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BLOOD DONATION AS A PUBLIC GOOD: AN EMPIRICAL INVESTIGATION OF THE FREE-RIDER PROBLEM

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Abstract

A voluntary blood donation system can be seen as a public good. People can take advantage without contributing, which leads to the so called free-rider problem. An empirical study is undertaken to analyse the extent of free-riding and its determinants in this context. Interviews of the general public in Spain (n=1,211) ask whether respondents are (or have been) regular blood donors; and if not, the reason. Free-riders are defined as those individuals who have no medical reason that disables them to donate blood *and* are not blood donors. We distinguish four different categories of free-riders depending on the reason given for not donating. Binomial and multinomial logit models are specified to estimate the effect of individual characteristics on both the propensity to free-ride and the likelihood to belong to one of the free-rider categories. Model estimates show that amongst those individuals who are able to donate, there is a 67% probability of being a free-rider. The most likely free-rider is female, single, with primary school or no education and who abstained in the 2004 elections. Gender, age, religion practice, political participation, and income of the region of residence are found to be background variables that explain the type of free-rider.

[200wds]

Key words: free rider, blood donation, public good

1. INTRODUCTION

Under a voluntary blood donation system, supply of blood depends on enough individuals giving for no financial reward. However, as Culyer (1973) states, unlike gifts between individuals with an underlying relationship, donating blood for transfusion to strangers is a matter of collective giving, which can be looked at as a public good. As a consequence, there arises an incentive to 'free-ride':

> *… with collective giving… what becomes significant is "need"…. Meeting such "needs" accordingly takes on the aspects of a public good – if one person meets the "need" of another there is a very high probability that others (beside the beneficiary) will agree the "need" has been met. There is accordingly a strong inclination for them to leave it to others to meet the "need". They will benefit from the indivisible benefits of the public good, a "juster society", without having to divert resources from their own (non-public) consumption to mitigate the "need". They get a "free ride". In such circumstances, a serious shortage in the degree to which agreed "needs" are met is clearly possible, so that all will lose.* (Culyer, 1973; pp.52-53)

The extent to which such 'shortage' threatens the optimal provision of the public good is something that is analysed in the literature leading to two versions of the free-rider hypothesis. Under the strong version, people do not contribute at all, so the public good is not provided. The weak version predicts that people contribute less than the Pareto optimal amount necessary to supply a public good but more than zero (Lipford 1995). The extent of the free-rider problem is also related to the size of the group (Olson, 1965; Chamberlin, 1974; Lipford, 1995; Brunner, 1998).

The general findings on free-riding in the literature vary across studies. Some show evidence on the strong free-rider hypothesis such that free-riding is overwhelming (see for example, Dawes et al, 1977; Kim and Walker, 1984). On the other hand, several authors find that people free-ride but not to the extent predicted by economic theory (e.g. Marwell and Ames, 1979; Dawes and Thaler, 1988; Andreoni 1990, 1995). A further finding indicates that while people do not free-ride in single-short games (see for example Marwell and Ames, 1981), people do tend towards free-riding in repeated games (for example Andreoni, 1988; also see Eckel et al, 2005, on crowding out of charitable giving).

Most of this literature is based on experimental economics. One disadvantage of analysing the free-rider hypothesis through experimental settings is that it is based in hypothetical scenarios and its conclusions might not mirror what happens in the real world; in addition, experiment participants may not be a representative sample of the whole population, which is crucial if we want to investigate further the types of free-riding and their socio-economic determinants.

One way to overcome such drawbacks is through non-experimental survey data and the design of appropriate questionnaires. In this paper we study possible free-riding in the blood donation context through face to face interviews undertaken in Spain. Note that most of the literature on blood donation look at *donation* and its determinants (e.g. Healy, 2000; Hollingsworth and Wildman, 2004; Steele et al., 2008; Wildman and Hollingsworth, 2009). In contrast to this, we look at those who *do not* donate and thus who are free-riders, rather than to those who *do* donate. This is because we focus on the determinants to free-ride, distinguishing between different types of free-rider according to the reason given for not donating. Of particular importance in this context is to differentiate from the rest those individuals who are not eligible to donate blood (and thus not capable of free-riding) due to some medical reason. To focus on the donors will in effect group these individuals together with the other non-donors and as a result risk overestimating the free-riding problem.

