How Donor Uncertainty Influences the Effectiveness of Match Subsidies
(Working Draft)

Zedekiah G. Higgs
University of Maryland, College Park
Department of Agricultural and Resource Economics

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Abstract

This paper explores whether donors are responsive to endogenous changes in the probability of receiving a match resulting from changes in fundraiser characteristics. The results provide strong evidence supporting the notion that changes in fundraiser characteristics can affect donors' beliefs about the probability of receiving a match, in turn affecting their donation decisions and the observed response to match subsidies. For a charity interested in maximizing the effectiveness of subsidy funds, the optimal match rate depends on the unique characteristics of their fundraiser.

1 Introduction

In a separate paper, I developed a model of charitable giving in which donors perceive match subsidies as uncertain, forming beliefs about the total giving of others in order to derive their perceived probability of receiving a match. The model allows for the characteristics of the fundraiser to affect donors' beliefs about the likely distribution of total donations by others. However, in the previous paper I simplified the analysis by considering exogenous changes in the match probability. This allowed us to derive testable predictions and, based on these predictions, I designed an online laboratory experiment to validate the model.

The results of the experiment closely aligned with our theoretical predictions, providing strong support for the model. In particular, we convincingly demonstrated that donors are responsive to changes in the match probability. Furthermore, they respond to changes in the match probability in predictable ways, consistent with our theoretical model.

In this paper, I seek to extend our results. I return to the development of the theoretical model, focusing now on endogenous changes in the match probability resulting from changes in fundraiser characteristics. I specifically consider the effects of changes in the number of potential donors and the wealth levels of potential donors, along with thoroughly exploring the predicted effects associated with changes in the match rate and the match limit. With our theoretical predictions in hand, I turn to designing an online laboratory experiment to validate the model.

The experiment is similar to the one used in the previous paper, except that rather than providing exogenous match probabilities, each problem now provides a match up to a given match limit. Donors are placed in groups, and their donation in a given problem receives a match only if the total donations of their group members do not exceed the stated match limit. In this way, the matches are made uncertain, reflecting the design of real-world fundraisers. Similar to the experiment in the previous paper, in this experiment subjects are presented with various prices (i.e., match rates) along with various match limits meant to create meaningful variation in their perceived match probabilities.

Unlike the previous experiment, in this experiment subjects complete a total of four stages. Each stage presents subjects with the same list of questions, with the same match rates and match limits. However, as stage provides a different combination of group size (i.e., the number of other participants each subject is grouped with) and endowments. The variation across stages is intended to produce meaningful variation in subjects' perceived match probabilities by affecting their beliefs about the likely total giving of their group. For example, as the group size increases (from N=5 to N=10), the match rates in each question remain the same, so subjects' perceived match probabilities should likely decrease, since it would be reasonable to expect a group of 10 donors to be more likely to exceed the match limit than a group of only 5 donors. Similar arguments hold for changes in the endowments.

The results of the experiment strongly support the hypothesis that donors are responsive to endogenous changes in the match probability. Furthermore, observed behavior is fairly consistent with theoretical predictions. Estimated match-price elasticities are in line with previous estimates

reported in the literature. However, the match price also shows strong correlations with the match limit and group size. That is, matches are found to be significantly more effective at increasing donations when the match limit is larger and the group size is smaller. This finding is consistent with the theoretical model. As the match limit increase and the group size decreases, the (perceived) probability of receiving a match should increase.

These findings extend our results from the previous paper to the case of endogenous changes in match probabilities. The theoretical model developed provides valuable new insights that advance our understanding of why people give, and the results of the experiment provide support for the model's validity.

The remainder of this paper is organized as follows. Section 2 develops the theoretical model, presents the assumptions needed, and derives theoretical results. Section 3 presents the experimental design and outlines the experimental procedures. Section 4 presents results, and Section 5 concludes. Proofs of theoretical results are provided in Appendix A. Appendices B, C, and D present additional tables, figures, and materials from the experiment, respectively.

2 Theory

In a previous paper, I developed a theoretical model of giving where donors perceive matches as uncertain. A donor's eligibility for a match hinges on the match limit and the aggregate donations from others. The uncertainty arises because donors are unaware of the total contributions from others when making their donation decisions. Consequently, each donor treats the total giving of others as a random variable and constructs a probability distribution for its value. The probability density function (PDF) of the total giving of others depends on fundraiser characteristics, such as the size of the fundraiser (i.e., the number of potential donors) and the average wealth of potential donors. In this way, the characteristics of a fundraiser can vary a donor's perceived probability of receiving a match, thereby affecting the donor's response to an advertised match offer.

In this paper, I continue to use the model developed in the previous paper. However, whereas in the previous paper I looked only at exogenous changes in a donor's perceived probability of receiving a match, here I extend the analysis to encompass endogenous changes resulting from changes in the characteristics of a fundraiser. Specifically, I consider how changes in the number of potential donors and the average wealth of potential donors affect the response to changes in the match rate.

In what follows, I reintroduce the model and restate all definitions, assumptions, etc. that are essential to the analysis in this paper. I then turn to deriving theoretical predictions regarding the response to changes in fundraiser characteristics. Based on the theoretical predictions, testable hypotheses are developed.

2.1 Basic Setup

For a given charity, there are a total of N potential donors, where N is exogenously determined. Each potential donor $i = 1, ..., N$ has utility given by the impure impact model of Hungerman and Ottoni-Wilhelm (2021). That is, each potential donor's utility is given by $U_i(w_i - g_i, g_i, R_i + \lambda R_{-i})$. I assume that U_i is strictly increasing and concave in each of its arguments for all i.

Each donor i is endowed with exogenous wealth, $w_i \in \mathbf{R}_+$, from which they choose an amount, $g_i \in [0, w_i]$, to donate to the charity. Let $G = \sum_{i=1}^{N} g_i$ be the total amount passed to the charity by all individuals $i = 1, ..., N$, and let $G_{-i} = \sum_{j \neq i} g_j$ be the total amount of donations passed to the charity by all individuals other than i. Donations to the charity are matched by a third party donor at some match rate, $\mu \in \mathbf{R}_+$, up to the point that the exogenously set lead gift, $\phi \in \mathbf{R}_+$, has been fully depleted. That is, as long as $\mu(g_i + G_{-i}) \leq \phi$ (that is, total donations do not exceed the match limit), individual i's donation, g_i, is matched at rate μ, so that the total donation received by the charity (i.e., donor i's *impact*) is $R_i = (1 + \mu)g_i$, consisting of i's donation of g_i and the third party's matching donation of μg_i. If $\mu G_{-i} < \phi < \mu(g_i + G_{-i})$, then i's donation is *partially* matched. In this case, donor i's impact is given by $R_i = g_i + \phi - \mu G_{-i}$. Finally, if $\mu G_{-i} \geq \phi$ (other's total donations exceed the match limit), i's donation, g_i, is not matched, and donor i's impact is given by $R_i = g_i$.

Note that the lead gift amount, ϕ, is different from the match limit, $\frac{\phi}{\mu}$. The lead gift is the total amount of funds available for matching donations, while the match limit is the total amount of donations that can be matched before the lead gift is fully exhausted. Therefore, holding the size of the lead gift, ϕ, constant, increasing the match rate, μ, will mechanically decrease the match limit, $\frac{\phi}{\mu}$. As the match rate is increased, fewer donations are required to fully exhaust the lead gift.[1]

To simplify the analysis, I ignore the possibility of donor i receiving a partial match. Instead, I will assume that donor i considers a partial match to be equivalent to a full match. This is formalized by the following assumption.

Assumption 1 *Donors consider their impact when receiving a partial match to be equivalent to their impact when receiving a full match. For all $i = 1, ..., N$, we have the following:*

$$R_i = \begin{cases} (1 + \mu)g_i & \text{for } 0 \leq G_{-i} < \frac{\phi}{\mu} \\ g_i & \text{for } \frac{\phi}{\mu} \leq G_{-i} \leq W_{-i} \end{cases} \tag{1}$$

where $W_{-i} = \sum_{j \neq i} w_j$.

Under this assumption, donors view the match as binary: they either receive a full match or no match, depending only on whether or not the total giving of others fully exhausts the match

[1] For example, consider a lead gift of \$1,000. If a 1:1 match is provided ($\mu = 1$), it will require \$1,000 in donations to fully exhaust the lead gift. However, if the match rate is increased to a 2:1 match ($\mu = 2$), then it will only take \$500 in donations to fully exhaust the lead gift.

limit. This is equivalent to donors simply ignoring the possibility of receiving a partial match. In practice, for large fundraisers with many donors, the probability of receiving a partial match will be negligible and likely would be ignored by the vast majority of donors.[2]

As long as the total giving of others is less than the match limit (i.e., $G_{-i} < \frac{\phi}{\mu}$), donor i will consider their impact to be $R_i = (1+\mu)g_i$. Therefore, donor i's utility is given by:

$$U_i\big(x_i, g_i, R\big) = \begin{cases} U_i\big(w_i - g_i,\ g_i,\ (1+\mu)g_i + \lambda R_{-i}\big) & \text{for } 0 \leq G_{-i} < \frac{\phi}{\mu} \\ U_i\big(w_i - g_i,\ g_i,\ g_i + \lambda R_{-i}\big) & \text{for } \frac{\phi}{\mu} \leq G_{-i} \leq W_{-i} \end{cases} \tag{2}$$

The parameters μ, ϕ, N, $\mathbf{w}$, λ, and R_{-i} are all exogenous. The total giving of others, G_{-i}, is assumed to be exogenous to g_i, but may be a function of the parameters. Together, the above two expressions give donor i's utility for any choice of $g_i \in [0, w_i]$ and any realization of the total giving of others, G_{-i}.

While (2) gives donor i's utility for any choice of $g_i \in [0, w_i]$ and total giving of others, G_{-i}, they are unable to optimize over (2) because the total giving of others, G_{-i}, is not known with certainty to them. Instead, I assume donors take G_{-i} to be a realization of a random variable $\tilde{G}_{-i}$, and they form beliefs about the distribution of $\tilde{G}_{-i}$ based on observable characteristics of the fundraiser. This is formalized by the following definition.

Definition 1 $F_i\big(G_{-i}|N, \mu, \phi, \mathbf{w}_{-i}\big) = P_i\left(\tilde{G}_{-i} \leq G_{-i}|N, \mu, \phi, \mathbf{w}_{-i}\right)$ is the CDF of donor i's perceived distribution of G_{-i}, given N, μ, ϕ, and $\mathbf{w}_{-i}$, where $\mathbf{w}_{-i}$ is a vector consisting of the wealth level of every donor among the fundraiser's population of potential donors other than donor i, and $\tilde{G}_{-i}$ is a real-valued random variable.

That is, based on the values of N, μ, ϕ, and $\mathbf{w}_{-i}$, each donor forms a distribution of the likely values of G_{-i}.[3] Assuming donors are expected utility maximizers and $F_i\big(G_{-i}|N, \mu, \phi, \mathbf{w}_{-i}\big)$ is twice continuously differentiable for all i, donor i will choose $g_i \in [0, w_i]$ to maximize

$$\begin{aligned} EU_i(g_i|\cdot) = F_i\left(\frac{\phi}{\mu}\,\middle|N, \mu, \phi, \mathbf{w}_{-i}\right) U_i\big(w_i - g_i,\ g_i,\ (1+\mu)g_i + \lambda R_{-i}\big) \\ + \left[1 - F_i\left(\frac{\phi}{\mu}\,\middle|N, \mu, \phi, \mathbf{w}_{-i}\right)\right] U_i\big(w_i - g_i,\ g_i,\ g_i + \lambda R_{-i}\big), \end{aligned} \tag{3}$$

where $F_i(\frac{\phi}{\mu}|\cdot)$ is the donor's perceived probability of being matched, and $[1 - F_i(\frac{\phi}{\mu}|\cdot)]$ is their perceived probability of not being matched. Also note that $U_i\big(w_i - g_i,\ g_i,\ (1+\mu)g_i + \lambda R_{-i}\big)$ is

[2] In order for a donor to perceive a significant probability of receiving a partial match, they would either need to have a high level of confidence that G_{-i} is very close to (but just below) the match limit, $\frac{\phi}{\mu}$, or they would need to be making a very large donation, g_i, relative to their beliefs about the total giving of others, G_{-i}.

[3] I assume the parameter values are known by all donors, choosing to instead introduce uncertainty through each donor's construction of their perceived distribution of G_{-i}. However, since each donor forms their own beliefs about the distribution of G_{-i}, the model would be equivalent if donors were to instead each hold unique beliefs about the values of the parameters.

donor i's utility given a certain match (i.e., $F_i(\frac{\phi}{\mu}|\cdot) = 1$ and $\mu > 0$), and $U_i\big(w_i - g_i,\ g_i,\ g_i + \lambda R_{-i}\big)$ is their utility when there is no match (i.e., $F_i(\frac{\phi}{\mu}|\cdot) = 0$ or $\mu = 0$). Thus, EU_i is simply the weighted average of the potential outcomes, match and no match.

The following definitions will be used to simplify the notation in the proceeding analysis:

Definition 2 Donor i's utility when *not* receiving a match is given by

$$U_i^0 \equiv U_i\big(w_i - g_i,\ g_i,\ g_i + \lambda R_{-i}\big). \tag{4}$$

Definition 3 Donor i's utility when receiving a match at rate μ is given by

$$U_i^1 \equiv U_i\big(w_i - g_i,\ g_i,\ (1+\mu)g_i + \lambda R_{-i}\big), \tag{5}$$

Definition 4 Donor i's *perceived probability of receiving a match* is given by

$$p_i \equiv F_i\left(\frac{\phi}{\mu}\,\middle|\, N, \mu, \phi, \mathbf{w}_{-i}\right). \tag{6}$$

Using these definitions, donor i's optimization problem (3) can be rewritten as choosing $g_i \in [0, w_i]$ to maximize

$$EU_i(g_i|\cdot) = p_i U_i^1 + (1 - p_i)U_i^0 \tag{7}$$

To guarantee that any local maximum is also a global maximum, I also make the following assumption.

