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Justice in an Uncertain World: Evidence on Donations to Cancer Research

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Abstract

The paper uses information on actual and hypothetical charitable contributions to cancer research in the United Kingdom to elicit information on justice principles endorsed by donors. The latter face a choice between contributing to several hereditary and lifestyle-related cancers and their choices of how much to donate to different cancers reveal how they view luck vis-a-vis risky individual choices. The estimation results reveal that donations are smaller for cancers with higher prevention rates, which is the probability that the potential cancer victim can avoid the cancer in question by some choice. We also find that provision of information on lifestyle-related causes of cancer adversely affects contributions. In contrast, information on hereditary causes has a positive effect on donations. Furthermore, a large share of donors indicated in their feedback that they chose donations to a hereditary over a lifestyle-related cancer to "punish" poor individual choices. These findings suggest that many donors lean toward choice egalitarianism, which conditions donations on the potential beneficiaries' choices.

Keywords: choice-egalitarianism, donations, choice vs. luck

JEL codes: D81, D63

1 Introduction

What a society perceives as fair is at the center stage of public debates surrounding financial bailouts of companies and countries, healthcare policies, and welfare programs. Under a democratic system of governance, these perceptions and policies reflect attitudes of individual society members to different justice principles. Hence, assessment of these individual attitudes is of paramount importance for understanding the drivers of public policies. The present study makes an important step in this direction by using two data sets; a naturally-occurring data on charitable contributions to cancer research in the United Kingdom and data from a representative survey on individual preferences to donate to different cancers.

In a non-deterministic world, justice principles can be differentiated according to the degree to which individuals are held responsible for their risky choices vis-a-vis their luck. At one end of this spectrum of justice principles is *strict egalitarianism* (Nielsen, 1985), which does not hold individuals responsible for any causes of inequality. According to the principle, social redistribution should be based solely on outcomes. At the opposite end of the spectrum is *libertarianism* (Nozick, 1974), which postulates that individuals should bear full responsibility for their circumstances even if they are caused by bad luck. Some theories of distributive justice combine egalitarian principles with concerns for individual responsibility[1]. One of the most notable among these is *choice egalitarianism* (Dworkin, 1981a, 1981b; Arneson, 1989, Cappelen, Konow, Sørensen and Tungodden, 2013) that holds people accountable for their risky choices but not for their luck. A related but different channel why decision-makers may favor punishing risky behavior is to mitigate moral hazard.

To understand which of these justice principles people endorse, we use charitable contributions to research on cancer treatment and prevention made via an online platform recently developed by the Cancer Research United Kingdom (CRUK). The data collected via the platform offered a unique opportunity to distinguish the incentives to contribute to cancers where chance plays a central role, like hereditary cancers, and cancers where individual choices are more important, namely lifestyle-related cancers. The platform enables

[1] See, e.g., Rawls, 1971, Dworkin, 1981a, 1981b, Arneson 1989, Cohen, 1989, Sen, 1993, Roemer, 1998, Fleurbaey, 2008.

potential donors to choose a cancer research project for sponsorship as well as provides them with full flexibility over the donation amount. The list of available projects includes both hereditary and lifestyle-related cancers and this characteristic of research projects is explicitly stated for several of them. Moreover, donors can easily access information regarding each cancer's prevention rate, which is the probability that the potential cancer victim can avoid the cancer in question by some choice.

The naturally-occurring data has certain limitations. Most notable of these is lack of socio-demographic data (except for gender) and lifestyle of donors. Since donations to hereditary versus lifestyle-related cancers may be affected by these variables, such absence of data creates obstacles in unambiguously establishing causality relationships between a cancer's prevention rate and donations to that cancer. The differences between the descriptions of the projects on the CRUK platform in terms of the degree cancers can be prevented might also not be entirely apparent to some donors. This may also hinder identifying a relationship between prevention rate and donations. To overcome these difficulties and to establish causality, we have created and implemented a survey that mimics key elements of the choice problem faced by actual donors who used CRUK's online platform.

To disentangle different incentives of donors in the empirical part of our paper, we develop a theoretical model of donation behavior for decision-makers who embrace one of different justice principles. Our theory yields a testable hypothesis that is examined in the empirical part of the paper: choice egalitarians' donations decrease with prevention rates while non-choice egalitarians are insensitive to these changes. The empirical analysis of the naturally-occurring data to elicit attitudes to different justice principles (study 1), a first attempt of this kind, reveals that a non-negligible part of the donors, especially women, in our data set are choice egalitarian. This is supported by a similar pattern of preferences for data obtained from the online survey where respondents faced a series of hypothetical choice questions (study 2) and our companion paper (Safra, Ma and Melkonyan, 2019).

The observation that, overall, the donations are higher to hereditary than to lifestyle-related cancers has a different interpretation. As charitable donations may be viewed as contributions towards improved research and the risk involved in preventable cancers may seem lower to individuals who intend to behave responsibly, the observation implies that

people are willing to pay more to reduce the risk of hereditary cancers. This is in line with an interesting connection reported in Viscusi, Huber and Bell (2014), who show that people who view their own cancer risk as high (low) have a higher (lower) willingness to pay for cancer policies.

The considerations of fair treatment of risk taking play a central role in a number of contexts. A notable illustration is offered by the functioning of a wide range of healthcare systems (Cappelen and Norheim, 2005). Two very recent examples are offered by policy changes in the operation of the National Health System (NHS) in the United Kingdom. In 2014, the NHS Blood and Transplant Service announced that it was changing its current policy by allowing people with severe drink-related liver diseases to be considered for liver transplants (The Guardian, 2014). Many questioned the appropriateness of this decision mentioning that individuals who are likely to have harmed their own health are not as deserving of treatment. The other example involves a policy that is tilted in the reverse direction. In 2016, hospital leaders in North Yorkshire, UK announced that overweight patients and smokers will be prohibited from most standard hip and knee surgeries for up to a year (The Telegraph, 2016).

Redistribution of income and wealth is another important area where individual responsibility for poor choices frequently has a key role. Fong (2001) analyzed a Gallup poll and found that respondents care about justice. According to her findings, "A strong taste for equity or reciprocity is consistent with the basic concept of insuring industrious people against bad luck, but not providing unconditional assistance to the poor if their condition is due to idleness." More recently, diverse justice views of how inadequate choices should influence redistributive policies reverberated loudly during the last global financial crisis. Many individuals and interest groups vehemently objected to using government resources to help the troubled financial institutions while others defended it on the basis that the alternative was even worse. A group of prominent economists wrote to Congress cautioning against a bailout of "particular investors and institutions whose choices proved unwise", with justice being their primary concern (Wolfers, 2008).

The experimental evidence suggests that a considerable fraction of laboratory subjects tend to accept inequalities reflecting differences in choice (Konow, 2000; Frohlich, Oppen-

heimer and Kurki, 2004; Cappelen, Hole, Sørensen and Tungodden, 2007; Cappelen, Sørensen and Tungodden, 2010; Krawczyk, 2010; Cappelen et al., 2013). Cappelen et al. (2013) find that many subjects in their experimental study differentiate between inequalities arising from choice and inequalities arising from luck. Cettolin and Riedl (2017) also examine how people view justice under uncertainty. They conduct an experimental analysis of interactions between uninvolved participants who allocate resources to recipients. Cettolin and Riedl (2017) find that when one out of two recipients faces an uncertain outcome, allocations by uninvolved participants are widely dispersed but have a clear pattern: recipients exposed to higher degrees of uncertainty are allocated less. In our paper we investigate a different question. We are interested in how money is allocated among individuals who are all exposed to the same degree of uncertainty but, for some of them, the uncertainty resulted from their own actions.