We conduct a survey of a representative sample of the general public in Spain[1] and ask (i) whether they are (or have been) a regular blood donor, and (ii) if not, why. Our objectives are: to examine whether or not free-riding behaviour actually exists in the blood donation context and if it does, to what extent; to explore the individual characteristics that explain free-riding behaviour; and to analyse the reasons to free-ride alongside the background characteristics that determine such different reasons.

We do not distinguish between the implications of different blood types or the various blood products (whole blood, red cells, plasma, and other blood based products). Furthermore, we do not distinguish between those who are current regular blood donors and those who have been regular blood donors in the past, or indeed between *self-reported* regular blood donors and *actual* regular blood donors. In what follows, section 2 explains the methods and data,

[1] In Spain, blood donations are voluntary with no monetary (or in-kind) remunerations (RD 1854/1993 and RD 1088/2005). In the year of our survey, 2004, the donation index (no. of donations per 1,000 population) was 39.6 (INE 2008), which is around the average donation rate for developed countries (38.1; WHO, 2009).

section 3 presents the results, followed by a discussion in section 4, and conclusions in section 5.

2. METHOD AND DATA

The relationship between public goods and free-riding is formulated by Andreoni (1990) through the following model. Let us assume that we have one private good x and one public good G (i.e. the stock of blood from a voluntary system) in an economy of n individuals, with the following utility function:

$$U_i = U_i(x_i, G) \qquad i = 1 \ldots\ldots n \qquad [1]$$

U_i is strictly quasi-concave and increasing in x and G. The amount of public good is determined by the total contribution by the n members of the economy:

$$G = \sum_{i=1}^{n} g_i \qquad [2]$$

Under [1], utility of individual i depends only on private consumption and the total supply of the public good: this is the "pure altruist" model.

Now, because G is a function of g_j ($j \neq i$) as well as g_i, if other people already make enough contributions (or if individual i believes that others do), then this leads to an incentive to free-ride. Furthermore, if the size of the group is large, then the proportion of those contributing tends to zero (Andreoni 1988), thus confirming the strong version of the free-rider hypothesis, where nobody donates. This model would not be able to explain how, in reality, a sufficiently large proportion of people donate blood.

Alternatively, Andreoni (1990) considers a model of donation with "warm glow". At the opposite extreme of preferences like those shown in [1], he considers the existence of "egoistic preferences" that is, individuals for whom the only motivation for donating is their own warm glow, arising from g_i:

$$U_i = U_i(x_i, g_i) \qquad [3]$$

Under [3], where U_i is strictly quasi-concave and increasing in x and g_i, there would be no incentives to free-ride because individuals do not benefit from the public good itself.

Between these two unrealistic extremes of pure altruism and egoism, Andreoni (1990) specifies an "impure altruist" model which assumes that people care about the public good but also receive a warm glow:

$$U_i = U_i(x_i, G, g_i) \qquad [4]$$

As noted by Brunner (1998), under this model, free-riding will depend on the relative strength of each of these motives: if individuals are motivated primarily by altruism, free-riding will be pervasive whilst if individuals are motivated by egoism, free-riding will be minimal.

We define free-riders as those individuals who are medically able to but decide not to donate blood, and therefore who would benefit from the blood stock any time they need it, without contributing to it. To identify those eligible to donate, we exclude those who have a health problem or a medical condition that disables them from donating blood. Undertaking the analysis without excluding this group of the population would lead to an overestimation of the free-rider problem.

Figure 1 illustrates the process of free riding, following a series of stages, as suggested by the exposition above. Prior to the first stage, individuals are screened according to whether they have any medical reason that impedes them to donate blood. Since this is not a matter of individual choice, this screening is not modelled, and those who have a medical reason are dropped from further analysis. Out of those who do not have any medical reason for not donating, in the first stage, we distinguish between those who are (or have been) regular blood donors, and those who are not (or have not been), where the latter are defined as free-riders. In the second stage, free-riders are categorised according to the reason for not donating: "others already do it", "fear of needles", "not thought about it" and gives no reason.

2.1. An empirical model for free-riding

In the first stage, we look at those who are capable of donating blood by specifying an empirical model that explains the probability to free-ride in the blood donation context, in terms of those individual characteristics that are expected to affect free-riding. An underlying (or latent) variable (F^*) represents an individual's propensity to be a free-rider. Thus, the model can be written as follows:

$$F_i^* = z_i\beta + \varepsilon_i \qquad [5]$$

where the i subscript represents individual respondents, z are the covariates, β represents the parameters and ε_i is the random error term. In practice, F_i^* is unobserved. Instead, we observe F_i which is a dummy variable representing whether or not the individual free-rides.

