CHOICE EXPERIMENTS AND NON USE VALUES

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Abstract

Altruism is a type of non-use value which can have different definitions depending on the type of goods entering the utility function of the altruistic person and her expectations about the contributions of others. The purpose of this paper is to measure the trade-offs between different types of altruistic values originating from social and environmental policies. The environmental policies are concerned with reducing the health effects from a power plant while the social policies invove both the accomplishent of public facilities for education and leisure and increasing the income of the affected population. The empirical application utilizes a choice experiment technique which allows for valuation of multiple goods. Health effects are decomposed into the values of the risk of becoming ill, the duration of the episodes and the limitations imposed by illness. Altruistic values are elicited from a population that is not affected by pollution. Results show that altruism is significant for policies directed to reducing health effects and improving the income level of the affected population, whereas there is egoism for a policy orientated to improving the public facilities of the polluted suburb. The value of altruism is significantly affected by the expectations about the net benefits to be received by the recepient population.

Keywords: Altruism, Choice Experiments, Health Effects, Pollution, Valuation.
JEL: Q49, Q25

Introducción

Environmental policies provide benefits to society which have to be considered in order to undertake efficient measures. Altruism can explain some of these benefits and therefore the amount people are willing to pay for policy actions. The value of altruism is the result of people being concern for the welfare of others. There are several types of altruism based on the type of good which enters the utility function of the individual, as outlined by Andreoni (1990) and Johansson (1995). Altruism is said to be paternalistic if the individual is concerned with other individuals' income or with some other commodity to be consumed by others, for instance, health. Pure altruism occurs when the individual is concerned only with the levels of utility of other individuals, irrespective of how these levels are attained. Bergstrom (1992) and Jones-Lee (1991, 1992) showed that pure altruism is not relevant for cost-benefit analysis and its inclusion would lead to double counting.

The types of altruism also imply some assumptions about how the rest of society would behave with regard to the public good or environmental policy. Paternalistic altruism assumes that the rest of individuals in society are also contributors to the public good (Johanson (1994)). However, pure altruism involves the assumption that the rest of individuals in society would not contribute to the public good, while impure altruism assumes that the individual also cares for the amount privately given to the public good (Andreoni (1990)). On the other hand, Johannesson et al. (1995) argued that the value of altruism could depend on the expectations about the net benefits that the receipent population would receive from the policy option. Empirical evidence on the value of altruism is provided by Viscusi et al. (1988) for the health risks from hazardous substances, and by Johannesson et al. (1995) for the value of safety.

Since altruism is a type of non-use value, its evaluation requires non-market valuation methods which do not rely on observed market transactions. This paper contributes to the investigation on the different types of paternalistic altruism by utilizing a multiple valuation approach based on the stated preference method of contingent choice or choice experiment. Past research on the value of altruism have predominantly used straightforward contingent valuation methods which are limited to value complex situations and public goods involving multiple attributes. Choice experiments consists of putting subjects in the situation of choosing among alternative policy options with different attribute levels. This technique is suitable to disentangle different types of altruism with regard to the environmental policy and the benefits to be received by the relevant population. Our experiment allows us to jointly evaluate policies towards reducing environmental health effects and alternative policies directed to increasing income and public facilities.

The application focuses on the health effects caused by the emissions from a large power plant. The economic benefits of policy measures for reducing pollution could be relevant not only to the affected population but also to other people who are not subject to its adverse effects. This issue is empirically investigated by eliciting the values placed by an urban population that is not received air emissions. The results show that altruistic values are relevant and significantly different from zero, and involve not only a concern for health effects but also for the income level of the affected population.

Data sources

The study of altruistic values is based on data obtained with a choice experiment survey in Las Palmas de Gran Canaria (Spain) in 2001. This is the largest city in the island of Gran Canaria with a population of 540.000 inhabitants. The city is the largest consumer of electricity in the island, which is provided by a large power plant based on fuel and gas consumption. Because of the direction of the winds, the particulates and other emissions of the power plant are drawn towards Jinamar, a nearby suburb which is about 7 km. south of Las Palmas and partially belongs to another large municipality. This is a marginal suburb with important social problems and an average low income level.