Assumption 2 *Let donor i's optimization problem in the absence of a match (i.e., $F(\cdot) = 0$) be given by $\max_{g_i \in [0,w_i]} U_i^0(g_i|\cdot)$, and let their optimization problem in the presence of a certain match (i.e., $F(\cdot) = 1$) be given by $\max_{g_i \in [0,w_i]} U_i^1(g_i|\cdot)$. Then for all $i = 1, ..., N$, we have the following:*

$$(i)\ \ U_{gg}^0 < 0\ \forall g \in [0, w_i] \tag{8}$$

$$(ii)\ \ U_{gg}^1 < 0\ \forall g \in [0, w_i] \tag{9}$$

2.2 Model Predictions

2.2.1 The Effect of a Change in the Perceived Match Probability

In this section I demonstrate that changes in the perceived probability of being matched (henceforth referred to as p) affect donors' optimal donation amounts. That is, donors should in general be responsive to changes in p. In what follows, I assume interior solutions and drop the i subscripts

for brevity. Taking the derivative of (3) with respect to g, the first order condition is given by

$$F\left(\frac{\phi}{\mu}\,\middle|\cdot\right)\cdot\left(-\frac{\partial U^1}{\partial x}+\frac{\partial U^1}{\partial g}+(1+\mu)\frac{\partial U^1}{\partial R}\right) + \left[1-F\left(\frac{\phi}{\mu}\,\middle|\cdot\right)\right]\cdot\left(-\frac{\partial U^0}{\partial x}+\frac{\partial U^0}{\partial g}+\frac{\partial U^0}{\partial R}\right)=0 \quad (10)$$

where $U^1 = U\big(w-g,\ g,\ (1+\mu)g+\lambda R_{-i}\big)$ is the donor's utility when there is a match, and $U^0 = U\big(w-g,\ g,\ g+\lambda R_{-i}\big)$ is the donor's utility in the absence of a match. Letting $FOC^1(g)$ denote the donor's first order condition given a certain match (i.e. $p=1$), and letting $FOC^0(g)$ denote the donor's first order condition in the absence of a match, the above first order condition can be rewritten as

$$pFOC^1(g)+(1-p)FOC^0(g)=0. \quad (11)$$

That is, the donor's first order condition given an uncertain match is simply the weighted average of their FOC's for the two possible outcomes (match and no match). This leads to the following result:

Lemma 1: *For each donor i, let $g^0(\mu)\in(0,w)$ be the optimal choice of g in the absence of a match, so that $g^0(\mu)$ maximizes $U^0 = U(w-g,\ g,\ g+\lambda R_{-i})$.*[4] *Likewise, let $g^1(\mu)\in(0,w)$ be the optimal choice of g given a certain match at rate μ, so that $g^1(\mu)$ maximizes $U^1 = U(w-g,\ g,\ (1+\mu)g+\lambda R_{-i})$. Finally, let $g^*(\mu)$ be the optimal choice of g given an uncertain match at rate μ, so that $g^*(\mu)$ maximizes $EU = pU^1+(1-p)U^0$, where $p\in(0,1)$. Then $g^*(\mu)\in\big(g^0(\mu),\ g^1(\mu)\big)$ for all μ such that $g^0(\mu)\neq g^1(\mu)$, and $g^*(\mu)=g^0(\mu)=g^1(\mu)$ for all μ such that $g^0(\mu)=g^1(\mu)$.*

Proof of Lemma 1 is provided in appendix A. Lemma 1 states that, for any match rate μ, each donor's optimal choice of g when the match is uncertain (g^*) must fall between their optimal choice of g when no match is received (g^0) and their optimal choice of g when the match is received with certainty (g^1). This provides us with our first testable hypothesis:

Hypothesis 1: *For a given match rate μ, the amount a donor chooses to donate will always fall between the amount they pass when there is no match and the amount they pass when the match is certain. That is, it must always be the case that $g^*(\mu)\in\big[g^0(\mu),\ g^1(\mu)\big]$.*

Note that Hypothesis 1 holds irrespective of the characteristics of the fundraiser (with the exception of μ, which must remain constant). This is because the other parameters only enter the donor's utility function through their effect on the donor's perceived probability of receiving a match.[5]

[4] Note that since μ does not enter U^0, $g^0(\mu)$ is constant in μ. That is, $g^0(\mu)=g^0$ for all $\mu\in\mathbf{R}_+$.

[5] This is a result of using the impure impact model of giving, which takes the total giving of others to be exogenous. For models in which the total giving of others is endogenous (e.g., Andreoni (1989, 1990); Becker (1974); Bergstrom et al. (1986); Cornes and Sandler (1984)), changes in a donor's beliefs about the total giving of others would directly

Thus, without knowing or making any assumptions regarding how a donor's perceived probability of receiving a match varies in response to a change in the characteristics of the fundraiser, because the donor's perceived probability of receiving a match must always be between 0 and 1, we know that their optimal donation g^* must also always be between g^0 and g^1.

Letting g^* denote the optimal choice of g as defined by (11), we can use the implicit function theorem to determine the donor's optimal response to a change in p:

$$\frac{\partial g^*}{\partial p} = \frac{FOC^0(g^*) - FOC^1(g^*)}{|H(g^*)|}, \tag{12}$$

where $|H(g^*)| < 0$ is the determinant of the Hessian for (3) evaluated at g^*.[6] The sign of $\frac{\partial g^*}{\partial p}$ depends on the sign of the numerator in (12), which can vary across donors. However, based on how a donor responds to receiving a certain match at rate μ relative to receiving no match, the sign of $\frac{\partial g^*}{\partial p}$ can be determined. This is formalized in the following lemma:

Lemma 2: *For each donor i and all μ, if $g^1(\mu) > (=) < g^0(\mu)$, then $FOC^0\left(g^*(\mu)\right) - FOC^1\left(g^*(\mu)\right) < (=) > 0$ for all p.*

Proof of Lemma 2 is provided in appendix A.

2.2.2 The Response to a Change in the Match Rate

A key feature of this model is its ability to provide insights into why match-price elasticities can vary across fundraisers, which I will now demonstrate. To begin, it is important to keep in mind that each donor's perceived distribution of G_{-i} is a function of the parameters $(N, \mu, \phi, \mathbf{w}_{-i})$, which in general will vary across fundraisers. While the exact relationships between the parameters and donors' beliefs about G_{-i} are free to vary across donors, I enforce the following assumptions:[7]

affect their utility and alter their optimal donation amount, independent of any match effects.

[6] Since the donor's optimization problem (3) is a function of only g and we have assumed an interior solution, the Hessian is just the term EU_{gg}. That is, $|H(g^*)|$ is just the second order condition evaluated at g^*. Since U^0_{gg}, $U^1_{gg} < 0\ \forall g \in [0, w]$ and EU is just a weighted sum of U^0 and U^1, it follows that $EU_{gg} < 0\ \forall g \in [0, w]$.

[7] Although I believe Assumption 3 to be reasonable—and I expect it should hold for most donors—it is mostly presented to simplify the discussion that follows. Technically, Assumption 3 can be tested by eliciting donors' perceived probabilities (to the extent that donors' reported beliefs are accurate reflections of their behavior). If the signs of any of the conditions presented in Assumption 3 are flipped, the predictions presented below will likewise flip signs in a straightforward way.

Assumption 3: *For all donors* $i = 1, ..., N$,

$$(a)\ \frac{\partial F_i(\frac{\phi}{\mu}|\cdot)}{\partial N} = \frac{\partial F_i(G_{-i}|\cdot)}{\partial N}\Big|_{G_{-i}=\frac{\phi}{\mu}} < 0$$

$$(b)\ \frac{\partial F_i(\frac{\phi}{\mu}|\cdot)}{\partial \phi} = \frac{1}{\mu} f(\frac{\phi}{\mu}|\cdot) + \frac{\partial F_i(G_{-i}|\cdot)}{\partial \phi}\Big|_{G_{-i}=\frac{\phi}{\mu}} > 0$$

$$(c)\ \frac{\partial F_i(\frac{\phi}{\mu}|\cdot)}{\partial \mu} = -\frac{\phi}{\mu^2} f(\frac{\phi}{\mu}|\cdot) + \frac{\partial F_i(G_{-i}|\cdot)}{\partial \mu}\Big|_{G_{-i}=\frac{\phi}{\mu}} < 0$$

$$(d)\ \frac{\partial F_i(\frac{\phi}{\mu}|\cdot)}{\partial \mathbf{w}_{-i}} = \frac{\partial F_i(G_{-i}|\cdot)}{\partial \mathbf{w}_{-i}}\Big|_{G_{-i}=\frac{\phi}{\mu}} < 0$$

Part (a) says that each donor's perceived probability of being matched decreases as the number of potential donors increases, all else equal. Essentially, donors believe that the larger the donor base is, the more the charity will on average receive in donations, all else equal.

Part (b) says the perceived probability of being matched *increases* as the match amount, ϕ, increases, all else equal. Note that an increase in ϕ has two effects on the probability of being matched: a direct effect (the first term in (b)), resulting from the increase in the match limit, and an indirect effect (the second term in (b)), resulting from the shift in the donor's perceived distribution of the total giving of others. Assumption (b) does not restrict the second term to be positive (i.e., they may believe donations will increase or decrease in response to an increase in ϕ). Instead, assumption (b) simply states that the direct effect must outweigh the indirect effect, so that the overall effect will be to increase the probability of being matched.

Part (c) says the perceived probability of being matched decreases as the match rate, μ, increases, all else equal. Note that, like the effect of an increase in ϕ, an increase in μ results in both a direct and an indirect effect. In this case, the direct effect is negative, since an increase in the match rate will mechanically decrease the match limit ($\frac{\phi}{\mu}$ is decreasing in μ). However, the indirect effect may once again be positive or negative. That is, donors may believe that total donations will either increase or decrease in response to an increase in the match rate. All that part (c) requires is that the direct effect outweigh the indirect effect so that the overall effect is negative.

Finally, part (d) says the perceived probability of being matched decreases as the wealth of the other potential donors increases, all else equal. That is, donors believe that donations will on average increase as the population of potential donors becomes more wealthy.

For each of these assumptions, I have assumed that the parameters of the fundraiser are known by all donors. This helps to make the presentation clearer, but it is not necessary for the analysis that will follow. It can instead be assumed that each donor forms their own beliefs about the parameters of the fundraiser. In that case, assumptions (a)-(d) would dictate how each donor's perceived probability of being matched would change as their *beliefs* about each parameter value

change, holding all else equal.[8]

Proposition 1 states that, for a given match rate μ, each donor's optimal donation is monotonic in their perceived probability, p, of being matched. Therefore, any donors who are responsive to matches should also be responsive to changes in p. However, when the changes in p are the result of changes in the characteristics of the fundraiser, the overall impact on donor behavior is much less straightforward.

As an example, consider the effect of an increase in the match rate, μ, for a donor who responds positively to a certain match (i.e., a donor for whom $g^1 > g^0$). Assume for now that $\frac{\partial g^1}{\partial \mu} > 0$, i.e, the donor's optimal donation under a certain match is increasing in the match rate. Because the donor responds positively to certain matches, it may seem reasonable to expect that they will also increase their donation in response to an increase in the *uncertain* match rate. However, this ignores the effect that increasing the match rate, μ, has on the perceived probability, p, of being matched. Accounting for this effect, it is possible for the same donor to *decrease* their donation in response to an increase in the match rate when the match is uncertain. Thus, a given donor may display different match-price elasticities depending on the characteristics of the fundraiser, and in general responses to matches may vary significantly across different fundraisers. This is formalized in the following result:

For a donor with EU given by equation (3), we have

$$\frac{\partial g^*}{\partial \mu} = \Bigg\{ \left[-\frac{\phi}{\mu^2} \cdot f\left(\frac{\phi}{\mu}\Big|\cdot\right) + \frac{\partial F\left(\frac{\phi}{\mu}\Big|\cdot\right)}{\partial \mu} \right] \cdot \left[FOC^0(g^*) - FOC^1(g^*) \right] + F\left(\frac{\phi}{\mu}\Big|\cdot\right) \cdot \left[g^* \left(U^1_{xR} - U^1_{gR} - (1+\mu) U^1_{RR} \right) - U^1_R \right] \Bigg\} \Bigg/ |H(g^*)| \quad (13)$$

Since $|H(g^*)| < 0$, the sign of 13 will be the opposite of the sign of the numerator. The first term in brackets captures the effect of the change in the match rate on the donor's perceived probability of being matched. By Assumption 3, this effect is negative. However, as highlighted in the discussion of Assumption 3, the magnitude of this effect will depend on the characteristics of the fundraiser (particularly the value of $\frac{\phi}{\mu}$), and in general it will vary across donors. From Lemma 2, the sign of the second term in brackets depends on the donor's response to a certain match. Thus, the first addend in the numerator can be either positive or negative, depending on the donor. Likewise, the sign of the final term in brackets also depends on the donor's response to a certain match. This is summarized in the following proposition:

[8] For example, a given donor is most likely unable to quantify the number of potential donors for any particular fundraiser, and they may not even be able to form a reasonably accurate estimate. However, they may still be able to identify that the Red Cross has significantly more potential donors than their local church. And, if so, it would be reasonable to assume that given a $10,000 match limit, the donor would perceive a much greater chance of being matched if the fundraiser in question was their local church rather than the Red Cross (*assumption (a)*). Thus, the model is able to provide insight into why donor behavior might vary across fundraisers, even if donors lack perfect knowledge of the parameters.

Proposition 2: *For each donor, if* $\frac{\partial g^1}{\partial \mu} > (=) < 0$*, then the first addend of the numerator of* $\frac{\partial g^*}{\partial \mu}$ *will be* $> (=) < 0$*, and the second addend of the numerator will be* $< (=) > 0$*. Thus, the first and second addends will always have opposite signs, and the overall sign of* $\frac{\partial g^*}{\partial \mu}$ *will be ambiguous.*

Proof of Proposition 2 is provided in Appendix A. While Proposition 2 does not lend itself to any easily testable hypotheses, it does provide insight into why donors might exhibit ostensibly contradictory reactions to changes in the match rate across different fundraisers. Donors may have negative match-price elasticities when they perceive a high probability of being matched and positive match-price elasticities when they perceive a low probability of being matched (and *vice versa*). As the perceived distribution of G_{-i} becomes more concentrated around the cutoff of $\frac{\phi}{\mu}$, such "reversals" will become more pronounced.[9]

2.2.3 The Response to Changes in Other Fundraiser Characteristics

The responses of donors to changes in each of the remaining fundraiser parameters (ϕ, N, and $\mathbf{w}_{-i}$) are less ambiguous. For these parameters, we can derive the following effects:

$$\frac{\partial g^*}{\partial \phi} = \frac{\left[\frac{1}{\mu} f(\frac{\phi}{\mu}|\cdot) + \frac{\partial F_i(\frac{\phi}{\mu}|\cdot)}{\partial \phi}\right] \cdot \left[FOC^0(g^*) - FOC^1(g^*)\right]}{|H(g^*)|} = \frac{\partial g^*}{\partial p} \cdot \frac{\partial F}{\partial \phi}, \tag{14}$$

$$\frac{\partial g^*}{\partial N} = \frac{\frac{\partial F_i(\frac{\phi}{\mu}|\cdot)}{\partial N} \cdot \left[FOC^0(g^*) - FOC^1(g^*)\right]}{|H(g^*)|} = \frac{\partial g^*}{\partial p} \cdot \frac{\partial F}{\partial N}, \text{ and} \tag{15}$$

$$\frac{\partial g^*}{\partial \mathbf{w}_{-i}} = \frac{\frac{\partial F_i(\frac{\phi}{\mu}|\cdot)}{\partial \mathbf{w}} \cdot \left[FOC^0(g^*) - FOC^1(g^*)\right]}{|H(g^*)|} = \frac{\partial g^*}{\partial p} \cdot \frac{\partial F}{\partial \mathbf{w}_{-i}}. \tag{16}$$

Since $|H(g^*)| < 0$, the sign of each effect is given by the opposite sign of the numerator. In general, the signs of the effects will vary across donors and fundraisers. However, Assumption 3 can be combined with Lemma 2 to give us Proposition 3:

[9] As the distribution of G_{-i} becomes more concentrated around $\frac{\phi}{\mu}$, the first term in the numerator of $\frac{\partial g^*}{\partial \mu}$ becomes more negative, increasing the magnitude of the first addend in the numerator. By Proposition 2, the first addend is positive for donors for whom $\frac{\partial g^1}{\partial \mu} > 0$. Thus, as the first addend increases in magnitude (i.e. becomes more positive), it becomes increasingly likely that $\frac{\partial g^*}{\partial \mu} < 0$. The opposite argument holds for donors for whom $\frac{\partial g^1}{\partial \mu} < 0$, so that it becomes increasingly likely that $\frac{\partial g^*}{\partial \mu} > 0$ as their perceived distribution of G_{-i} becomes more concentrated around $\frac{\phi}{\mu}$.

