***	**9.47****	**-**	**56.36****	**-**
	(2.08)	(1.80)	(2.25)	(2.01)	(2.61)		(3.19)	
education	**5.51****	**1.43**	**12.79****	**0.42**	**5.63****	**-**	**5.29****	**-**
	(1.96)	(1.01)	(2.89)	(0.40)	(2.36)		(2.62)	
age	**-0.78**	**1.93**	**-1.96**	**0.54**	**-**	**-**	**-**	**-**
	(-1.17)	(1.45)	(-0.65)	(0.60)				
gender	**-6.74***	**-0.27***	**-14.67****	**-0.06**	**-5.77****	**-1.10***	**-12.33****	**-**
	(-2.02)	(-1.89)	(-2.12)	(-0.03)	(-2.87)	(-1.93)	(-2.70)	
car	**4.77**	**2.13**	**6.52**	**-1.00**	**-**	**-**	**-**	**-**
	(0.87)	(0.92)	(1.28)	(-0.65)				
income	**2.11****	**0.17**	**5.00***	**0.83**	**5.21****	**1.79***	**4.44****	**-**
	(2.08)	(0.18)	(2.04)	(1.23)	(2.40)	(2.07)	(2.22)	
nation	**-41.39*****	**8.51***	**-41.83*****	**-1.23**	**-47.86*****	**-**	**-23.00*****	**-**
	(-5.74)	(1.92)	(-4.61)	(-0.66)	(-7.16)		(-3.12)	
LR Chi^2	**82.39**	**460.77**	**66.55**	**423.44**	**74.13**	**449.39**	**54.69**	**414.25**
N	**163**	**163**	**154**	**152**	**163**	**163**	**154**	**152**

Table 8: Full and best Tobit models of explanatory variables in determining WTP ('wtp1' excluded)

	ALL VARIABLES INCLUDED				BEST FITTING MODEL			
Explanatory Variables	**Part-whole subsample**		**Whole-part subsample**		**Part-whole subsample**		**Whole-part subsample**	
	5%	**20%**	**20%**	**5%**	**5%**	**20%**	**20%**	**5%**
Constant	**-54.45***	**-84.58****	**-59.76****	**-56.42****	**-24.26***	**-57.55*****	**-45.38****	**-31.58****
	(-1.87)	(-2.26)	(-2.12)	(-2.35)	(-1.86)	(-2.61)	(-2.14)	(-2.03)
Envrank	**6.18***	**9.00****	**0.94**	**0.75**	**6.4***	**15.96*****	**-**	**4.67***
	(1.66)	(2.16)	(0.80)	(0.23)	(2.00)	(3.24)		(2.03)
Biorank	**3.41**	**7.79**	**5.36**	**11.87***	**-**	**-**	**-**	**6.10***
	(0.53)	(0.85)	(1.08)	(1.88)				(2.11)
Envgroup	**12.63***	**16.86***	**9.61***	**22.41***	**10.64***	**-**	**-**	**-**
	(1.77)	(2.01)	(1.93)	(2.10)	(2.02)			
Protect	**2.31**	**6.29**	**2.50**	**5.61***	**-**	**-**	**-**	**-**
	(0.89)	(1.30)	(1.08)	(1.83)				
Richpay	**7.80***	**16.13**	**39.79****	**14.40**	**9.47****	**-**	**56.36****	**-**
	(2.08)	(0.77)	(2.25)	(1.27)	(2.61)		(3.19)	
Education	**5.51****	**7.66****	**12.79****	**2.08***	**5.63****	**5.05****	**5.29****	**4.89***
	(1.96)	(1.99)	(2.89)	(1.78)	(2.36)	(2.25)	(2.62)	(1.80)
Age	**-0.78**	**1.77**	**-1.96**	**-2.09**	**-**	**-**	**-**	**-**
	(-1.17)	(0.48)	(-0.65)	(-0.81)				
Gender	**-6.74***	**-10.32****	**-14.67****	**-10.99***	**-5.77****	**-5.56****	**-12.33****	**-**
	(-2.02)	(-2.80)	(-2.12)	(-1.85)	(-2.87)	(-2.59)	(-2.70)	
Car	**4.77**	**6.37**	**6.52**	**-4.95**	**-**	**-**	**-**	**-**
	(0.87)	(1.00)	(1.28)	(-1.39)				
Income	**2.11****	**2.81**	**5.00***	**5.29****	**5.21****	**3.92***	**4.44****	**2.95****
	(2.08)	(1.11)	(2.04)	(2.58)	(2.40)	(1.63)	(2.22)	(2.40)
Nation	**-41.39*****	**-42.84*****	**-41.83*****	**-33.08*****	**-47.86*****	**-35.55**	**-23.00*****	**-30.66****
	(-5.74)	(-3.77)	(-4.61)	(-4.27)	(-7.16)	(-4.99)	(-3.12)	(-4.21)
LR Chi^2	**82.39**	**70.78**	**66.55**	**59.25**	**74.13**	**26.81**	**54.69**	**24.77**
N	**163**	**163**	**154**	**152**	**163**	**163**	**154**	**152**

* p<0.10 ** p<0.05 *** p<0.01

Explanation of explanatory variables[20]

log(wtp1) = respondent's max WTP from the first (5% or 20%) proposal
envrank = rank given to environmental concerns compared to other social/economic problems
biorank = 1 if biodiversity loss is very important to respondent, 0 otherwise
envgroup = 1 if respondent belongs to an environmental group, 0 otherwise
protect = importance to the respondent of protecting the areas in question
richpay = % of costs respondent says should be borne by rich countries
education = level of education of respondent
age = age group of respondent
gender = 1 if female, 0 if male
car = number of cars in the respondents household
income = household income group
nation = 1 if UK, 0 if Italian
Figures in brackets are t-statistics

The first thing to notice is that the constant in each case is highly significant. Whilst this could be due to omitted variables, more likely it points to a moral satisfaction element in responses (Kahneman & Knetsch, 1992). It is also further evidence that respondents experienced considerable uncertainty in answering and resorted to a roughly common conception of a socially acceptable level of payment for such a good. This would be consistent with the findings of Schkade & Payne (1994) who use verbal protocol analysis to show that respondents in CV surveys do not generally have well-defined values pre-stored in their minds for most environmental goods. Rather they construct values during the interview process.