The laboratory experiments provide important insights into possible behavior in real-life situations and guidance for theoretical developments. However, the context and nature and magnitudes of different outcomes in real-life situations involving applications of different justice principles differ drastically from the environments considered in laboratory experiments. Hence, the potential for generalizability of the predictions obtained from laboratory experiments to a wide range of domains hinges upon a combination of theory and empirical evidence from naturally occurring environments (Winkler and Murphy, 1973; Harrison and List, 2004). We make one of the first steps in this direction in the context of understanding individuals' attitudes to different distributive justice principles. In addition to providing a positive reconciliation of the findings regarding these attitudes from the laboratory and naturally-occurring environments, we offer a number of additional insights about factors that affect charitable contributions. Thus, the paper also contributes to a burgeoning literature on charitable giving (see, e.g., Auten, Sieg and Clotfelter, 2002; Landry, Lange, List, Price and Rupp, 2010) and provides guidance for structuring fund-raising activities.

In Section 2, we develop and analyze a model of charitable contributions that yields new insights and a testable hypothesis about the relationship between cancer prevention rate and donations. In Section 3, we develop the empirical model to analyze the naturally-occurring data (study 1) and report its results. In addition to the result mentioned above, we find

that provision of information on hereditary causes of a cancer in a project description has a statistically significant positive effect on donations. In contrast, information on lifestyle-related causes negatively affects contributions. These findings suggest that a significant share of the donors tends to favor choice egalitarianism. The estimation results also reveal a considerable amount of "in-gender favoritism" with each gender donating significantly more to cancers that affect only their own gender. There is also considerable difference in how different genders react to the inclusion of information about cancer causes in the project descriptions. Section 4 reports the results of an empirical analysis of the online survey (study 2). These findings provide significant support for the analysis and results of study 1 as they show that donations are higher to the hereditary cancer than to the lifestyle-related cancer. Moreover, we asked individuals to provide a rationale behind their choices and learned that a large share of the respondents revealed choice-egalitarianism as the sole reason for their decision. Similarly to study 1, the respondents in study 2 who had personal or family history with the disease would donate more to it. The final section of the paper concludes and outlines avenues for future research.

2 Theoretical Model

We model a donor who decides how much to contribute to a cancer of certain type.[2] The donor possesses other-regarding preferences. She cares about her own utility, denoted by U^D, that is derived from her own income, and the utility of a representative cancer patient, denoted by U^P. Her preferences are represented by the function $W\left(U^D, U^P\right)$, which is assumed to be strictly increasing in both arguments and concave with non-negative cross-partial derivatives.[3] For simplicity, we assume that the donor's own utility U^D displays risk neutrality so that $U^D(x) = x$ for all income levels x. The donor's initial income equals y

[2]The comparative statics results in this section hold in a wide range of environments where, in addition to the level of donations, donors choose the cancer type toward which to direct their contributions. Such extension would yield a finding that a choice-egalitarian donor is more likely to donate to cancers with relatively low prevention rates than a non-choice-egalitarian donor. For space considerations, we do not model this choice.

[3]Utilitarianism corresponds to the case of linear W.

and she considers donating a non-zero part d of her income to research on a specific type of cancer, assuming her donation will have a positive effect on the patient's utility U^P. More specifically, she believes that her donation will increase the patient's probability of survival. Let $p_s(d)$ denote the probability of survival, or survival rate, for a patient diagnosed with this type of cancer. It is defined as

$$p_s(d) = p_s^0 + \left(1 - p_s^0\right) e(d),$$

where $p_s^0 \in (0,1)$ is the cancer's current survival rate and $e : \mathbb{R}_+ \to [0,1]$ is a strictly increasing and strictly concave function with $e(0) = 0$. The survival rate function represents the donor's beliefs that (1) her donation has a positive effect on the survival rate and (2) the size of the effect is negatively related to the current survival rate. Note that for our specification all values of $p_s(d)$ fall between p_s^0 and 1.

It is assumed that surviving the cancer, an outcome denoted by H, yields the patient, in the eyes of the donor, a utility of one unit. That is, $U^P(H) = 1$. Dying from the cancer, an outcome denoted by M, yields a lower utility. The level of utility under contingency M depends on whether the donor takes into account the extent to which this cancer may be induced by the patient's lifestyle and on whether the donor's preferences exhibit dissatisfaction with the patient for his cancer-inducing behavior. To model this possibility, let $p_r \in [0,1)$ denote the probability that the cancer victim can avoid the cancer by modifying his behavior, called the *prevention rate*. When $p_r = 0$, the cancer victim could not have avoided the cancer. In contrast, when p_r is arbitrarily close to 1, the cancer patient could have avoided the cancer with almost certainty. As we discuss in the following section, the prevention rate varies significantly across different cancer types.

The donor believes that an unhealthy lifestyle is a choice made by a supposedly informed individual. A *choice egalitarian* donor acts upon this belief in the following sense. She reasons that since the patient seems to care less about his own death by following an unhealthy lifestyle[4], his utility difference between being healthy and being dead is smaller than that of patients who do not follow this kind of risky behavior. To reflect this trait of the donor's preferences, we assume that $U^P(M) = p_r$ for a choice egalitarian donor. Hence, the utility

[4]This assumption accords well with the literature on the value of statistical life (Viscusi and Aldy, 2003).

difference between the two health outcomes under this assumption is given by $U^P(H) - U^P(M) = 1 - p_r$, which is decreasing with the prevention rate. If the donor is not choice egalitarian (that is, either a strict egalitarian or a libertarian), then she uses $U^P(M) = 0$.[5] The latter donor doesn't discriminate between cancer patients based on the prevention rates of cancers from which the patients suffer.

In addition to the egalitarian dimension, the justice principles may be differentiated depending on whether a principle of justice is applied ex ante or ex post. At one end of this spectrum is the idea that a principle of justice may be applied ex ante – to the expected utilities of the individuals involved (Diamond, 1967; Weymark, 1991; Epstein and Segal, 1992; Mongin, 2001; Karni and Safra, 2002; and Grant, Kajii, Polak and Safra, 2010). At the other end is the idea that a principle may be applied ex post – to the final outcome allocations (Harel, Safra and Segal, 2005; Adler and Sanchirico, 2006; Fleurbaey, 2010; and Grant, Kajii, Polak and Safra, 2012). These two principles coincide when society adopts utilitarianism (Harsanyi, 1977). However, as most justice notions involve some degree of non-linearity, the two principles usually lead to different social distributions.[6]

For the problem considered in our paper, the donor follows an *ex ante* principle if the expected utility of the patient is integrated as an argument into the function W. In this case the donor's objective function is given by

$$V^{xa}(d) = W\left(U^D(d), EU^P(d)\right) = W\left(y - d, p_s(d)\, U^P(H) + (1 - p_s(d))\, U^P(M)\right), \quad (1)$$

where $EU^P(d)$ is the patient's expected utility. Note that both choice egalitarian and non-choice egalitarian ex ante donors use the same objective function. The only difference between them is manifested in the value they associate with $U^P(M)$.

Alternatively, the donor follows an *ex post* principle if the values of W for all possible final outcomes are computed before taking expectations, and in this case her objective is

[5] Note that although libertarians are opposed to compulsory donations, they are not advocating against voluntary ones.

[6] Anderoni, Aydyn, Barton, Bernheim and Naecker (2016) provide evidence for the effect of timing on subjects' fairness preferences under risk. Also, see Exley (2016) for evidence on how risk is used as an excuse for selfish behavior.

given by

$$V^{xp}(d) = p_s(d)\, W\left(y - d, U^P(H)\right) + (1 - p_s(d))\, W\left(y - d, U^P(M)\right). \tag{2}$$

Clearly, when W is not linear the two principles and the corresponding donation behavior differ. As will become clear below, our data does not allow to differentiate between the ex ante and ex post principles. The reason for considering those two extremes is to show that the testable predictions of our theoretical model are robust to these two formulations of the justice principle.

In Appendix, we prove the following proposition:

Proposition 1

(*i*) *Both ex ante and ex post choice egalitarian donors donate smaller amounts to cancers with higher prevention rates.*

(*ii*) *Donations of all non-choice egalitarian donors are unaffected by prevention rates.*

The proposition predicts that if some of the actual donors are choice egalitarian then, controlling for other factors, we will tend to observe higher donations to cancers with smaller prevention rates. The larger the share of the choice egalitarian donors the more pronounced this effect is. Note also that since the proposition applies both to ex ante and to ex post preferences, our findings are robust against variations in the donor's justice views along this dimension.