Proposition 3: *For each donor, if* $g^1 > (=) < g^0$*, then each of the following must hold:*

$$(i)\ \frac{\partial g^*}{\partial \phi} > (=) < 0$$

$$(ii)\ \frac{\partial g^*}{\partial N} < (=) > 0$$

$$(iii)\ \frac{\partial g^*}{\partial \mathbf{w}_{-i}} < (=) > 0$$

The proof of Proposition 3 follows directly from Assumption 3 and Lemma 2. Proposition 3 leads to the following testable hypotheses:

Hypothesis 2: *Donors who increase (decrease) their donation in response to a certain match will decrease (increase) their donation in response to an increase in the number of potential donors.*

Hypothesis 3: *Donors who increase (decrease) their donation in response to a certain match will decrease (increase) their donation in response to an increase in the wealth of the population of potential donors, holding their own wealth constant.*

3 Experiment Design and Procedures

From January to March of 2024, I used the Prolific platform to recruit 150 subjects to participate in an online experiment. After choosing to participate in my study on Prolific, subjects are provided with a link to a Qualtrics survey. After completing the Qualtrics survey and verifying their submission in Prolific, participants are paid a \$9 base payment through Prolific. In addition to the base payment, subjects are also paid bonus payments ranging from \$0-\$13, depending on their decisions during the experiment.

Upon opening the Qualtrics survey, subjects are first taken to a consent page. After consenting to participate in the study, they are taken to the instructions page. During the instructions, subjects are required to answer a series of questions to test their understanding.[10] After reading through the instructions and correctly answering all test questions, subjects are then taken to the main task of the experiment. Following the main task, subjects are then asked to complete follow-up tasks to

[10]There are a total of three test questions. Each question presents subjects with an example scenario and asks them to select the correct answer from a drop-down list. If they select an incorrect answer, they are provided with an explanation for why their answer is wrong and asked to try again. There are no limits on the number of attempts a subject can make, but they cannot proceed until they answer each question correctly. While it is technically possible for a subject to get through the questions without actually understanding the task—for example, by indiscriminately trying each answer until they happen upon the correct one—the Prolific platform has implemented safeguards to prevent this sort of behavior. Attention-check questions are commonly included in surveys, and Prolific allows researchers to withhold payment from any subject who incorrectly answers at least two attention-check questions within a survey. This holds even if the subject takes the time to complete the entire survey (which may be a sizable commitment, depending on the study). Because of this, subjects have a very real incentive to carefully answer all questions. In fact, a handful of subjects actually returned their survey before completing the instructions, likely out of fear that their payment would be withheld as a result of them incorrectly answering the test questions.

measure their risk preferences, and then are asked to complete some basic survey questions before submitting their survey.

Section 3.1 discusses the main task of the experiment. Section 3.2 discusses the follow-up tasks. Section 3.3 discusses the survey questions included in the experiment. Section 3.4 outlines the procedures used in the experiment. A copy of the full text of the experiment is provided in Appendix D.

3.1 Main Task

The main task consists of 4 stages. In each stage, subjects are randomly grouped with other subjects and each member of the group is provided with the same endowment (and the endowment of each group member is common knowledge). The number of other group members and the endowment provided to each member of the group varies across stages, with $N \in \{5, 10\}$ and $\mathbf{w} \in \{80, 120\}$, where the endowment is provided in Tokens (10 Tokens = \$1). Note that N denotes the number of *other* members in a subject's group, so that the full group size, including the subject, is given by $N + 1$.

Within each stage, subjects are presented with a menu of 13 problems (similar to the menu of problems used in the experiment from the previous paper) in which they must decide how much of their endowment to pass to a real charity.[11] Among the 13 decision problems within each stage, four different match rates are offered: $\mu \in \{0, 0.5, 1, 2\}$. Furthermore, for each nonzero match rate, three different lead gifts/match limits are provided.[12] Table 1 shows the parameter values used in each question, which remain the same across all four stages.

In each question, any amount a subject chooses to pass to the charity will receive a match at the stated match rate as long as the total donations of the N other group members does not exceed the stated match limit for the problem. Consistent with the theoretical model developed in Section 2, whether or not a subject's donation receives a match depends only on the decisions of the *other* members of their group, and there are no partial matches.

Subjects are placed into new random groups for each stage and no information about the decisions of other subjects is ever provided. However, subjects are always informed of the group size (N) and the endowments of all group members ($\mathbf{w}$). The only role of the groups is to determine whether a subject's donations are matched (i.e., whether or not their group's total donations, G_{-i}, exceed the match limit, $\frac{\phi}{\mu}$), but subjects never receive any information about the giving of others or whether the match limit was exceeded. Instead, subjects must construct their own beliefs about the probability of being matched based on the exogenously determined parameters, N, μ, ϕ, and $\mathbf{w}$.

[11] As in the last paper, the charity used is *charity: water*. The description of the charity provided in the instructions to the experiment is identical to that used in the previous paper.

[12] The match limit ($\frac{\phi}{\mu}$) is determined by the amount of the lead gift (ϕ) and the match rate (μ), so that, for a given match rate, the lead gift and match limit convey the same information. However, in the experiment, subjects are informed of the match limit in each problem—not the lead gift amount—since this is typically the procedure used in real-world fundraisers and likely reduces confusion on the part of donors.

Table 1: Match rates and lead gifts/match limits used in all stages.

Question	match rate (μ)	lead gift (ϕ)	match limit ($\frac{\phi}{\mu}$)
1	0	NA	NA
2	1/2	80	160
3	1/2	120	240
4	1/2	160	320
5	1/2	∞	∞
6	1	120	120
7	1	160	160
8	1	240	240
9	1	∞	∞
10	2	160	80
11	2	240	120
12	2	320	160
13	2	∞	∞

Within each stage, all 13 decision problems are presented simultaneously within a single table. Each row presents a question, and there are five separate columns. The first column contains the description for each problem, which informs the subject of the number of other subjects in their group (N), the amount that they and each of their group members have been endowed with ($\mathbf{w}$), the match rate (μ), and the match limit ($\frac{\phi}{\mu}$). The descriptions for each problem all begin with the sentence, "*You, and each of the* {5, 10} *other members of your group, are endowed with* {80, 120} *Tokens.*" With the exception of the problems that provide certain matches and the one problem that provides no match, the remainder of the description for each problem has the following format: "*The experimenter will match donations at a* {0.5:1, 1:1, 2:1} *rate up to a match limit of* {80, 120, 160, 240, 320} *Tokens.*" The problems that provide certain matches instead read "*The experimenter will match all donations at a* {0.5:1, 1:1, 2:1} *rate.*" The description for the problem with no match says nothing more than the first sentence, informing subjects of their group size and endowments.

The second column of each problem provides a text-entry box in which subjects are prompted to enter the number of Tokens they would like to pass to the charity. After a subject enters a value in column 2 of a given problem, the remaining columns (3-5) automatically populate to provide the subject with the following information: column 3 reports the number of Tokens the subject will hold for themselves (their endowment minus the amount they pass), column 4 reports the total donation that will be received by the charity if no match is received, and column 5 reports the total donation that will be received by the charity if a match is received.[13] These values are reported to subjects to reduce confusion and prevent calculation errors, and subjects are free to edit their

[13]For questions that provide a 100% chance of receiving a match (i.e., those with no match limit), column 4 displays "N/A" regardless of the amount the subject chooses to pass, helping to make it clear to the subject that the match is certain. Likewise, for the question that provides a 0% chance of receiving a match, column 5 displays "N/A" regardless of the amount the subject chooses to pass, helping to make it clear that there is no chance of receiving a match.

Table 2: Parameter values used for each question order.

	Order 1		Order 2		Order 3		Order 4	
Question	μ	$\frac{\phi}{\mu}$	μ	$\frac{\phi}{\mu}$	μ	$\frac{\phi}{\mu}$	μ	$\frac{\phi}{\mu}$
1	0	NA	0	NA	1/2	∞	2	∞
2	1/2	160	2	80	1/2	320	2	160
3	1/2	240	2	120	1/2	240	2	120
4	1/2	320	2	160	1/2	160	2	80
5	1/2	∞	2	∞	1	∞	1	∞
6	1	120	1	120	1	240	1	240
7	1	160	1	160	1	160	1	160
8	1	240	1	240	1	120	1	120
9	1	∞	1	∞	2	∞	1/2	∞
10	2	80	1/2	160	2	160	1/2	320
11	2	120	1/2	240	2	120	1/2	240
12	2	160	1/2	320	2	80	1/2	160
13	2	∞	1/2	∞	0	NA	0	NA

responses as many times as they like before submitting them.

Once a subject has provided acceptable responses to all 13 questions within a stage, they are able to submit their decisions for the stage. If they fail to answer any of the questions, or if they provide an unacceptable response to any of the questions (e.g., they attempt to pass a negative amount or an amount greater than their endowment), they receive an error message informing them of the specific issue and are unable to continue until providing an acceptable response. After successfully submitting their responses, they move on to the next stage, where they are presented with the same 13 questions but are assigned a new combination of group size (N) and endowments ($\mathbf{w}$). After completing a stage, subjects are unable to return to it. To maintain incentive compatibility, only one problem from all four stages is randomly selected for payment (Azrieli et al., 2018).[14]

To account for any order effects induced by the order in which the 13 questions are presented, subjects are randomly assigned one of four different orders. Subjects are assigned the same question order in all four stages. The orders used are shown in Table 2. The first order exactly matches what is presented in Table 1, with questions ordered first by ascending match rates and then by ascending lead gifts/match limits. The remaining orders vary by presenting match rates in ascending order and/or match limits in descending order, as well as placing the no-match question at either the beginning or end of the list.

Similarly, to account for any order effects associated with the parameter values presented in each stage (N and $\mathbf{w}$), subjects are presented with the stages in random order. Given that there are four distinct stages, there are $4! = 24$ possible orders. By limiting the analysis to only the first

[14]To help subjects understand the procedure, they are told that one of the four stages will be randomly selected, and that one problem from the selected stage will then be randomly selected to determine payment. In practice, however, the computer drew a random number between 1 and 52 to determine the problem selected for payment, rather than conducting a two-stage lottery.

stage presented to each subject, I am able to make between-subject comparisons that are free of any potential stage-order effects. Looking at all stages presented to subjects, I am also able to make within-subject comparisons of behavior across stages. Because the order of stages is completely randomized for each subject, I am also able to test for stage-order effects.

Below I discuss each stage in greater detail. Although the order of stages is randomized for each subject, I number them 1 through 4 to make it easier to refer to each stage.

Stage 1: $N = 5$**,** $\mathbf{w} = 80$

In Stage 1, subjects are grouped with 5 other subjects (i.e., $N = 5$), and all subjects are endowed with 80 Tokens (i.e., $\mathbf{w} = \mathbf{80}$). The total wealth of the other members of each subject's group in Stage 1 is 400 Tokens (5 other subjects, each endowed with 80 Tokens). Therefore, for any match limit less than 400 Tokens, it is possible for the total donations of the group to be large enough to exceed the match limit. That is, the match becomes uncertain.

Stage 2: $N = 10$**,** $\mathbf{w} = 80$

In Stage 2, subjects are again endowed with 80 Tokens each, but they are now grouped with 10 other subjects ($N = 10$). The total wealth of the other members of each subject's group is now 800 Tokens (10 other subjects with 80 Tokens each). Relative to Stage 1, the other members of each subject's group now have twice as many Tokens available to them. According to Proposition 3 in Section 2, for questions that provide uncertain matches, the increase in group size should cause subjects to adjust their donation amounts relative to Stage 1, due to a decrease in their perceived probabilities of receiving a match. Whether they should be expected to increase or decrease their donations relative to Stage 1 will depend on their response to certain matches, which will also be observed.[15] Thus, the comparison of Stages 1 and 2 provides a test of Hypothesis 2.

Stage 3: $N = 5$**,** $\mathbf{w} = 120$

In Stage 3, subjects are grouped with 5 other subjects ($N = 5$), and they are now each endowed with 120 Tokens ($\mathbf{w} = \mathbf{120}$). The total wealth of the other members of each subject's group is 600 Tokens (5 other subjects with 120 Tokens each). Relative to Stage 1, the other members of each subject's group now have 50% more Tokens available to them. According to Proposition 3, the increase in the endowments of the *other* members of a subject's group should affect their giving decisions in the uncertain-match questions, as a result of a decrease in their perceived probability of receiving a match.[16] However, this result is confounded by the wealth effect that results from

[15]Note that the model developed in Section 2 predicts that a change in the number of other potential donors (N) will only affect a donor's choice of donation through its effect on the donor's perceived probability of receiving a match. Because of this, the model also predicts that changes in N should have no impact on how much a donor gives when no match is offered or when a match is received with certainty. That is, going from Stage 1 to Stage 2 should have no effect on the amount donors give in the no-match and certain-match questions. Therefore, the comparison of Stages 1 and 2 allows for a test of the theoretical model. If subjects are observed to adjust their donation amounts in the no-match and certain-match questions when moving between Stages 1 and 2, this would suggest that the giving decisions of others do in fact enter into donor utility.

[16]Note that Proposition 3 and Hypothesis 3 are both written in terms of the wealth levels of the *other* potential

the increase in the donor's own endowment. As a result, Hypothesis 3 cannot be directly tested by comparing Stages 1 and 3. That said, the model also predicts that an increase in N should have no effect on a donor's behavior in the no-match and certain-match questions. Therefore, the wealth effect that results from increasing the donor's own endowment can be estimated by comparing their behavior in the no-match and certain-match questions in Stages 1 and 3.

Stage 4: $N = 10$**,** $\mathbf{w} = 120$

In Stage 4, subjects are grouped with 10 other subjects ($N = 10$), and they are each endowed with 120 Tokens ($\mathbf{w} = \mathbf{120}$). The total wealth of the other members of each subject's group is 1200 Tokens (10 other subjects with 120 Tokens each). Relative to Stage 1, Proposition 3 now predicts the largest effect on behavior in uncertain-match questions, since there are now two factors contributing to a decrease in donors' perceived probabilities of receiving a match. Like Stage 3, there is a wealth effect resulting from the increase in subjects' own endowments (relative to Stage 1).

3.2 Follow-up Tasks

After completing all four stages of the main task, subjects are then asked to complete two follow-up tasks to measure their risk preferences: a *Payment Follow-up Task* and a *Donation Follow-up Task*. The order in which the tasks are presented to subjects is randomized across subjects.