The policy proposal to be investigated consisted of specific measures to reduce the health effects from pollution caused by the power plant. These measures involved the installation of filters for the reduction of emissions of particulates and other gases causing negative health effects. The objective was to reduce the probability of becoming ill or having some episode of respiratory illness. Two focus groups with individuals from the objective population were conducted which allowed us to specify the relevant attributes, their levels, the payment vehicle, the relevant policy option, and the effectiveness of the communication devices.

The pollution problem was also studied by consulting a group of experts (doctors, health authorities and social workers) with the aim of obtaining qualitative and quantitative assessments of health effects. Other quantitative data were also obtained from available reports on the area. These studies concluded that pollution levels use to exceed regulatory limits in the polluted area, and that respiratory illnesses were more prevalent than in other areas.

As a result of discussions in focus groups and expert opinion, the health effects were reduced to three basic dimensions. These constitute the attributes which were considered relevant from the perception of the affected population. Table 1 presents the specification of the selected attributes and their levels. For the health effects, the attributes selected for the study were the risk of becoming ill or having an episode of respiratory illness, the duration of the episodes and the activity restrictions caused by the episode. Two other attributes were also included in relation to other types of altruism that the objective population could show for policy proposals in the study area. These are the money income supplement and the social policy. The former was intended to raise the income level of the people in the study area, while the latter pretended investment in public facilities for education and leisure.

Table 1. Atributes and levels

ATRIBUTES	LEVELS
RISK	4 of 10 people suffering illness (about 10.000 in Jinamar) 3 of 10 people suffering illness (about 7.500 in Jinamar) 2 of 10 people suffering illness (about 5.000 in Jinamar) 1 of 10 people suffering illness (about 2.500 in Jinamar)
DURATION	One week Three days One day
RESTRICTIONS	Severe (the subject can't carry out any activity) Medium (the subject can carry out some activities) Light (the subject can carry out the usual activities)
INCOME SUPPLEMENT	No Yes
SOCIAL POLICY	No Yes
COST	5.000 ptas. 10.000 ptas. 15.000 ptas. 20.000 ptas.

[(J)] *Atributos presentados en el cuestionario de Jinamar.*
[(L)] *Atributos presentados en el cuestionario de Las Palmas.*

The group of five attributes defining the policy options was complemented by a sixth attribute specifying its total cost. This is the amount the subject would have to pay if the policy option was carried out based on the definition and particular levels of the rest of attributes. Because the negative perception of income taxes, the payment vehicle was defined as an annual contribution to a specific fund for financing both the health and social policies considered in the option. The levels of this attribute were obtained from the analysis of the responses to the pre-test data of an open-ended WTP question for the alternative policy options, and tested in focus groups. In order to reduce protest responses because of the possible opinion that the firms causing pollution should be made responsible for its costs, it was stated that costs would be equally shared by the firms and the population of Gran Canaria if the policy option was passed.

Particular attention was given to the specification of the scenario for the pollution problem and the context of altruism, as well as the effectiveness of the communication devices. The

Appendix presents the wordings of the valuation scenario and an example of a choice card utilized in the study. Each of the attributes and levels were described both verbally and with the aid of color diagrams before the full choice card with policy options were put to the subject. Each choice card consisted of three alternatives. Two of them were policy options defined by a particular combination of the levels of the six attributes. The last option was the status quo, which was defined as a 40\% risk of becoming ill, one week duration, severe restrictions of activity, zero cost and none of the social or income policies. The risk reduction levels were communicated by icons describing the relative number of people affected in a scale of one to ten. These illustrative devices were proved in focus groups and pre-test studies to be effective in communicating risk changes.

The attributes considered in this study and their levels lead to 32×42×22=574 potential combinations. Since it is not cognitively feasible for the subject to compare all these options there is need to scale down the number of alternatives. The set of policy options for the choice experiment was obtained by a D-optimal design (Huber and Zwerina (1996)) obtained from the full factorial with restrictions. This method is based on the maximization of the information matrix for the least square estimators of the parameter vector for the attributes set. The result is a reduced number of orthogonal profiles or policy options from the full factorial design, which were randomly combined in groups of two in order to build up the choice sets which are shown to the subject, after adding the status quo option in every set. The D-optimal design led to 20 profiles which were inserted in 10 different blocks or choice sets of pairs of profiles. Each subject received 8 choice sets taken from the optimal design, were one of them was intentionally repeated for consistency testing. In order to distribute the full design across the sample, the choice sets were randomly distributed in three different subsamples.