A couple of remarks regarding our modeling approach and possible extensions of the model are in order. The decision-maker in our model can be interpreted as having altruistic motives. Under this interpretation, the choice egalitarian decision-maker has a "discriminating" altruism in the sense that she treats different cancer patients differently. The non-choice egalitarian decision-maker has a "non-discriminating" altruism in the sense that the utility of all patients enters the decision-maker's utility function the same way. Note also that we did not model donation behavior arising from the decision-maker's incentive to get a "warm glow" (Andreoni, 1989). We could easily accommodate this additional incentive to donate in our model. If we did, then it is easy to observe that an individual who was driven only by the "warm glow" would not differentiate between cancer patients in her giving. Thus, this

type of donor would behave similarly to the non-choice egalitarian.[7]

3 Study 1

3.1 Data

Our analysis utilizes a data set that is based on a recently developed and utilized online donation platform "My Project" (CRUK, 2015a).[8] The platform was operated by CRUK, which is the world's largest independent cancer research charity. "My Project" presented potential donors with a multi-layer system to choose a project for a donation and its amount. When a potential donor entered the website, she was presented with 24 different categories, including almost all cancer types (20 categories) and some general cancer-related activities and services (4 types).[9] After one of these 24 categories was selected, the potential donor could review all of the available projects under the chosen category.

There was no specific order in which different cancer types appeared on a computer screen when a potential donor entered the platform (see Figure 1 for the screenshots of "My Project" platform). All cancer types were scattered on the screen. After selecting a cancer type, the donor could see all projects available for the selected cancer type displayed in an alphabetical order. Other options for displaying the projects were also available. However, for all cancer types, the available projects all fit on the same page. In summary, the design of the platform minimized the order effects.

Each project was accompanied by a description. The platform contained full details of all projects that were available for sponsorship at the time the data was collected. To give

[7] One could also consider a game-theoretic model where the patient first makes an 'investment' choice whether to adopt a healthy lifestyle and avoid the cancer, and then the donor makes her decision. In such a setup, a reciprocity model in the spirit of Charness and Rabin (2002) seems a good starting point. However, game-theoretic models seem less appropriate in our framework, as communication channels between donors and patients do not exist.

[8] After usage for some time, the format of raising donations changed from "My Project" to CRUK (2019). However, the functionality and information content have changed minimally. The main changes pertain to how information can be accessed.

[9] These four are "basic cancer biology research", "cancer nurses", "clinical trials" and "general research".

a taste of such projects, here is an excerpt from the description of an actual project: "this project aims to understand how breast cancer establishes its nutrient supply and how these supply lines could be shut down to control breast cancer growth." (CRUK, 2015b).

If the potential donor decided to donate to a project she then chose the amount of donation. She could also leave comments which were then made publicly available. The platform recorded the donation time, name of donor, chosen project, amount of donation and comments (if any).

One of the main novelties of the donation platform was the donors' full control over the destinations of their contributions. This is in stark contrast to the standard way of allocating donations within charities, where "directed service" is only available to very large donors[10] and donations from the rest of donors are allocated by charities on a need basis. The platform provided a unique opportunity to test the responsiveness of contributions to various aspects of sponsored projects.

Our data covers the period from April 1, 2014 to May 11, 2015, which is all of the data that was made available to us by the CRUK. The estimation results are very similar for the data set that covers exactly one year. Given our research objectives, we cannot use some of the data. Data for donations to four cancer categories on the platform (women's, men's, child and rare cancers) and four cancer-related services were removed from the sample, since the donors' preferences over beneficiaries' individual responsibility in causing a cancer are not identifiable for these categories. We have also excluded one cross-listed sarcoma project that fell into both cervical and womb cancer categories. Furthermore, because our research interest is in individual decision-making, we excluded donations from institutions (such as companies and non-profit organizations) and groups consisting of non-family members. Since donations over £200 tend to be from groups consisting of non-family members, we excluded these donations as well.[11] After these exclusions, our sample contains 4,129 donations to 14 categories and 31 projects. Out of a total of 31 projects on the platform, 22 mentioned

[10] Charities may have different interpretations for what a "very large" donation is. Irrespective of the interpretation, "directed service" is in general not available to everyone. We are grateful to David Milton, the head of the fundraising team from Worldwide Cancer Research, for clarifying these and many other specifics of charitable giving to cancer.

[11] We used the donors' comments to identity whether donations are from groups of non-family members.

cancer treatment only and 9 mentioned both treatment and prevention. Table 1 contains a summary of different categories, the number of donors for each category, and sample statistics for these donations.

Table 1 reveals that the average donation in our sample was £37 while the total amount of donations was £150,943. Among distinct cancer types, breast cancer attracted the most aggregate donation. This is a consequence of a relatively large number of donors who make contributions to breast cancer (a total of 1,204 donors) and in spite of the fact that the average donation to breast cancer (£31) is the lowest. The top two average donations were to womb cancer (£64) and bone cancer (£57), respectively. The standard deviations for the latter two donation types are also considerably large (at 50 and 46, respectively).

The summary statistics for the variables in our data set are reported in Table 2. We classified the projects in the dataset based on the information about hereditary and lifestyle-related causes provided in the projects' descriptions (*description* in Table 2). Since none of the project descriptions mentions both hereditary and lifestyle-related causes, three categories were created: (i) only hereditary causes are mentioned, (ii) only lifestyle-related causes are mentioned, and (iii) neither hereditary nor lifestyle-related causes are mentioned. Two projects, one for lung cancer and the other for skin cancer, mention lifestyle-related causes in their descriptions. Three projects mention hereditary causes. One of these is for bowel cancer, another is for breast cancer while the third is for ovarian cancer.

At first glance, the statistics in Table 2 might suggest that donations are higher when information about hereditary causes is a part of a description compared to the case when lifestyle-related causes are mentioned or no information is provided. Such conclusions are, however, suspect since they do not take into account other factors that may affect donations. As the estimation results based on a model that controls for cancer type and other available information demonstrate, these reservations are warranted - information on hereditary causes in a description has a positive effect on donations while information on lifestyle-related causes has the reverse effect.

We have carefully searched for sources of heterogeneity among the projects in addition to the inclusion of hereditary and lifestyle-related causes of the disease. We have not detected any other content differences across the projects. The projects on the platform had similar

length, format, and wording.

The comments left by the donors provide insights into the rationale behind donations.[12] We have found four main events/factors associated with donations: attendance of a fund-raising event (variable *attend* in Table 2), loss of a family member or a friend (*loss*), donation as a gift to another person (*gift*)[13], and fighting with a cancer (*fight*). The last refers to the scenarios where the donor herself, a relative, or a friend are fighting with a cancer. About 64% of the donors in our sample left comments. Among those who provided comments, most (53%) mention attendance of a fund-raising event. The shares of donors who mention loss of a family member or a friend, current fight with the disease and donation as a gift are given by 21%, 10% and 3%, respectively.

We used the donors' names to identify their gender.[14] There are three categories for gender - male, female, and unisex. The latter encompasses two groups of donors: donors with names that could belong to a man or a woman, and couple-donors. Although men's donations are on average 16% higher than women's, the number of women donors is substantially higher than the number of men[15] and the latter effect is so strong that the total amount of donations by women exceeds that by men. This pattern across the two genders is in line with other studies of charitable giving in the UK (see, e.g., CAF, 2015).

To understand donation behavior driven by the degree a cancer could be prevented by taking precautionary actions, we use data (CRUK, 2016a) on the prevention rate for each cancer category in our dataset. This information is easily accessible on the CRUK's cancer information platform. According to CRUK (2016a), the prevention rate estimates the fraction of cancers that can be attributed to "modifiable lifestyle" and "other theoretically avoidable factors" (see also Parkin, Boyd, Darby, Mesher, Sasieni, Walker and Peto, 2011). It is reasonable to expect that a vast majority of the donors may not be fully aware of

[12] The coding of the comments was independently performed by two researchers. The results were then compared to each other.