Both tasks present subjects with a list of 11 choices, where they must choose either Option A or Option B. In the *Payment Follow-up Task*, Option A always provides the subject with "*A 50% chance of receiving $1, and $0 otherwise*". Option B provides a guaranteed fixed payment, increasing in $.10 increments, from $0 in the first question to $1 in the final question. The *Donation Follow-up Task* is identical, except that the options provide donations to the charity rather than payments to the subject. The presentation of the tasks is modeled after the presentation used by Exley (2016) for similar tasks.[17]

The first and last questions of each follow-up task provide an attention/understanding check. In the first question, subjects are choosing between a lottery that provides a $1 payment (or donation) with 50% probability and a guaranteed payment (or donation) of $0, so it is expected that all subjects should choose Option A (the lottery) in the first question. In the last question, Option B provides a guaranteed payment (or donation) of $1, so it is expected that all subjects should prefer Option B in the final question.[18]

The *Payment Follow-up Task* and *Donation Follow-up Task* allow me to estimate subjects' risk preferences for payments and donations, respectively, based on when they choose to switch from Option A to Option B (assuming they switch exactly once). Subjects who are more risk averse will switch from Option A to Option B earlier, while those who are more risk loving will switch later.

donors, $\mathbf{w}_{-i}$.

[17] See figures A.3 and A.4 in Appendix A of Exley (2016). The lotteries and guaranteed payments used are different, but I have borrowed Exley's instructions.

[18] If a subject were for some reason to prefer that the charity receive nothing, it would be rational for them to begin by choosing Option B and then switch to choosing Option A.

3.3 Survey Questions

After completing the follow-up tasks, subjects answer some basic demographic questions, including age, gender, estimated family income, political views (e.g., conservative, liberal, etc.), importance of religion in their life, and estimated charitable contributions within the last year. Subjects are also asked to rate—on a scale of 0 to 10—how familiar they are with charity:water, how well they understood the procedure used to determine their payment, how well they understood the procedure used to determine their total donation, and how confident they were during the experiment that their donation (and any matching donation provided by the experimenter, if applicable) would actually be donated to the charity on their behalf. Copies of the questions included in the survey are provided in Appendix D. Summary statistics for subjects' responses to the survey questions are provided in Table B.2.

3.4 Procedures

Once subjects finish answering the survey questions, their payment is reported to them. To determine each subject's payment, one question from the main task is randomly selected. Subjects receive the number of Tokens they chose to hold for themselves in the randomly selected problem. These Tokens are converted to US dollars at the rate 10 Tokens = \$1. One problem is then also randomly selected from the *Payment Follow-up Task*. If the subject chose the guaranteed payment (Option B) in the randomly selected problem, then that amount is added to their total payment. If they instead chose the lottery (Option A), the computer 'flips a coin' to determine the outcome of the lottery.[19]

Subjects are also provided with information regarding their total donation. Each subject's total donation is calculated through a similar process to that of their payment. The same randomly selected decision problem that was selected to determine their payment in the main task is also used to determine their total donation. In addition to this amount, a random question is also drawn from the *Donation Follow-up Task*, and the resulting additional donation (if any) is added to the subject's total donation.

The message the subject receives regarding their total donation varies depending on the nature of the problem randomly selected to determine their payment. If their randomly selected problem provided no match, then the subject is informed of this and told that their final donation is equal to the amount they chose to pass. If their randomly selected problem provided a match with certainty, then they are informed of this, and the applicable matching amount, based on the match rate and the amount they chose to pass, is added to their total donation. In this case, their total donation (not including the *Donation Follow-up Task*) is given by $(1+\mu_k)g_k$, where k denotes the randomly selected problem, μ_k is the match rate in the selected problem, and g_k is the amount they chose to pass in the selected problem.

[19] This is done by drawing a random number x from a uniform distribution over $(0, 1)$. If $x < 0.5$, then the subject receives a payment of \$1. Otherwise, the subject receives \$0.

If a subject's randomly selected problem provided an uncertain match—that is, a match that depends on the total donations of the other members of the subject's group—then the subject is not informed whether they will receive a match, since all match determinations are made at the end of the study, after all survey responses have been received. Instead, the subject is reminded of the parameters in their selected problem (including the match rate and match limit) and told that they will be randomly grouped with the applicable number of other subjects from the experiment, and the decisions of those random group members (in the same problem) will be used to determine whether they will receive a match. The subject is also informed of the possible amounts of their total donation, based on the outcome of the matching process. That is, they are told what their total donation will be if they do not receive a match, as well as what their total donation will be if they do receive a match.[20]

Subjects' earnings are paid to them through Prolific using bonus payments within two business days after they complete the experiment.[21] This is in addition to the $9 base payment they receive, which is automatically paid to them after they verify their submission in Prolific. The average total payment received by participants (including both the base payment and the bonus payment) is $17.33. The median completion time among participants is 27 minutes and 18 seconds, and the average reward-per-hour received is $19.79.

At the time of this writing, match determinations have not yet been made for each subject, and subjects' total donations have not yet been donated to the charity. Once match determinations have been made for each subject so that each subject's total donation can be calculated, the sum of all subjects' total donations will be donated to the charity in a single lump-sum donation. On average, subjects chose to donate $2.95 out-of-pocket to the charity. The maximum average total donation, assuming all subjects end up receiving a match, is $5.65. The total donation received by the charity as a result of the experiment will be between $442.90 (assuming no subjects receive a match) and $847.40 (assuming all subjects receive a match).

4 Results

Table B.2 presents summary demographic statistics for all subjects. Section 4.1 presents evidence that fundraiser characteristics affect how donors respond to match subsidies. Section 4.2 looks more closely at the response to changes in the match limit, and considers the extent to which observed behavior is consistent with the theoretical model. Section 4.3 classifies subjects as *match lovers*, *haters*, and *ignorers* to further explore the heterogeneity in behavior and test the predictions of Hypotheses 1 and 2. Section 4.4 tests for order effects, based on the order in which the stages are presented.

[20] The details of the process for determining match outcomes are presented to subjects in the instructions, before they begin the main task. The full instructions, including the description of the matching process, are provided in Appendix D.

[21] In practice, subjects received their bonus payments within 1-2 hours of verifying their submission in Prolific. However, in the description posted to Prolific, and in the experiment instructions, subjects were provided with a guarantee that their bonus payment would be received within two business days.

4.1 Evidence that fundraiser characteristics affect the response to matches

Table 3 reports the results of estimating various log-log Tobit regression models for subjects' total gross donations (assuming any offered matches are received), accounting for censoring from above and below.[22] Column (1) presents the results of regressing only on endowment, price, and a dummy variable equal to 1 whenever a match is offered. The estimated coefficient on price (–1.252) is in line with previous research, particularly previous experimental work.

In column (2), two additional controls are included, for the match limit and group size. Both controls are highly statistically significant, demonstrating that, on average, donations vary as fundraiser characteristics vary. The signs of both coefficients are in line with our expectations: on average donations are increasing in the match limit and decreasing in group size.

Column (3) introduces an interaction term between price and the match limit. This term is statistically significant, but the coefficients on price and match limit are no longer statistically significant. However, this is in line with our expectations, since this implies that donors will be unresponsive to price changes when the match limit is 0 (i.e., when there is no chance of receiving the match). The negative sign on the interaction term is also consistent with our expectations, since it implies that decreases in price (i.e., increases in the match rate) become more effective at increasing donations as the match limit increases.

Column (4) adds another interaction term between price and group size. The addition of the interaction term removes the significance of the coefficient on group size. Both of the coefficients on match limit and group size are estimated to be 0, while both of the interaction terms are statistically significant. This suggests that group size and match limit mainly impact donations through their interactions with price, while having little direct impact on behavior. Again, this is consistent with the theoretical model and predictions. Furthermore, the positive sign on the interaction term between price and group size is also consistent with our expectations, since this implies that donors become less responsive to decreases in price as the number of group members increases.

Columns (5) and (6) include additional interactions between the match limit and group size and between match limit, group size, and price. The inclusion of these interaction terms reduces the precision of the coefficient estimates on the other interaction terms, with the coefficient on the price-group size interaction losing all statistical significance in the final model. However, while less precise, the interaction term between price and match limit remains statistically significant in every model, suggesting that the match limit is an important factor in determining how donors respond to match subsidies.

Taken together, these results provide strong evidence that the response to match subsidies varies as fundraiser characteristics vary. In particular, there is especially strong evidence that the response to match subsidies is influenced by the match limit. While we have not ruled out other possible explanations, these results are consistent with the theoretical model developed in Section 2, in which donors consider the probability of receiving a match.

[22] Table B.1 reports the results using the amount passed (i.e., subjects' out-of-pocket donations).

Table 3: Comparison of Tobit regression models

Charity receipts	(1)	(2)	(3)	(4)	(5)	(6)
Endowment	0.634***	0.615***	0.619***	0.619***	0.618***	0.617***
	(0.054)	(0.054)	(0.054)	(0.054)	(0.054)	(0.054)
Price	-1.252***	-1.313***	-0.321	-0.735**	-0.666*	-0.043
	(0.040)	(0.042)	(0.309)	(0.346)	(0.350)	(0.729)
Match (=1)	0.041	-0.452***	0.375	0.435	0.382	0.390
	(0.051)	(0.109)	(0.278)	(0.279)	(0.282)	(0.282)
Match limit		0.082***	-0.066	-0.077	-0.014	-0.043
		(0.016)	(0.049)	(0.049)	(0.070)	(0.076)
Group size		-0.135***	-0.131***	0.040	0.141	0.105
		(0.032)	(0.032)	(0.071)	(0.108)	(0.114)
Price*Match limit			-0.180***	-0.194***	-0.188***	-0.323**
			(0.056)	(0.056)	(0.056)	(0.149)
PxN				0.251***	0.196*	-0.102
				(0.094)	(0.104)	(0.323)
MLxN					-0.028	-0.014
					(0.022)	(0.026)
PxMLxN						0.065
						(0.066)
Constant	0.161	0.512	0.497	0.163	-0.031	0.045
	(4.544)	(4.544)	(4.577)	(4.581)	(4.581)	(4.585)
Controls	Y	Y	Y	Y	Y	Y
Observations	7722	7722	7722	7722	7722	7722

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

4.2 The effect of changes in the match limit

Figure 1 plots the average amount passed at each match limit for each match rate.[23] For each match rate, out-of-pocket donations appear to increase as the match limit increases, consistent with our prediction that the response to matches is influenced by fundraiser characteristics. However, contrary to our prediction in Hypothesis 1, Figure 1 shows that on average uncertain matches do not always fall between the amount passed in the absence of a match and the amount passed given a certain match. Instead, out-of-pocket donations appear to respond negatively to the low match limits (relative to the no-match baseline) and peak at the high match limits, before falling again when matches are provided with certainty. This pattern holds even when controlling for group size and endowment (see Figure C.1, which produces a separate graph for each group size/endowment combination).

Hypothesis 1 places no restrictions on the slopes of the lines between the endpoints. For

[23]The exact values plotted in Figure 1 can be found in Table B.3.

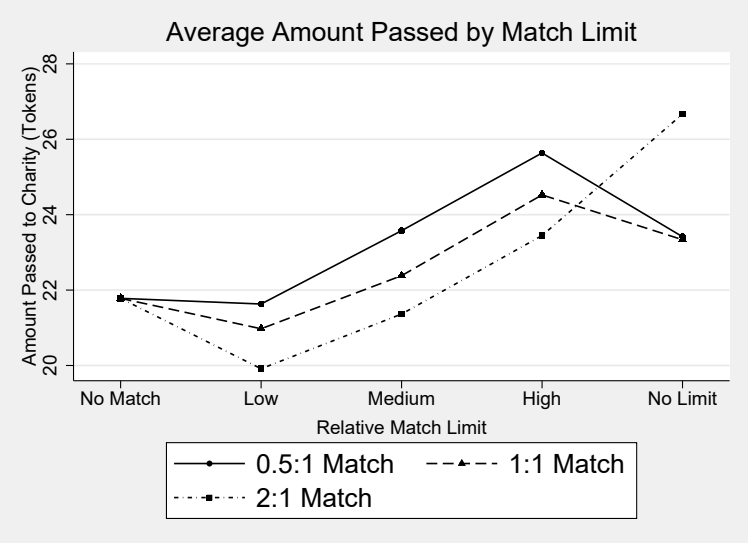


Figure 1: Average amount passed (in Tokens) at each match limit

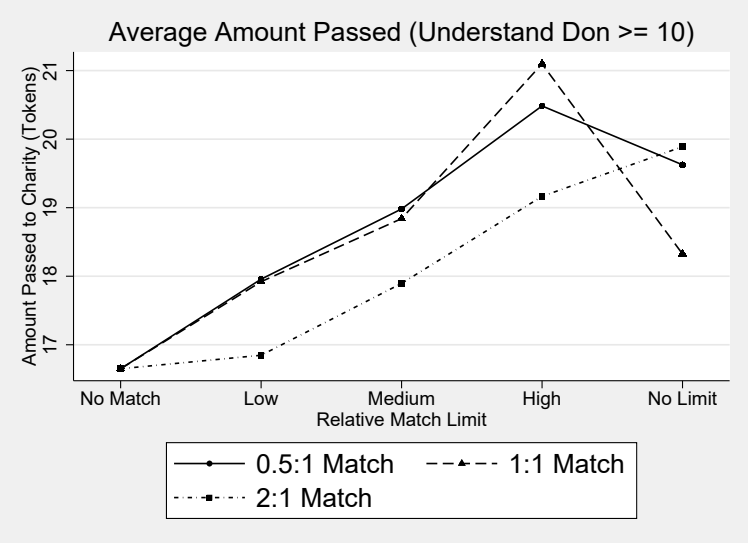
example, out-of-pocket donations may increase between *low* and *medium* match limits and then decrease between *medium* and *high* match limits for a given match rate. However, it requires that the out-of-pocket donations at each uncertain match level (low, medium, and high) fall between the no-match and certain-match (no limit) levels. Figure 1 shows that this does not hold for any of the match rates. That said, Figure 1 plots the *average* donation amounts, and thus it is still possible that individual donors behave consistently with Hypothesis 1.

It is not clear why donors would behave in this way. One possibility is that subjects were simply confused about how the matching subsidies work. To test whether confusion might explain the observed behavior, I remake Figure 1 including only subjects who report a 10 out of 10 when asked in the follow-up survey to rate their understanding of how their total donation is determined. The results are shown in Figure 2.

Figure 2 shows that the behavior of subjects who report fully understanding how the match subsidies work is more consistent with Hypothesis 1. However, for the 0.5:1 and 1:1 match rates, subjects continue to reduce their out-of-pocket donations under certain matches relative to the high match limits. While not consistent with Hypothesis 1, this behavior is consistent with a lead gift effect. It appears that mentioning a (high) match limit may lead donors to give more. Although the certain-match questions implicitly imply the largest match limit, no match limit is explicitly mentioned in these questions.

4.3 Match lovers, haters, and ignorers

To better understand the extent to which subject behavior is consistent with the predictions of the theoretical model, I classify subjects as *match lovers*, *haters*, and *ignorers* based on their response to certain-matches at each match rate. A subject is classified as a *match lover* at a given match rate if they choose to pass more to the charity when receiving the match with certainty versus



Notes: Averages are calculated using observations from 41 subjects who report a 10 out of 10 when asked to rate their understanding of how their total donation is determined. Reported averages are for out-of-pocket donations, calculated in Tokens (10 Tokens = $1).