Not surprisingly, the first subsample bid, (log)wtp1, is the most important determinant of the second subsample bid. Whilst this would tend to indicate a strong anchoring effect of the first bid on the second, it may also simply indicate the respondents' degree of preference. The very high R^2 in the second regression in each subsample also suggests that respondents are largely using their first bid as a reference point.

Turning to other explanatory variables in Table 5, we have already noted that Italian respondents were more likely to offer higher bids than those in the UK. Males were also more likely to state higher bids. As expected, income and education show a positive correlation with WTP, as does the variable 'richpay'.

[20] Full details of these can be found in the questionnaire (see Appendix A).

Other variables were not generally significant and only one ('protect' in the 20% part-whole subsample) showed a 'wrong' (theoretically unexpected) sign.

When wtp1 is excluded as an explanatory variable for wtp2 (Tables 6 and 8), other variables, as we would expect, become more important in predicting the dependent variable and their statistical significance also increases. This was particularly the case for the variables 'envrank', 'envgroup' and 'edu' which all acted in a theoretically expected direction. In the part-whole subsample, 'gen' and 'nation' became more important, with males and Italians stating significantly higher WTP. In the whole-part subsample, income becomes an important factor in determining WTP. Of course, the overall fit of the models with wtp1 excluded is lower, and R^2 values fall significantly. Tables 7 and 8 show the best fitting Tobit models, which produced very similar results to the OLS models.

Analysis of the reasons people gave as to *why* they stated a particular WTP amount showed that strategic behaviour may have been a factor. In all, 28% said that their bid would be enough if everyone else contributed similar amounts, indicating that the amounts offered by others was an important consideration when formulating bids. A further 22% felt it was an 'important issue' or represented a 'good cause'. Once again, this suggests the presence of a 'warm glow' effect (Andreoni, 1990) amongst these respondents. However, the largest group (61%) said that their WTP bids were appropriate given their income, indicating that the majority of respondents adopted some kind of mental accounting process before giving their bids.

4.8 Validity and reliability

Content validity (which relates to the quality of the design of the questionnaire) was carried out prior to the survey as mentioned in Section 3.4 and was enhanced by the high response rate. We cannot test for criterion validity since real markets for this good do not exist (at least within the everyday transactions of respondents). Construct validity deals with whether or not the results are as expected. Given the nature of the good in our survey and the lack of substitution possibilities, it is unsurprising that WTP amounts found are generally higher than most other CV surveys (Bateman *et al.,* 1993). The results of the first WTP question in both the 5% and 20% cases (without the anchoring effect) are generally slightly higher than the results obtained by Kramer *et al.,* (1996). This may be due to the increasingly high profile of environmental issues such as climate change in recent years, and in particular areas of tropical rainforest such as Amazonia. Another factor may be the voluntary payment mechanism used in that paper and the fact that it considered 5% of the *entire world's* remaining forest, rather than a specific, identifiable area. Theoretical validity has already

been examined via estimation of the bid function, and it is encouraging that many of the variables are statistically significant and in the expected direction.

Reliability is a measure of the precision or accuracy of the data, where high variance of the mean indicates low reliability. Assessment of instrument reliability indicates that WTP bids were not random guesses. In addition, Mitchell & Carson (1989) suggest that an adjusted R^2 greater than a threshold figure of 15% provides a general testament to the instrument's reliability. However, the high variance does cast doubt on the overall validity of the results.

5. Conclusions

The CVM is unique in the field of environmental valuation because it has the potential to measure welfare effects on people far removed from the area under consideration in the study. Our survey demonstrates that a majority of households in the UK and Italy are willing to pay to support tropical rainforest preservation efforts. At best however, the results we have obtained can provide only a crude guide to individual preferences and estimates of value. At worst, they may be "spurious guesses motivated primarily by a subconscious desire to support a 'good cause' irrespective of the particular good under evaluation" (Bateman & Langford, 1997, p.579). Indeed, since respondents in the two sub-samples expressed analogous first bids, it is likely that they were not valuing the specific program in question, but were expressing the general importance of Amazonia to them.

We found evidence of considerable uncertainty in responses to the WTP questions. Plausible explanations for such results include respondents' adherence to notions of social fairness and an obligation to pay a fair share of the costs. Strategic behaviour cannot be ruled out and may have led to an understatement of WTP in the case of the UK survey, and an overstatement in the Italian survey. The results may therefore be lacking in reliability, consistency and validity. An anchoring effect is apparent when considering the second bids in both sub-samples.

On the other hand, given the nature of the good and the unfamiliarity with the process experienced by respondents, such uncertainty is hardly surprising. The values elicited are significant and there is certainly evidence of a relationship between WTP and socioeconomic and attitudinal variables, suggesting that responses to the valuation questions were non-random. The results are also consistent with other CV surveys in that WTP tends to increase as the number of available substitutes goes down or as the change in the level of provision goes up (Bateman *et al.,* 1993).

In general though, we would disagree with those who affirm that the CVM is a panacea to the problems of incorporating environmental values into decision making processes and can be applied to any environmental good or service. Whilst following the NOAA guidelines as closely possible, the findings of this study still suggest that respondents who are unfamiliar and far removed physically from the good demonstrate excessive uncertainty in the valuation process for the results to be considered valid and reliable.

This aside, the results we have obtained suggest that, aggregated across households, an annual fund to conserve the areas in question could yield around

£0.6bn in the UK and a similar amount in Italy, easily covering the costs of the program outlined in Section 1.1. Whilst we can't be sure what decision processes individuals used to give their WTP amounts, this demonstrates that, even from an economic viewpoint alone, conservation may a viable proposition, and a dramatic reduction in deforestation could be justified. Of course, this is not the complete picture, and a full CBA would need to take into account the opportunity costs of preservation on business and the local populations.

Further research should attempt to expand the use of the CVM or other methods to determine more reliable estimates of passive use values. In particular, the potential for cross-country surveys and comparisons is enormous. Wider projects could also incorporate CV studies to estimate the TEV of remaining forests in areas such as Brazilian Amazonia. Carbon sequestration values, in particular, are likely to be large, and may even exceed non-use values (Pearce, 1998).