The questionnaire contained initial questions about the perception of the pollution problem by the subject, its relationship with the health status of the affected population and the social problems of the suburb. The subject was familiarized with health risks by eliciting her perception of the risks implied by several common activities, such as car traveling, smoking, eating food with additives, and breath contaminated air. These questions were followed by the description of the valuation scenario, with the presentation of the attributes, their levels and the questions about the choice sets. Each subject had the options of either choosing the status quo involving no payment for any of the policy options, or answering a “do not know/do not answer" option. Those who chose some of these options were asked for a reason.

For those who agreed to pay for some of the policy options, the study of the different types of altruism was enhanced by asking about their perception of the potential benefits to be received from the affected population in the polluted area. This question was as follows:

Let us consider that the policy measures are carried out, and that all people of Gran Canaria, including those in Jinamar, have to pay a given amount of money, how would you think that the people of Jinamar would value these measures in comparison with what they would have to pay?"

The subject could answer whether she expect the affected population would value more, less or the same as the amount they would be required to pay. For a paternalistic altruist it would be necessary that her expected benefits to others turns out larger than the amount she expects would be required to others for the policy proposal. In order to concentrate on paternalistic altruism, it was also recalled that all the population of the island of Gran Canaria will be required to pay a given amount of money if the policy proposal is passed. Discussions in focus groups indicated that this provision rule reduced possible free riding behaviour and was seen as fair and right.

The questionnaire ended with questions about socioeconomic characteristics and the health status of the subject. The final questionnaire was passed through in-person interviews to 350 individuals taken randomly from the population of Las Palmas de Gran Canaria. The field work was conducted in February 2001. The average time for each interview was about 20 minutes. The interviews were carried out by professional interviews from a survey research firm and trained in the specifics of discrete choice experiments.

Empirical models

The dicrete choice data obtained to measure altruistic preferences can be modeled with the formulation and estimation of random utilty models. Let us consider that there are a number of individuals q=1,...,Q, who are assumed to be utility maximizers and face a number of alternatives j=1,...,J, from the choice set C, given the income constraint. Let x be a vector of market goods with price p_x, and s_j is a vector of of attribute levels of alternative j. Let also y_q be individual's income and p_j the cost of alternative j (i.e. one of the elements of s_j. The problem for the individidual q is to solve the following maximization problem:

$$\max_j U(x, s_j) / s.a. \ p_x x \leq y_q - p_j$$

where U(.) is the utilty function. For each alternative, the indirect utility function $V=V(s_{jq},y_q)$ depends on the levels of the attributes s of alternative j, the socieconomic characteristics of the subject and the income level. However, the researcher does not know for certain function V but a deterministic component v [Thurstone (1927)]. Thus, indirect utility can be written as

$$V(s_{jq}, y_q) = v(s_{jq}, y_q) + \varepsilon_{jq}$$

where ε_{jq} is the random term which can explain, for instance, that identical subjects realize different choices because of unobserved behavioural or intrinsic characteristics. This random compontent accounts for measurement errors and unobserved preferences or attributes, and allows the researcher to conduct inference on indivividuals' preferences (Ben-Akiva and Lerman (1985)).

The subject would choose option i to any j in choice set C if V(i)>V(j), i≠j, i,j0C [McFadden (1984)]. The probability of choosing alternative i is

$$P(i/C) = P \ldots$$

The deterministic component can be expressed as a lineal function of explanatory variables [Laureau and Rae (1985), Smith and Desvousges (1986)]:

$$v_i = \alpha + \beta' s_{iq} + \gamma(y_q - P_i)$$

where " is the specific constant for each alternative, $ is a vector of utility coeffcients associated with the vector s of explanatory variables, γ is the price coefficient of alternative.