Figure 2: Average amount passed by match limit—full understanding

the baseline (no match) question. *Match haters* are defined conversely. A subject is classified as a *match ignorer* at a given match rate if they pass the same amount in the certain-match question as in the no-match question. It is important to note that, consistent with the theoretical model, the same subject may be a *match lover* at one match rate (e.g., a 1:1 match) while simultaneously being a *match hater* (or *match ignorer*) at some other match rate (e.g., a 2:1 match).

Because subjects face the no-match question and the same certain-match questions four different times (once in each stage), the classifications are based on their *average* decisions across all four stages. For example, if a subject passes an average of 10 Tokens in the no-match questions across all four stages, and they pass an average of 20 Tokens in the questions providing a 2:1 match *with certainty* across all four stages, they are classified as a 2:1-*match lover*. It is possible, however, that in one (or more) of the stages the subject may have chosen to pass more in the no-match question than they did in the 2:1 certain-match question.

Table 4 lists the number of each type of donor at each match rate, as well as the number of donors of each type who behave consistently with Hypothesis 1. While the number of *match haters* remains more or less constant across match rates, the number of *match lovers* increases substantially as the match rate increases (from 54 at the 0.5:1 match rate to 71 at the 2:1 match rate), with subjects shifting from being *match ignorers*. Overall, *match lovers* are the most represented donor type. While not shown in Table 4, 20 subjects pass the same amount in every question throughout the experiment. Of those 20 subjects, 19 of them passed 0 Tokens in every question.

Table 4 shows that, overall, subject behavior is not generally consistent with Hypothesis 1. Across all match rates, subjects behave consistently with Hypothesis 1 51% of the time. *Match*

Table 4: Donor types and their consistency with Hypothesis 1.

		0.5:1 Match		1:1 Match		2:1 Match		All Match Rates	
		Count	Percent	Count	Percent	Count	Percent	Count	Percent
Lovers	Inconsistent	40	74.07	37	60.66	36	50.70	113	60.75
	Consistent	14	25.93	24	39.34	35	49.30	73	39.25
	Total	54		61		71		186	
Ignorers	Inconsistent	13	20.63	15	27.78	12	26.67	40	24.69
	Consistent	50	79.37	39	72.22	33	73.33	122	75.31
	Total	63		54		45		162	
Haters	Inconsistent	19	57.58	26	74.29	22	64.71	67	65.69
	Consistent	14	42.42	9	25.71	12	35.29	35	34.31
	Total	33		35		34		102	
All Types	Inconsistent	72	48.00	78	52.00	70	46.67	220	48.89
	Consistent	78	52.00	72	48.00	80	53.33	230	51.11
	Total	150		150		150		450	

Notes: Table lists the number of subjects at each match rate, broken down by donor type, whose behavior is consistent with Hypothesis 1, which predicts that all donations in uncertain-match questions should fall between the amount passed in the no-match question and the amount passed in the certain-match question. Each question type is averaged across all four stages for each subject. For example, a subject's decisions in each stage for the questions with a 0.5:1 match rate and a LOW match limit are averaged, to derive the subject's average pass amount in those questions. This is repeated for all match rate/match limit combinations. For a subject's behavior to be classified as being consistent with Hypothesis 1, their average pass amounts for each uncertain-match question at a given match rate must be between their average pass amount in the no-match questions and their average pass amount in the certain-match questions (at the same match rate). Subjects are classified as *match lovers* for a given match rate if they pass more in the certain-match questions at that match rate, averaged across all four stages, than they do in the no-match questions, averaged across all four stages. *Match haters* are classified conversely. *Match ignorers* for a given match rate pass the same amount, averaged across all four stages, in the no-match and certain-match questions.

ignorers are the most consistent donor type, but this is mostly driven by the 20 subjects who simply choose to pass the same amount in every question. Interestingly, it appears that the same donors remain consistent throughout all match rates: as the number of *match lovers* who behave consistently with Hypothesis 1 increases as the match rate increases, the number of *match ignorers* who behave consistently drops, while the number of subjects behaving inconsistently with Hypothesis 1 remains relatively constant in both groups. Thus, it appears that the consistent *match ignorers* shift to being *match lovers* as the match rate increases, increasing the number of consistent *match lovers* as they do so.

Although subjects are only observed to behave consistently with Hypothesis 1 51% of the time, in general behavior does not stray too far from the predicted behavior. This can be seen in Figure 3. Figure 3 plots the average out-of-pocket donations of *match lovers* (left column) and *match haters* (right column) at the 0.5:1 match rate (top row), 1:1 match rate (middle row), and 2:1 match rate (bottom row). Within each panel, the average pass amounts are plotted for each match limit and each unique stage (as defined by the group size and endowment). Overall, the behavior of *match lovers* is fairly consistent with Hypothesis 1—with the exception of the 0.5:1 match, *match lovers* tend to consistently donate amounts that fall between their donations in the no-match questions (dotted light-gray line) and their donations in the certain-match questions (solid black line). Likewise for *match haters*, with the exception of the 2:1 match rate, their average donations under uncertain matches tend to fall between their no-match and certain-match donations, consistent with Hypothesis 1. However, somewhat counterintuitively, *match haters* pass more to the charity as the match limit increases, just as *match lovers* do.

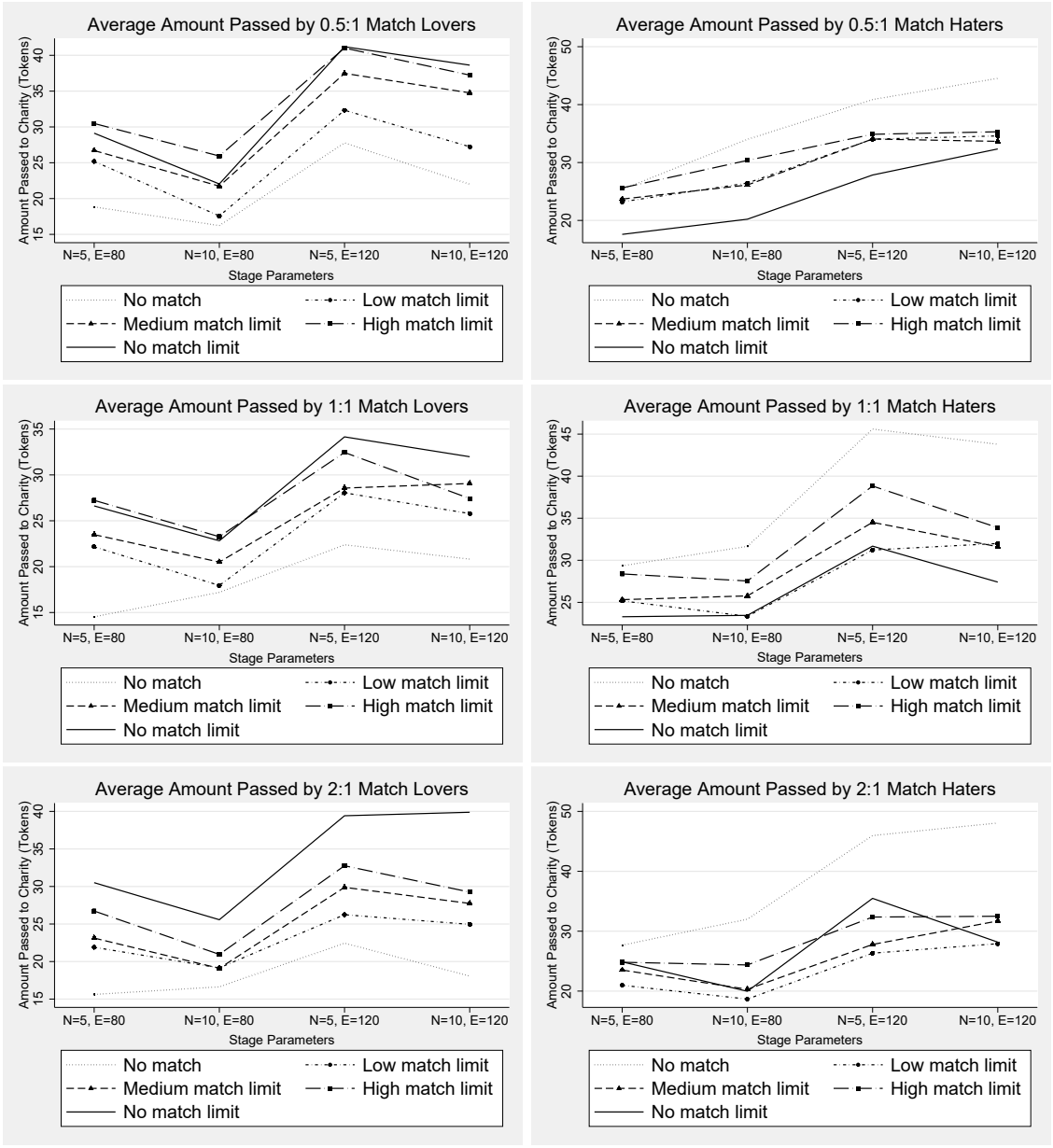
Figure 3 also provides evidence that donors are responsive to changes in the number of group members, N. Consistent with Hypothesis 2, all else equal, *match lovers* tend to decrease their donations when the number of group members increases.[24] The behavior of *match haters*, however, is less consistent. At the 0.5:1 match rate, they increase their average donations under uncertain matches as the group size increases (consistent with Hypothesis 2), but at the 1:1 match rate they decrease their donations as the group size increases. Furthermore, both *match lovers* and *match haters* appear to adjust their donations in the no-match and certain-match questions in response to changes in group size, which is inconsistent with the predictions of the theoretical model.[25]

Although *match haters* appear to decrease their donations under 1:1 matches as the group size increases, the regression results provided in Table 5 show that in general this behavior is not significant. Table 5 reports the results of regressions run separately for *match lovers* and *match*

[24] This can be seen by the fact that the first and last sections of each line tend to be downward sloping. The first section shows the change in the average amount passed when going from ($N = 5$, $w = 80$) to ($N = 10$, $w = 80$), and the last section shows the change when going from ($N = 5$, $w = 120$) to ($N = 10$, $w = 120$). The fact that the last two points tend to be higher than the first two points, resulting in the middle section being upward sloping, reflects the wealth effect that results from the higher endowment in the last two points relative to the first two points ($w = 120$ versus $w = 80$, respectively).

[25] Recall that the total donations of others are taken to be exogenous, and therefore only affect the donor's utility through their impact on the donor's perceived probability of being matched. Therefore, for the no-match and certain-match questions—where the probability of receiving a match cannot be affected—changes in group size shouldn't enter the donor's utility function.

Figure 3: A comparison of match lovers and haters



Notes: Left column: *match lovers*. Right column: *match haters*. Top row: 0.5:1 match. Middle row: 1:1 match. Bottom row: 2:1 match. *Match lovers* are subjects whose average out-of-pocket donations are higher for certain-match questions than no-match questions, and vice versa for *match haters*. *Match lovers* and *match haters* are defined at the match-rate level—that is, the same subject may be a *match lover* at one match rate (e.g., a 1:1 match) and a *match hater* at a different match rate (e.g., a 2:1 match). At the 0.5:1 match rate, there are 54 *match lovers* and 33 *match haters*. At the 1:1 match rate, there are 61 *match lovers* and 35 *match haters*. At the 2:1 match rate, there are 71 *match lovers* and 34 *match haters*.

haters. However, unlike in the preceding analysis in which *match lovers* and *haters* were classified at the subject-match rate level, in Table 5 they are classified at the subject level. This is done by averaging each subject's donations in *all* certain-match questions (i.e., including the 0.5:1 certain-match questions, the 1:1 certain-match questions, etc.) and comparing the average to their average donation in the no-match questions. From Table 4 we know that donors move between donor types as the match rate varies, so averaging donations across all match rates in this way likely introduces additional noise.[26] Thus, Table 5 includes additional results based on stricter classifications—*super match lovers* and *haters*—which only include subjects who are classified as *match lovers* at every match rate or, respectively, as *match haters* at every match rate. This of course significantly reduces the number of observations, though. There are only 39 subjects classified as *super match lovers*, and a measly 13 subjects who are classified as *super match haters*.[27]

In general, *match haters* are not responsive to changes in group size.[28] However, consistent with what we observe in Figure 3, the estimated coefficients on the interaction terms between price and match limit are negative for *match haters* and *super match haters*, reflecting the fact that *match haters* increase their donations as the match limit increases. However, the coefficients on match limit are also negative and statistically significant across models, reflecting the fact that they still donate less when a match is offered, relative to the no-match questions.

Furthermore, consistent with our analysis thus far, Table 5 shows that *match lovers* increase their donations in response to increases in the match limit, and decrease their donations in response to increases in group size. Moreover, these effects work predominantly through price, affecting the response to matches. Thus, it appears the behavior of *match lovers* is largely consistent with Hypotheses 1 and 2.

4.4 Checking for stage-order effects

Table 6 reports regression results for regressions estimated separately for each stage of the experiment. The Stage 1 models, reported in columns (1) and (5), are estimated using data only from the first stage that each subject completed, precluding any order effects. Column (1) shows that subjects are responsive to price changes, and on average they increase their gross donations as the match limit increases. However, the coefficient estimates for endowment and group size are not

[26] That being said, it appears that most of the movement is from the *match ignorer* group into the *match lover* group, since the number of *match haters* remains essentially constant. Though the predictions derived from the theoretical model are based on classifying *match lovers* and *haters* at the donor-match rate level, if a subject sometimes acts as a *match ignorer* and other times acts as a *match lover*, it does not seem unreasonable to consider them to be a *match lover* in general. Of course, if they sometimes act as a *match hater*, then labeling them a *match lover* would be troubling, and I cannot with certainty rule this possibility out based on the data provided in Table 4 alone.

[27] There are also 38 subjects who would be classified as *super match ignorers*, since they (on average) give the same amount in the no-match questions as in the certain-match questions at each match rate. These 38 subjects include the 20 who always pass the same amount in every question, but they also include 18 subjects who pass different amounts but on average are unresponsive to all certain matches. Combined, the *super match lovers*, *haters*, and *ignorers* account for 60% of all subjects (90 out of 150).

[28] Subjects who are classified as *super haters* do appear to pass more on average as group size increases. However, when an interaction term between price and group size is included, this effect disappears, suggesting any response to group size does not influence the effectiveness of price changes.