Finally, we would not advocate that results from CV surveys such as these should alone be used to determine whether unique resources such as Amazonia are protected. There are many other questions to consider apart from economic efficiency. It is also the case that many people affected by deforestation cannot afford to pay anything to ensure the protection of Brazilian Amazonia. We have made a first attempt to discover the non-use values that residents in the UK and Italy hold for rainforest and biodiversity preservation. The values we have elicited are clearly significant and should, arguably, be considered by decision-makers, since they are not, at the current time, generally incorporated into such processes at all. This paper provides only an *indication* of the scale of monetary flows that may be required to prevent future ecosystem loss, and to ensure a sustainable future for the areas concerned.

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Appendix A Full version of questionnaire used in the study

UNIVERSITY OF EAST ANGLIA
CONFIDENTIAL

TIME STARTED (24 HOUR CLOCK) | | | : | | |

TIME ENDED (24 HOUR CLOCK) | | | : | | |

WAS THIS INTERVIEW CONDUCTED:

1. AT THE RESPONDENTS HOME ADDRESS
2. ELSEWHERE

IF (1), STREET/TOWN.....

FULL

POSTCODE.....

IF (2), INTERVIEW LOCATION.....

DATE: | | / | | / | |

DAY (enter number): Mon = 1 Tue = 2 Wed = 3 Thu = 4 Fri = 5 Sat = 6 Sun = 7

WEATHER CONDITIONS IF ON SITE (enter the correct response, one in each box)

A	B	C	D
1. Sunny 2. Broken cloud 3. Overcast	1. Dry 2. Drizzle/showers 3. Persistent rain	1. Hot (>20^{0}C) 2. Warm (15-20^{0}C) 3. Cool (10-15^{0}C) 4. Cold (<10^{0}C)	1. Calm 2. Breezy 3. Windy

INTERVIEWER INSTRUCTIONS

1. Statements and questions to be read out are shown in bold type;
2. You should not interview those under 18 nor foreign tourists;
3. Try not to specify the precise purpose of the survey at the outset - you can tell respondents that this might prejudice their answers.
4. Read aloud only the text in **BOLD**.

INTRODUCTION

Hello, I am (GIVE NAME AND SHOW IDENTIFICATION) **from the University of East Anglia. We are carrying out a survey among people in the Norwich area and I'd be very grateful if you would answer a few questions concerning your opinions regarding an important environmental issue. This is not a marketing or sales survey and any information you provide will be kept strictly confidential. Would you be prepared to answer some questions?**

If answer = Yes, then proceed. If answer = No, then record refusal to interview and withdraw politely

The questions I will ask you are intended to get your personal opinion. Therefore, there are no 'right' or 'wrong' answers - just what you think. If you do not know what you think about a specific question you can always answer 'don't know'.

SECTION A. GENERAL ATTITUDES

A.1 How important do you personally think environmental problems are relative to other problems such as unemployment, housing, the National Health Service, crime, education, and so on? Please answer using this scale where the number 5 indicates that you think environmental problems are very important relative to such issues and the number 1 indicates that you think they are not very important compared to those issues.

1	2	3	4	5
Not very important relative to others				**Very important relative to others**

Don't know = 9

A.2 I would like you to consider this list of environmental problems. For each one, could you please use the scale to indicate the relative priority you believe it deserves in terms of spending public funds, where 1 means a low priority and 5 means a high priority?

Environmental problems						
A. Global warming	1	2	3	4	5	Don't know=9
B. Deforestation	1	2	3	4	5	Don't know=9
C. Ozone layer depletion	1	2	3	4	5	Don't know=9
D. Sea pollution	1	2	3	4	5	Don't know=9
E. Biodiversity loss	1	2	3	4	5	Don't know=9
F. Air pollution	1	2	3	4	5	Don't know=9
G. Hazardous waste management	1	2	3	4	5	Don't know=9

A.3 Are you or is anyone in your household a member of any of the following groups?

RSPB	1
Church or religious group	2
World Wide Fund for Nature	3
Sports club/Gym	4
Rotary/Lions club	5
Friends of the Earth/Greenpeace	6
National Trust	7
Cultural/Arts association	8
Other local or County nature trust	9
None	10

OTHER GROUP (Please specify)……

SECTION B. Rainforests and Biodiversity

This survey is mainly concerned with issues regarding the Brazilian tropical rainforest. Here is a picture illustrating a typical landscape in the forest in its natural state (SHOW PICTURE OF AMAZONIA REGION).

B.1 Before today, have you ever read about, heard about, or seen TV programs about tropical rain forests?

1=Yes 0=No 2=Don't know

B.2 In your opinion, are tropical rain forests important?

1=Yes 0=No 2=Don't know

If yes go to B.3, if no go to B.4

B.3 What are the main reasons why you believe tropical rain forests to be important?

(Not to be shown to the interviewee)

Pharmaceutical research	1
Carbon Storage	2
Climate regulation	3
Hydrological services (e.g. water catchment, nutrient cycling)	4
Global warming reduction	5
Species richness and diversity	6
Wildlife habitat conservation	7
Economic resource for developing countries	8
Biodiversity	9
For the indigenous people who live there	10

OTHER (Please specify)…….

Don't know 99

ONLY FOR THOSE WHO HAVE ANSWERED NO IN QUESTION B.2

B.4 What are the main reasons why you believe tropical rainforests not to be important?

Not to be shown to the interviewee

I don't care about environmental issues	1
There are more important issues	2
Tropical rainforest is not in my country/somebody else's problem	3
Never heard about this issue before	4
We can survive without them	5

OTHER (Please specify)…….....

Don't Know 99

B.5 In your opinion, do you believe that tropical rain forests are under threat?

1=Yes 0=No 2=Don't know

If yes go to B.6, if no go to (INFORMATION).

B.6 In your opinion, what are the main reasons for tropical rainforests being under threat?

Not to be shown to the interviewee:

Logging (for commercial use of timber)	1
Mining	2
Fires	3
Hunting	4
Fishing	5
Pollution	6
Overpopulation of the areas concerned	7
Local farmers clearing land for agriculture	8
Multi-national corporations clearing land for agriculture and mining	9
Failure of government policy in the countries concerned	10
Failure of richer countries to provide assistance	11
In-migration in the rainforest/Settlement	12
International Trade	13
Greed	14

OTHER (Please specify)…….