There are alternative models for estimating the parameters of the utility function which are based on different assumpitons about the error distribution. The assumption of Gumbel or Type I extreme value distribution leads to multinomial and conditional logit models depending on whether or not indivdiual characteristics are included in the utility function [McFadden (1974); Ben-Akiva and Lerman (1985)]. The probability of choosing alternative i is,

$$\Pr(i/C) = \frac{e^{\mu v_i}}{\sum_{i \in C} e^{\mu v_i}}$$

The scale parameter : is commonly assumed to equal to 1 [Ben-Akiva and Lerman (1985)].

The measure of the monetary benefits from a change in utilility [Hanemann (1984)] is defined as

$$E(DP) = \int^{\infty} F_{\varepsilon}(\Delta v)dP - \int_{-\infty}^{0}[1 - F_{\varepsilon}(\Delta v)dP$$

and the marginal value for a single attribute s_z is

$$DP = \frac{\partial v / \partial s_z}{[illegible]} = \frac{-\beta_z}{[illegible]}$$

where γ_p is the coefficient of the price attribute. The average value of alternative j is

$$DP = \frac{s^j \beta}{[illegible]}$$

The problem with the model outlined above is that it is subject to the property of the independence of irrelevant alternatives (IIA). This means that the ratio of the probability of any two alternatives is indepdent of any other alternative. The implications is that the models cannot account for preference heterogeneity across individuals, and therefore the variance of the random component is constant across the alternatives. This property can be proved by utilizing the test of Hausman and McFadden (1984).The test statisics is:

$$q = [b_u - b_r]' inv[\Omega_r - \Omega_u][b_u - b_r]$$

where u and r refer to the unrestricted model and the restricted model under the assumption that one of the alternatives is not considered respectively, b is a vector of estimated parameters and Ω is the variance-covariance matrix.

In this paper we consider two alternative models which allows us to bypass the IIA assumption. The first is the random parameters logit (RPL) model [Bath (1997), McFadden y Train (1996)]. The indirect utilility function is defined as:

$$V_{jq} = \alpha_{jq} + \varphi_j w_{jq} + \beta_{jq} s_{jq} + \xi_j z_q + \gamma_q (y_q - P_j)$$

where "$_{jq}$ is an alternative specific constant, φ_j is a vector of non-random parameters, $\$_{jq}$ is a vector of random parameters which vary across individuals, with distribution :$_q$, which is specific for each indivdiual. :$_q$ is assumed to be normally distributed with zero mean and unitary variance, and reflects individual unobserved heterogeneity. s_{jq} and w_{jq} are vectors of specific attributes for each alternative and each individual, and z_q is a vector of socio-economic characteristics. A subset of "$_{jq}$ y $\$_{jq}$ is randomly distributed between the individuals, so that for each random parameter, a new random parameter ρ_{kj} is defined as a function of indivdiual's characteristics which do not vary for each choice decision. The functional form for these random parameters can be assumed lognormal. This model allows for correlation between the alternatives [Bath (1997)], breaking down the IIA assumption and it is estimated by simulation of the likelihood function following, Geweke et al. (1994).

An alternative model which relaxes IIA is the extreme value heteroschedastic logit (EVHL) model [Bhat (1995), Hensher et al. (1997)]. This model assumes that the error terms are independent but not identically distributed with zero mean and variance $\pi^2/6\theta_i^2$, i.e.

with v=v($,$s_{iq}$).

The cumulative distribution function for each ε_i is assumed to be extreme value with variance θ_i and scale parameter λ_i=1 θ_i.

If the scale parameters of the random components of the alternatives are the same, then the EVHL becomes the multinomial logit model. The property that EVHL allows for different scale parameters across alternatives bypasses the IIA asumption and is also useful to model individual heterogeneity The error term represents unobserved attributes in each alternative. Thus, the scale parameter is an indicator of the uncertainty associated with expected utility, and provides the relative weight of the observed and unobserved components in the estimation of the choice probability [Louviere et al. (2000)]. The EVHL model is estimated by maximum likelihood.