[13] An example of a donation in this category is a Christmas gift from person A to person B that specifies that a specific contribution to the charity will be made in the name of person B.

[14] The procedure of coding the names was also independently performed by two researchers. Similarly to the outcome for coding of the comments, the comparison revealed almost identical results.

[15] The ratio of the numbers of male to female donors in our sample is 0.66. This number is considerably smaller than the ratio of the two genders (0.98) in the UK population.

these prevention rates and may not be good at making such predictions with high precision. Rather, it is more sensible to assume that their beliefs about the prevention rates for these cancers are rather crude.

In light of these considerations, we created three categories, low, medium, and high, for the cancer prevention rates and assumed that donors can correctly place cancers in their respective categories but don't have more refined beliefs about the prevention rates. Based on the distribution of the prevention rates, we placed the cancers with prevention rates of less than 10% in the low prevention rate category, cancers with prevention rates of more than 75% in the high category, and the rest of the cancers in the medium category. Given the high prevalence of cancer among general population and a plethora of information about cancer in the media, it is sensible to expect that many individuals, and especially donors to cancer research, will have an adequate understanding as to which categories the prevention rates of various cancers fall into. The variable for the prevention rate category, as reported in Table 3, is used as a proxy for the individual responsibility of beneficiaries of donations in preventing a cancer.

Finally, given ample evidence that donations vary with the time of the year (see, e.g., Eckel, Grossman and Milano, 2007; Tilcsik and Marquis, 2013), we also control for the month the donation was made.

3.2 Empirical Model of Donation Behavior and Its Findings

We estimate the following linear lognormal model:[16]

$$\ln Y_i = \beta_0 + \mathbf{D}_i'\gamma + \mathbf{C}_i'\delta + \varepsilon_i, \tag{3}$$

where Y_i is the amount of a donor's contribution, D_i is the vector of all dummy variables (attend, loss, fighting, and gift), and C_i is the vector of all categorical variables (gender, cancer type, prevention rate category, month, and description). Due to heteroscedasticity concerns, we used White's (1980) heteroscedasticity-consistent estimator in all specifications

[16] A logarithmic transformation of the donation amount reduces the skewness of the distribution from 2.09 to -0.07 and the kurtosis from 7.60 to 3.26.

of the empirical model.[17]

The main estimation results are reported in Table 4. There, we followed Halvorsen and Palmquist (1980) and Kennedy (1981) by transforming the estimated coefficients from (3) into what Halvorsen and Palmquist (1980) call relative effects and what we call estimated effects. For the dummy variables in D_i, the estimated effects are calculated as $\exp(\widehat{D}_i - \frac{1}{2}\widehat{V}(\widehat{D}_i)) - 1$, where $\widehat{D}_i$ is the estimate of D_i and $\widehat{V}(\widehat{D}_i)$ is the estimate of the variance of $\widehat{D}_i$. The categorical variables in C_i are dummy-coded. For this reason, their estimated effects are calculated similarly to those for the dummy variables.

We begin with specifications A and B, which reveal the relationship between the individual responsibility variables and contributions. Potential donors have access to two types of information about the role of individual responsibility for different cancers. The first type of information is related to the statements about hereditary and lifestyle-related causes in the project descriptions - the focus of specification A. The second type pertains to the three categories of cancer prevention rates - the focus of specification B. Since the cancer type and prevention rate categorical variables are highly correlated, we don't estimate a specification where both of these variables are present.

[17] Each donation is recorded with a unique system reference number in the data set we obtained from the CRUK. The data contained only the first names of donors and several first names appeared repeatedly. Unfortunately, there is no identifying information to unambiguously determine whether donations came from the same individual or different individuals sharing the same first name. On the one hand, the functionality of the donation platform allows for any individual to come back and make another donation. On the other hand, given the extent of the population that the CRUK website could reach, the chances that any two observations with a common first name correspond to different donors are very high. We have performed the estimations under the assumption that whenever two observations are characterized by the same first name they represent two individuals and the assumption that whenever two observations are characterized by the same first name they represent the same individual. The estimation results are similar. We only report the results under the first assumption.

Ideally, one would have identifying information and deal with the data as an unbalanced panel. A fixed effects model would be appropriate in this case. This would allow to uncover a number of additional behavioral aspects of justice under uncertainty and channels affecting charitable contributions. Since the present data set does not contain such information, we leave this interesting research avenue to the future. We are indebted to the editor for this point.

If donors are choice egalitarians and take this information into account, then, according to Proposition 1, they will express their likes and dislikes via their donations. We find that this indeed is the case for both types of information (see Results 1.1 and 1.2).

In specification A, the variables that characterize the information on individual responsibility in the project descriptions have a jointly significant effect on donations (robust Wald test, $p = 0.01$). Each of these variables is also statistically significant individually.

Result 1.1. (a) *Donations are larger when information on hereditary causes of a cancer is provided in the project description compared to the scenario where no such information is provided;*
(b) *Donations are smaller when information on lifestyle-related causes of a cancer is provided in the project description compared to the scenario where no such information is provided.*

Based on our estimation results, when information on the hereditary causes of a cancer is included in the project description donations increase by 16.0%. In contrast, mentioning lifestyle-related causes in the project description leads to a 17.4% decrease in the donation (see Table 4). When a donor reads in the project description that the cancer under her consideration has hereditary (lifestyle-related) causes, she will likely associate a relatively small (large) prevention rate with the cancer. When donors form their beliefs in this fashion, Result 1.1 confirms the hypothesis put forth by Proposition 1 that donors will contribute more (less) to cancers with smaller (larger) preventions rates.

Result 1.1 has immediate implications for the design of fund-raising activities by charities. If their objective is to maximize the amount of charitable contributions, they may want to include information on hereditary causes and to exclude information on lifestyle-related causes from the project descriptions.

From specification B, we conclude that:

Result 1.2. *Donors contribute less to cancers with larger prevention rates.*

Compared to the cancers with low prevention rates, the amount of donations to the cancers with medium prevention rates is estimated to be 5.9% less, while the amount of donations to the cancers with high prevention rates is estimated to be 7.8% less (see Table

4). Thus, both types of information about individual responsibility, the descriptions of the causes of the cancers and their prevention rates, have a significant impact on donations. This finding is consistent with Proposition 1 of our theoretical model. Proposition 1 and Results 1.1 and 1.2 also suggest that a non-negligible share of the donors in our data set are choice egalitarians.

As was mentioned in the Introduction, this observation is supported by a result that appears in our companion paper (Safra, Ma, and Melkonyan, 2019). When respondents were asked to allocate £100 for the treatment of two different cancer types, one for a typical hereditary cancer and the other for a typical lifestyle-related cancer, the average allocation was £66 to the former and £34 to the latter. Discounting for a potential self-interest behavior, it is shown there that $30\% - 67\%$ of the respondents exhibit a choice egalitarian behavior. Results 1.1 and 1.2 are also reinforced by Results 2.1 and 2.6 in the next section. We will spell out the relationship after introducing the latter findings.

We now turn to the effects of other variables on donations. Since the effects are similar across different specifications in Table 4, unless stated otherwise, we report the estimated effects based on specification A. Our estimates indicate that, ceteris paribus, men are expected to donate 23.7% more than women (Table 4). Recall, however, that the overall donation of women exceeds that of men since the number of women donors is 52.0% higher than the number of men (Table 2).

It is informative to juxtapose our findings to the existing estimates of the generosity of the two genders.[18] Similar to our results, a number of studies report that women are more likely to donate than men (see, e.g., Andreoni, Brown and Rischall, 2003; Piper and Schnepf, 2008).[19] The evidence on the effect of gender on the amount of donations is more mixed. Although many studies find that men give higher amounts (Lyons and Passey, 2005; De Wit and Bekkers, 2015), some find higher contributions by women (Chang, 2005). The difference in the contributions depends significantly on the type of charity under consideration (Andreoni et al., 2003; Eckel, Grossman and Johnston, 2005). For example, men favor sports and

[18] For surveys of gender differences in behavior and preferences, see, e.g. Croson and Gneezy (2009) and Wiepking and Bekkers (2012).

