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ATTITUDES TOWARDS BLOOD AND LIVING ORGAN DONATIONS

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Attitudes towards blood and living organ donations

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Abstract

We model the decision of whether or not to become a blood/living organ donor. The expected utility for becoming a donor is a function of the degree of altruism, the consumption of goods, the costs of donation, the very pleasure of giving, and the recipient's utility associated to donation. Empirically, we observe differences in the expected costs and benefits from donation between blood and non-blood donors, and between individuals with different willingness to donate living organs. Looking at benefits/costs of donation through reasons for donating/not donating, we conclude policies to encourage donation should focus on raising awareness and provide information.

Key words: altruism, uncertainty, blood donations, living organ donations

JEL classification: D6, D8, D9, I1

Introduction

Some countries seem to have reached a ceiling of blood donations due to the ageing of the donor population (Ditto et al., 2003) and to difficulties in filling the gaps left by those who leave. In addition, organ donations are decreasing, due to the reduction in traffic fatalities (Dickert-Collin, Elder and Moore, 2009) and so the number of people on waiting lists for organ transplantation is increasing exponentially (Becker and Elías, 2007). Thus, there is an urgent need to encourage donations and increase the supply of blood and organs (Epstein, 2008) among potential blood and living organ donors. To

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achieve this, the variables that individuals consider to be important in regard to blood and living organ donations need to be determined.

The main focus of this paper is altruism. The best-known definition of altruism is that given by Augusto Comte (1852), who defined altruism as self-sacrifice for the benefit of others. An altruist is an individual who is willing to make a personal sacrifice if the well-being of another individual or even of a whole society is thus improved. Having thus defined altruism, we can say that donations of blood and organs are a clear example of altruistic behaviour.

Altruism, pro-social behaviour, benevolence and reciprocity are forms of behaviour that have been addressed by numerous economists and social scientists. Andreoni (2006), states that charitable giving is motivated out of altruism. Hanson (2000) explores health behaviours considering they are often described in terms of simple altruism, analyzing a model of altruism that fits with genetic inheritance. Bergstrom (2006) defines a donor as benevolent if he/she agrees with the recipient on what is good for him and *vice versa*. Culyer (1980) analyses altruistic behaviour in the health care system and states that different rules emerge in the caring approach depending on whether caring is postulated to relate to a person's absolute level of medical care consumption, to the deviation of their consumption from the mean, or to health itself. Arrow (1963) says that the physicians' behaviour is supposed to be governed by a concern for the customer's welfare, and thus, their objectives are very different from those of a salesman. Fehr and Schmidt (2006) distinguish between social preferences, interdependent preferences and intention-based preferences, all of which represent individuals' concern for other individuals. Other authors such as Bénabou and Tirole (2006, 2007), Seabright (2009), Lacetera and Macis (2008) and Becker and Elías (2007) explore mechanisms of incentives to encourage pro-social activities, defending the idea of a market for blood and organs, in order to refute the idea transmitted by Titmuss (1970) according to whom economic incentives crowd out individuals from those activities that are considered to be voluntary if a reward is offered in compensation.

Even though altruistic behaviour has been studied for a long time, no single reason why individuals behave altruistically has been found. Researchers exploring the attitudes

that lead individuals to become donors of blood or organs agree on the influence of a sense of duty (Wildman and Hollingsworth, 2009), responsibility, love and other psychological rewards (Thorne, 2006). Multiple variables have been explored in the context of blood and living organ donations, with the aim of analysing their importance for individuals: trust in the health-care system (Rando, Blanca and Frutos, 2002), solidarity, family tradition (Goette and Stutzer, 2008), reciprocity (Fehr and Schmidt, 2006; Fong, Bowles and Gintis, 2004) and the benefit perceived by donors when they give blood or an organ for transplantation. However, other variables that may influence willingness to become a blood or living organ donor still need to be considered, as it is necessary to analyse the importance of variables that have already been considered by other researchers.

In this paper, therefore, we explore attitudes towards blood and living organ donations, reasons for donating and the effects expected by individuals from blood and living organ donations. Our main contribution is the study of the relationship between the reasons for donating or not doing so and the effects of blood and living organ donations. Analysing these aspects can indicate which issues need to be emphasised to attract potential donors.

In the following section, we develop an economic decision model, as behavioural economic models can help to disentangle complex individual decision-making processes. We assume that individuals' preferences can be represented with an interdependent utility function with arguments that include the utility that the recipient derives from the donation. An individual with such a utility function derives utility not only from the consumption of certain goods and services, but also from the variations in the recipient's utility as a result of the blood or living organ donation or even the mere fact of donating. However, individuals may also experience some disutility from donation, which could be due to health losses or other negative effects that reduce their well-being. We consider the standard of a rational individual, utility maximiser, who decides to become a donor when the result of donating is an increase in his/her level of utility.

Then, section 3 of this paper presents the empirical work, where we focus on the

questionnaire design and present the statistical analysis. We empirically test whether the arguments in our decision model are different for blood donors (BDs) and non-blood donors (NBDs) for the blood donations case and for individuals with strong willingness with those who are less willing to donate an organ in life. Data were compiled using a questionnaire distributed in May 2010 to the staff at the Public University of Navarre in Pamplona, Spain.

Finally, section 4 contains a discussion in which we comment on the most significant findings of the paper and propose open questions for research. The main conclusions reached are presented in section 5.

2. The Model

An individual ***i*** faces the following decision: to become a blood/living organ donor or not. The individual's preferences are represented by a utility function, which is characterised by non-monotonic preferences and fulfils all the necessary properties to be numerically represented (we assume that preferences are asymmetric, negatively transitive and continuous) and is additively separable into self-interested and other-regarding utilities, based on previous models of altruism presented in the relevant literature such as Becker and Barro (1986), Levine (1998), and others.

For our model, we assume:

• Linearity and additive separability: on the one hand, the self-interested and other-regarding utilities are independent and the weights given by an individual to self-interest and to other-regarding utilities are complementary. The individual's degree of altruism is measured by a parameter, which can take any value in the (0, 1) interval, so that the individual is defined on a continuum from very self-interested to very altruistic, excluding the possibility of pure selfishness/altruism. On the other hand, each function (self-interested and other-regarding) is additive in its arguments. We consider self-

interest as a function of the self-consumption of a set of goods and the expected costs from donation, and consider other-regarding as a function of the pleasure of donating and the expected benefits that the recipient would derive from the donation.

• Temporality: The individual can make a decision at any point of the time-frame during his/her lifetime, so that $t = a, ..., a + L_i$ is the finite time horizon for any individual, where L_i represents the life expectancy of an individual of age a. This implies that an individual can decide to become a donor more than once. We discount utility at a factor (r). The discount rates for the donor and for the recipient are considered to be identical.

Preferences for any individual ***i*** are represented by a utility function $U_{i,}$ that is a mapping U_i: $\Re^4 \rightarrow \Re$ so that:

$$U_i = U_i\left(X_i, H_{i,g}, G_i, U_{-i} \right) \qquad \textbf{(1)}$$

where X_i is a finite set of goods and services available for consumption by the ***i***-individual, $H_{i,G}$ represents the function of expected costs for the ***i***-individual when a blood or a living organ donation is made, G_i represents the donation made by the donor ***i*** to a recipient $-$ ***i*** and $U_{-i,G}$ the utility of the recipient $-$***i*** that is associated with the donation.