A utility maximising individual who is medically capable of donating blood would choose to free-ride if the utility derived from this choice exceeds the utility of donating blood.

$$\Pr(F_i = 1|z_i) = \Pr(U_{1i} > U_{0i}) \qquad [6]$$

If the utility of free-riding is greater than that of donating ($U_{1i} > U_{0i}$) s/he would choose to free-ride ($F_i = 1$), and if otherwise($U_{1i} \leq U_{0i}$) s/he would not choose to be a non-donor ($F_i = 0$; and therefore would donate blood).

The estimation process is undertaken through logit regressions. So, we assume that ε_i is distributed logistically, leading to the following binary logit model:

$$\Pr(F_i = 1 \, |z_i) = \frac{\exp(z_i\beta)}{1+\exp(z_i\beta)} \qquad [7]$$

Likelihood ratio (LR) tests and Reset specification tests are carried out to appraise the appropriateness of the different functional forms. Estimations of equation [7] allow us to empirically assess the relevance for free-riding of the different hypothesised explanatory variables.

Regarding the latter, we anticipate that demographic, socio-economic and other individual characteristics are associated with people's attitudes between donating and free-riding (see for example Hollingsworth and Wildman, 2004; Wildman and Hollingsworth, 2009; Steele et al, 2008). First, we may expect there to be some pattern by respondents' socio-economic status: educational qualification and income per capita of the region of residence are considered as proxies for socioeconomic status. Second, some previous studies support the proposition that the free-rider problem increases as group size increases (Olson, 1965; Sweeney, 1973), therefore we also consider size of area of residence as a proxy for group size. Thirdly, a further interest is the role of political participation, which we interpret as a proxy for the individual's level of engagement with the community. Fourthly, membership in religious organisations and church attendance correlate with volunteering in general (Greeley, 1997), so we consider "not practicing religion" as another variable that might explain free-riding. Finally, amongst the demographic variables, age, gender and marital status are considered.

2.2. An empirical model for reasons to free-ride

In the second stage we look exclusively at those individuals who free-ride. We distinguish different types of free-riders according to the reasons they give for not donating blood. We distinguish four different categories of free-riders: those who report that they do not donate because others already do it; those who plead that they have an aversion to needles; those who have not thought about it; and those who do not give any reason or say that they do not know. The first group may be called the 'self-admitted free-riders', and they are used as the base case.

We specify a model to estimate the probability of being of one or another type of free-rider and to estimate the effect of background characteristics on this. A multinomial logit model (MNLM) is estimated, which applies to discrete dependent variables that can take (unordered) multinomial outcomes representing the reasons for free-riding: $y = 1, 2, \ldots .m$.

Given a set of binary variables defined to indicate which reason ($j=1,\ldots.,m$) is reported by each free-rider individual ($i= 1,\ldots\ldots,n$). $y_{ij} = 1$ if $y_i = j$; 0 otherwise, with associated probabilities $P(y_i=j) = P_{ij}$.

Then, the MNLM uses,

$$P_{ij} = \frac{\exp(z_i \beta_j)}{\sum_k \exp(z_i \beta_k)} \qquad [8]$$

where k is the number of reasons to choose from by the free-riders. With a normalization that $\beta_m = 0$, which reflects the fact that only relative probabilities can be identified, with respect to the base alternative m (Jones, 2000).

The dependent variable takes one of four values depending on the reason given for not being a regular blood donor: $Y_i = 1$ if the individual reports that "others already do it"; $Y_i = 2$ if the individual reports “I have an aversion to needles”; Y_i = 3 if the individual reports “I have not thought about it”; and Y_i = 4 if the individual reports “I have no reason” or “I do not know”. One reason is recorded for each free-riding respondent. Therefore, the MNLM would identify the probability of being of a particular free-rider category relative to the reference outcome (“others already do it”). We consider the same set of covariates (z) as in the previous free-riding model.

The MNLM assumes independence of irrelevant alternatives (IIA). That is, if we consider the ratio of the probability of two different reasons to free-ride k and l, IIA implies that the relative probability depends only on the characteristics of the two reasons and not on any of the other reasons (i.e. if a new alternative is introduced, all of the absolute probabilities will be reduced proportionally so that the relative probabilities between k and l remain unaffected).