Don't Know 99

I would now like you to listen carefully to the following information about tropical rainforests:
It has been stated by the United Nations that tropical rainforests are "by far the richest, most diverse, and most complex" biological systems on earth, providing habitat for a wide variety of plants and animals. However, since 1950, deforestation has caused the loss of 40% of the world's tropical rainforests, reducing them from 9% to 6% of the earth's land surface area. At present, roughly 50,000 Km^2 (an area roughly the size of Denmark) of tropical rainforest is lost every year.

Deforestation occurs because of various pressures. These include land clearance for farming, commercial timber removal, fuelwood gathering, cattle grazing and mining. Deforestation represents an enormous threat to the survival of the rain forest.

As mentioned above, tropical rain forests are the most biologically diverse regions on earth.

I am going now to read out four statements about Biodiversity. I would like you to use this scale to tell me how strongly you agree or disagree with each statement. The number 5 indicates that you strongly agree and the number 1 indicates that you strongly disagree.

CARD 4:

1	2	3	4	5
Strongly disagree				**Strongly agree**

Don't know 9

B.7 Do you agree with the following statement: Biodiversity is a measure of the number of different plant and animal species in a particular area: for example, the number of different types of birds (golden eagles, sparrows, blackbirds...) or the number of different types of trees (oak, elm, ash).

B.8 Do you agree with the following statement: Biodiversity is the extent of genetic variation within a particular species: for example, different types of fruit tree, different types of wheat, different breeds of sheep....

B.9 Do you agree with the following statement: Biodiversity is the number of different ecosystems and habitats in a particular area: for example, marshes, pine forests, coastal beaches, and grass meadows.

B.10 Do you agree with the following statement: Biodiversity is crucial for medical research and pharmaceutical production.

I now would like to read you some statements to clarify the concept of Biodiversity and its role.

The UN Convention on Biological Diversity states: "Biological Diversity … includes diversity within species, between species and of ecosystems."

Biodiversity is the product of 3 billion years of evolution and it constitutes an incomparable global information bank, information which allows improvements in agricultural crops as well as in medical research.

For example, there is a one-in-four chance that prescribed drugs have their origins in genetic materials found in tropical forests.

Tropical rainforests are the most biologically diverse areas on earth. In fact, they contain over 50% of all plant and animal species in the world.

SECTION C (1): VALUATION – PART THEN WHOLE

I would like you to listen carefully to the following information about Brazilian Amazonia. This is the area shown on this map. **(SHOW LOCATION MAP)**

SCENARIO

Brazilian Amazonia constitutes over 40% of all the remaining tropical rainforest in the world. As you can see from this map, Brazilian Amazonia covers an area larger than Western Europe. **(SHOW MAP)**

The red areas shown in this second map **(SHOW MAP)** are the areas of Brazilian Amazonia which have been deforested to date. This is equivalent to an area the size of France.

Nearly 20% of the entire world's plant and animal species can ONLY be found in Amazonia. The UN Biodiversity Convention signed at the Rio Earth Summit in 1992 emphasised the important connection between deforestation and biodiversity loss. As a result of this, specific areas of Brazilian Amazonia have been identified as being particularly important. **(SHOW MAP)**

PLAN A (PART)

The dark green areas in this map have been designated as national parks, biological or ecological reserves. They are areas of important biological and cultural diversity. Together, they make up around 5% of Brazilian Amazonia. At present, these reserves exist ON PAPER ONLY. They have not yet been implemented in practice due to a lack of funds.

If implemented, no commercial exploitation such as logging, agriculture, mining, hunting or fishing would be allowed in these areas. The native inhabitants would be allowed to remain, but their lifestyles do not damage the reserves. Other than this, only scientific research and ecotourism would be permitted in these areas.

If this program is not implemented, there is a danger that the Brazilian government will be unable to prevent illegal activities from severely degrading these areas.

I would now like to ask you some questions about your opinions and preferences regarding this issue. There are no 'right' answers, and you may answer 'don't know' to any question if you are unsure. You may also change your answers at any time.

C-1. First of all, in your opinion, how important is it to you that these areas in the Brazilian tropical rainforest, shown in dark green (SHOW MAP 3 AGAIN)**, should be protected?**

Please give a number from 1 to 5 (SHOW CARD 5) **where 1 is 'not important at all' and 5 is 'very important'.**

CARD 5

1	2	3	4	5
Not important at all				Very important

Don't know 9

Again, please listen to the following information before answering the questions that follow.

If implemented, the Brazilian Institute of the Environment and Natural Renewable Resources would run these parks and reserves. This is a government agency with responsibility for environmental issues and natural resources in Brazil.

The Brazilian government has agreed to finance some of this program. However, given the scale of this project, additional funds would be required for its successful implementation. Since the whole world benefits from the existence of tropical rainforests, richer countries would have to contribute.

C-2. In your opinion, should developed countries help to pay for the costs of preserving tropical rain forests?

1=Yes 0=No 2=Don't know

C-3. If yes, approximately what percentage of the costs of conservation do you believe should be borne by developed countries?

%

If this scheme is to be implemented, payments would have to be made every year to ensure the maintenance of the reserves. In Europe, such funds would be raised by an EU wide tax.

C-4. Would you, in principle, be in favour of paying such a tax if the money raised was used to directly implement the program to protect these areas?

1=Yes 0=No 2=Don't know

If no, go to C-5. If yes or don't know, go to C-6

C-5. What is the main reason or reasons why you would not wish to pay such a tax?
Not to be shown to the interviewee

I cannot afford to pay	1
You cannot put money values on goods such as these	2
Everyone should pay for this not just people in richer countries	3
I object to the idea of paying taxes to Europe	4
Taxes are too high already	5
The government should pay for this	6
Rainforests should be protected by law, we shouldn't have to pay to protect them	7
This is a problem for the Brazilian government	8
The change is too small to be of importance	9
I am satisfied with the existing situation	10
I think this problem is not a priority	11
I do not feel that this issue is important	12
I do not trust EU	13
I do not trust the British government	14
I need more information/time to answer the question	15

OTHER (please state).....

THEN GO TO PLAN B

C-6. What is the main reason or reasons why you are willing to pay some amount for the proposed change?