In addition, preferences are monotonic in X_i, in G_i, and U_{-i}, but not in $H_{i,G}$. This implies the following marginal effects:

$$\frac{\partial U_i(.)}{\partial X_i} \geq 0; \frac{\partial U_i(.)}{\partial H_{i,G}} \leq 0; \frac{\partial U_i(.)}{\partial G_i} \geq 0; \frac{\partial U_i(.)}{\partial U_{-i,G}(.)} \geq 0 \qquad \textbf{(2)}$$

The inter-temporal utility function proposed for representing donor preferences, is therefore the following:

$$U_{i,t}\left(X_i, H_{i,G}, G_i, U_{-i}\right) = \delta_{i,t} \cdot \pi_{i,t}\left(X_{i,t}, H_{i,t,G}\right) + (1-\delta_{i,t}) \cdot \nu_{i,t}\left(G_{i,t}, U_{-i,t,G}(q_{-i,t}, H_{-i,t,G}), \alpha_{i,t}\right) \quad \textbf{(3)}$$

where:

$\delta_{i,t}$ and $\left(1-\delta_{i,t}\right)$ represent the degree of self-interest and the degree of altruism,

respectively, of an individual ***i***. $\delta_{i,t}$ is a parameter which can take any value in the (0, 1) interval. The degree of altruism of an individual can vary over time.

- $\pi_{i,t}$ and $\nu_{i,t}$ represent the self-interested and the other-regarding utility functions, respectively, of an individual ***i*** at instant ***t***. Under the assumption of additive separability:

$$\pi_{i,t}\left(X_{i,t},H_{i,t,G}\right)=\pi_{i,t}\left(X_{i,t}\right)+\pi_{i,t}\left(H_{i,t,G}\right) \quad \textbf{(4)}$$

$$\nu_{i,t}\left(G_{i,t},U_{-i,t,G}(q_{-i},H_{-i,t,G}),\alpha_{i,t}\right)=\nu_{i,t}\left(G_{i,t}\right)+\nu_{i,t}\left(U_{-i,t,G}(q_{-i,t},H_{-i,t,G}),\alpha_{i,t}\right) \quad \textbf{(5)}$$

• $\pi_{i,t}(X_{i,t})$ is the utility for the individual ***i*** derived from the consumption of a set of goods X_i at the time ***t*** which reports a utility $x_{i,t,G}$ (subscripts ***i, t*** and ***G*** represent the individual, the time period and the donation respectively). We consider that an individual's utility derived from consumption if the donation is made, throughout his/her lifetime, is the sum of the expected utility from consumption at each period of time over the whole time frame:

$$\pi_{i,t}\left(X_{i,t}\right)=\sum_{t=a}^{a+L_i}\frac{x_{i,t,G}}{(1+r)^{t-a}} \qquad \forall X_{i,t}=\sum_{t=a}^{a+L_i}x_{i,t,G} \quad \textbf{(6)}$$

• $\pi_{i,t}(H_{i,t,G})$ represents the disutility derived from the expected health losses associated with donation. This disutility need not consist only of health losses (measured, for example, by the loss of Quality Adjusted Life Years). We assume that other costs could also affect the individual. In general then $H_{i,t,G}$ is the function of all the costs associated with donation, so that disutility over the whole time-frame would be expressed as:

$$\pi_{i,t}\left(H_{i,t}\right)=\sum_{t=a}^{a+L_i}\frac{h_{i,t,G}}{(1+r)^{t-a}} \qquad \forall H_{i,t}=\sum_{t=a}^{a+L_i}h_{i,t,G} \quad \textbf{(7)}$$

- $v_{i,t}(G_{i,t})$ represents the individual's utility derived from the mere fact of donating at time ***t*** if the donation is made. The individual obtains a per-se utility, $G_{i,t}$, the pleasure of donating, which can take only values greater than zero or zero.

$$v_{i,t}(G_{i,t}) = \frac{G_{i,t}}{(1+r)^{t-a}} \qquad \forall G_{i,t} \geq 0 \qquad \textbf{(8)}$$

- $v_{i,t}\left(U_{-i,t,G}(q_{-i,t}, H_{-i,t,G}), \alpha_{i,t}\right)$ represents the utility that the individual ***i*** obtains when the recipient derives a positive utility as a result of donation. This utility depends on the expected gains in the recipient's well-being due to the donation, $H_{-i,t,G}$, and on the probability of success of the donation, $q_{-i,t}$. The utility of the donor derived from the utility of the recipient may be higher or lower depending on how sensitive the donor is to variations in the utility of the recipient, and is measured by a parameter $\alpha_{i,t}$. This parameter could be lower or higher than 1. In the model, we consider that an individual does not give more importance to the utility of the recipient than to his/her own utility and thus consider that $\alpha_{i,t} \leq 1$. This implies that an increase of one unit of utility for the recipient increases the utility of individual ***i*** by the same amount or less. We assume that this utility is positive only when the donation is expected to be successful, $q_{-i,t} > 0$, and the health of the recipient improves as a result of the success of the donation, $H_{-i,t,G} > 0$. The expected value of the utility improvement for the recipient would be the total utility gains over time multiplied by the probability of the donation of being successful.

Then:

$$U_{-i,t} = \sum_{t=a}^{a+L_{-i}} \frac{q_{-i,t} \cdot h_{-i,t,G}}{(1+r)^{t-a}} \ni v_{i,t}\left(U_{-i,t}\left(q_{-i,t}, H_{-i,t,G}\right), \alpha_i\right) = \left(\sum_{t=a}^{a+L_{-i}} \frac{q_{-i,t} \cdot h_{-i,t,G}}{(1+r)^{t-a}} \right)^{\alpha_{i,t}}, \quad \forall H_{-i,t,G} = \sum_{t=a}^{a+L_{-i}} q_{-i,t} \cdot h_{-i,t,G} \quad \textbf{(9)}$$

By linking equations 3 to 9, we derive the following expression for the expected utility

of becoming or not becoming a blood or living organ donor:

$$U_{i,t}(.) = \delta_{i,t} \cdot \left(\sum_{t=a}^{a+L_i} \frac{x_{i,t,g} + h_{i,t,G}}{(1+r)^{t-a}} \right) + (1-\delta_{i,t}) \cdot \left(\frac{G_{i,t}}{(1+r)^{t-a}} + \left(\sum_{t=a}^{a+L_{-i}} \frac{q_{-i,t} \cdot h_{-i,t,G}}{(1+r)^{t-a}} \right)^{\alpha_{i,t}} \right) \quad \textbf{(10)}$$

The individual, a priori neither purely self-interested nor purely altruistic, decides whether to become a donor or not depending on the expected gains and losses associated with the donation. As a rational individual, he/she decides to become a donor when the expected utility of deciding to become a donor is positive. Otherwise, the best decision for the individual would be not to become a donor.