We test for its appropriateness using the Hausman and Small-Hsiao tests, by first estimating the model with all of the four reasons for free-riding, and subsequently re-estimating it by dropping one of the reasons. This is then followed by the tests for IIA (see Scott and Freese, 2001). If IIA is violated, an alternative model should be considered (such as the nested multinomial logit or the multinomial probit model) that relax the IIA property. In addition, a Wald test is conducted to explore whether or not combining some of the response categories would make the model more efficient.

2.3. Data and variables definition

The data were collected during 2004 in Spain. A survey of 1,211 individuals over 18 years of age was undertaken. Face to face interviews were assigned across the 17 *Comunidades Autónomas* (‘Regions’ for short), reflecting the local resident population proportionally. Within each of the Regions, interviews were randomly allocated so that the achieved sample is representative of the general Spanish population in terms of socio-demographic characteristics. In general, 48% of the individuals are male, with average age of 45.15 (SD 18.10); and 52% female, with average age of 46.45 (SD 18.04).

The questionnaire has questions on demographic and socioeconomic characteristics of the respondents as well as a question on blood donation, where the respondent is asked whether s/he is, or has been, a regular blood donor; no definition of regular blood donation is given. Those who reply “no” are asked to select their main reason for it from a short list. Those who select “because of medical reasons” at this stage are excluded from all analysis, since donating or otherwise is not within their choice and thus they do not enter the model for free-riding. The binary dependent variable in the logit model, *free-ride*, takes the value 1 if individual *i* is a free-rider (i.e. the individual is not or has not been a regular blood donor, although they could be), 0 if otherwise (i.e. the individual is or has been a regular donor). The reasons for not donating are recorded by a set of categorical variables: *others_do_it* (for those individuals who say because others already do it); *aver_needles* (for those who report having a fear of needles); *have_not_thought* (for those who report not having thought about it); and *don't_know* (for those who do not give any reason). There is an option for "other reasons" but since this is selected by only five respondents, it is dropped from the analysis. One reason is recorded for each non-donating respondent. The baseline category is *others_do_it*.

Regarding the independent variables, *age* enters the model as a continuous variable. The binary variable *female* indicates whether or not the individual is female. Education is recorded by the level of schooling and has been categorised in three dummy variables representing low education *primary_studies* (those with primary school education or less: the baseline category), middle education *secondary_studies* (those with secondary school education), and high education *university_studies* (those with higher and university education). Civil status is indicated by *single* (the baseline), *married* and *divorced_widowed.* Population size of the area of residence is proxied by *small_area* indicating whether the individual lives in an area of 10,000 or less inhabitants. The variable *abstenc* indicates that the individual did not vote in the March 2004 national election (the most recent at the time of the survey). Per capita income of the region of residence is recorded by three dummy variables representing low income region (*reglow*), middle income region (*regmid*) and high income region of residence (*reghigh*: the baseline category). Finally, the binary variable *no_relig* indicates whether the respondent does not practice any religion.

3. RESULTS

Table 1 shows the summary statistics of the different samples used in the analysis. Out of the 1,211 participants in the survey, item non-response leads to 184 missing cases, which corresponds to 15% of the entire data, leaving 1,027 valid cases. Of these, 264 individuals report that they cannot donate blood because of medical reasons, so they are excluded from the analysis. This leaves 763 usable cases, of which 509 are free-riders (i.e. 67% of usable cases). As can be seen, the distribution of background characteristics across the whole sample and the smaller samples used for the analyses are similar. With respect to the group of interest (i.e. free-riders; n=509), mean age is 44 and about half of them are female; regarding the reasons to free-ride, 22% choose because others already do it, 10% aversion to needles, 20% have not thought about it, and 48% give no reason (see last column of table 1).

Table 2 reports (in odds ratios) the results of the logit regression that describes individuals' propensity to free-ride. The model passes the Reset specification test, indicating that there is no evidence of functional form problems.

Results show that females have a significantly higher propensity to free-ride than men: the relative risk of free-riding is 45% higher in females than in males ($p<0.05$). Similarly, those who did not vote in the 2004 elections have almost a 60% higher relative risk of being free-riders than those individuals who voted ($p<0.05$). On the other hand, the level of education is negatively correlated with the propensity to free-ride, with a clear gradient: individuals with secondary school education have a 44% lower relative risk to free-ride compared to those with primary school education or less (baseline) ($p<0.1$), whilst individuals with university education have almost a 60% lower relative risk to free-ride ($p<0.05$). Finally, being divorced or widowed is also negatively correlated with free-riding ($p<0.1$). Age, income of the region of residence, or size of area of residence do not have significant impacts on the probability to free-ride.