Table 5: Comparing Match Lovers and Haters

Pass	Lovers	Haters	Lovers	Haters	Super Lovers	Super Haters	Super Lovers	Super Haters
Endowment	0.653***	0.600***	0.658***	0.604***	0.700***	0.579***	0.704***	0.584***
	(0.071)	(0.067)	(0.071)	(0.066)	(0.077)	(0.129)	(0.077)	(0.129)
Price	-0.840***	0.157***	-0.170	0.752*	-0.339***	0.596***	0.291	2.152***
	(0.055)	(0.051)	(0.454)	(0.427)	(0.059)	(0.100)	(0.495)	(0.828)
Match limit	0.171***	-0.000	-0.016	-0.143**	0.162***	-0.231***	0.003	-0.443***
	(0.021)	(0.020)	(0.064)	(0.060)	(0.023)	(0.039)	(0.069)	(0.116)
Group size	-0.244***	-0.007	-0.035	0.123	-0.309***	0.156**	-0.151	0.117
	(0.042)	(0.039)	(0.094)	(0.088)	(0.045)	(0.076)	(0.101)	(0.171)
Match (=1)	-0.826***	-0.164	0.217	0.631*	-0.297*	1.323***	0.590	2.507***
	(0.144)	(0.135)	(0.366)	(0.342)	(0.156)	(0.262)	(0.396)	(0.663)
PxML			-0.229***	-0.175**			-0.196**	-0.260*
			(0.074)	(0.069)			(0.080)	(0.134)
PxN			0.300**	0.188			0.228*	-0.065
			(0.123)	(0.116)			(0.134)	(0.225)
Constant	-0.675*	0.560	-1.104***	0.290	-0.407	0.462	-0.733*	0.514
	(0.374)	(0.343)	(0.408)	(0.376)	(0.391)	(0.689)	(0.429)	(0.749)
Observations	3458	2106	3458	2106	2028	663	2028	663

Notes: Standard errors in parentheses. All columns report results of Tobit log-log regressions of the out-of-pocket donation, accounting for censoring from below and above. *Lover* and *Hater* columns report results from regressions restricted to subjects who are classified as *match lovers* and *match haters*, respectively. Subjects are classified as *lovers* if their average pass amount across all certain-match questions (including all match rates and stages) is greater than their average pass amount in all no-match questions (including all stages). *Haters* are defined conversely. Subjects are classified as *Super Lovers* if they are classified as *match lovers* at all three match rates (0.5:1, 1:1, and 2:1). Whereas the *Lovers* and *Haters* columns require that subjects be *match lovers* or *match haters* on *average*, the *Super Lovers* and *Super Haters* columns require that they display *match loving* or *match hating* behavior within each match rate. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

statistically significant, due to the lack of within-subject variation.

Comparing columns (1) through (4), there don't appear to be significant changes in behavior between stages. The coefficients on price and match limit are stable across stages, and in every stage the lack of within-subject variation in endowment and group size results in statistically insignificant estimates. However, when comparing the models in columns (5) through (8), the story is different. The match limit affects how subjects respond to price changes in columns (6), (7), and (8), and group size also affects how subjects respond to price changes in columns (6) and (8). However, neither the match limit nor group size are estimated to have a statistically significant effect on the response to price changes in column (5). That is, these effects appear to develop only after subjects have completed the first stage.

In Tables B.4 and B.5, I repeat the analysis using a combined regression that includes a full set of stage-dummy interaction terms. This allows the model to use within-subject variation to produce more precise estimates of the coefficients on endowment and group size, while still estimating

Table 6: Regressions by Stage

Gross don.	Stage 1 (1)	Stage 2 (2)	Stage 3 (3)	Stage 4 (4)	Stage 1 (5)	Stage 2 (6)	Stage 3 (7)	Stage 4 (8)
Endowment	1.619	0.100	2.093*	-1.286	1.621	0.102	2.182*	-1.283
	(0.998)	(1.068)	(1.170)	(1.114)	(0.997)	(1.067)	(1.271)	(1.113)
Price	-1.343***	-1.278***	-1.307***	-1.295***	-1.579**	-0.849	0.362	-0.918
	(0.076)	(0.075)	(0.069)	(0.075)	(0.640)	(0.614)	(0.567)	(0.632)
Match limit	0.098***	0.065**	0.089***	0.073**	0.064	-0.141	-0.107	-0.118
	(0.030)	(0.028)	(0.026)	(0.030)	(0.091)	(0.086)	(0.079)	(0.090)
Group size	-0.514	-0.013	-0.115	0.127	-0.344	0.330	-0.210	0.453
	(0.599)	(0.639)	(0.691)	(0.664)	(0.611)	(0.647)	(0.735)	(0.674)
Match (=1)	-0.481**	-0.425**	-0.509***	-0.365*	-0.291	0.721	0.586	0.695
	(0.202)	(0.194)	(0.178)	(0.200)	(0.518)	(0.493)	(0.451)	(0.514)
PxML					-0.042	-0.252**	-0.238***	-0.233**
					(0.104)	(0.099)	(0.090)	(0.103)
PxN					0.243	0.485***	-0.181	0.464***
					(0.173)	(0.169)	(0.157)	(0.171)
Constant	-2.583	3.159	-5.968	6.987	-2.927	2.474	-6.293	6.338
	(5.689)	(6.365)	(7.130)	(6.791)	(5.688)	(6.383)	(7.976)	(6.778)
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Observations	1950	1950	1950	1872[a]	1950	1950	1950	1872[a]

Notes: Standard errors in parentheses. All columns report the results of log-log Tobit regressions for the total donation received by the charity (assuming a match is received), accounting for censoring from below and above. Each stage of the experiment is estimated separately. In this table, the *stage* refers to the order in which the subject completed the experiment, not to a particular group size/endowment combination. For example, the Stage 1 model restricts observations to only those obtained in the first stage completed by each subject.

[a] Due to a small error in the experiment code when the experiment was first published, 6 participants were presented with the same group size and endowments in the third and fourth stages of the experiment. Because of this, the observations from the fourth stage were dropped for these subjects, reducing the total number of observations in the fourth stage by 78 (13 fourth-stage questions times 6 participants).

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

separate coefficients for each stage. With the added power, the coefficients on endowment are now highly statistically significant and consistent with the baseline results reported in Table 3. Furthermore, the same pattern of finding statistically significant coefficient estimates for group size, and the interaction between price and group size, still exists. Wald tests of joint equality across stages show statistically significant differences in the coefficients on group size in both Table B.4 (p-value = .000) and Table B.5 (p-value = .000). For the model including interaction terms between price and group size, reported in Table B.5, a Wald test of joint equality across stages produces a p-value of .056. The comparisons across stages suggest there may be a stage-order effect with respect to the effect of group size. While it also appears there may be an effect on the response to the match limit as well, this difference is not found to be statistically significant.

It seems plausible that the effect of group size on the response to matches might change as subjects are exposed to additional stages. Subjects may be unable to form clear expectations

regarding the probability of receiving a match, and they may have little sense of how the number of group members might affect the match probability. As the number of group members changes between stages, though, the original stage may serve as an anchor, with subjects adjusting their behavior in recognition of the impact that the change in group size has on the probability of receiving a match.

However, upon closer inspection of the estimates for each stage, it can be seen that the statistical difference is driven by Stage 3. A Wald test of the joint equality of the coefficients on group size in Table B.5, excluding Stage 3, produces a p-value of .228. Importantly, the coefficient estimates for Stages 2 and 4 are very similar, challenging the notion that subjects are learning across stages. Furthermore, going from Stage 1 to Stage 2, the change in coefficient estimates on group size and PxN move in the opposite direction as the change going from Stage 2 to Stage 3. Again, this challenges the notion that subjects are learning. Instead, it appears that the behavior in Stage 3 is anomalous and does not follow a trend consistent with a continuous shift in subject behavior.

Table B.6, which lists the average pass amounts for each match rate in each stage, finds no statistical difference in the average donations in each stage. However, when the analysis controls for the group size and endowments faced by subjects in each stage, it becomes clear that behavior in Stage 3 is significantly different from the other stages. Table B.10 provides the average pass amounts across stages at each match rate, with separate tables for each group size/endowment combination. Looking at this table, it becomes clear that the differences between stages are driven by subjects who are presented with a group size/endowment combination of (N=5, Endow=120) or (N=10, Endow=80) in Stage 3. Subjects who are presented with the (N=5, Endow=120) combination in Stage 3 give significantly more than subjects who encounter the combination in other stages. Conversely, subjects who encounter the (N=10, Endow=80) combination in Stage 3 give significantly less than subjects who encounter the combination in other stages. This behavior can also be seen in Figure C.3, which plots the values listed in Table B.10. The (N=10, Endow=80) graph, shown in the top-right panel, shows a significant drop in average donations in Stage 3 relative to the other stages. The (N=5, Endow=120) graph, shown in the bottom-left panel, shows a significant peak in average donations in Stage 3.

Figure C.2 plots the average amount passed by subjects at each match rate and match limit, graphed separately for each stage. Average behavior in Stage 3 does not appear qualitatively different from the behavior in Stages 2 and 4. Interestingly, it is Stage 1's behavior that appears different. Whereas the average amounts passed given a low match limit are lower than the no-match average for every match rate in Stages 2 through 4, this pattern does not hold in Stage 1. Instead, in Stage 1 average donations increase monotonically in the match limit for all match rates, until decreasing in response to certain matches at the 0.5:1 and 1:1 rates.

Figure C.1 plots the average pass amounts in separate graphs for each of the different stages, as defined by the number of group members and endowments. It is strange the extent to which average behavior in the (N=5, endow=80) stage (displayed in the top-left panel of Figure C.1) is similar to the average behavior of subjects in Stage 1 (displayed in the top-left panel of Figure C.2).

Because the order of stages is randomized for each subject, subjects were presented with all four different stages (i.e., group size and endowment combinations) in Stage 1. Thus, it is unclear why average behavior appears so similar between the (N=5, endow=80) stage and Stage 1.

5 Conclusion

This study builds upon our previous model of charitable giving, where donors perceive match subsidies as uncertain and form beliefs about the total giving of others to estimate their probability of receiving a match. Our earlier findings demonstrated that donors respond predictably to exogenous changes in match probabilities, aligning closely with our theoretical predictions.

In extending this work, we focused on endogenous changes in match probabilities resulting from variations in fundraiser characteristics, such as the number of potential donors and their wealth levels. By developing a theoretical model and designing an online laboratory experiment, we tested how changes in match rate and match limit, along with group size and endowment variations, influence donor behavior.

The experiment revealed that donors are responsive to endogenous changes in match probabilities. Consistent with our theoretical model, donations increased with higher match limits and smaller group sizes, confirming that donors' perceived probabilities of receiving a match play a critical role in their decision-making process.

Overall, this research provides significant insights into why people give and offers practical guidance for designing effective fundraisers. By understanding how donors form beliefs about match probabilities based on fundraiser characteristics, charities can optimize match schemes to maximize donations, thereby enhancing the efficiency and impact of their fundraising efforts.

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A Proofs

Proof of Lemma 1: I will first prove that $g^0 < g^1 \implies g^0 < g^* < g^1$. The proof consists of two parts. First I will show that $g^0 < g^*$, and then I will show that $g^* < g^1$, thus completing the proof that $g^0 < g^1 \implies g^0 < g^* < g^1$.

Recall that g^* is defined by the first order condition $FOC^*(g^*) = pFOC^1(g^*)+(1-p)FOC^0(g^*) \equiv 0$. Likewise, g^0 and g^1 are defined by the first order conditions $FOC^0(g^0) \equiv 0$ and $FOC^1(g^1) \equiv 0$, respectively. By the second order conditions for U^0 and U^1 (Assumption 1), $FOC^0(g)$ and $FOC^1(g)$ are decreasing in g. Furthermore, since EU is a weighted sum of U^0 and U^1, $FOC^*(g)$ must also be decreasing in g. Thus, it follows that $FOC^*(g^0) = pFOC^1(g^0) + (1-p)FOC^0(g^0) > 0$, since $g^0 < g^1$ implies $FOC^1(g^0) > 0$. Finally, since $FOC^*(g^0) > 0$, it follows that $g^* > g^0$.

To see that $g^* < g^1$, note that $FOC^*(g^1) = pFOC^1(g^1) + (1-p)FOC^0(g^1) < 0$, since $g^0 < g^1$ implies $FOC^0(g^1) < 0$. Thus, because $FOC^*(g)$ is decreasing in g, it follows that $g^* < g^1$, thereby demonstrating that $g^0 < g^1 \implies g^0 < g^* < g^1$.

The proof that $g^1 < g^0 \implies g^1 < g^* < g^0$ follows similarly. If $g^1 < g^0$, then $FOC^*(g^0) = pFOC^1(g^0) + (1-p)FOC^0(g^0) < 0$, since $FOC^1(g)$ is decreasing in g. Therefore, $g^1 < g^0$ implies

$g^* < g^0$. Furthermore, $g^1 < g^0$ implies $FOC^*(g^1) = pFOC^1(g^1) + (1-p)FOC^0(g^1) > 0$, since $FOC^0(g)$ is decreasing in g. This implies $g^* > g^1$, thereby demonstrating that $g^1 < g^0 \implies g^1 < g^* < g^0$.

Finally, if $g^0 = g^1$, then both g^0 and g^1 solve $FOC^*(g) = 0$. Thus, $g^* = g^0 = g^1$, completing the proof of Lemma 1.

Proof of Lemma 2: First consider $g^1 > g^0$. From Lemma 1, we have that $g^0 < g^* < g^1$. Therefore, $FOC^0(g^*) < 0$ and $FOC^1(g^*) > 0$, implying $FOC^0(g^*) - FOC^1(g^*) < 0$. That is, $g^1 > g^0 \implies FOC^0(g^*) - FOC^1(g^*) < 0$.

Now consider $g^0 > g^1$. From Lemma 1, we have that $g^1 < g^* < g^0$. Therefore, $FOC^0(g^*) > 0$ and $FOC^1(g^*) < 0$, implying $FOC^0(g^*) - FOC^1(g^*) > 0$. That is, $g^0 > g^1 \implies FOC^0(g^*) - FOC^1(g^*) > 0$.

Finally, consider $g^0 = g^1$. From Lemma 1, we have that $g^* = g^0 = g^1$. Therefore, $FOC^0(g^*) = FOC^1(g^*) = 0$, implying $FOC^0(g^*) - FOC^1(g^*) = 0$. That is, $g^0 = g^1 \implies FOC^0(g^*) - FOC^1(g^*) = 0$, completing the proof of Lemma 2.

Proof of Proposition 2: If $\frac{\partial g^1}{\partial \mu} > (=) < 0$, then $g^1(\mu_1) > (=) < g^1(\mu_0)$ whenever $\mu_1 > \mu_0$. Letting $\mu_0 = 0$ and noting that $g^1(0) = g^0(0) = g^0(\mu)$, it follows that $\frac{\partial g^1}{\partial \mu} > (=) < 0 \implies g^1(\mu) > (=) < g^0(\mu)$. It is now a direct result of Assumption 3 and Lemma 2 that the first addend of the numerator of $\frac{\partial g^*}{\partial \mu}$ will be $> (=) < 0$. Thus, it only remains to show that the second addend of the numerator will be $< (=) > 0$.

Recall that g^1 is the choice of g that maximizes $U^1(g) = U(w-g,\ g,\ (1+\mu)g + \lambda R_{-i})$. Totally differentiating the associated first order condition with respect to μ gives

$$\frac{\partial g^1}{\partial \mu} = \frac{g^1\left[U^1_{xR} - U^1_{gR} - (1+\mu)U^1_{RR}\right] - U^1_R}{|H^1(g^1)|},$$

where $|H^1(g^1)| < 0$ is the second order condition derived from $U^1(g)$, evaluated at g^1. Thus, $\frac{\partial g^1}{\partial \mu} > (=) < 0$ if and only if $g^1\left[U^1_{xR} - U^1_{gR} - (1+\mu)U^1_{RR}\right] - U^1_R < (=) > 0$. Since $F(\cdot) \geq 0$, it follows that the second addend of the numerator of $\frac{\partial g^*}{\partial \mu}$ will be $< (=) > 0$, completing the proof.