$$U_{i,t}(.) = \delta_{i,t} \cdot \left(\sum_{t=a}^{a+L_i} \frac{x_{i,t,G} + h_{i,t,G}}{(1+r)^{t-a}} \right) + (1-\delta_{i,t}) \cdot \left(\frac{G_{i,t}}{(1+r)^{t-a}} + \left(\sum_{t=a}^{a+L_{-i}} \frac{q_{-i,t} \cdot h_{-i,t,G}}{(1+r)^{t-a}} \right)^{\alpha_{i,t}} \right) \geq 0 \quad \textbf{(11)}$$

From this expression, two solutions to the individual's utility maximisation problem emerge. The individual would decide to become a donor when:

$$\frac{\delta_{i,t}}{(1-\delta_{i,t})} \geq -\frac{\left(\frac{G_{i,t}}{(1+r)^{t-a}} + \left(\sum_{t=a}^{a+L_{-i}} \frac{q_{-i,t} \cdot h_{-i,t,G}}{(1+r)^{t-a}} \right)^{\alpha_{i,t}} \right)}{\left(\sum_{t=a}^{a+L_i} \frac{x_{i,t,g} + h_{i,t,G}}{(1+r)^{t-a}} \right)} \quad \forall \sum_{t=a}^{a+L_i} \frac{x_{i,t,g} + h_{i,t,G}}{(1+r)^{t-a}} \geq 0 \quad \textbf{(12)}$$

$$\frac{\delta_{i,t}}{(1-\delta_{i,t})} < -\frac{\left(\frac{G_{i,t}}{(1+r)^{t-a}} + \left(\sum_{t=a}^{a+L_{-i}} \frac{q_{-i,t} \cdot h_{-i,t,G}}{(1+r)^{t-a}} \right)^{\alpha_{i,t}} \right)}{\left(\sum_{t=a}^{a+L_i} \frac{x_{i,t,G} + h_{i,t,G}}{(1+r)^{t-a}} \right)} \quad \forall \sum_{t=a}^{a+L_i} \frac{x_{i,t,G} + h_{i,t,G}}{(1+r)^{t-a}} < 0 \quad \textbf{(13)}$$

Equation (12) represents the condition that is necessary for the individual to decide to become a donor for positive values of the self-interested utility. Equation (13) represents the condition under which an individual decides to become a donor for negative values of the self-interested utility. The existence of two solutions means that values can be found for which an individual will find that deciding to become a donor is beneficial, because the value of the other-regarding utility offsets the negative value of the self-

interested utility.

An individual may make different decisions at different time periods, depending on changes in costs and benefits over the time-frame, deciding to become a donor if and only if the total expected utility from becoming a donor is positive. Considering an individual who tends towards pure self-interest, $\delta_{i,t} \to 1$, or an individual close to pure altruism, $\delta_{i,t} \to 0$, the difference can be seen in the results that emerge from equation (10).

A highly altruistic individual observes only the per-se utility derived from donation and the value of the gains in utility of the recipient as a result of receiving the donation. When the individual is very altruistic, $\delta_{i,t} \to 0$, whatever the value of the costs associated with the donation, it becomes annulled by the high degree of altruism.

$$\lim_{\delta_{i,t}\to 0} U_i = \left(\frac{G_{i,t}}{(1+r)^{t-a}} + \left(\sum_{t=a}^{a+L_i} \frac{q_{-i,t} \cdot h_{-i,t,G}}{(1+r)^{t-a}} \right)^{\alpha_{i,t}} \right) \qquad \textbf{(14)}$$

A highly self-interested individual ($\delta_{i,t} \to 1$) decides to become a donor when the utility from consumption exceeds the expected health losses, no matter what the value of the expected gains for the recipient or the value of the per-se utility, since it is annulled by the low degree of altruism.

$$\lim_{\delta_{i,t}\to 1} U_i = \left(\sum_{t=a}^{a+L_i} \frac{x_{i,t,G} + h_{i,t,G}}{(1+r)^{t-a}} \right) \qquad \textbf{(15)}$$

According to our model, when the individual is neither purely selfish, nor purely altruistic, the decision to become a donor or not depends not only on how much he/she expects to gain or to lose, but also on the weights given to those gains and losses that help the individual to make a decision, and these weights are the degree of altruism and of self-interest.

3. Empirical work

We explore, in a natural setting, the variables that could influence an individual's decision to donate blood and his/her willingness to donate an organ in life.

Our hypothesis is that there should be differences in the expected values for the costs and benefits of donating between BDs and NBDs, and also between individuals with a stronger willingness to donate an organ in life and individuals with a weaker willingness to donate. Thus, we analyse the reasons for donating or not, and the relationship between these reasons and the expected effects of both kinds of donations, in the belief that such analyses help identify the determinants of the expected benefits and costs.

A questionnaire was designed and distributed among the staff of the Public University of Navarre in May 2010. The questionnaire addresses blood and living organ donations separately, and the questions differ for BDs and NBDs.

For both kinds of donations we explore, first, the reasons for donating/being willing to donate or not; second, the expected effects of the donation and differences between groups; and finally whether the expected effects can be explained by the reasons for donating/being willing to donate or not that are included in the questionnaire.

When individuals make decisions, they quantify their expected benefits and costs. These expected effects are the arguments included in the utility function proposed: the expected costs, the expected per-se benefit and the expected benefit derived from the benefit to the recipient. We analyse the expected effects of a blood donation for blood and non-blood donors, and also for individuals with strong and weak willingness to donate an organ in life as the actual determinants of individuals' decision making. Having information about the reasons for donating or not, and the expected effects of blood and living organ donations, could be helpful not only for a better understanding of individuals' decision making process to become a blood or a living organ donor or not, but also because it could identify the most neglected issues with respect to each kind of donation and therefore the areas where intervention is most needed, and thus help design policies focused on the attraction for potential donors.

In our questionnaire on blood and living organ donations, we include the most

significant reasons and effects referred to by authors such as Titmuss (1970), Andreoni (2006), Goette and Stutzer (2008), Fehr and Schmidt (2006), among others for the case of blood donations, and Rosel et al. (1995), Rando et al. (1995, 2005 and 2007), Hilhorst M. (2004) and Morgan S. et al. (2008) among others, for the case of organ donations. Figure 1 shows the list of items considered in the questionnaire, for blood and living organ donations. Some of the questions differ depending on the context, i.e., blood or living organ donations.

[Insert Figure 1 about here]

3.1. Questionnaire Design

The questionnaire was e-mailed to all potential respondents, 1,414 employees at the Public University of Navarre, and reminders were sent after 1 week, 2 weeks and 1 month.

The questions were different for BDs and NBDs, although there was a common part on living organ donations which was the same for all the respondents. The questionnaire concluded with socio-demographic questions such as gender, age and staff group.

BDs were asked questions concerning why they had decided to become BDs and why they thought other people do not donate. Conversely, NBDs were asked why they were not BDs and why they thought people decided to become BDs.

In most of the questions, the respondents were asked to select their degree of agreement/disagreement with statements concerning blood and living organ donations. A 5- level Likert scale was used, ranging from 1. *Completely Agree* to 4. *Completely Disagree* while the fifth level was reserved for the usual *No Answer* option. Open questions were also included in the questionnaire, specifically for the questions on reasons for donating blood or not.