Figure 2 plots the mean values of the predicted probabilities of being a free-rider for each background characteristic, under the counterfactual that the whole sample takes the characteristic in question, while retaining their other characteristics. For example, for "males", the probability of free-riding is predicted for each individual assuming they were all male regardless of their actual gender, but keeping their marital status, education, etc unchanged. This exercise results in the highest mean probabilities of free-riding when the whole sample is assumed to be either female (71%), single (71%), had low education (74%), or did not vote in the 2004 general election (74%). The combination associated with the highest probability of free-riding (older single women, with low education, living in a non-small area with low capita income, who did not vote) results in a 88% propensity to free-ride, while on the other hand the least likely combination has a 42% propensity.

Regarding the MNLM on the reasons why respondents free-ride, the Small-Hsiao and Hausman tests cannot reject the null hypothesis that IIA holds ($p<0.05$), and therefore the use of MNLM is appropriate. Furthermore, the Wald test for combining alternative reasons rejects the null hypothesis that any pair of reasons for free-riding are indistinguishable ($p<0.05$).

Table 3 shows the discrete changes in the probability of a free-rider giving a particular reason not to donate. The figures shown in the table correspond to the mean of discrete changes in the probability of giving each reason not to donate. It can be seen that the four response categories have different patterns, as suggested by the Wald test for combining alternative reasons mentioned above. Regarding those free-riders that indicate that they do not donate because others already do it, the predicted probability of giving this reason ($Y_i = 1$) is 0.005 lower for each year of the individual's age, 0.106 higher for married than single individuals, 0.124 lower for non-religious than religious, and 0.123 lower for residents in a low income region than in a high income region (all of them at $p<0.05$). The predicted probability of pleading an aversion to needles ($Y_i = 2$) is 0.087 higher for females than males, 0.086 lower for divorced or widows than for singles, and 0.051 lower for those who abstained in the 2004 elections than those who voted. Regarding those who say they have not thought about it ($Y_i = 3$), the predicted probability of giving this reason is 0.180 higher for the non-religious than religious. Finally, the predicted probability of not giving a reason ($Y_i = 4$) is 0.005 higher for each year of age, 0.135 higher for those with secondary school education than with primary school education or less, 0.155 higher for those who abstained and 0.116 for those who live in relatively small areas.

4. DISCUSSION

This study is based on a large scale face-to-face interview survey of a representative sample of the general public in Spain. The interviews includes a set of questions on whether or not the respondent is (or has been) a regular blood donor, and if not, for what reason.

In the first stage, using a logit regression to explain free-riding, we conclude that out of those who are medically capable of donating, not everybody free-rides, as would be expected from an economic model of pure altruism. Instead, there is a two-to-one split between free-riders and contributors, which is more in line with the impure altruism model. In addition, individual propensity to free-ride is significantly explained in terms of gender, education, political participation and marital status. Other studies also observe that females or those with lower education are more likely to be non-donors (eg. Healy, 2000; Chliaoutakis et al, 1994); and those who did not vote in the elections are more likely to free-ride, suggesting that the involvement in the community is not only associated with attitudes to public goods in general but also with the blood donation context. On the other hand, in contrast to previous evidence (Olson, 1965; Sweeney, 1973), the size of the area of residence is not significant. However, given that this variable only captures whether population size is 10,000 or less, it does not rule out lower thresholds leading to a significant impact. The effect of religious practice is not significant either. Elsewhere, Healy (2000) finds that regular church attendance is positively and significantly associated with the likelihood of donation but only where the Red Cross runs the blood supply; the effect of church attendance is not significant under other systems, or even negative in Norway and Denmark (Healy, 2000). Thus, overall, the exercise indicates that free-riding is clearly not distributed randomly across the potential donors. Other factors not available in this analysis concerning institutional characteristics and cultural factors might also influence the likelihood of free-riding.

In the second stage, we estimate a multinomial logit model that explains the reasons given by the free-riders for not donating. In summary, gender, age, religious practice, political participation and income of the region of residence are found to explain the reason for free riding. The results also indicate that the set of determinants for giving a particular reason for not donating vary across the four reasons available in the questionnaire. For example, those who state an aversion to needles are more likely to be females than those who give other reasons. Those who do not give any reason are more likely to be those who did not vote in the past elections. Curiously, the effect of religion has a different sign depending on the reason for not donating: those who state that others already donate are more likely to practice a religion, but those who have not thought about it are more likely to not practice religion.