[19] However, there are exceptions, albeit very few. For a survey that used a variation of the dictator game, Bekkers (2007) finds that men are more likely to give to health charities than women.

recreation charities while women prefer health and human services and many other charity types (see, e.g., Andreoni et al., 2003 and Piper and Schnepf, 2008).

Wiepking and Bekkers (2012) argue that "the more socioeconomic variables, such as age, income and educational level, that are included in the models examining charitable giving, the smaller the reported gender differences in giving are." Since our data set doesn't contain information on income and wealth levels of the donors, a part of the estimated gender difference in donations may be due to higher levels of these two economic variables for men.

In addition to examining the relationship between gender differences and amounts of donations, we investigated how gender affects the destinations of donations. We found a significant statistical relationship ($\chi^2(13) = 105$, $p = 0.00$) by testing the hypothesis of independence between gender and cancer type (see, e.g., Agresti 2013). Figure 2 depicts the empirical distributions of female and male donors for each cancer category. For three out of four "women only" cancer categories (breast, cervical and womb cancers), the number of women as a percentage of all women donors exceeds the corresponding figure for men. However, for ovarian cancer the percentage for men slightly exceeds the percentage for women (see Figure 2). Similar to women, men tend to favor own gender. For prostate cancer, which is the only "men only" cancer category in our data set, the number of men as a percentage of all men donors substantially exceeds the corresponding figure for women. The pattern is similar when one compares "men's cancer" and "women's cancer" categories which were removed from our data set. For men's cancer, there are 49.2% female donors and 36.1% male donors; while for women's cancer, there are 57.7% female donors and 17.3% male donors.

There are a number of explanations for such behavior. First, self-interested individuals may be concerned that in the future they may get cancers affecting own gender. As a result of this purely selfish motive, they will contribute more to research on these cancers. Second, "in-group favoritism" (Sumner, 1906, Rudman and Goodwin, 2004; Chen and Li, 2009) for gender may be a result of preference for individuals of own group. The third potential explanation for "in-gender favoritism" is that donors have superior information about cancers that affect own gender and, as a result, contribute more to those cancers.

We conducted a closer examination of the differences in behavior between genders. Specifications A_{female} and A_{male} in Table 5 contain the estimation results for female-only and male-

only groups, respectively. A comparison of these results reveals that women and men respond differently to information in the project descriptions. Women are sensitive to the information about lifestyle-related causes of cancer but not responsive to the information about hereditary causes. Mentioning lifestyle-related causes in the project descriptions causes women to decrease their donations by 27.0%. In contrast, men are sensitive to the information on hereditary causes of cancer but not responsive to the information on lifestyle-related causes of cancer. The former leads men to increase their donations by 21.9%.

Specifications B_{female} and B_{male} in the same table focus on the effects of the prevention rate on donations by women and men, respectively. A comparison of the estimation results for these two specifications reveals that the prevention rates have a statistically significant effect only for women. The latter are estimated to donate 14.3% less to cancers with high prevention rates compared to cancers with low prevention rates. Thus, the significant effects of the prevention rate for the whole sample is in large part driven by women.

We now turn to the donors' comments. First, the estimation reveals that donations by individuals who mention a loss of a family member or a friend are greater by 49.2% than those of others in our sample (Table 4). This is consonant with the existing empirical results that personal experience promotes donations by increasing donors' awareness of the needs of an affected group (Burgoyne, Young and Walker, 2005; Bekkers, 2008) and reducing the social distance[20] between the donor and affected individuals (Small and Simonsohn, 2008).[21] Second, the donors who state fighting a cancer donate 13.1% more (Table 4). The other two factors have insignificant effect on donations. There is, however, a positive correlation between participation in a fund-raising event and contributing as a group. Since the latter contributions have been removed from our sample and they tend to involve larger amounts, this might be causing an insignificant relationship between participation in a fund-raising event and the level of contributions.

We also examined the behavior of donors who mentioned loss of a family member or a friend (specifications A_{loss} and B_{loss} in Table 4) to determine how strong the judgments of

[20] Social distance refers to "feelings of connection (or lack thereof) between two individuals" (Loewenstein and Small, 2007).

[21] However, some studies find no evidence that experience of illness matters for decisions whether or not and how much to give (e.g., Smith, Kehoe and Cremer, 1995).

responsibility are among people in this group. As one might have expected, loss of a close person is likely to outweigh other channels through which donors select destinations and amounts of their donations. Indeed, both Results 1.1 and 1.2 are found insignificant among donors in this group.

Finally, we found that the estimated donation for January is 22.1% more than that for other months. This pattern is most likely attributable to the structure of the UK tax system where January 31 is one of the two deadlines for filing tax returns (see, e.g., Romney-Alexander, 2002). Donations in the UK are normally made through the Gift Aid system, which allows for both matching and rebates from HM Revenue and Customs (Scharf and Smith, 2015), and tax relief can only be claimed on the January deadline.

In conclusion of this section, we would like to comment on what some may perceive as potential drawbacks of the empirical analysis in this section. Our discussion also sets the stage for the empirical study 2. One could argue that the relation between the donation size and prevention rate might be confounded by wealth and self-interest effect. Our results reported in this and companion paper suggest otherwise. Result 1.1 in the present paper that donors respond to information on cancer causes within same cancer types, suggest that, irrespective of wealth, self-interest, and other motives, preventability of a cancer plays an important role in donation behavior. Furthermore, Safra, Ma, and Melkonyan (2019) demonstrate that the self-interest incentive fails to explain the behavior of 30 - 67% of the population. The findings in the next section provide even a more resounding answer to such concerns. There, we find that individual income does not have a statistically significant effect on donations to either the hereditary or lifestyle-related cancers.

Some readers of our paper may also suggest that not donating to lifestyle-related cancers may be a form of a commitment device to change habits in order to reduce the risk of getting a lifestyle-related cancer. Again, our findings suggest that even if this channel is present, it is minimal. First, if the commitment channel was sizeable we would not find evidence reported in Result 1.1. Second, in the present study we analyze the size of donations rather than the choice of which cancer to donate to. Third, the number of donations to lifestyle-related cancers is not considerably different from that to other cancer types. And, fourth, our analysis in the next section reveals that choice egalitarianism is the primary rationale

behind donation behavior for a substantial share of donors.

4 Study 2

4.1 Data

The study was conducted from January 31- February 12, 2019 using the online survey platform Maximiles.[22] The participants were compensated with loyalty points for participating in the study. These points were issued in real time and could be redeemed immediately for various products (such as books, airline tickets, etc.).

A total of 246 valid responses were obtained out of a group of 303 respondents recruited from the UK general population.[23] The online experiment contained a total of 35 questions. Table 6 provides a summary of the background and demographics data for our sample. All socio-demographic groups have a significant representation in our sample. The individuals in 40-49, 50-59 and 60-69 age groups each constitute 22% of the sample, the individuals in 18-28 age group make up 7% of the sample while the individuals who are over 70 years old are 13% of the sample. In terms of the highest level of education, 32% of the respondents finished a secondary school, 9% took some university modules, and 26% of the sample had a Bachelor's degree. Finally, 63% of the sample had income in the range of £20,001-£80,000 and 32% had income below £20,000.

To elicit preferences toward different justice principles, the respondents faced a series of hypothetical choice questions (see Online Appendix). For the first of the choice questions, the respondents were asked to decide whether to donate to one, both, or none of the following two causes: research on treatment of *non-Hodgkin lymphoma* (NHL) and research on treatment of *melanoma*. NHL is a cancer that develops in the lymphatic system, which is a network of vessels and glands spread throughout one's body. The percentage of preventable cases of NHL in the United Kingdom is around 3%, which means that about 3% of the cases could

[22] In contrast to the present survey, in Safra, Ma and Melkonyan (2019) the respondents were presented only with information about causes of a generic cancer and faced a different choice problem.