The questionnaire was written using the *Encuesta Facil*[3] software package, which has the advantage of data collection, with responses being returned directly to an Excel Workbook. This avoids the bias associated with manual data processing[4].

3.2. Data Analysis

We analyze, first, the reasons for donating blood or not, and the concerns about donating an organ in life. Second, we test whether there are differences in the perception of costs, per-se and social benefits *i)* of blood donations between blood and non-blood donors, and *ii)* of living organ donations among all individuals, depending on their willingness to donate an organ in life. Then, we look at the relationship between the effects of and the reasons for both types of donation, separately. The dependent variables in both cases are the expected effects.

These are:

- $COST_i$: represents the expected costs, material or otherwise, or the negative effects on the donor's health, the first of these with respect to blood donations and the second with respect to living organ donations.
- $PER\text{-}SE_i$: represents the perception of a benefit by the mere fact of donating.
- $SOCIALBENEFIT_i$: represents the perception of a benefit because someone's welfare will be improved by receiving the donation.
- $NETBENEFIT_i$: represents the perception of higher benefits than costs of donating.

All of these are dummy variables which, in all the models except one, take the value 1 when the respondent selects level 1, *completely agree*, for the relevant question, and 0 in every other case (the variables are defined in Figure 1). The variables are dummified

[3] www.encuestafacil.com

[4] The questionnaire is available from the authors on request in Spanish (original) and English (revised translation)

by aggregating levels 1 and 2 of agreement when necessary. Table 1 shows the regression models estimated for each of the cases in this study.

[Insert Table 1 about here]

In each of the regression models, the dependent variable is one of the expected effects mentioned above.

Concerning the independent variables:

- *BDi* is a dummy variable that takes the value 1 if the individual is a blood donor and the value 0 if the individual is not a blood donor.
- *WTDi* is a variable that takes the value 1 if the individual would without a doubt donate an organ in life to a relative and 0 in every other case.
- $RNOTDONATING_i$ is a vector of the reasons for not donating (see figure 1). In the case of blood donations, the reasons for not donating are the independent variables, and each of the reasons is a dummy variable taking the value 1 when the individual selects the corresponding reason and 0 in every other case. In the case of living organ donations, the reasons included as independent variables take the value 1 when the individual completely agrees with the reason stated and 0 in every other case alternatively, it takes the value 1 when the individual agrees completely or just agrees and 0 in every other case.
- ε_i is a random variable that represents the error of the estimation.

As logit models, these were estimated by the Maximum Likelihood method, and GRETL 1.8.7 statistical software.

3.3 Results

We focus on the following results obtained from the questionnaire: i) population and response rates; ii) the distribution of BDs and NBDs, controlling for socio-demographic variables (gender, age and staff group); iii) the reasons for donating and not donating blood; iv) concerns about living organ donations and willingness to donate an organ in life to a relative; v) the effects of blood and living organ donations and vi) the relationship between the reasons and the expected effects.

i) Data collection, population and response rates

Table 2 shows information on the total number of questionnaires sent and collected in the study. Out of the 1,414 employees of the Public University of Navarre, 281 questionnaires were collected. This represents 20% of the population. 65% of the employees of the Public University of Navarre are members of the teaching staff, and among our respondents, they constitute 54.81%. The other staff members constitute 34.09% of the population of employees at the university, and 45.19% of our respondents.

[Insert Table 2 about here]

Our margin of error was 5.2% for a 95% confidence level, which is considered acceptable for survey research (Bartlett, Kotrlick and Higgins, 2001).

ii) Distribution of respondents according to gender, age and university staff group

Figure 2 shows the distribution of individuals according to the socio-demographic variables examined. 38% of our respondents were BDs. Of these 47.5% were male, and 43.5% were members of the teaching staff. The mean age of our sample was 41.38 years. 21% of the respondents were aged less than 35 years, and 75% of them were between the ages of 35-55. There were only 13 individuals (4.62%) over the age of 55.

Among the teaching staff, 67 individuals were BDs, equivalent to 43.50% of the total teaching staff, while among the other staff members, the proportion of BDs was lower, with 40 individuals out of 127.

[Insert Figure 2 about here]

iii) Reasons for donating/not donating blood

Table 3 shows the results for the reasons for donating according to BDs. These results show the reasons in order of importance, from the most often cited, *awareness of the need* mentioned by 67.28% of the BDs, to the least cited, *knowing somebody in need* with only 1 individual, less than the 1% of the blood donor population. The values shown in the table show the number of respondents who choose the corresponding reason because this is the most important for him/her to become a blood donor.

[Insert Table 3 about here]

The same analysis but this time with respect to the subgroup of NBDs, is shown in Table 4. According to the NBDs, the most important reasons for not donating blood are health problems (45.40%), fear (17.24%), and not having thought about it (13.21%). For 5.17% of the individuals who do not donate this is because of a lack of awareness. The remaining reasons were very diverse for this sample.

[Insert Table 4 about here]

Table 5 shows the level of agreement on the same reasons for donating (according to the NBDs) and on the reasons for not donating (according to the BDs). The respondents were not asked to choose the most important reason, but rather their level of agreement/disagreement in each case. Thus, we will comment results focusing on the modal value that is the most frequent answer to each question.

The results obtained show that the highest modal value among the reasons for donating blood, according to the NBDs, for level 1, *completely agree*, is that of awareness of the need, with 43.67% of individuals. For level 2, *some agreement*, the highest modal value was conversation with family or friends (56.89%). On the contrary, these respondents disagree about the importance of blood donor campaigns in a person deciding to become a blood donor, with 15.51% of respondents selecting level 3, *some disagreement*, and 7.47% level 4, *completely disagree*.

The BDs agree that a NBD may not have thought about donating before. The highest modal value observed is in level 2, *some agreement*, selected by 46.72% of the respondents. Fear of donating was another influential factor according to the NBDs, and for the BDs, the highest modal value (51.4%) is on level 2, *some agreement*. Not being aware of the need for blood donations to cover the demand for blood was selected by 41.12% of the respondents; in this case the highest modal value is for level 1, *completely agree*. The health reasons factor was selected in level 2 by 40.18% of the respondents. However, 35.5% completely disagreed that mistrust of the Health Care System (HCS) could be a reason why people do not donate. Moreover, 29% of individuals disagreed that the reason for not donating is that blood donations are not rewarded.

[Insert Table 5 about here]

iv) Willingness to donate an organ in life and concerns about a living organ donation

Table 6 shows how the individuals are distributed among the different levels of willingness to donate. Most respondents (58.71%) report complete agreement with donating an organ in life to a relative if the case arises. Of the remaining respondents, 31.67% report some agreement, and only 8% of the respondents disagree or do not answer this question. No important differences were observed between BDs and NBDs. Our respondents were mainly in levels 1 and 2, being in complete agreement or in some agreement with respect to willingness to donate an organ in life to a relative.