Not to be shown to the interviewee

I think the future of the Brazilian rainforest is a very important issue	1
I am very concerned about climate change	2
I am very concerned about biodiversity loss	3
I may want to visit the rainforest at some time in the future	4
This is a very good cause	5
My answer reflects my views on the need to preserve all rainforests, not just this area	6
I will not really have to pay any extra amount	7
We should improve the environment for the animals/plants concerned	8
We should improve the environment for future generations	9
In order to preserve the genetic diversity	10
We should improve the environment for other people to enjoy	11
Richer countries have a responsibility / moral duty to help	12
I would receive some personal benefit from paying	13

OTHER (please state).....

C-7. I would now like you to consider what is the most that you and your household would be willing to pay in increased taxes to ensure that the areas shown in dark green in this map (SHOW MAP AGAIN) **become permanently designated as national parks and reserves; and are thereby preserved in their natural state. In answering please bear in mind that any money you pay in increased taxes you will be unable to spend on other goods or services. You and your household would have to pay this amount each year.**

Now in order to help you answer this question please look at this card, on which are written different amounts of money ranging from 0 up to £500. What I would like you to do is to start at the top of the list and ask yourself: 'Would I and my household be prepared to pay 50 pence each year to ensure this program was implemented? Or would I prefer to continue with the current situation rather than paying that amount? If the answer is yes, then I would like you to place a TICK ( ) in the space next to that amount. Then, proceed down the payment ladder placing a tick next to each amount that you are <u>almost CERTAIN you would pay</u>. (GIVE RESPONDENT A PEN).

<u>Please don't agree to pay an amount if you think you can't afford it or if you feel that there are more important things for you to spend your money on, or if you are not sure about being prepared to pay or not.</u>

When you reach an amount that you are not <u>sure</u> of paying then simply leave it BLANK.

When you reach an amount that you are <u>almost certain that you would not pay</u>, then place a CROSS ( ) next to the amount and STOP.

INTERVIEWER: EITHER YOURSELF OR THE RESPONDENT TICK THE AMOUNTS THE RESPONDENT IS <u>CERTAIN THEY WOULD BE PREPARED TO PAY,</u> AND CROSS THE AMOUNT THE RESPONDENT IS CERTAIN THEY WOULD <u>NOT PAY.</u>

Amount (£ per year)	Prepared to pay (✔, ✘)
0	.....
50p	.....
£1	.....
£1.5	.....
£ 2	.....
£2.5	.....
£3	.....
£4	.....
£5	.....
£6	.....
£7	.....
£8	.....
£9	.....
£10	.....
£12	.....
£15	.....
£20	.....
£25	.....
£30	.....
£35	.....
£40	.....
£45	.....
£50	.....
£60	.....
£75	.....
£100	.....
£150	.....
£200	.....
£300	.....
£400	.....
£500	.....
Any other amount	.....

Remember you may revise your decision at any time during this interview. Please tell me if you wish to do so.

AFTER VALUATION, ASK THE FOLLOWING QUESTION.

C.8 What is the main reason why you chose (RE-STATE RESPONDENTS MAXIMUM AMOUNT) **in particular as your maximum willingness to pay?**

Not to be shown to the interviewee

This is the maximum I can afford to pay given my income	1
This is the maximum I am prepared to spend on the environment	2
This is how much I would normally expect to pay in taxes on other environmental goods and services	3
This is how much I would normally expect to pay in taxes on other (non-environmental) goods and services	4
This was a random choice	5
This would be enough if everyone paid the same amount	6
I could easily afford this amount	7
This is a reasonable amount for this particular issue	8

OTHER..... Don't know 99

PLAN B (WHOLE)

Now please look at this map. (SHOW MAP)

This map shows a different, more ambitious program, in which the red areas would be designated as national parks and reserves. Altogether, these areas constitute around 20% of Brazilian Amazonia.

If this scheme were implemented, no commercial exploitation such as logging, agriculture, mining, hunting or fishing would be allowed in these reserves. The native inhabitants would be allowed to remain, but their lifestyles would not damage the reserves. Other than this, only scientific research and ecotourism would be permitted in these reserves.

If this program is not implemented, there is a danger that the Brazilian government will be unable to prevent illegal activities from severely degrading these areas.

C-9. I would now like you to consider what is the most that you and your household would be willing to pay in increased taxes to ensure that the areas shown in red in this map (SHOW MAP AGAIN) become permanently designated as national parks and reserves; and are thereby preserved in their natural state. In answering please bear in mind that any money you pay in increased taxes you will be unable to spend on other goods or services. You and your household would have to pay this amount each year.

(IF THE RESPONDENT AGREED TO PAY SOMETHING UNDER THE 5% SCHEME, THEN READ THE FOLLOWING. IF NOT, THEN GO TO SECTION AFTER C-10)

Once again, go down the payment ladder ticking those amounts you are sure you would pay, leaving blank those you are unsure about, and crossing the first amount you wouldn't pay.**(SHOW SECOND PAYMENT LADDER)**

AFTER VALUATION, ASK THE FOLLOWING QUESTION.

C-10. What is the main reason why you chose (RE-STATE RESPONDENTS MAXIMUM AMOUNT) **in particular as your maximum willingness to pay?**

This is the maximum I can afford to pay given my income	1
This is the maximum I am prepared to spend on the environment	2
This is how much I would normally expect to pay in taxes on other environmental goods and services	3
This is how much I would normally expect to pay in taxes on other (non-environmental) goods and services	4
The amount is four times larger than for the first scheme	5
This amount is larger than for the first scheme (but less than four times larger)	6
This was a random choice	7
This would be enough if everyone paid the same amount	8
I could easily afford this amount	9
This is a reasonable amount for this particular issue	10
This scheme is too ambitious / not realistic	11

OTHER..... Don't know 99

THEN GO TO SECTION D

TO READ ONLY TO THOSE WHO ANSWERED NO IN QUESTION C.4

C-10. Now in order to help you answer this question please look at this card on which are written different amounts of money ranging from 0 up to £500. What I would like you to do is to start at the top of the list and ask yourself: 'Would I and my household be prepared to pay 50 pence each year to ensure this program was implemented? Or would I prefer to continue with the current situation rather than paying that amount? If the answer is yes, then I would like you to place a TICK ( ) in the space next to that amount. Then, proceed down the payment ladder placing a tick next to each amount that you are almost CERTAIN you would pay. (GIVE RESPONDENT A PEN).