B Additional Tables

Table B.1: Comparison of Tobit regression models

Pass	(1)	(2)	(3)	(4)	(5)	(6)
Endowment	0.611***	0.593***	0.596***	0.596***	0.595***	0.594***
	(0.048)	(0.048)	(0.048)	(0.048)	(0.048)	(0.048)
Price	-0.296***	-0.356***	0.623**	0.231	0.296	0.895
	(0.036)	(0.037)	(0.278)	(0.310)	(0.314)	(0.656)
Match (=1)	0.072	-0.412***	0.402	0.458*	0.409	0.417*
	(0.045)	(0.098)	(0.249)	(0.250)	(0.253)	(0.253)
Match limit		0.081***	-0.066	-0.076*	-0.017	-0.044
		(0.014)	(0.044)	(0.044)	(0.063)	(0.068)
Group size		-0.126***	-0.122***	0.039	0.132	0.098
		(0.028)	(0.028)	(0.064)	(0.096)	(0.101)
Price*Match limit			-0.178***	-0.191***	-0.185***	-0.315**
			(0.050)	(0.050)	(0.050)	(0.134)
PxN				0.237***	0.186**	-0.101
				(0.084)	(0.093)	(0.291)
MLxN					-0.026	-0.013
					(0.020)	(0.023)
PxMLxN						0.062
						(0.060)
Constant	0.299	0.632	0.620	0.312	0.129	0.207
	(4.219)	(4.154)	(3.983)	(3.885)	(3.934)	(3.856)
Controls	Y	Y	Y	Y	Y	Y
Observations	7722	7722	7722	7722	7722	7722

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.2: Summary demographic data for all subjects

Summary Statistics	μ	σ	Min	Median	Max
Age	40.72	12.057	20	38	76
Knowledge of charity	.93	1.968	0	0	10
Understanding of pay	7.57	2.344	1	8	10
Understanding of donation	7.53	2.339	0	8	10
Confidence in donation	7.51	2.896	0	9	10
SEX					
Female	.41	.494			
Male	.58	.495			
Other	.01	.082			
INCOME					
Don't know/Prefer not to answer	.05	.212			
Less than $50,000	.31	.465			
Between $50,000 and $75,000	.21	.411			
Between $75,000 and $100,000	.17	.374			
Between $100,000 and $150,000	.17	.380			
Between $150,000 and $200,000	.07	.250			
More than $200,000	.02	.140			
POLITICS					
Prefer not to say	.01	.082			
Unsure/Undecided	.01	.115			
Liberal	.54	.500			
Moderate	.23	.420			
Conservative	.21	.411			
RELIGION					
Not important	.48	.501			
Somewhat important	.22	.416			
Important	.15	.362			
Very important	.15	.355			
RECENT DONATIONS					
Less than $20	.43	.497			
Between $20 and $50	.16	.368			
Between $50 and $100	.13	.334			
More than $100	.28	.451			
Observations	150				

Table B.3: Average amount passed (in Tokens) for each match rate and match limit

		0.5:1 Match				1:1 Match				2:1 Match			
	Baseline	LOW	MED	HIGH	INF	LOW	MED	HIGH	INF	LOW	MED	HIGH	INF
mean	21.78	21.63	23.58	25.64	23.42	20.97	22.38	24.53	23.34	19.91	21.37	23.45	26.67
semean	1.10	1.06	1.13	1.17	1.17	1.01	1.04	1.08	1.08	1.00	1.01	1.03	1.16
min	0	0	0	0	0	0	0	0	0	0	0	0	0
p50	10	10	14	15	10	12	15	17.5	15	10	15	16	20
max	120	120	120	120	120	120	120	120	120	120	120	120	120
count	594	594	594	594	594	594	594	594	594	594	594	594	594

Table B.4: Comparing stages in a combined model, no interaction terms

Charity receipts	Stage 1 (1)	Stage 2 (2)	Stage 3 (3)	Stage 4 (4)	p-value[a]
Endowment	0.655***	0.627***	0.523***	0.651***	.880
	(0.126)	(0.127)	(0.127)	(0.128)	
Price	-1.367***	-1.284***	-1.307***	-1.291***	.888
	(0.082)	(0.082)	(0.082)	(0.084)	
Match limit	0.102***	0.065**	0.089***	0.073**	.853
	(0.032)	(0.032)	(0.031)	(0.033)	
Group size	-0.132*	0.037	-0.441***	0.018	.000
	(0.074)	(0.074)	(0.074)	(0.075)	
Match (=1)	-0.510**	-0.425**	-0.508**	-0.365	.959
	(0.219)	(0.215)	(0.213)	(0.224)	
Constant	0.301	0.232	1.572	0.083	
	(4.608)	(4.607)	(4.612)	(4.612)	
Controls	Y	Y	Y	Y	
Observations	7722	7722	7722	7722	

Notes: Standard errors in parentheses. Reported coefficient values come from a combined log-log Tobit regression model for total charity receipts (assuming a match is received), accounting for censoring from below and above. The combined model includes dummy variables for each stage, along with a full set of interactions between each stage dummy and all covariates. The coefficient estimates reported for each stage are calculated by combining the appropriate terms from the full model, using the delta method to calculate standard errors. The full set of controls is included in the combined model, but the controls are not interacted with stage dummies.

[a] Reported p-values are for Wald tests of joint equality between the coefficients for all stages.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.5: Comparing stages in a combined model, with interaction terms

Charity receipts	Stage 1 (1)	Stage 2 (2)	Stage 3 (3)	Stage 4 (4)	p-value[a]
Endowment	0.656***	0.631***	0.527***	0.655***	.885
	(0.125)	(0.126)	(0.126)	(0.128)	
Price	-1.574**	-0.773	0.323	-0.901	.266
	(0.693)	(0.681)	(0.677)	(0.710)	
Match limit	0.064	-0.144	-0.105	-0.120	.419
	(0.098)	(0.096)	(0.094)	(0.101)	
Group size	0.032	0.352**	-0.553***	0.342**	.000
	(0.147)	(0.147)	(0.147)	(0.150)	
Match (=1)	-0.301	0.739	0.570	0.709	.509
	(0.561)	(0.547)	(0.539)	(0.576)	
Price*Match limit	-0.046	-0.256**	-0.234**	-0.236**	.512
	(0.113)	(0.110)	(0.108)	(0.116)	
PxN	0.239	0.455**	-0.171	0.467**	.056
	(0.186)	(0.187)	(0.187)	(0.191)	
Constant	-0.017	-0.403	1.777	-0.556	
	(4.613)	(4.612)	(4.618)	(4.616)	
Controls	Y	Y	Y	Y	
Observations	7722	7722	7722	7722	

Notes: Standard errors in parentheses. Reported coefficient values come from a combined log-log Tobit regression model for total charity receipts (assuming a match is received), accounting for censoring from below and above. The combined model includes dummy variables for each stage, along with a full set of interactions between each stage dummy and all covariates. The coefficient estimates reported for each stage are calculated by combining the appropriate terms from the full model, using the delta method to calculate standard errors. The full set of controls is included in the combined model, but the controls are not interacted with stage dummies.

[a] Reported p-values are for Wald tests of joint equality between the coefficients for all stages.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.6: Average amount passed (in Tokens) in each stage, by match rate

	Stage 1	Stage 2	Stage 3	Stage 4	p-value[a]
Baseline	19.15	22.75	23.54	21.69	.518
	(1.94)	(2.23)	(2.35)	(2.30)	
0.5:1 Match	23.84	23.16	24.48	22.75	.717
	(1.14)	(1.11)	(1.17)	(1.11)	
1:1 Match	22.53	22.55	23.46	22.68	.910
	(1.03)	(1.02)	(1.08)	(1.08)	
2:1 Match	23.15	21.84	24.09	22.30	.447
	(1.04)	(1.00)	(1.13)	(1.05)	

Notes: Standard errors in parentheses. Average amount passed (in Tokens) in each stage, averaged by all questions of the same match rate. The stage numbers refer to the order in which subjects completed the experiment. For example Stage 1 is the first stage of the experiment, and Stage 4 is the last stage of the experiment. This table provides insights into whether or not average behavior varies systematically as subjects progress through the experiment.

[a] Reported p-values are exact p-values from Wilks' lambda tests of equality across all stages, assuming homogeneity.

Table B.7: Average amount passed at each match rate

	Baseline	0.5:1 Match	1:1 Match	2:1 Match
mean	21.78114	23.56481	22.80471	22.84891
semean	1.103122	.5663019	.5263568	.5275196
min	0	0	0	0
p50	10	12	15	15
max	120	120	120	120
count	594	2376	2376	2376

Table B.8: Average amounts passed in no-match and 0.5:1 match-rate questions by stage

	Baseline S1	Baseline S2	Baseline S3	Baseline S4	Match 05 S1	Match 05 S2	Match 05 S3	Match 05 S4
mean	19.14667	22.74667	23.54	21.6875	23.84333	23.15667	24.47833	22.74826
semean	1.935385	2.230763	2.349785	2.296992	1.143581	1.107865	1.168888	1.107845
min	0	0	0	0	0	0	0	0
p50	10	11	10	10	12	12	14	10
max	120	120	115	120	120	120	120	120
count	150	150	150	144	600	600	600	576

Table B.9: Average amounts passed in 1:1 and 2:1 match-rate questions by stage

	Match 1 S1	Match 1 S2	Match 1 S3	Match 1 S4	Match 2 S1	Match 2 S2	Match 2 S3	Match 2 S4
mean	22.52667	22.54667	23.46333	22.67708	23.15333	21.83833	24.085	22.29688
semean	1.031806	1.020241	1.080555	1.080526	1.040934	.9966071	1.128061	1.049529
min	0	0	0	0	0	0	0	0
p50	15	15	15	15	15	15	15	15
max	120	120	120	120	120	120	120	120
count	600	600	600	576	600	600	600	576

Table B.10: Average amount passed by match rate and stage, for each group size/endowment combo

		N=5					N=10				
		Stage 1	Stage 2	Stage 3	Stage 4	p-value[a]	Stage 1	Stage 2	Stage 3	Stage 4	p-value[a]
Endow=80	Baseline	16.41 (3.41)	19.58 (3.58)	17.94 (4.53)	15.49 (3.18)	.862	17.84 (3.21)	19.83 (3.93)	13.50 (3.44)	23.83 (4.39)	.275
	0.5:1 Match	19.12 (1.70)	22.9 (1.91)	20.49 (2.21)	18.59 (1.73)	.352	19.80 (1.71)	21.29 (1.95)	13.19 (1.52)	22.06 (1.88)	.002
	1:1 Match	19.80 (1.64)	22.96 (1.67)	18.90 (2.11)	20.96 (1.82)	.415	20.33 (1.67)	20.95 (1.88)	12.61 (1.34)	21.28 (1.83)	.001
	2:1 Match	20.85 (1.61)	22.91 (1.65)	18.45 (2.03)	21.03 (1.87)	.383	20.07 (1.73)	19.01 (1.64)	13.29 (1.42)	20.91 (1.79)	.005
	count	39	40	33	37		37	35	36	40	
Endow=120	Baseline	26.24 (4.56)	23.69 (5.93)	35.58 (5.47)	18.56 (4.49)	.122	14.69 (3.75)	27.37 (4.48)	25.60 (4.36)	29.97 (6.20)	.155
	0.5:1 Match	28.22 (2.35)	25.05 (3.04)	38.46 (2.79)	20.44 (2.18)	.000	28.53 (3.22)	23.51 (2.04)	24.63 (2.11)	31.27 (3.05)	.126
	1:1 Match	26.11 (2.14)	24.99 (2.88)	34.78 (2.54)	20.48 (2.00)	.000	23.69 (2.76)	21.65 (1.83)	26.05 (2.00)	29.08 (3.04)	.145
	2:1 Match	26.54 (2.16)	24.38 (2.81)	35.61 (2.63)	19.00 (1.78)	.000	25.09 (2.79)	21.25 (1.88)	27.26 (2.21)	29.42 (2.96)	.091
	count	42	32	38	36		32	43	43	31	

Notes: Standard errors in parentheses. Each panel of table displays data for a different group size/endowment combination. Each panel shows the average amount passed (in Tokens) in each stage, averaged by all questions of the same match rate (and same group size/endowment combination). The stage numbers refer to the order in which subjects completed the experiment. For example Stage 1 is the first stage of the experiment, and Stage 4 is the last stage of the experiment. Count lists the number of subjects who face the given group size/endowment combination in each stage of the experiment. Note that for each match rate there are four questions (with varying match limits), so the number of observations for the match rate averages is four times the number of subjects. This table provides insights into whether or not average behavior varies systematically as subjects progress through the experiment, based on when they encounter each group size/endowment combination.

[a] Reported p-values are exact p-values from Wilks' lambda tests of equality across all stages, assuming homogeneity.

Table B.11: Estimated probability of receiving a match in each question of experiment, based on observed behavior

			Estimated Probability of Receiving a Match			
Question	Match Rate	Match Limit	Stage 1 (N=5, E=80)	Stage 2 (N=10, E=80)	Stage 3 (N=5, E=120)	Stage 4 (N=10, E=120)
1	0	0	.0023[a]	0	.0015[a]	0
2	0.5	160	.909	.4295	.6982	.1891
3	0.5	240	.9921	.7892	.9056	.3975
4	0.5	320	1	.9046	.9846	.655
5	0.5	∞	1	1	1	1
6	1	120	.7281	.2146	.5719	.0709
7	1	160	.8931	.353	.7348	.1392
8	1	240	.9912	.7305	.9035	.4379
9	1	∞	1	1	1	1
10	2	80	.4586	.0617	.3427	.0216
11	2	120	.7167	.1851	.5479	.0601
12	2	160	.8487	.3095	.6813	.1246
13	2	∞	1	1	1	1

Notes: Table reports the estimated true match probabilities in each question, based on observed behavior in the experiment. Reported match probabilities for each question are calculated by forming 10,000 random groups (of either size $N = 5$ or $N = 10$, depending on the question), summing the total donations of the group, and determining whether the total donations of the group are less than or equal to the match limit for the question (in which case a match is received) or whether the total donations exceed the match limit (in which case no match is received). The estimated match probabilities reported are the proportion of random groups for which total donations are less than or equal to the match limit for the question. Note that, because the match determinations for each subject are based entirely on the donation decisions of their randomly selected group members, their own decision of how much to donate has no impact on their probability of receiving a match. Therefore, match probabilities for each subject are exogenous to their own decisions, and the reported values in this table are a good approximation for the true match probabilities faced by each subject. (Each subject technically faces slightly different match probabilities, since the calculation of their probabilities will exclude their own decisions from the sample when drawing random groups. However, in practice this effect is negligible.)

[a] Estimated match probabilities in the no-match questions can be nonzero because of the process used to determine whether a match is received. A match is received if the total donations of the other members of a subject's group are less than *or equal* to the match limit. Thus, a match can be 'received' in the no-match questions as long as every member of the group passes nothing. This rarely occurs when the group size is 5 ($N = 5$), and is never observed to occur when the group size is 10 ($N = 10$), reflecting the lower likelihood of being matched with group members who all choose to pass nothing as the group size increases. Note that 'receiving' the match is meaningless in these questions, since the match rate is equal to 0.