[Insert Table 6 about here]

Table 7 shows the results for individuals' concerns about living organ donations. The majority completely agree or are in some agreement with each of the questions posed. 35.51% of the respondents believe that information about living organ donations is incomplete, while 43.77% agree completely they are aware of the complexity of the living organ donation procedure. Concerning the positive aspects, 44.12% of the respondents agree completely that they feel healthy enough to become a living organ donor, while 50.88% completely agree that they trust the health care system (HCS).

[Insert Table 7 about here]

v) Effects of blood and living organ donations

Table 8 shows the results from the *logit* models for the two kinds of donations considered in our questionnaire: blood and living organ donations. Concerning blood donations, significant differences were detected between BDs and NBDs in the perceptions of costs, social benefits and net benefits associated with donation, but not between them on the perception of a per-se benefit. The BDs were less likely to agree completely that there are costs, material or otherwise, associated with a blood donation ($\hat{\beta}_1^{COST} = -0.775$). The difference between BDs and NBDs is significant at a 90% confidence level when we take into consideration only level 1 of agreement, but it is not significant when levels 1 and 2 are aggregated. The BDs were less likely to agree completely on the perception of a social benefit associated with donation, and the difference between BDs and NBDs is significant ($\hat{\beta}_1^{SOCIALBENEFIT} = -0.495$). No differences in the perception of a per-se benefit were found between blood and non-blood donors, but the results show that the BDs are less likely to agree completely on the perception of a per-se benefit ($\hat{\beta}_1^{PER-SE} = -0.156$). Concerning the net benefit, the BDs

are significantly more likely to agree completely on the perception that the benefits of a blood donation outweigh its costs.

The results referring to living organ donations show that there are significant differences between individuals with a high willingness to donate (WTD) and those with a low WTD with respect to the perception of costs, per-se, social and net benefits. Those individuals who completely agree on donating an organ in life are less likely to agree completely on the perception of costs associated with a living organ donation ($\hat{\gamma}_1^{COST} = -0.445$), and the difference between this group and the other individuals who have doubts about donating is statistically significant. In addition, individuals who are completely willing to donate an organ in life are significantly more likely to agree on the perception of per-se, social and net benefits ($\hat{\gamma}_1^{PER-SE} = 0.95, \hat{\gamma}_1^{SOCIALBENEFIT} = 1.315, \hat{\gamma}_1^{NETBENEFIT} = 1.412$).

[Insert Table 8 about here]

vi) Relationship between reasons and expected effects

Table 9 shows the results of regression logit models to account for each of the effects of blood donations.

On considering the estimated models, we observe that awareness of the need and having had conversations with family or friends increases the probability of agreement on the perception of a per-se benefit from blood donations ($\hat{\beta}_1^{AWARENESS} = 0.714, \quad \hat{\beta}_4^{CONVERSATIONS} = 1.871$). The probability of agreement on the perception of a social benefit from blood donations increases the more an individual agrees on being aware of the need ($\hat{\beta}_1^{AWARENES} = 1.060$). Concerning costs, the probability of an individual agreeing on the perception of costs ($\hat{\beta}_1^{LACK\ AWARENESS} = 1.308$) increases for individuals who are not aware of the need for blood donations, and decreases for those individuals who state they do not donate

because of health reasons ($\hat{\beta}_4^{HEALTH} = -0.453$).

[Insert Table 9 about here]

Table 10 shows the results of the regression logit models for estimating the effects of donating an organ in life. The independent variables are the reasons why individuals may or may not have doubts about donating. We observe that individuals who agree that information about living organ donations is incomplete are more likely to agree on the perception of costs from a living organ donation. This coefficient is significant at a 99% confidence level. For those individuals who state that they trust the health care system, the probability of perceiving a per-se benefit increases significantly. Finally, the probability of agreement on the perception of a social benefit increases significantly for individuals who agree on feeling healthy enough to donate an organ in life.

[Insert Table 10 about here]

4. Discussion

We have developed a utility maximisation model on attitudes towards blood and living organ donations. In our model, an individual will decide to become a donor if the expected utility of being a donor exceeds that of not becoming a donor. The importance of the perceived benefits and costs of donating is affected by the degree of self-interest, $\delta_{i,t}$, which differs from one individual to another and which could vary over time. Thus, individuals might expect higher benefits than costs from donating but yet decide not to become BDs because their degree of altruism is not high enough to compensate ($\delta_{i,t} \to 1$). Conversely, an individual can expect higher costs than benefits, but can also have a degree of altruism high enough to compensate the costs of the donation.

We assume separability on the arguments of the utility function, but this assumption could be lifted. The utility function is inter-temporal and all the variables are discounted at a fixed rate. We also assume that if an individual decides not to become a

donor he/she is automatically not concerned about the recipients' well-being, failing to take into account the gains in utility for the donor from improvements in the recipients' well-being as a consequence of a donation from another person. Consideration of a positive other-regarding utility for the individual even if he/she decides not to donate is a possible extension of our model. The model considers that a positive attitude towards donation does not imply an actual donation, as we incorporate uncertainty in the possibilities of becoming a donor. In some cases, a potential donor is rejected on grounds of health, tissue incompatibilities or other reasons such as regulatory constraints. A typical example is bone marrow, where tissue compatibility is a hindrance to donation for most donors.

We set out to describe decision making by individuals concerning blood and living organ donations, in the awareness that there are major differences between the two types of donations. While it is possible to give blood several times during the donor's lifetime, a kidney or a liver can only be donated once. A living organ donor in general becomes a chronic patient in need of regular medical monitoring, which may be seen by individuals as a negative effect on the donor's quality of life. As a consequence the two types of donations are addressed separately in the questionnaire.

The questionnaire has contributed to identifying the reasons for donating (or not) and the relationship between these reasons and the individuals' expected effects of blood and living organ donations for a selected population.

Concerning reasons for donating or not donating blood, our results show that the most important reason for deciding to become a donor is awareness of the need for BDs to cover the demand for blood. According to the NBDs, the most important reasons for not donating are health problems, fear, and not having thought about it.

These results suggest where the expected benefits and costs of a donation come from. In this sense, we analyse the expected benefits and costs of blood and living organ donations. With this information, we study the differences on the one hand, between BDs and NBDs and on the other hand between individuals with a strong and a weak willingness to donate an organ in life. Results show that the BDs are less likely to perceive the costs of a blood donation, while they perceive per-se benefit and also that

there is a benefit associated with the improved welfare of a recipient. The main difference between BDs and NBDs comes from their respective perceptions of costs. Indeed, the per-se and social benefits perceived by BDs are lower than those perceived by the NBDs, and this difference is statistically significant. In addition, concerning the expected net benefit of a blood donation, there is a significant difference between BDs and NBDs. As a result, it is concluded that the determinants of the decision to become a BD are the costs, perceived to be higher by NBDs than by BDs, and the degree of altruism, which may be very low for NBDs.

There was seen to be a significant difference between the respondents with a stronger WTD an organ in life and those with a weaker WTD, as regards the perception of costs and per-se and social benefits. Those having complete WTD are less likely to perceive costs of living organ donations, in the understanding of such costs as negative effects on the donors' health, but they are more likely to perceive per-se, social and net benefits.