While the study is conducted on a large-scale representative sample of the general public, there are a few things that should be taken into account before the findings can be generalised. Interview surveys may be criticised on two fronts. First, compared to analysing real choices revealed through actual donation behaviour, interview surveys are vulnerable to biases introduced by recall or the presence of an interviewer. However, this paper explicitly distinguishes between non-donation by choice (free-riding) and imposed non-donation (due to medical reasons), as grouping those who *cannot* donate with those who *choose* not to donate would overestimate the free-rider problem. This distinction requires more information beyond whether or not somebody donates, and justifies the interview approach. Second, compared to experimental settings, where relevant scenarios can be manipulated to explore the relevant parameters under which participants will agree or not agree to donate blood, interviews are very crude. However, the objective of this paper is to probe about their real world behaviour and to ask for their reasons for it, which is better suited to interview surveys.

Nevertheless, it remains that the data on free-riding and its reasons are self-reported, which has three factors for consideration. Firstly, our first question is designed to consider both current and past regular donors, and therefore the proportion of donors in our study (about 33% of potential donors, or 24% if we include those who cannot donate in the denominator) is higher than published statistics that are based only on current donors (about 5%). This is as expected, but admittedly makes external verification difficult. Secondly, the presence of an interviewer may have biased the responses towards what is perceived as more socially acceptable: viz. to self-report as a blood donor. Combining these two factors, at the extreme, anybody who has *ever* donated blood may have reported themselves to be a "regular" blood donor, even when they have done so just once in their lives[2]. Insofar as this is the case, our results would be underestimating the free-rider problem. Thirdly, different respondents may have had different perceptions of what constitutes "regular" blood donation, and if there is a systematic pattern across respondent subgroups, then the results would be affected by this.

With regard to the reasons for free-riding there are two issues to note. First, again, the presence of the interviewer may have affected the respondent to select reasons that potentially appear more socially acceptable, by claiming to have a medical reason or not to have thought about it, rather than to admit to a fear of needles or to say others do it. Second, regarding the reasons available to the interviewee for free-riding, some respondents may have found that their reason for not donating was not offered as an option. For example, some may find access to the relevant facilities problematic, or indeed may be willing to sell blood for a financial reward but not to give away. However, this is not a major problem because the option "other reasons" is also given and taken by just 0.4% of the survey respondents. On the other hand, the option "have not thought about it" may appear too similar to not giving a reason. The statistical evidence reported above nevertheless suggests that the categories used in the MNLM cannot be regarded as undistinguishable from each other. And finally, a free-rider may have more than one reason for not donating blood: for example, somebody with an aversion to needles may, as a result, not think about donating blood. In this study, the interview has only coded the first reason people chose out of the set of reasons presented, which we interpret as the main reason.

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[2] In fact, the proportion of donors who are (or have been) a regular blood donor in our study is close to the proportion of individuals who have *ever* given blood in Spain (24%) reported in Healy (2000).

A related issue is the relationship between free-riding of some and altruistic behaviour of others. Arrow (1972) for instance assumes that the creation of a market simply increases individuals' range of options, thus leading to higher benefits for all concerned (also see Singer, 1973). However, Titmuss (1970) argues that this would erode altruistic behaviour. One way to examine this would be to carry out a study with two samples: one from a donation based system and another from a mixed system like the one proposed by Arrow, and to compare (i) the levels of free-riding in the two systems, (ii) the prevalence of those who free-ride "because others already donate", and (iii) the prevalence of those who free-ride "because others already are paid for that (i.e. in the market)".

CONCLUSION

Voluntary blood donation is a public good, and is susceptible to free-riding. Based on interview data, we explore the extent of the free-rider problem and the different reasons given for it in the context of blood donation. In order to avoid the overestimation of free-riding, we distinguish between those who *can but do not* donate from those who *cannot* donate for medical reasons, excluding the latter group. The determinants of free-riding indicate that the propensity to free-ride is associated with certain background characteristics, and thus free-riders are not randomly distributed within the population. Furthermore, the determinants of the reasons for free-riding suggest that the four reasons offered in the questionnaire can be regarded as distinct reasons, and each are associated with their own set of significant covariates, indicating that free-riders are a heterogeneous group.