Please don't agree to pay an amount if you think you can't afford it or if you feel that there are more important things for you to spend your money on, or if you are not sure about being prepared to pay or not.

When you reach an amount that you are not sure of paying then simply leave it BLANK.

When you reach an amount that you are almost certain that you would not pay, then place a CROSS (×) next to the amount and STOP.

INTERVIEWER: EITHER YOURSELF OR THE RESPONDENT TICK THE AMOUNTS THE RESPONDENT IS CERTAIN THEY WOULD BE PREPARED TO PAY, AND CROSS THE AMOUNT THE RESPONDENT IS CERTAIN THEY WOULD NOT PAY.

Remember you may revise your decision at any time during this interview. Please tell me if you wish to do so.

AFTER VALUATION, ASK THE FOLLOWING QUESTION.

C.11 What is the main reason why you chose (RE-STATE RESPONDENTS MAXIMUM AMOUNT) **in particular as your maximum willingness to pay?**

Not to be shown to the interviewee

This is the maximum I can afford to pay given my income	1
This is the maximum I am prepared to spend on the environment	2
This is how much I would normally expect to pay in taxes on other environmental goods and services	3
This is how much I would normally expect to pay in taxes on other (non-environmental) goods and services	4
This was a random choice	5
This would be enough if everyone paid the same amount	6
I could easily afford this amount	7
This is a reasonable amount for this particular issue	8

OTHER..... Don't know 99

SECTION D: OPINIONS AND BELIEFS

I am now going to read out a number of statements about these proposals. Please use the scale on this card (SHOW 1-5 SCALE, ENSURE THE RESPONDENT CAN SEE THIS FOR ALL THE FOLLOWING QUESTIONS) **to tell me the extent to which you agree or disagree with each of these statements. I would like your immediate response, so please do not spend too much time on any one question.**

INSERT ANSWER CODE FROM THE SCALE: (DON'T KNOW = 9)

D-1. The proposals regarding Brazilian Amazonia are something that particularly interest me?	
D-2. I have <u>previously</u> been interested in Amazonian issues?	
D-3. I feel I am capable of making a decision about the proposals regarding the Brazilian Amazonia?	
D-4. I feel the world-wide public should be widely consulted about proposed changes to the Brazilian Amazonia?	

I am now going to read out a number of statements about the environment. Please use the same scale (SHOW 1-5 SCALE, ENSURE THE RESPONDENT CAN SEE THIS FOR ALL THE FOLLOWING QUESTIONS) **to tell me the extent to which you agree or disagree with each of these statements. I would like your immediate response, so please do not spend too much time on any one question.**

INSERT ANSWER CODE FROM THE SCALE: (DON'T KNOW = 9)

D-5. The environment is very adaptable and will recover from any harm caused by people.	
D-6. With expert management, we can prevent environmental disasters.	
D-7. The environment is very fragile and the slightest human interference will cause a major disaster.	
D-8. No matter what we do, the environment will change in unpredictable ways both for the better and the worse.	
D-9. Claims that current levels of pollution are changing the earth's climate are exaggerated.	
D-10. While some local plants and animals may have been harmed by environmental degradation, over the whole earth there has been little effect.	

SECTION E: SAMPLE CHARACTERISTICS

Finally, I have a few questions about your household circumstances. These are only used for statistical purposes to check whether we have interviewed a representative sample of the local population and all answers are completely confidential.

E-1. Are you:

INSERT ONE NUMBER ONLY:

Single	1
Married/living with someone	2
Divorced/separated	3
Widowed	4

E-2. <u>Including yourself</u>, how many people in your household are:

INSERT ANSWERS:

Over 16 years old	.....
Between 5 and 16 years old	.....
Below 5 years old	.....

E-3. At what level did you complete your education? IF STILL STUDYING: Which best describes the highest level you have obtained up until now?

CIRCLE ONE ANSWER ONLY:

Primary	1
O levels/ GCSE/ CSE/ School Cert./ or equivalent (SCE in Scotland) (Intermediate GNVQ)	2
A levels/ Advanced/ Vocational training (HNC/ HND) (BTEC) or equivalent (SCE H Grade) (Advanced GNVQ)	3
Professional qualification of degree level	4
College/ University/ First degree level	5
Higher degree (MSc, PhD, etc.)	6

E-4. Which of these age groups do you belong to? Please read out code letter.

AGE CARD

<u>Age:</u>		<u>Male</u>	<u>Female</u>	<u>Socio-economic group</u> (RECORD JOB AND SECTOR OF CHIEF WAGE EARNER)
18-24 years	(A)	01	11	
25-34 years	(B)	02	12	
35-44 years	(C)	03	13	Job: _____
45-54 years	(D)	04	14	
55-64 years	(E)	05	15	Sector: _____
65-74 years	(F)	06	16	

E-5. What is your current work status?

INSERT ONE ANSWER ONLY:

Self-employed	1
Employed full-time (30 hours plus per week)	2
Employed part-time (under 30 hours per week)	3
Student	4
Unemployed	5
Looking after the home full-time / housewife	6
Retired	7
Unable to work due to sickness or disability	8

E-6. Do you (or your household) own a car?

CIRCLE ONE ONLY:

Yes	1
No	2

How many cars? .....

E-7. Which daily newspaper do you read most often?

PLEASE STATE ONE ANSWER ONLY:

The Sport	1
The Sun	2
The Star	3
The Mirror	4
The Mail	5
The Express	6
The Independent	7
The Guardian	8
The Telegraph	9
The Times	10
The Financial Times	11
Daily Record	12
Eastern Daily Press	13
Evening News	14
Don't read newspapers	15

OTHER (please state).....