Concerning the relationship between reasons and effects, with respect to blood donations, the perception of costs is higher for individuals with a lack of awareness of the need, and lower for individuals with health problems. Conversely, the benefits associated with donation are a result of individuals' awareness of the necessity of blood donations to cover the demand for blood; indeed, this is the reason most widely cited by BDs for donating blood. In addition, when BDs were asked why people do not donate, a high percentage agreed that fear and health reasons are important reasons for not donating blood. However, a high proportion of BDs also feel that NBDs are free-riders, i.e. individuals who do not donate because others do.

Concerning living organ donations, most respondents were concerned about the question of information, which is considered to be incomplete. When we explored the relationship with the perception of costs, this variable is in fact partially accounted for by the expectation of the costs of living organ donations. The majority of individuals feel healthy enough to donate an organ in life, and trust the health care system, and these are explanatory variables of the per-se and social benefits.

These results suggests that policies should be oriented toward providing information on blood and living organ donations, making individuals aware of the need, and also toward reducing the fears and concerns that any individual may have.

5. Conclusions

We developed an economic model to examine the decision individuals make as to whether to become a blood donor or a living organ donor. Our model refers to an individual who is thinking about donating blood or an organ in life. The decision ultimately adopted depends on the expected benefits and costs associated with donation, and also on the individual's degree of altruism. Our questionnaire results show that perceptions of the benefits and costs of donation are not the same for blood donors as for non-blood donors, or between individuals with a strong willingness to donate an organ and those with only weak willingness to donate. In addition, we analyze and detect, for our sample, the reasons for donating blood or not, and the concerns about living organ donations. This information accounts for the perceived benefits and costs of blood and living organ donations.

Thus, we highlight variables that may be significant for the design of policies aimed at increasing the number of donors. Such policies should address the issue of encouraging altruism, reducing the perceived costs of donation, increasing awareness among the population of the need for blood and organs, increasing the benefits of donation, such as the pleasure of donating, and increasing the probability of success of transplants and transfusions.

Future research could be focused on the design of policies aimed at increasing the number of donors. Further research will be focused on finding a mechanism of incentives to attract new donors but which do not result in a loss of active donors, who are dissuaded by incentive policies.

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FIGURES

Fig. 1: Variables influencing the decision to become a blood or a living organ donor

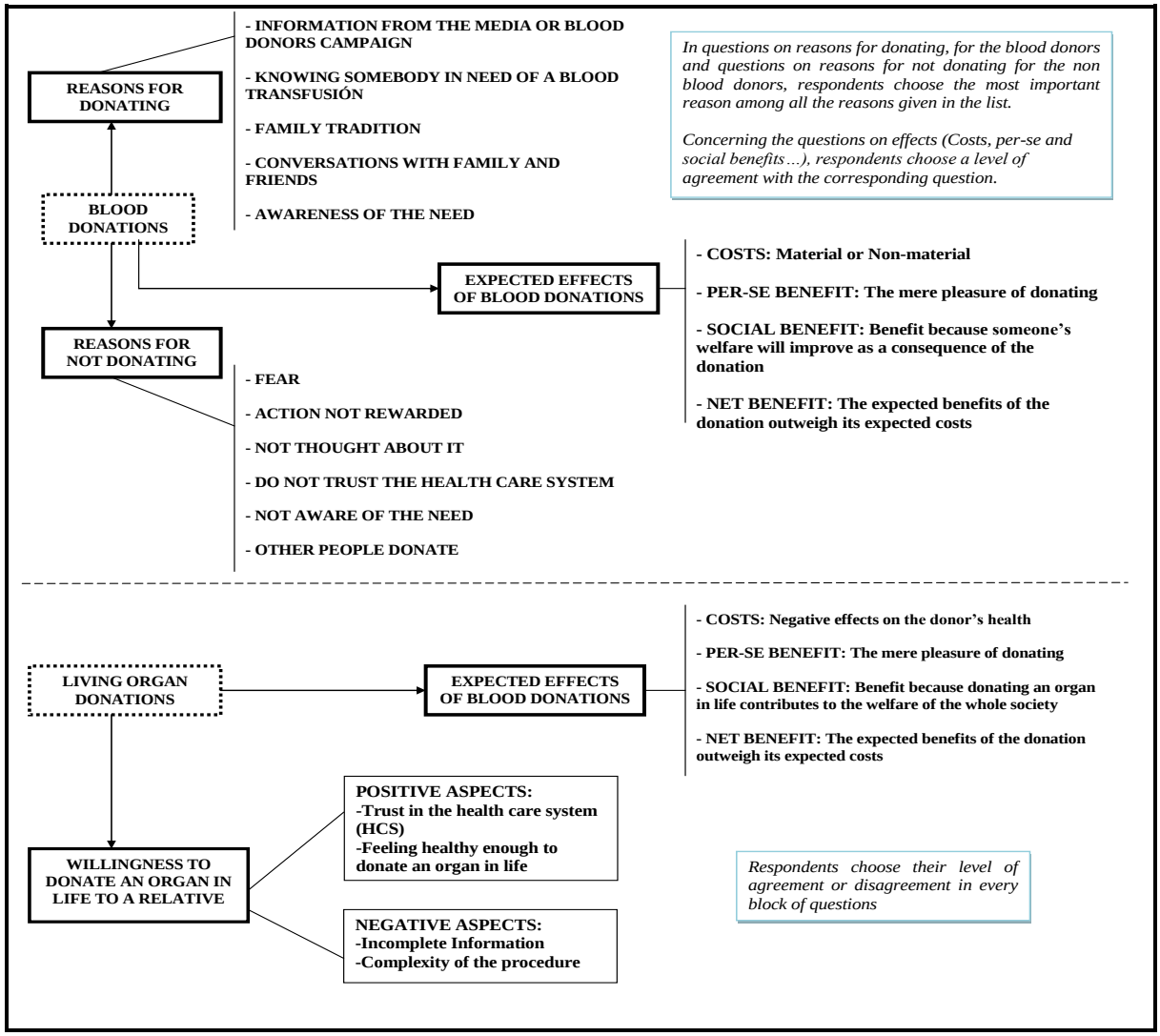
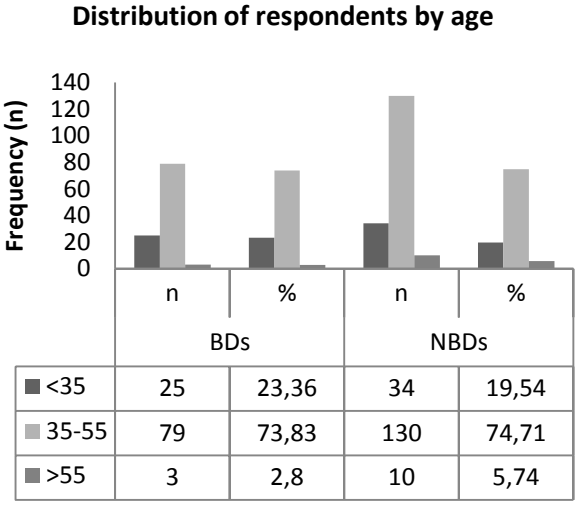
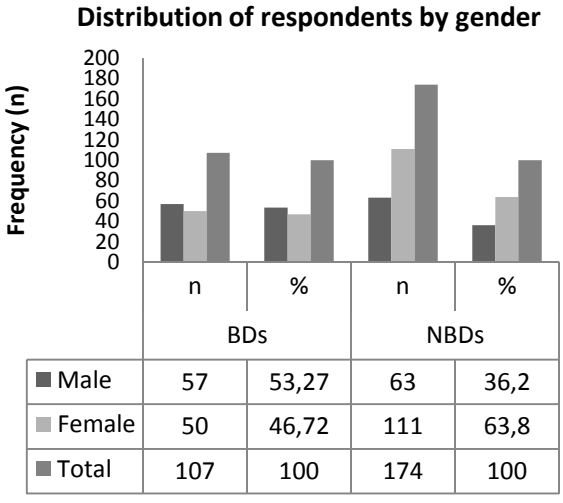