[23] We have removed 47 incomplete questionnaires, 9 questionnaires that were completeed in less than 1 minute, and 1 questionnaire for which the respondent refused to continue after reading the consent form.

have been prevented by adopting alternative lifestyles (the remaining 97% are associated with hereditary genetic defects or other causes). Melanoma is a type of skin cancer that develops from the pigment-containing cells known as melanocytes and that can spread to other organs in the body. The percentage of preventable cases of melanoma in the United Kingdom is around 86%, which means most of the cases could have been prevented by adopting an alternative lifestyle (especially avoiding UV radiation associated with excessive exposure to sunlight). This information was provided to the respondents so that they have a good understanding about the causes of two cancers (see Question 1 in Online Appendix). Our choice of these two cancers was driven by the fact that the first of them was almost entirely due to hereditary causes while the second was mainly due to lifestyle activities.

The second question addressed to the respondents elicited the amount the respondents would have donated to a specific cause. We designed this question differently for three groups categorized according to their previous answers: (1) respondents who chose to donate only to NHL, (2) respondents who chose to donate only to melanoma and (3) respondents who chose to donate to both cancers. The respondents in the first two groups were asked to enter a donation amount between £0.01 and £200 for the cancer they chose. Respondents who decided to donate to both cancers, the third group, were asked to choose a donation amount (between £0.01 and £200) both for non-Hodgkin lymphoma and for melanoma. The donation amounts entered by the respondents are denoted by y_{NHL} and y_M for the *NHL donation* and *melanoma donation* questions, respectively.

As indicated in Table 8, 15.0% of the sample donated only to NHL while only 6.9% of the sample donated only to melanoma. The majority of the sample (52.9%) donated to both cancers. The average donation to NHL is higher than the average donation to melanoma (£39.24 vs. £32.82) for the respondents who decided to donate only to one of the two cancers. Similarly, for the respondents who decided to donate to both cancers, the average donation to NHL is higher than the average donation to melanoma (£33.10 vs. £30.31).

In addition to individuals' views on justice, a number of other factors may affect the destinations and amounts of donations. To this end, we elicited information on several individual characteristics. First, the proportions of the respondents in our sample who had suffered from cancer or had relatives who had cancer were 9.3% and 63.4%, respectively. We

have that 44.3% of the respondents viewed own lifestyles healthier compared to a reference point given by the average lifestyle. In contrast, 7.3% of the respondents considered own lifestyles more unhealthy than the average. We also recorded the average amount of time the respondents stayed outside per day between 10 AM and 4 PM in summer (on a seven-point scale with 0 = less than an hour, 1 = 1 hour to 6 = 6 hours). The average score for this variable was 2.1 for weekdays, while the average score was 3.0 for weekend days. The share of the respondents in our sample who had experienced a red or painful sunburn that lasted a day or more during the preceding 12 months was 26.4%. Finally, 18.7% of the sample reported having used artificial tanning equipment. During the 12 months preceding the questionnaire, the average number of times the respondents who used an artificial tanning equipment in winter, spring, summer and fall were 0.15, 0.24, 0.34 and 0.18, respectively.[24]

Finally, we have also asked participants to freely comment on the rationale behind their choices. We identified 124 comments that were meaningful. Among these, 16.1% unambiguously identified the choice-egalitarian motive, 19.4% mentioned loss of a family member to the cancer in question, 62.1% mentioned some other reason, and 2.4% were combinations of the choice-egalitarian motive with some other motives behind their choices. For the group of people who choose to donate more to NHL than to melanoma, the share of participants who unambiguously indicated the choice-egalitarian motive for their choice was 44.2%.

4.2 Empirical Model of Donation Behavior and Its Findings

Before examining the drivers behind donations to different causes, we examine the differences across the respondents' donations to NHL and melanoma (see Table 7 for descriptive statistics of the choice questions). The results of both a Wilcoxon sign-rank test and a t-test indicate that the difference between the donations toward NHL and melanoma (for the whole sample) is significantly different from zero ($p = 0.00$ for both tests). The statistical tests also reveal that, for individuals who chose to donate to both cancers, the donation toward NHL is significantly larger than that toward melanoma ($p = 0.05$ from a t-test). Thus,

Result 2.1. *Individuals on average donate significantly more to NHL than to melanoma.*

[24] Due to lack of statistical evidence, we did not use these variables in the empirical analysis.

To evaluate the effect of demographic and control variables on donations to NHL and melanoma, we estimated the following system of seemingly unrelated regression equations (Zellner, 1962)[25]:

$$Y_i = \beta_0 + \mathbf{D}_i'\gamma + \mathbf{G}_i'\delta + \mathbf{C}_i'\ell + \varepsilon_i,$$

where each equation corresponds to one of two cancer types, Y_i is a continuous variable reflecting an individual's donation amount to NHL or melanoma, $\mathbf{D}_i$ is the vector of *socio-demographic* variables, $\mathbf{G}_i$ is the vector of all *group identity* variables, and C_i is the vector of comments in different categories (see Table 8 for descriptions and sample statistics of independent variables). The estimation yields a number of interesting findings.

Result 2.2. *Individuals who indicated the choice-egalitarian motive in their comments would donate significantly more to NHL and significantly less to melanoma.*

The respondents who mentioned choice-egalitarianism as the rationale behind their choice were estimated to donate £27.82 more to NHL and £13.89 less to melanoma. Results 2.1 and 2.2 reinforce our findings in the previous sections that a significant part of the population is choice egalitarian. Our next finding is also of particular significance.

Result 2.3. *Individual income and self-described lifestyles do not have a statistically significant effect on donation to either cancer.*

One may argue that more wealthy individuals may donate to cancers with low prevention rates for purely personal reasons, simply because they and their friends and relatives are more likely to be affected by those type of cancers. This could cause a significant concern in Study 1 where data for income and lifestyle is not available. The result that neither of these two variables affects donations allays such concerns for causality between prevention rate and donations in Study 1. Note also that we found that the respondents' ethnic background does not have a statistically significant effect on donations to either cancer.

[25] Since donations were chosen contemporaneously, the disturbances in the estimated equations are likely to be correlated.

According to the estimation results, individuals who are suffering or suffered from a cancer would donate more to the cancer by which they have been affected. It is expected that individuals who are suffering or suffered from NHL would donate £23.54 more to NHL than those without such experience. Similarly, individuals who are suffering or suffered from melanoma would donate £18.69 more to the disease than others. This finding is completely aligned with the corresponding result in Study 1, where it was found that the donors who stated fighting a cancer would donate 13.1% more.

From Table 9, the respondents with relatives who are suffering or suffered from melanoma are estimated to donate £7.07 more to research on the disease. However, family history does not have a statistically significant effect for NHL. In contrast, loss of a family member to NHL has a substantial effect on donations to the disease; an increase of £17.92 according to our estimation. Again, these findings are consonant with the corresponding results for Study 1, where we have estimated that a loss of a family member or a friend are greater results in a 49.2% increase in donations.

We also found that, compared to men, women would donate £14.22 less to NHL and £9.71 less to melanoma (Table 9). This finding agrees with the corresponding result for Study 1, where it was found that donations from men are significantly higher. Age also has a significant effect. A one unit increase in the age band, corresponding to about 10 years, is estimated to lead to a decrease of £5.62 in the donation to NHL and a decrease of £2.95 in the donation to melanoma.

Finally, individuals who are more educated and individuals who have children would donate more to melanoma. A one unit increase in the index for education is estimated to lead to a statistically significant increase of £2.27 in the amount allocated to melanoma. Our estimates also reveal that, compared to people who do not have children, individuals with children would donate £8.10 more to melanoma. These two effects are not statistically significant for NHL.