E-8. Looking at this card (SHOW CARD)**, could you tell me which category best describes your total household income each year/week, after deduction of tax?**

CARD: PLEASE STATE THE LETTER ON THE LEFT HAND SIDE WHICH APPLIES:

LETTER	Total Household Income (£)	
	YEARLY	WEEKLY
A	0-4,999	0-96
B	5,000-7,499	96-144
C	7,500-9,999	144-192
D	10,000-14,999	192-288
E	15,000-19,999	288-385
F	20,000-29,999	385-577
G	30,000-39,999	577-769
H	40,000-49,999	769-962
I	50,000+	962+

IF RESPONDENT ANSWERS DON'T KNOW, PLEASE ASK HIM/HER TO GIVE AN ESTIMATE

IF RESPONDENT REFUSES TO ANSWER, PLEASE TELL HIM/HER THAT THE ANSWERS ARE COMPLETELY CONFIDENTIAL AND THAT INCOME IS A VERY IMPORTANT EXPLANATORY FACTOR FOR THE RESEARCHERS

E-9. Last of all, what did you think of this questionnaire, was it: *INTERVIEWER: READ EACH STATEMENT TO RESPONDENT.*

INSERT ONE ANSWER FOR EACH STATEMENT:

	Yes	No
1-Interesting?	1	2
2-Too long?	1	2
3-Difficult to understand?	1	2
4-Educational?	1	2
5-Unrealistic/Not credible?	1	2
6-Other? (please specify):	1	2

THIS IS THE END OF OUR INTERVIEW!!!

THANK YOU VERY MUCH FOR YOUR TIME AND ATTENTION

SECTION F: Interviewer Questions

F-1. How interested did the respondent appear to be during the interview?

CIRCLE ONE ONLY:

Extremely interested	1
Very interested	2
Somewhat interested	3
Slightly interested	4
Not interested at all	5

F-2. Did you enjoy doing this interview?

CIRCLE ONE ONLY:

Extremely enjoyed	1
Enjoyed a lot	2
Somewhat enjoyed	3
Slightly enjoyed	4
Not at all	5

F-3. Please write any other relevant comments about this interview below.

.....

.....

.....

THANK YOU VERY MUCH!!!

Appendix B Differences in 2nd version of the questionnaire

SECTION C(2): VALUATION – WHOLE THEN PART

I would like you to listen carefully to the following information about Brazilian Amazonia. This is the area shown on this map. **(SHOW SOUTH AMERICA MAP)**

SCENARIO

Brazilian Amazonia constitutes over 40% of all the remaining tropical rainforest in the world. As you can see from this map, Brazilian Amazonia covers an area larger than Western Europe. **(SHOW MAP 1)**

The red areas shown in this second map **(SHOW MAP 2)** are the areas of Brazilian Amazonia which have been deforested to date. This is equivalent to an area the size of France.

Nearly 20% of the entire world's plant and animal species can ONLY be found in Amazonia. The UN Biodiversity Convention signed at the Rio Earth Summit in 1992 emphasised the important connection between deforestation and biodiversity loss. As a result of this, specific areas of Brazilian Amazonia have been identified as being particularly important. **(SHOW MAP 4)**

PLAN A - WHOLE

The red areas in this map have been designated as national parks, biological or ecological reserves. They are areas of important biological and cultural diversity. Together, they make up around 20% of Brazilian Amazonia. At present, these reserves exist ON PAPER ONLY. They have not yet been implemented in practice due to a lack of funds.

If implemented, no commercial exploitation such as logging, agriculture, mining, hunting or fishing would be allowed in these areas. The native inhabitants would be allowed to remain, but their lifestyles do not damage the reserves. Other than this, only scientific research and ecotourism would be permitted in these areas.

If this program is not implemented, there is a danger that the Brazilian government will be unable to prevent illegal activities from severely degrading these areas.

I would now like to ask you some questions about your opinions and preferences regarding this issue. There are no 'right' answers, and you may answer 'don't know' to any question if you are unsure. You may also change your answers at any time.

C-1. First of all, in your opinion, how important is it to you that these areas in the Brazilian tropical rainforest, shown in red (SHOW MAP 4 AGAIN)**, should be protected?**

Please give a number from 1 to 5 (SHOW CARD 5) **where 1 is 'not important at all' and 5 is 'very important'.**

CARD 5

1	2	3	4	5
Not important at all				Very important

Don't know 9

Again, please listen to the following information before answering the questions that follow.

If implemented, the Brazilian Institute of the Environment and Natural Renewable Resources would run these parks and reserves. This is a government agency with responsibility for environmental issues and natural resources in Brazil.

The Brazilian government has agreed to finance some of this program. However, given the scale of this project, additional funds would be required for its successful implementation. Since the whole world benefits from the existence of tropical rainforests, richer countries would have to contribute.

C-2. In your opinion, should developed countries help to pay for the costs of preserving tropical rain forests?

1=Yes 0=No 2=Don't know

C-3. If yes, approximately what percentage of the costs of conservation do you believe should be borne by developed countries?

%

If this scheme is to be implemented, payments would have to be made every year to ensure the maintenance of the reserves. In Europe, such funds would be raised by an EU wide tax.

C-4. Would you, in principle, be in favour of paying such a tax if the money raised was used to directly implement the program to protect these areas?

1=Yes 0=No 2=Don't know

If no, go to C-5. If yes or don't know, go to C-6

C-5. What is the main reason or reasons why you would not wish to pay such a tax?
Not to be shown to the interviewee

I cannot afford to pay	1
You cannot put money values on goods such as these	2
Everyone should pay for this not just people in richer countries	3
I object to the idea of paying taxes to Europe	4
Taxes are too high already	5
The government should pay for this	6
Rainforests should be protected by law, we shouldn't have to pay to protect them	7
This is a problem for the Brazilian government	8
The change is too small to be of importance	9
I am satisfied with the existing situation	10
I think this problem is not a priority	11
I do not feel that this issue is important	12
I do not trust EU	13
I do not trust the British government	14
I need more information/time to answer the question	15

OTHER (please state).....

THEN GO TO PLAN B

C-6. What is the main reason or reasons why you are willing to pay some amount for the proposed change?

Not to be shown to the interviewee

I think the Brazilian rainforest is important	1
I am very concerned about climate change	2
I am very concerned about biodiversity loss	3
I may want to visit the rainforest at some time in the future	4
I get satisfaction from giving to a good cause	5
My answer reflects my views on the need to preserve all rainforests, not just this area	6
I will not really have to pay any extra amount	7
We should improve the environment for the animals/plants concerned	8
We should improve the environment for future generations	9
In order to preserve the genetic diversity	10
We should improve the environment for other people to enjoy	11
Richer countries have a responsibility / moral duty to help	12
I would receive some personal benefit from paying	13

OTHER (please state).....