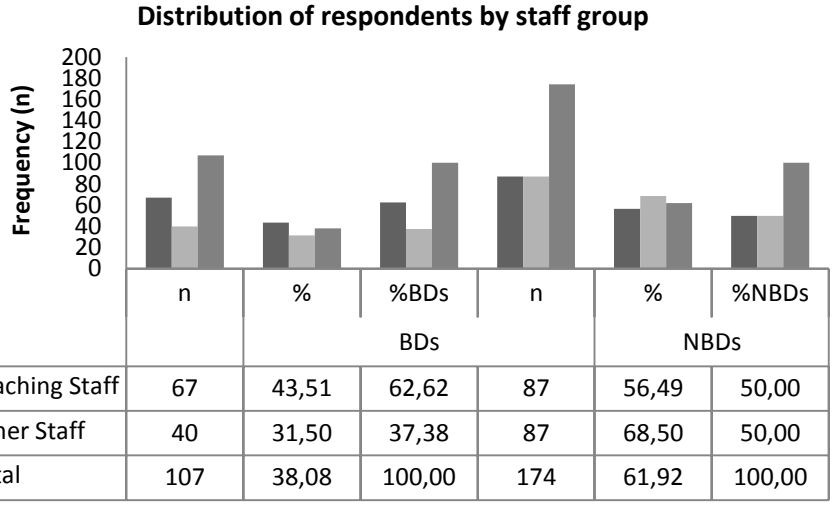
Fig. 2: Distribution of respondents according to gender, age and university staff group



	BDs		NBDs	
	n	%	n	%
<35	25	23,36	34	19,54
35-55	79	73,83	130	74,71
>55	3	2,8	10	5,74



	BDs		NBDs	
	n	%	n	%
Male	57	53,27	63	36,2
Female	50	46,72	111	63,8
Total	107	100	174	100



	BDs			NBDs		
	n	%	%BDs	n	%	%NBDs
Teaching Staff	67	43,51	62,62	87	56,49	50,00
Other Staff	40	31,50	37,38	87	68,50	50,00
Total	107	38,08	100,00	174	61,92	100,00

BDs: **Blood Donors;** ***NBDs:*** **Non-Blood Donors.** *In total there are 107 BDs and 174 NBDs (black columns, first graphic on the left and graphic on the bottom). Most of the respondents are between the range of 33 and 55 years. There are more respondents of the teaching staff than of the other staff, and more women than men.*

Table 1: Regression models

The variable BDi is a dummy variable which takes value 1 when the respondent is a Blood Donor and 0 otherwise. The variable WTDi is a dummy variable which takes value 1 when the individual is completely agree on that he is willing to donate an organ in life, and 0 otherwise. In the second model estimated for Blood Donations we do not include a constant term as the reasons for donating and for not donating are mutually exclusive.

Regression models for Blood Donations	Regression models for Living Organ Donations
1. Differences between BDs and NBDs	***1. Differences between individuals who are completely willing to donate an organ in life and all other individuals***
$P[COSTS_i = 1] = \beta_0 + \beta_1 \cdot BD_i + \varepsilon_i$	$P[COSTS_i = 1] = \gamma_0 + \gamma_1 \cdot WTD_i + \varepsilon_i$
$P[PER-SE_i = 1] = \beta_0 + \beta_1 \cdot BD_i + \varepsilon_i$	$P[PER-SE_i = 1] = \gamma_0 + \gamma_1 \cdot WTD_i + \varepsilon_i$
$P[SOCIALBENEFIT_i = 1] = \beta_0 + \beta_1 \cdot BD_i + \varepsilon_i$	$P[SOCIALBENEFIT_i = 1] = \gamma_0 + \gamma_1 \cdot WTD_i + \varepsilon_i$
$P[NETBENEFIT_i = 1] = \beta_0 + \beta_1 \cdot BD_i + \varepsilon_i$	$P[NETBENEFIT_i = 1] = \gamma_0 + \gamma_1 \cdot WTD_i + \varepsilon_i$
2. Influence of the reasons for donating blood or not on the expected effects	***2. Influence of the reasons for donating or not donating an organ in life on the expected effects***
$P[COSTS_i = 1] = \vec{\beta}_k \cdot RNOTDONATING_i + \varepsilon_i$	$P[COSTS_i = 1] = \gamma_0 + \vec{\gamma}_k \cdot RNOTDONATING_i + \varepsilon_i$
$P[PER-SE_i = 1] = \vec{\beta}_k \cdot RDONATING_{ii} + \varepsilon_i$	$P[PER-SE_i = 1] = \gamma_0 + \vec{\gamma}_k \cdot RDONATING_i + \varepsilon_i$
$P[SOCIALBENEFIT_i = 1] = \vec{\beta}_k \cdot RDONATING_{ii} + \varepsilon_i$	$P[SOCIALBENEFIT_i = 1] = \gamma_0 + \vec{\gamma}_k \cdot RDONATING_i + \varepsilon_i$

Table 2: Population and Response Rates

Column "N" represents the total number of individuals of each staff group who should have received the questionnaire. Column "n" represents the number of questionnaires completed for each group. The response rate in % represents the % of questionnaires that were collected from the total of questionnaires sent.These data correspond to the 2009-2010 academic year.

Group	N	%	n	%	Response Rate in %
Teaching staff	932	65.91	154	54.81	16.52
Other staff	482	34.09	127	45.19	26.34
TOTAL	1,414	100	281	100	19.87

Table 3: Reasons cited by BDs for donating blood

List of reasons	*n*	%
Awareness of the need	72	67.28
Conversations with family/friends	17	15.88
Family tradition	10	9.34
Media (campaign)	6	5.60
Know somebody in need	1	0.93
Other reasons	1	0.93
TOTAL	107	100

Table 4: Reasons for not donating blood, for the NBDs

List of Reasons	***n***	**%**
Health Reasons	79	45.40
Fear	30	17.24
Have not thought about it	23	13.21
Lack of awareness of the need	9	5.17
Others donate	4	2.29
Mistrust of Health Care System	3	1.72
Nothing in exchange	0	0
Other reasons	26	14.94
TOTAL	174	100

Table 5: Reasons for donating, according to NBDs, and reasons for not donating, according to BDs