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TABLES AND FIGURES

TABLE 1: SUMMARY STATISTICS

Variable	Whole sample (1)		Valid cases sample (2)		Sample used in logit model (3)		Sample used in MNLM (4)	
	N	Mean	N	Mean	N	Mean	N	Mean
Female	1211	.516	1027	.516	763	.472	509	.499
Age	1211	45.8	1027	45.9	763	43.4	509	43.7
Single	1210	.259	1027	.254	763	.283	509	.297
Married	1210	.623	1027	.633	763	.630	509	.621
Divorcy_wid	1210	.117	1027	.113	763	.086	509	.082
Primary_le~s	1208	.331	1027	.335	763	.283	509	.316
Second_stu~s	1208	.541	1027	.539	763	.586	509	.576
University~s	1208	.127	1027	.126	763	.131	509	.108
Reghigh	1211	.193	1027	.167	763	.172	509	.167
Regmid	1211	.608	1027	.639	763	.638	509	.625
Reglow	1211	.199	1027	.194	763	.190	509	.208
No_relig	1149	.448	1027	.460	763	.499	509	.483
Abstenc	1085	.173	1027	.170	763	.182	509	.204
Small_area	1211	.242	1027	.237	763	.249	509	.251
Free_rider					763	.667		
Others_do_it							509	.216
Aver_needle							509	.104
Haven't_tho~t							509	.204
Don't_know							509	.475

(1) Number of observations available for each variable
(2) Excludes 184 individuals who have missing values in any of the relevant variables
(3) Excludes those individuals who are unable to donate due to medical reasons
(4) Excludes those individuals who are blood donors

TABLE 2: LOGIT ESTIMATION OF FREE-RIDING IN BLOOD DONATION

	Odds Ratio	95% Conf.	Interval
Female	1.452 (**)	1.061	1.986
Age	1.002	.989	1.016
Married	.763	.490	1.188
Divorc_wid	.513 (*)	.250	1.053
Second stud	.660 (*)	.431	1.009
University stud	.412 (**)	.237	.718
Regmid	1.003	.660	1.523
Reglow	1.356	.799	2.299
No_relig	.832	.600	1.154
Abstenc	1.589 (**)	1.036	2.438
Small_area	.935	.649	1.346

N=763; wald chi2(11)=30,29; Prob >chi2=0.001;
Log pseudolikelihood = -470.632; Pseudo R2 = 0.0305
Reset test: chi2(1)=0.13; prob>chi2=0.718
** p-value <0.05 * p-value <0.1

TABLE 3: MNLM DISCRETE CHANGES

	$P(Y_i = 1)$	$P(Y_i = 2)$	$P(Y_i = 3)$	$P(Y_i = 4)$
Female	-.055	.087**	-.061*	.028
Age	-.005**	-.001	.0001	.005**
Married	.106**	-.046	-.013	-.048
Divorc~wid	.073	-.086**	.148	-.134
Second~stud	-.061	-.053	-.020	.135**
Univer~stud	-.056	-.026	-.054	.137*
Regmid	.083*	.059*	-.024	-.117
Reglow	-.123**	.109	.090	-.076
No_relig	-.124**	.016	.180**	-.071
Abstenc	-.073*	-.051**	-.030	.155**
Small area	-.057	.019	-.076*	.116**

Y_i (1= others already do it; 2= aversion to needles; 3=have not thought it; 4= don´t know/answer)
** p-value <0.05 * p-value <0.1