Results

Each subject answers questions on eight different choice sets, thus there are 2800 potential observations of individual choice available for estimation purposes. Out of the total sample, 40 percent chose the status quo option, i.e. the current situation with no additional policy measures regarding health or social facilities. The proportion of the sample refusing to give an answer to the choice task is 16 percent, which is a reasonable rate if we consider that the environmental problem being questioned does not affect the objective population. The individuals were questioned about their uncertainty when deciding upon every choice task. The responses reveal that 84 percent of the subjects were sure or very sure about their choice. Thus, the choice task seems to be quite clear for the subjects and they were almost certain about their final decision when facing the alternatives.

Table 2 presents the definition of the variables utilized for the specification of the utility function. The attribute variables as well as other binary variables are coded by using code effects instead as conventional dummy variables. This means that the status quo level takes the value of -1 and the other levels are coded accordingly to this value. This way of coding dummy variables is convenient because it reduces correlation with the specific constant, improving estimation results for small samples (Adamowicz et al. (1994)).

Table 2. Variables

VARIABLE	DEFINITION	VALUES
RISK	Decrease in the risk of suffering a respiratory illness due to air pollution, compared with the status quo (s.q =4 of 10 people)	3 = from s.q. to 1 of 10 2 = from s.q. to 2 of 10 1 = from s.q. to 3 of 10 0 = no change
RESTRICTIONS	Decrease in restrictions to carry out daily activities, compared with the status quo (s.q.= severe i.e. the subject can't carry out any activity)	1 = from s.q. to light 0= from s.q. to medium -1 =no change
DURATION	Decrease in the duration of illness, compared with the status quo (s.q. = one week)	1 = from s.q. to 1 day 0 = from s.q. to 3 days -1 =no change
SOCIAL POLICY	Public investment in social policies (education, recreation, etc.) (s.q.=no investement)	-1= no 1= yes
INCOME SUPPLEMENT	Public policy to improve the income of affected population (s.q.=no policy)	-1 = no 1 = yes
COST	Cost of the policies (s.q. = 0)	5.000 ptas.; 10.000 ptas.; 15.000 ptas.;20.000 ptas.
RENTAINF	If the monthly income of the subject is lower or equal than 150.000 ptas	-1 = no 1 = yes
CONTAMIN	If the subject considers that the air quality in Jinamar is bad or very bad.	-1 = no 1 = yes
NIÑOS	If there are children in his/her family (lower than 18 year-old)	-1 = no 1 = yes
INSEG	If the subject states a lowconfidence level in his/her choice (1 or 2 from a scale of 5 points, with 1=very unconfident and 5 very confident)	-1 = no 1 = yes
BNETO	If the subject considers that people in Jinamar obtain a net benefit from the implementation of proposed measures (i.e. benefits higher than their WTP)	-1 = no 1 = yes

The hypothesis of IIA for the multinomial logit model is rejected at the 95 percent level, since the chi-squared statistics for the H-M test after excluding option A from the choice sets takes the value of 15.52, which is larger than the critical value 14.06. Thus, the ratio of any two choice probabilities is not independent from the excluded alternative. Since the ML model does not account for unobserved individual heterogeneity there is need to utilize alternative models which do not rely on the IIA assumption, such as RPL and EVHL as discussed above.

The models for the utility function are estimated with a linear specification for the parameters. The results are presented in Table 3. ASC is the alternative specific constant which takes the value of 1 if the subject chooses some of the policy options and -1 if she takes the status quo. The coefficient for this variable indicates the effects of unobserved attributes on individual's utility. The goodness of fit as measured by the percentage of correct predictions and the R^2 are similar across all models considered. The results are not substantially different between ML and RPL models regarding the signs, significance levels, and magnitude of the estimated coefficients. The standard deviations of the random parameters of the RPL model are not significant, while the scale parameters and the standard deviations of EVHL model are very significant. Thus, the latter model shows a better representation of individual unobserved heterogeneity across the sample.

Table 3. Utility Function.