C-7. I would now like you to consider what is the most that you and your household would be willing to pay in increased taxes to ensure that the areas shown in red in this map (SHOW MAP 4 AGAIN) **become permanently designated as national parks and reserves; and are thereby preserved in their natural state. In answering please bear in mind that any money you pay in increased taxes you will be unable to spend on other goods or services. You and your household would have to pay this amount each year.**

(SHOW FIRST PAYMENT LADDER)

Now in order to help you answer this question please look at this card, on which are written different amounts of money ranging from 0 up to £500. What I would like you to do is to start at the top of the list and ask yourself: 'Would I and my household be prepared to pay 50 pence each year to ensure this program was implemented? Or would I prefer to continue with the current situation rather than paying that amount? If the answer is yes, then I would like you to place a TICK ( ) in the space next to that amount. Then, proceed down the payment ladder placing a tick next to each amount that you are <u>almost CERTAIN you would pay</u>. (GIVE RESPONDENT A PEN).

<u>Please don't agree to pay an amount if you think you can't afford it or if you feel that there are more important things for you to spend your money on, or if you are not sure about being prepared to pay or not.</u>

When you reach an amount that you are not <u>sure</u> of paying then simply leave it BLANK.

When you reach an amount that you are <u>almost certain that you would not pay</u>, then place a CROSS ( ) next to the amount and STOP.

INTERVIEWER: EITHER YOURSELF OR THE RESPONDENT TICK THE AMOUNTS THE RESPONDENT IS <u>CERTAIN THEY WOULD BE PREPARED TO PAY,</u> AND CROSS THE AMOUNT THE RESPONDENT IS CERTAIN THEY WOULD <u>NOT PAY.</u>

Remember you may revise your decision at any time during this interview. Please tell me if you wish to do so.

AFTER VALUATION, ASK THE FOLLOWING QUESTION.

C.8 What is the main reason why you chose (RE-STATE RESPONDENTS MAXIMUM AMOUNT) **in particular as your maximum willingness to pay?**

Not to be shown to the interviewee

This is the maximum I can afford to pay given my income	1
This is the maximum I am prepared to spend on the environment	2
This is how much I would normally expect to pay in taxes on other environmental goods and services	3
This is how much I would normally expect to pay in taxes on other (non-environmental) goods and services	4
This was a random choice	5
This would be enough if everyone paid the same amount	6

OTHER..... Don't know 99

PLAN B - PART

Now please look at this map. **(SHOW MAP 3)**
This map shows a different, less ambitious program, in which the dark green areas would be designated as national parks and reserves. Altogether, these areas constitute around 5% of Brazilian Amazonia.
If this scheme were implemented, no commercial exploitation such as logging, agriculture, mining, hunting or fishing would be allowed in these reserves. The native inhabitants would be allowed to remain, but their lifestyles would not damage the reserves. Other than this, only scientific research and ecotourism would be permitted in these reserves.
If this program is not implemented, there is a danger that the Brazilian government will be unable to prevent illegal activities from severely degrading these areas.
C-9. I would now like you to consider what is the most that you and your household would be willing to pay in increased taxes to ensure that the areas shown in dark green in this map **(SHOW MAP 3 AGAIN)** become permanently designated as national parks and reserves; and are thereby preserved in their natural state. In answering please bear in mind that any money you pay in increased taxes you will be unable to spend on other goods or services. You and your household would have to pay this amount each year.

(IF THE RESPONDENT AGREED TO PAY SOMETHING UNDER THE 20% SCHEME, THEN READ THE FOLLOWING. IF NOT, THEN GO TO SECTION AFTER C-10)

Once again, go down the payment ladder ticking those amounts you are sure you would pay, leaving blank those you are unsure about, and crossing the first amount you wouldn't pay. **(SHOW SECOND PAYMENT LADDER)**

AFTER VALUATION, ASK THE FOLLOWING QUESTION.

C-10. What is the main reason why you chose (RE-STATE RESPONDENTS MAXIMUM AMOUNT) **in particular as your maximum willingness to pay?**

This is the maximum I can afford to pay given my income	1
This is the maximum I am prepared to spend on the environment	2
This is how much I would normally expect to pay in taxes on other environmental goods and services	3
This is how much I would normally expect to pay in taxes on other (non-	4

environmental) goods and services	
The amount is four times smaller than for the first scheme	5
This amount is smaller than for the first scheme (but less than four times smaller)	6
This was a random choice	7
This would be enough if everyone paid the same amount	8
This would still require substantial funds	10

OTHER..... Don't know 99

THEN GO TO SECTION D

TO READ ONLY TO THOSE WHO ANSWERED NO IN QUESTION C.4

C-10. Now in order to help you answer this question please look at this card on which are written different amounts of money ranging from 0 up to £500. What I would like you to do is to start at the top of the list and ask yourself: 'Would I and my household be prepared to pay 50 pence each year to ensure this program was implemented? Or would I prefer to continue with the current situation rather than paying that amount? If the answer is yes, then I would like you to place a TICK ( ) in the space next to that amount. Then, proceed down the payment ladder placing a tick next to each amount that you are almost CERTAIN you would pay. **(GIVE RESPONDENT A PEN).**

Please don't agree to pay an amount if you think you can't afford it or if you feel that there are more important things for you to spend your money on, or if you are not sure about being prepared to pay or not.

When you reach an amount that you are not sure of paying then simply leave it BLANK.
When you reach an amount that you are almost certain that you would not pay, then place a CROSS (×) next to the amount and STOP.

INTERVIEWER: EITHER YOURSELF OR THE RESPONDENT TICK THE AMOUNTS THE RESPONDENT IS CERTAIN THEY WOULD BE PREPARED TO PAY, AND CROSS THE AMOUNT THE RESPONDENT IS CERTAIN THEY WOULD NOT PAY.
Remember you may revise your decision at any time during this interview. Please tell me if you wish to do so.

AFTER VALUATION, ASK THE FOLLOWING QUESTION.

C.11 What is the main reason why you chose (RE-STATE RESPONDENTS MAXIMUM AMOUNT) **in particular as your maximum willingness to pay?**

Not to be shown to the interviewee

This is the maximum I can afford to pay given my income	1
This is the maximum I am prepared to spend on the environment	2
This is how much I would normally expect to pay in taxes on other environmental goods and services	3
This is how much I would normally expect to pay in taxes on other (non-environmental) goods and services	4
This was a random choice	5
This would be enough if everyone paid the same amount	6

OTHER..... Don't know 99