FIGURE 1: THE PROCESS OF FREE-RIDING

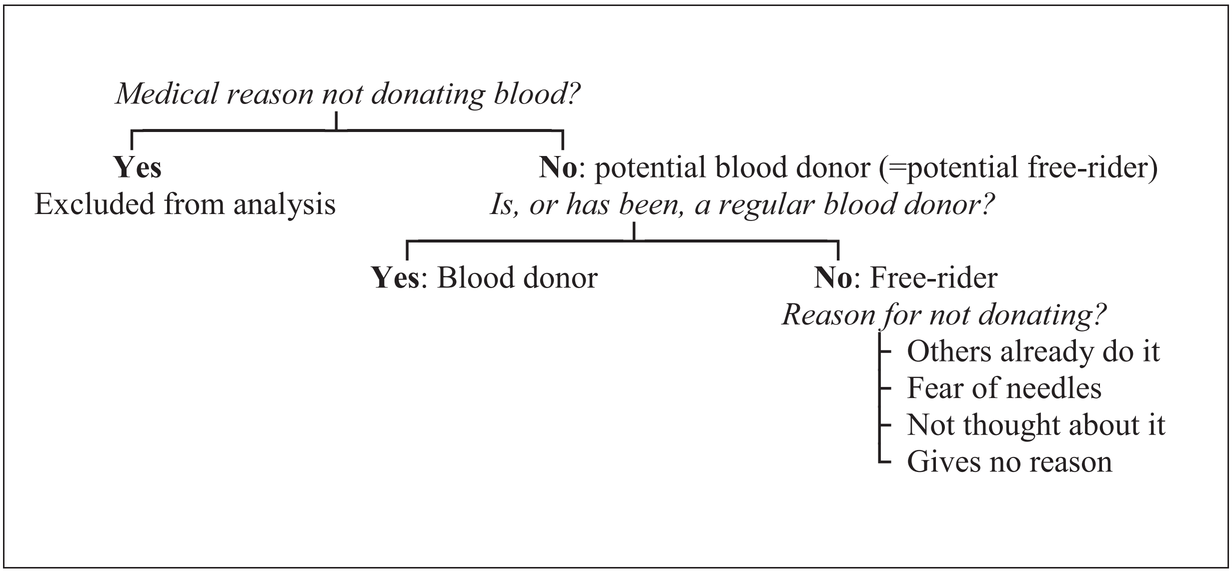
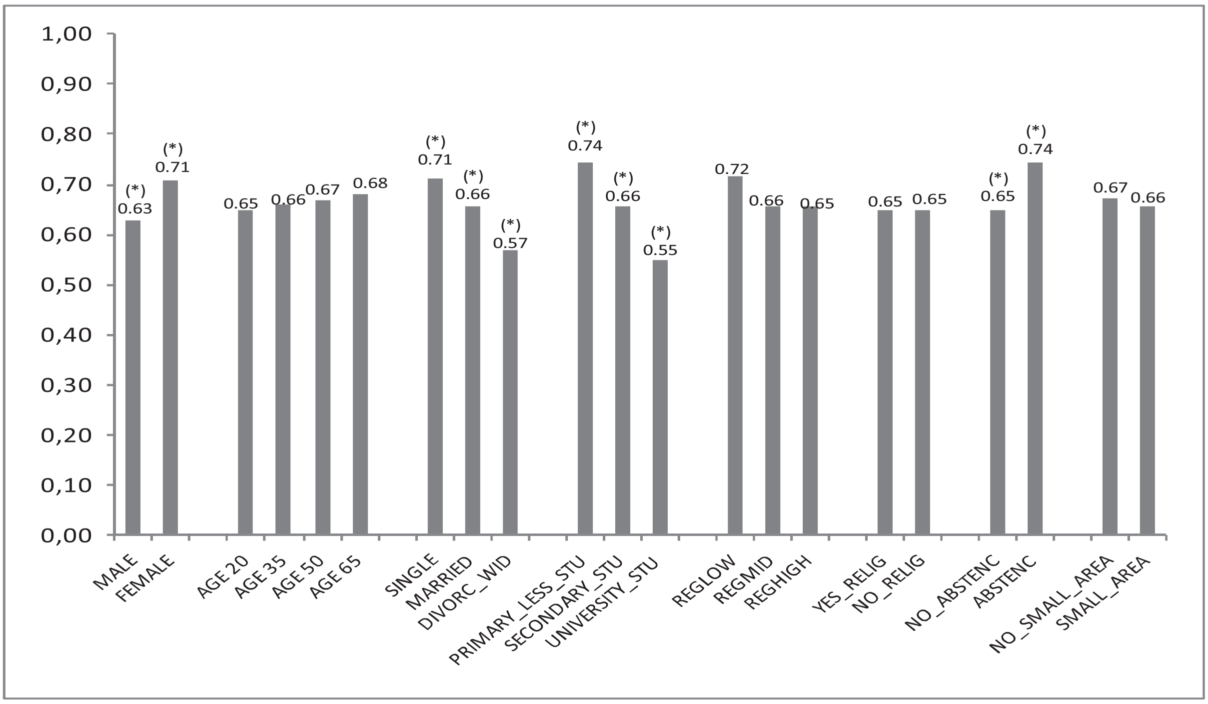


FIGURE 2. AVERAGE PREDICTED PROBABILITIES OF BEING A FREE-RIDER BY DIFFERENT RESPONDENT CHARACTERISTICS



(*) The difference of average predicted probabilities amongst categories of the variable comes from the corresponding parameter in the logit estimates that resulted statistically significant