		ML		RPL		EVHL	
	Variables	Coef.	t	Coef.	t	Coef.	t
Constant	*AEC*	0.0040 (0.1667)	0.024	0.0038 (0.1706)	0.023	0.7562* (0.2148)	3.519
Atributes	*RISK*	0.1737* (0.0313)	5.552	0.1737* (0.0309)	5.609	0.0744* (0.0268)	2.773
	RESTRICTIONS	0.1481* (0.0401)	3.685	0.1481* (0.0413)	3.586	0.0785* (0.0282)	2.780
	DURATION	0.1399* (0.0399)	3.499	0.1399* (0.0410)	3.408	0.0542** (0.0265)	2.041
	SOCIAL POLICY	-0.1303* (0.0396)	-3.290	-0.1303* (0.0395)	-3.300	-0.0620** (0.0251)	-2.462
	INCOME SUPPLEMENT	0.1388* (0.0403)	3.439	0.1388* (0.0403)	3.444	0.0594** (0.0242)	2.455
	COST	-0.00001** (0.000007)	-2.181	-0.00001** (0.000007)	-2.172	-0.000009** (0.000004)	-2.254
Socio-economic variables	*RENTAINF*AEC*	-0.8429* (0.1554)	-5.424	-0.8428* (0.1697)	-4.966	-0.5822* (0.1153)	-5.049
	*INSEG*AEC*	1.1014* (0.0828)	13.303	1.1013* (0.0817)	13.466	0.9317* (0.0847)	10.991
	*BNETO*AEC*	1.0800* (0.0522)	20.696	1.0801* (0.0529)	20.404	0.8201* (0.0562)	14.590
	*CONTAMIN*AEC*	0.2783* (0.0822)	3.383	0.2784* (0.0838)	3.320	0.1997* (0.0677)	2.946
	*NIÑOS*AEC*	0.1338** (0.0615)	2.175	0.1338** (0.0675)	1.983	0.1140** (0.0483)	2.363
Standard deviations of parameter distributions	*sRISK*	-		0.0009 (0.0217)	0.045	-	
	sRESTRICTIONS	-		0.0051 (0.0313)	0.164	-	
	sDURATION	-		0.0016 (0.0314)	0.052	-	
	sSOCIALPOLICY	-		0.0077 (0.0305)	0.252	-	
	sINCOMESUPP	-		0.0098 (0.0327)	0.298	-	
	sCOST	-		0.0000005 (0.000003)	0.146	-	
Scale parameters of HEV dist.	*sA*	-		-		2.3867* (0.7861)	3.036
	sB	-		-		2.7939* (1.0536)	2.652
Standard deviations of HEV dist.	*sA*	-		-		3.0610* (1.0082)	3.036
	sB	-		-		3.5834* (1.3513)	2.652
	Log-ver.	-191715		-1917.04		-1913.99	
	Log-ver. restric.	-2564.16		-2564.16		-2564.16	
	Chi-Squared	-		1294.23		1300.33	
	R^2 adjusted	0.2504		0.2495		0.2513	
	% correct predictions	52.36		52.36		52.48	
	Nº observ.	2334		2334		2334	

Standard values between brackets
p<0,01; **p<0,05;*p<0,10.*

The estimated coefficients can be interpreted as the impact of the variable of interest on individual utility. It can be seen that the selected attributes are all significant with the expected signs. Individual's utility increases with lower risk levels of contracting a respiratory illness due to pollution effects, less activity restrictions and less duration of the episodes, and declines with the amount of money to be paid for the policy proposal. Socioeconomic variables have been introduced interacting with ASC. Income has a positive effect on the probability of choosing a policy option, as expected by theory. In addition, those subjects who live with children under sixteen show larger altruistic values, probably because of their concern and information about the potential health problem. This is also the case for those individuals who think that the quality of air in the affected suburb is bad or very bad. The degree of uncertainty with which individuals answer the choice tasks has also an effect on their preferences for the policy measures.

The results of the estimated models show that the value of altruism is relevant across the sample and can be disentangled into policies to reduce the risk of becoming ill, other health effects and social or income policies. The estimated parameter for the social policy is negative, suggesting that individuals could present egoism for this type of policy, or at least they do not favor the realization of these policies for the well-being of the affected population. However, the estimated parameter for the income policy is positive and significant, revealing that there is paternalistic altruism with respect to income. The relative magnitude of the estimated coefficients indicate that the policy of reducing the risk of becoming ill and the limitations of illness have larger contributions to individual's utility than the income distribution policy.