Use of hypothetical allocations in our second study raises the issue of reliability of these responses. We believe that the results are meaningful for at least three reasons. First, before rolling out the surveys in the present study and our companion paper (Safra et al., 2019), we conducted pilot tests and informal interviews of potential donors to check the validity of

the survey questions and to identify a reasonable range for donations. Second, the range of feasible donations in the hypothetical questions were chosen to mirror the actual donations in the CRUK data we used in the present study. The latter contained $6,300$ observations between £0 and £200 with the average donation equal to £37.63. This was the principal reason why the maximal donation was set to £200 in the hypothetical questions. Moreover, the median donation for the survey data is very much in line with the corresponding statistic of the CRUK data (£25). Third, to verify that the survey participants paid attention and took their tasks seriously, we added catch trial questions and monitored their response times. Both measures indicated that the vast majority of the participants carefully deliberated about their choices.

5 Concluding Remarks

Luck and individual choices play a central role in the distribution of income, health status, and social standing across individuals within a society. We examine how people view inequalities arising from these two factors. An online platform designed by CRUK to solicit donations to cancer research offers the potential donors an ability to choose the destinations of their contributions. For some of these destinations, hereditary causes of the disease are more prevalent while for others lifestyle causes are dominant. Moreover, this information is explicitly stated for some of the cancer types on the online platform. Thus, through their contributions donors are revealing how they view the adverse health outcomes that are more likely to be caused by luck versus those for which individual choices play a relatively large role. By testing the predictions of our theoretical model, we find that donors contribute more to cancers with relatively low prevention rates and to projects for which hereditary cancer causes are included in the descriptions. Furthermore, donors contribute less to projects for which lifestyle-related cancer causes are mentioned in the description. Based on these findings, we conclude that a non-negligible share of the donors embrace choice egalitarianism as a guiding principle in making their contributions. Interestingly, this effect is mainly due to strong preference for choice egalitarianism among women. Among our other results are the findings that there is a significant amount of "in-gender favoritism" in donation behavior

and there is a considerable gender difference in reaction to various causes of cancers. Due to paucity of socio-demographic and lifestyle-choice information in our naturally-occurring data, we conducted a survey that also revealed strong support for choice egalitarianism and a number of other findings in study 1.

There are a number of interesting avenues for future research. It would be interesting to see whether preferences toward justice principles vary across different domains. Healthcare policy, unemployment benefits, education system, and income redistribution all seem to be good candidates for an inclusion in such comparison. Another appealing area for research would be to compare attitudes to different justice principles between different countries and juxtapose these difference to the countries' social policies. Finally, it would also be very informative to examine differences in the justice principles adopted by people in the field and in the lab.

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6 Appendix: Proof of Proposition 1

(i) We start with the analysis of the choice egalitarian ex ante donor's choice problem. Using the assumptions about the values of $U^P(H)$ and $U^P(M)$, the choice egalitarian ex ante donor's utility function in (1) can be written as

$$V^{xa}(d) = W(y-d, p_s(d) + (1-p_s(d))\, p_r).$$

The first-order condition for the maximization of this objective function is given by

$$\begin{aligned} \frac{\partial V^{xa}(d)}{\partial d} &= -W_1(y-d, p_s(d) + (1-p_s(d))\, p_r) \\ &\quad + p_s'(d)(1-p_r) W_2(y-d, p_s(d) + (1-p_s(d))\, p_r) \\ &= 0. \end{aligned} \tag{4}$$

Note that concavity of W and strict concavity of e imply that the second-order condition for the donor's optimization problem is always satisfied. Denote the optimal level of d by d^*. By the implicit function theorem, the effect of p_r on the optimal d^* is given by

$$\begin{aligned} \frac{\partial d^*}{\partial p_r} &= -\frac{\frac{\partial^2 V^{xa}(d)}{\partial d \partial p_r}}{\frac{\partial^2 V^{xa}(d)}{\partial d^2}} \\ &= -\frac{-W_{12}(\cdot)(1-p_s(d)) - p_s'(d) W_2(\cdot) + p_s'(d)(1-p_r)(1-p_s(d)) W_{22}(\cdot)}{\frac{\partial^2 V^{xa}(d)}{\partial d^2}} \\ &< 0, \end{aligned}$$

where the last inequality follows from the sign assumptions on the second-order derivatives of W. Hence, the optimal donation is negatively affected by the prevention rate.

Next consider a choice egalitarian ex post donor. From (2), her objective function can be written as

$$V^{xp}(d) = p_s(d) W(y-d, 1) + (1-p_s(d)) W(y-d, p_r).$$

Differentiating it with respect to d yields the first-order condition for her optimization problem

$$\begin{aligned} \frac{\partial V^{xp}(d)}{\partial d} &= p_s'(d)[W(y-d,1) - W(y-d,p_r)] \\ &\quad - p_s(d)[W_1(y-d,1) - W_1(y-d,p_r)] - W_1(y-d,p_r) \\ &= 0. \end{aligned} \tag{5}$$

By the implicit function theorem and the properties of W, we have

$$\begin{aligned}\frac{\partial d^*}{\partial p_r} &= -\frac{\frac{\partial^2 V^{xp}(d)}{\partial d \partial p_r}}{\frac{\partial^2 V^{xp}(d)}{\partial d^2}} \\ &= -\frac{-p_s'(d) W_2(\cdot) - (1 - p_s(d)) W_{12}(\cdot)}{\frac{\partial^2 V^{xp}(d)}{\partial d^2}} \\ &< 0,\end{aligned}$$

which implies that the optimal donation of the choice egalitarian ex post donor is also negatively affected by the prevention rate.

(ii) By setting p_r equal to 0 in (1), a non-choice egalitarian ex ante donor's objective can be written as

$$V^{xa}(d) = W(y - d, p_s(d)).$$

Similarly, setting p_r equal to 0 in (2), a non choice egalitarian ex post donor's objective can be written as

$$V^{xp}(d) = p_s(d) W(y - d, 1) + (1 - p_s(d)) W(y - d, 0).$$

Since the prevention rate does not appear in both functions, the optimal donation of either donor is independent of p_r. ■

Table 1. Descriptive Statistics for Donations by Cancer Type[†]

Cancer Type	**Number of donors**	**Total donation**	**Mean**	**Standard deviation**	**Median**
Bone	94	5,354	57	46	39
Bowel	234	10,208	44	40	31
Brain	481	17,571	37	35	25
Breast	1,204	37,568	31	31	19
Cervical	65	2,822	43	44	25
Lung	297	11,157	38	39	20
Lymphoma[‡]	73	3,108	43	40	31
Oesophageal	526	17,134	33	33	20
Ovarian	174	6,237	36	32	25
Pancreatic	393	17,504	45	41	25
Prostate	279	9,770	35	33	23
Skin	176	7,215	41	37	30
Stomach	108	3,692	34	33	25
Womb	25	1,603	64	50	40
Total	4,129	150,943	37	36	25

[†] UK taxpayers can add a 25% gift to their donation at no additional cost, since CRUK claims this additional amount from the UK's tax and customs authority. This amount is included in the reported data.

[‡] Lymphoma refers to non-Hodgkin's lymphoma.

Table 2. Descriptive Statistics

Variable	**Number of donors**	**Total donation**	**Mean**	**Standard deviation**	**Median**
Description					
Hereditary	265	10,685	40	39	25
lifestyle-related	357	13,343	37	37	25
Neither	3,507	126,915	36	35	25
Comment[†]					
Attend	1,386	45,156	33	31	25
Loss	562	28,086	50	42	38
Fighting	253	9,905	39	37	25
Gift	66	2,516	38	29	30
Others[‡]	2,020	72,127	36	36	23
Gender					
Female	2,167	74,975	35	35	20
Male	1,426	57,333	40	36	25
Unisex	536	18,635	35	35	25
Total	4,129	150,943	37	36	25

[†] The number of donors who left comments is 2,639. Among these donors, 2,109 attributed their donations to one or more of the four categories of comments we have created.

[‡] "Others" represents donors who either left no comments (1,490 donors) or ascribed their donations to factors other than those captured by the four categories of the comments (530 donors).