	Completely Agree		*Some Agreement*		*Some Disagreement*		*Completely Disagree*		*NA*		*Missing Answers*	
Reasons for donating: NBDs (n=174)	***n***	***%***	***n***	***%***	***n***	***%***	***n***	***%***	***n***	***%***	***n***	***%***
Media (campaign)	20	11.49	76	43.67	27	15.51	13	7.47	29	16.66	9	5.17
Know somebody in need	33	18.96	83	47.70	17	9.77	8	4.59	24	13.79	9	5.17
Family Tradition	46	26.43	77	44.25	14	8.04	7	4.02	21	12.06	28	16.09
Conversations with family/friends	24	13.79	99	56.89	11	6.32	5	2.87	24	13.79	11	6.32
Awareness of the need	76	43.67	64	36.78	10	5.74	0	0	17	9.77	7	4.02
Reasons for not onating: BDs (n=107)												
Fear	30	28.03	55	51.40	7	6.54	5	4.67	7	6.54	3	2.80
Not rewarded	6	6	28	26	31	29	27	25	10	9.34	5	4.67
Having not thought about it	41	38.31	50	46.72	7	6.54	0	0	6	6	3	2.80
Don’t trust the Health Care System	4	3.73	15	14.01	37	34.57	38	35.51	8	7.47	5	4.67
Lack of awareness of the need	44	41.12	40	37.38	12	11.21	3	2.80	5	4.67	3	2.80
Others donate	19	17.75	42	39.25	16	14.95	15	14.01	11	10.28	4	3.74
Health Reasons	23	21.49	43	40.18	22	20.56	7	6.54	8	7.47	4	3.74

Table 6: Willingness to donate an organ in life. Frequencies and percentages

	Blood Donors		Non-Blood Donors		TOTAL	
Willingness to Donate	***n***	***%***	***n***	***%***	***n***	***%***
1. Completely agree	60	56.07	105	60.34	165	58.71
2. Some agree	37	34.57	52	29.88	89	31.67
3. Some disagree	1	0.93	1	0.57	2	0.71
4. Completely disagree	0	0	1	0.57	1	0.35
5. NA	8	7.47	12	6.89	20	7.11
Missing answers	1	0.93	3	1.72	4	1.42
Total	107	38	174	62	281	100

Table 7: Concerns about living organ donations

	Completely agree		*Some agreement*		*Some disagreement*		*Completely disagree*		*NA*	
	n	***%***	***n***	***%***	***n***	***%***	***n***	***%***	***n***	***%***
Incomplete information	97	34.51	95	33.80	50	17.79	25	8.89	10	3.55
Complexity of the procedure	123	43.77	86	30.60	20	7.11	4	1.42	45	16.01
Feel healthy enough to donate	124	44.12	107	30.80	19	6.76	13	4.62	14	4.98
Trust the HCS	143	50.88	92	32.74	22	7.82	5	1.77	14	4.98

Table 8: Estimation of regression models for Blood Donations and Living Organ Donations

Each of the columns represents results from the estimation of a different regression model. Results show the coefficients estimated by the Maximum Likelihood method, the standard deviations (in brackets), the p-values and the mean of the dependent variable. Dependent variables take value 1 if the individual chose level 1 (completely agree) and 0 otherwise. $COST^2$ and $NETBENEFIT^2$ take value 1 if the individual chose level 1 or 2(completely agree or some agreement) and 0 otherwise.

	DEPENDENT VARIABLES					
Blood Donations	*COST*	*$COST^2$*	*PER-SE*	*SOCIALBENEFIT*	*NETBENEFIT*	*$NETBENEFIT^2$*
intercept	-1.559***	-0.230	1.059	1.432	-1.471	-0.348
	(0.204)	(0.152)	(0.176)	(0.196)	(0.199)	(0.153)
BD_i	-0.775 *	-0.182	-0.156	-0.495*	0.836***	0.723***
	(0.404)	(0.248)	(0.279)	(0.294)	(0.288)	(0.249)
p-value	*0.055*	*0.463*	*0.576*	*0.092*	*0.003*	*0.003*
Mean Dep. Var	*0.141*	*0.425*	*0.730*	*0.773*	*0.247*	*0.482*
N	*269*	*281*	*271*	*269*	*267*	*281*

Living Organ Donations	*COST*	*PER-SE*	*SOCIALBENEFIT*	*NETBENEFIT*
intercept	0.287	-0.324	-1.720	-1.781
	(0.190)	(0.191)	(0.263)	(0.270)
WTD_i	-0.445 **	0.954***	1.315***	1.142***
	(0.246)	(0.252)	(0.307)	(0.315)
p-value	*0.070*	*0.000*	*0.000*	*0.000*
Mean Dep. Var.	*0.505*	*0.557*	*0.299*	*0.264*
N	*277*	*276*	*277*	*276*

Significant at 10%; **Significant at 5%;*Significant at 1%*

Table 9: Estimation of the relationship between reasons for and effects of blood donations

The dependent variable COST takes the value 1 when the respondent chooses levels 1 or 2 of agreement and 0 in every other case. PER-SE and SOCIALBENEFIT take value 1 if the individual agrees completely (level 1) and 0 otherwise. Results show the values of the coefficients, the standard error (in brackets) and the p-value.

	Blood Donors		**Non-Blood Donors**	
List of reasons	PER-SE	SOCIALBENEFIT	***List of reasons***	COST
Awareness	0.714***	1.060***	Fear	0.133
	(0.254)	(0.273)		(0.366)
	0.005	0.000		0.715
Campaign (media)	1.609	1.609	Lack of awareness	1.308
	(1.095)	(1.095)		(0.804)
	0.141	0.141		0.103
Family tradition	0.693	0.693	Others donate	-1.098
	(0.707)	(0.707)		(0.154)
	0.327	0.327		0.341
Conversations with family/friends	1.871**	0.587	Health reasons	-0.453***
	(0.759)	(0.557)		(0.231)
	0.013	0.292		0.049
			Don't trust the HCS	-0.693
				(1.224)
				0.571
			Haven't thought about it	-0.006
				(0.447)
				0.988
Mean Dep. Var.	*0.730*	*0.773*	*Mean Dep. Var.*	*0.425*
N	*104*	*103*	*N*	*174*

Significant at 10%; **Significant at 5%;*Significant at 1%*

Table 10: Estimation of the relationship between reasons for and effects of living organ donations

Each of the dependent variables (PER-SE, SOCIALBENEFIT and COST) takes the value 1 if the individual agrees completely and 0 in every other case.

Reasons	PER-SE	SOCIALBENEFIT	COST
Constant	-0.174	-1.851***	-0.167
	(0.188)	(0.258)	(0.288)
	0.356	0.000	0.561
Incomplete information			1.954***
	-	-	(0.486)
			0.000
Complexity of the procedure			-0.615
	-	-	(0.449)
			0.170
Healthy enough	0.246	0.987***	
	(0.261)	(0.290)	-
	0.346	0.000	
Trust in the HCS	0.577**	0.818***	
	(0.258)	(0.298)	-
	0.025	0.006	
Mean Dependent variable	*0.556*	*0.293*	*0.563*
R^2	*0.021*	*0.083*	*0.145*

**Significant at 10%; **Significant at 5%; ***Significant at 1%*