The results on the hypothesis of altruism are conditioned by the expectations subjects have about the net benefits of the affected population. Table 4 shows the frequency distribution of the expected net benefits across the sample. A large majority of 46 percent considered that the policy proposal would benefit the people in the polluted suburb, with a small minority of 10 percent who said that the population of concern would benefit less than the amount they would be required to pay. A proportion of 17 percent thought that the affected population would experience no net benefits at all. Thus, paternalistic altruism can be negative only for a small proportion of the sample, while it is necessarily positive for the large majority. On average, the coefficient for the net benefits variable in the estimated models is significant and positive, proving that those subjects who expect that the affected population will benefit from the policy proposal are more likely to choose some of the policy options and experience higher utility.

Table 4. Expectations about net benefits

	Frecuency	Percentage
More	161	46
Less	35	10
Equal	62	17,7
DK/DA	92	26,3
Total	350	100

Willingness to pay for a marginal change in some of the attributes is given by the negative of the ratio of the marginal utility of the particular attribute and the marginal utility of income. The former is given by the estimated parameter for the attribute of interest and the latter by the estimated parameter of the cost attribute. This ratio is also the marginal rate of substitution between the attribute and income. The results of the attribute values and their confidence intervals are presented in Table 5. The welfare estimates with the EVHL model are lower and show larger variability across attributes than with the alternative models. They also present substantially lower standard deviation leading to shorter confidence intervals. Since EVHL considers individual and alternative heterogeneity it provides more reliable welfare estimates. The largest value is obtained for reducing the limitations imposed by the illness episodes while the lowest is given for reducing their duration. The income redistribution policy is valued approximately 15 percent less than a marginal reduction in the risk of becoming ill from air pollution.

Table 5. Marginal Value of Attributes

Atributes	ML	RPL	EVHL
RISK	11352,38** (1121, 21583)	11358,82** (1215, 21502)	7918,52* (2204, 13632)
RESTRICTIONS	9676,98** (-11, 19365)	9687,14** (-264, 19639)	8353,30* (2072, 14633)
DURATION	9144,59*** (-1416, 19705)	9143,88*** (-1621, 19908)	5770,08*** (-650, 12191)
INCOME SUPPLEMENT	9073,43** (-335, 18481)	9074,72** (-405, 18555)	6322,82** (897, 11748)

Confidence interval (95%) between brackets.
p<0,01; **p<0,05;*p<0,10.*

Conclusions

Altruistic preferences are relevant for evaluating welfare measures if the individual is concerned with some good affecting the welfare of other individuals. This implies paternalistic altruism as opposed to pure altruism, in which the subject is concerned only with the utility level of others, irrespectively of how it would be attained. In this paper we have investigated the hypothesis of paternalistic altruism by utilizing a choice experiment technique which allows us to consider the relationships between environmental and social policies in forming altruistic preferences. The experiment was concerned with the health effects from pollution by power production. The evidence was obtained from a population that is not negatively affected by the externality problem.

The EVHL model was able to better represent individual heterogeneity and bypass the failure of the IIA hypothesis of the ML model. The estimated models reveal that altruistic values can be explained by disposable income, the uncertainty in the response, the presence of children in the household and the opinion about the quality of air in the affected suburb. The results of the choice experiment shows that altruistic preferences are significant for the reduction of the risk of becoming ill, the duration of the episodes, and the limitations imposed by illness. In addition, a redistribution policy for increasing the income of the affected population is also a source of non-use or altruistic values. This policy was valued less than the risk reduction policy but was comparable to other dimensions of the health effects from pollution. Overall, the sum of the values for the health attributes overcome the value of the income policy by a factor of four. Nevertheless, the redistribution policy is relevant and constitutes a complementary approach to deal with the negative externality and other social problems.

The evidence of altruistic values and preferences does not apply to a social policy of funding infrastructures for education and leisure. This policy presented a significant negative impact on utility, revealing that subjects tend to be egoistic regarding this type of policies. Further research is needed in order to provide more evidence on the nature of altruistic values and the policies for which these values are relevant. This evidence would contribute to determine the extent of the relevant market for environmental and social policies. The evaluation of these policies should take account of non use values such as paternalistic altruism when they are relevant in the population.

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