Table 3. Prevention Rates by Cancer Type†

Cancer Type	Prevention Rate
Low Prevention Rate	
Prostate	0
Bone	0.5
Brain	0.5
Lymphoma	6
Medium Prevention Rate	
Ovarian	21
Breast	27
Pancreatic	37
Womb	37
Bowel	54
High Prevention Rate	
Stomach	75
Skin	86
Lung	89
Oesophageal	89
Cervical	100

† Given that CRUK (2015b) specifies the prevention rates to be "less than 0.5% " for bone and brain cancer, we have set them to 0.5%.

Table 4. Regression Results

	Specification			
Variable	A	B	A_{loss}	B_{loss}
Prevention Rate: Medium		-0.059^{*} (0.035)		-0.004 (0.094)
Prevention Rate: High		-0.078^{**} (0.037)		-0.072 (0.098)
Attend	0.011 (0.029)	-0.022 (0.029)		
Loss	0.492^{***} (0.040)	0.547^{***} (0.040)		
Fighting	0.131^{**} (0.059)	0.134^{**} (0.057)		
Gift	0.107 (0.104)	0.145 (0.104)		
Gender: Unisex	0.059 (0.041)	0.033 (0.041)	0.034 (0.097)	0.036 (0.099)
Gender: Male	0.237^{***} (0.030)	0.221^{***} (0.030)	0.360^{***} (0.082)	0.367^{***} (0.079)
Description: Hereditary	0.160^{**} (0.062)		0.030 (0.153)	
Description: lifestyle-related	-0.174^{**} (0.094)		-0.195 (0.238)	
January effects	0.221^{***} (0.071)	0.198^{**} (0.073)	-0.051 (0.153)	-0.038 (0.148)
Cancer type (13)	✓	–	✓	–
R^2	0.068	0.043	0.061	0.030
Number of Observations	4,129	4,129	562	562

Robust standard errors (White 1980) are reported in parentheses.

*,**,*** significant at the 10%, 5%, and 1% levels, respectively.

Table 5. Regression Results by Gender

	Specification			
Variable	A_{female}	A_{male}	B_{female}	B_{male}
Prevention Rate: Medium			-0.033 (0.050)	-0.068 (0.057)
Prevention Rate: High			-0.143^{***} (0.055)	0.059 (0.058)
Attend	-0.007 (0.041)	0.063 (0.051)	-0.051 (0.040)	0.012 (0.049)
Loss	0.410^{***} (0.056)	0.670^{***} (0.070)	0.485^{***} (0.054)	0.681^{***} (0.069)
Fighting	0.145^{*} (0.078)	0.046 (0.110)	0.147^{*} (0.076)	0.081 (0.105)
Gift	0.165 (0.124)	-0.084 (0.242)	0.194 (0.123)	-0.010 (0.232)
Description: Hereditary	0.102 (0.091)	0.219^{**} (0.096)		
Description: lifestyle-related	-0.270^{**} (0.137)	-0.183 (0.123)		
January effects	0.285^{**} (0.111)	0.209^{*} (0.102)	0.233^{*} (0.114)	0.209^{*} (0.107)
Cancer type (13)	✓	✓	–	–
R^2	0.068	0.083	0.035	0.043
Number of Observations	2,167	1,426	2,167	1,426

Robust standard errors (White 1980) are reported in parentheses.

*,**,*** significant at the 10%, 5%, and 1% levels, respectively.

Table 6. Background and Demographics (N=218)

Variable	Response Category	Percentage
Gender	Male	48.4
	Female and others	51.6
Age	18-28 years old	6.5
	29-39 years old	15.0
	40-49 years old	22.0
	50-59 years old	21.5
	60-69 years old	21.5
	Over 70 years old	13.4
Education	Primary school	1.2
	Some secondary school	7.3
	Secondary school	31.7
	Vocational school	15.5
	Some university modules	8.5
	Bachelors degree	26.4
	Some graduate-level modules	2.0
	Masters degree	6.1
	Some doctoral-level modules	0.4
	Doctorate degree	0.8
Household	Live alone	22.8
	Live with others	77.2
Income	£0 to £20,000	31.7
	£20,001 to £40,000	37.4
	£40,001 to £60,000	17.5
	£60,001 to £80,000	7.7
	£80,001 to £100,000	4.1
	Over £100,000	1.6
Children	Have no children	36.6
	Have children	63.4
Ethnic	White	91.9
	Black/African/Caribbean/Black British	1.6
	Asian/Asian British	4.9
	Mixed / multiple ethnic groups	1.6
	Other ethnic group	0.0

Table 7. Descriptive Statistics of Choice Questions

Variables	Mean	Standard deviation	Median	Min	Max	Skewness	Kurtosis
Donations fpr the whole sample (n = 246, 100.0%)							
NHL	23.39	40.49	5.00	0.00	200.00	2.57	9.88
Melanoma	18.28	32.46	5.00	0.00	200.00	2.78	12.04
Donations to NHL only (n = 37, 15.0%)							
NHL	39.24	56.57	15.00	1.00	200.00	1.97	5.80
Donations to melanoma only (n = 17, 6.9%)							
Melanoma	32.82	35.46	20.00	5.00	150.00	2.36	8.18
Donations to both cancers (n = 130, 52.9%)							
NHL	33.10	41.46	12.50	1.00	200.00	1.96	6.80
Melanoma	30.31	37.62	10.00	1.00	200.00	2.11	8.11

Table 8. Means and Standard Deviations of the Independent Variables

Variable	Mean	Std. dev.	Variable	Mean	Std. dev.
Group identity			*Socio-demographics*		
Personal history	0.093	0.292	Gender_female&others	0.516	0.501
Family history	0.634	0.483	Age bands	2.768	1.454
Considers own lifestyle healthy	0.443	0.498	Education level	3.488	1.786
Considers own lifestyle unhealthy	0.073	0.261	Live with others	0.772	0.420
Outside_weekdays	2.081	1.594	Income level	1.199	1.180
Outside_weekend days	2.963	1.650	Have children	0.634	0.483
Have a sunburn	0.264	0.442	Ethnic	0.163	0.577
Use artificial tanning equipment	0.187	0.391			
Time of using tanning equipment			*Comments*		
Winter	0.154	0.939	Choice egalitarians (CE)	0.081	0.274
Spring	0.240	1.594	Lost a family member	0.098	0.298
Summer	0.341	2.543	Some other reason	0.313	0.464
Fall	0.179	1.030	CE + some other reason	0.012	0.110

Table 9. Regression Results

	Specifications	
Variable	NHL	Melanoma
Personal history	23.54^{***}	18.69^{***}
	(8.41)	(6.81)
Family history	1.18	7.07^{*}
	(5.14)	(4.16)
Considers own lifestyle healthy	0.40	-4.15
	(5.15)	(4.16)
Considers own lifestyle unhealthy	13.57	-0.27
	(9.94)	(8.04)
Outside_weekdays	1.68	-1.80
	(1.93)	(1.56)
Outside_weekend days	-1.52	1.50
	(1.84)	(1.49)
Have a sunburn	0.18	-5.80
	(6.05)	(4.89)
Use artificial tanning equipment	7.90	7.83
	(6.42)	(5.20)
Gender_female&others	-14.22^{***}	-9.71^{**}
	(5.01)	(4.05)
Age bands	-5.62^{***}	-2.95^{*}
	(2.11)	(1.71)
Education level	1.28	2.27^{*}
	(1.47)	(1.19)
Live with others	-4.80	-5.24
	(6.63)	(5.36)
Income level	1.05	-0.18
	(2.40)	(1.94)
Have children	2.79	8.10^{*}
	(5.85)	(4.73)
Ethnic	-4.54	-3.92
	(4.49)	(3.63)
Choice egalitarians (CE)	27.82^{***}	-13.89^{*}
	(9.28)	(7.51)
Lost a family member	17.92^{**}	-6.36
	(8.61)	(6.97)
Some other reason	7.83	5.24
	(5.61)	(4.54)
CE + some other reason	3.15	-21.87
	(22.03)	(17.83)

*,**,*** significant at the 10%, 5%, and 1% levels, respectively.