Table B.12: Regressions using observed match probabilities

Pass	(1)	(2)	(3)	(4)	(5)	(6)
Endowment	0.610***	0.685***	0.673***	0.762***	0.751***	0.739***
	(0.048)	(0.049)	(0.049)	(0.059)	(0.059)	(0.064)
Price	-0.295***	-0.399***	-0.187**	-0.420***	-0.205**	0.260
	(0.036)	(0.038)	(0.085)	(0.039)	(0.087)	(0.326)
Match (=1)	0.070	-0.176***	0.006	0.118	0.315*	0.715**
	(0.045)	(0.055)	(0.085)	(0.146)	(0.162)	(0.307)
Match probability[a]		0.257***	0.004	0.461***	0.204	0.351**
		(0.032)	(0.097)	(0.095)	(0.132)	(0.169)
Price*Match prob.[a]			-0.310***		-0.314***	-0.054
			(0.112)		(0.112)	(0.252)
Match limit				-0.081**	-0.084**	-0.173**
				(0.036)	(0.036)	(0.069)
Group size				0.118**	0.111**	0.132
				(0.056)	(0.056)	(0.082)
Price*Match limit						-0.140
						(0.103)
PxN						0.069
						(0.146)
Constant	-1.097***	-1.441***	-1.388***	-2.027***	-1.962***	-1.947***
	(0.325)	(0.327)	(0.328)	(0.418)	(0.418)	(0.418)
Observations	7800	7800	7800	7800	7800	7800

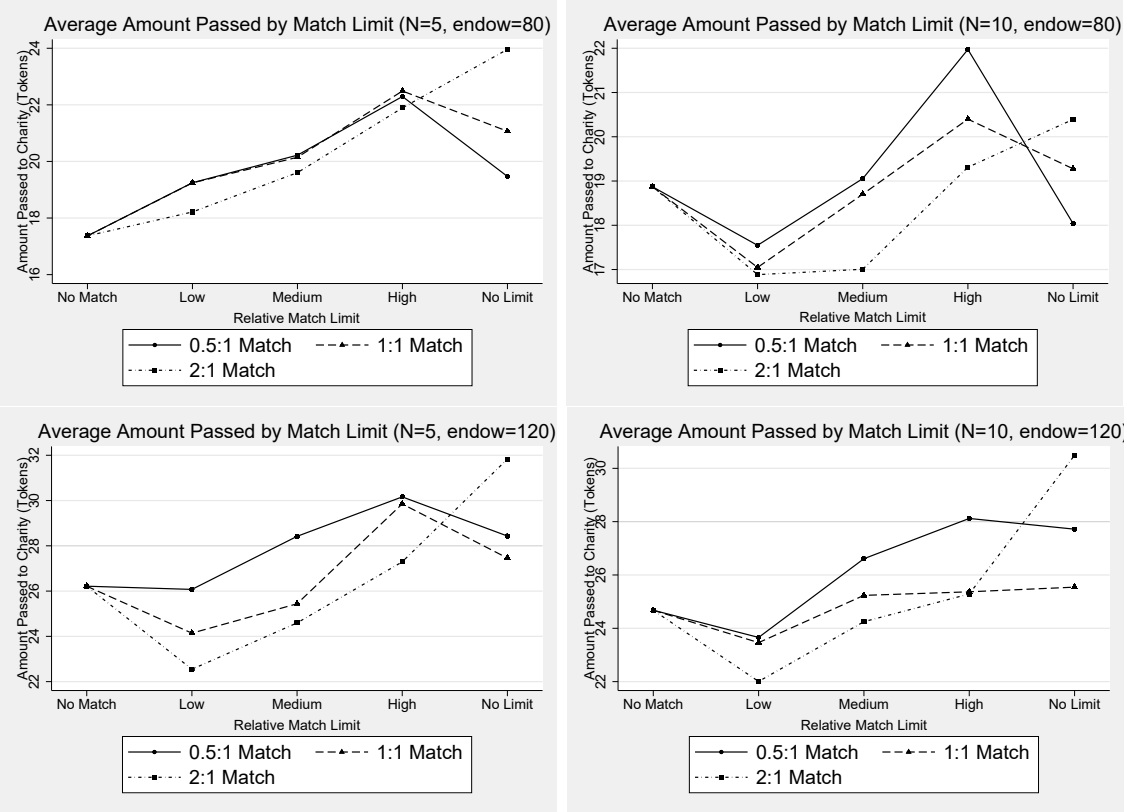
Notes: Standard errors in parentheses. All columns show the results of Tobit regressions of the log of the number of Tokens passed on the log of endowment (in Tokens), log price, and a match dummy. All models also account for censoring from above (at the endowment level) and below (at 0). The match probability covariate is constructed from observed behavior in the experiment; see Table B.11 for more details. Price*Match prob. is an interaction between the log-price and the constructed match probabilities. The remaining covariates are all logged, and the interaction terms interact the log variables.

[a] Match probabilities are estimated using subjects' observed donation decisions in each question. See Table B.11 for a discussion of the procedure used to calculate the match probability for each question, as well as a tabulation of the estimated match probabilities.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

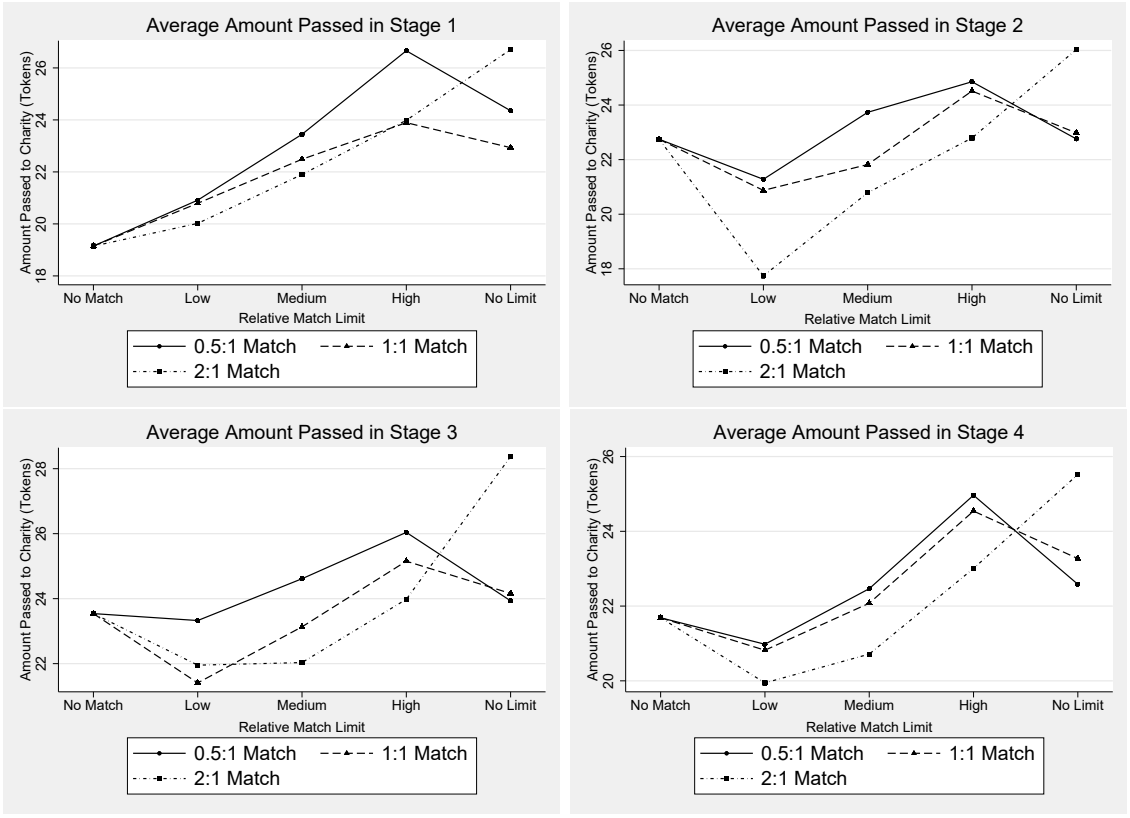
C Additional Figures

Figure C.1: Average amount passed at each match limit for each match rate, graphed separately for each group size and endowment combination.



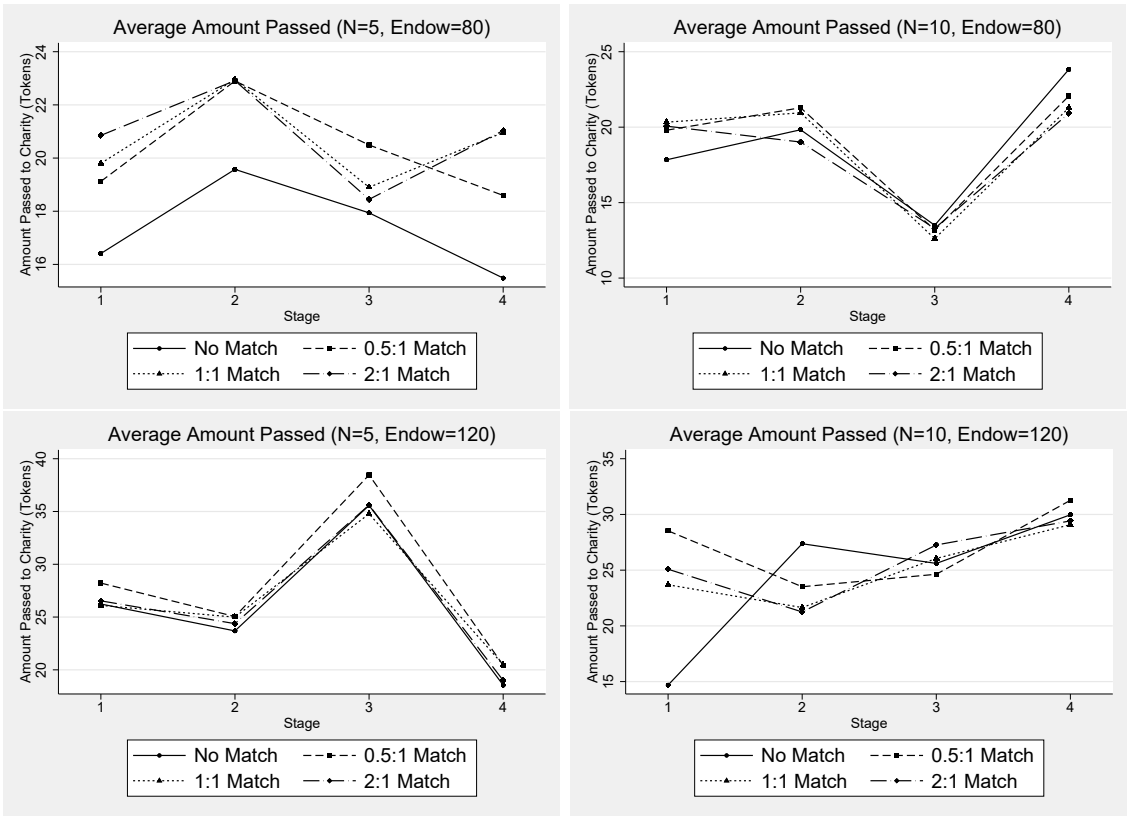
Notes: Figure plots the average amount passed (i.e., out-of-pocket donation) by all subjects at each match rate and match limit, graphed separately for each unique stage, as defined by the combination of the group size and endowment. Here, 'stage' does not refer to the order in which subjects complete the main task of the experiment. To make this distinction clear, each graph is labeled by its parameters (e.g., $N = 5$, endow $= 80$). The purpose of plotting each stage separately is to provide insight into the extent to which subject behavior changes in response to changes in group size and endowment. Note that the match limits are different for each match rate. Therefore, to make the match rates comparable and to plot them all within the same graph, I redefine each match rate's match limits as LOW, MEDIUM, and HIGH.

Figure C.2: Average amount passed at each match limit for each match rate, graphed separately for each stage.



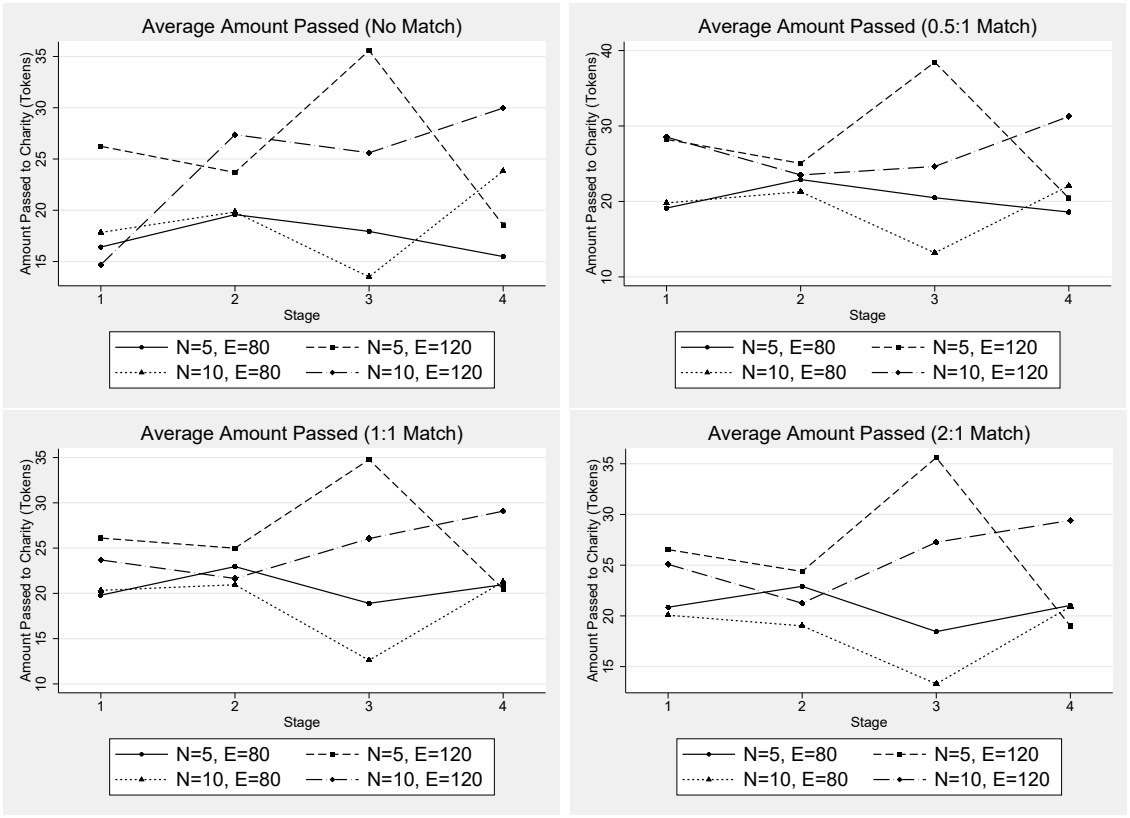
Notes: Figure plots the average amount passed (i.e., out-of-pocket donation) by all subjects at each match rate and match limit, graphed separately for each stage. Here, 'stage' refers to the stage order (e.g., the first stage, the second stage, etc.), not the unique group size and endowment combination that defines the different stages. The purpose of plotting each stage separately is to provide insight into the extent to which subject behavior changes over time, as they are exposed to additional stages. Note that the match limits are different for each match rate. Therefore, to make the match rates comparable and to plot them all within the same graph, I redefine each match rate's match limits as LOW, MEDIUM, and HIGH.

Figure C.3: Average amount passed at each match rate in each stage, graphed separately for each group size/endowment combo.



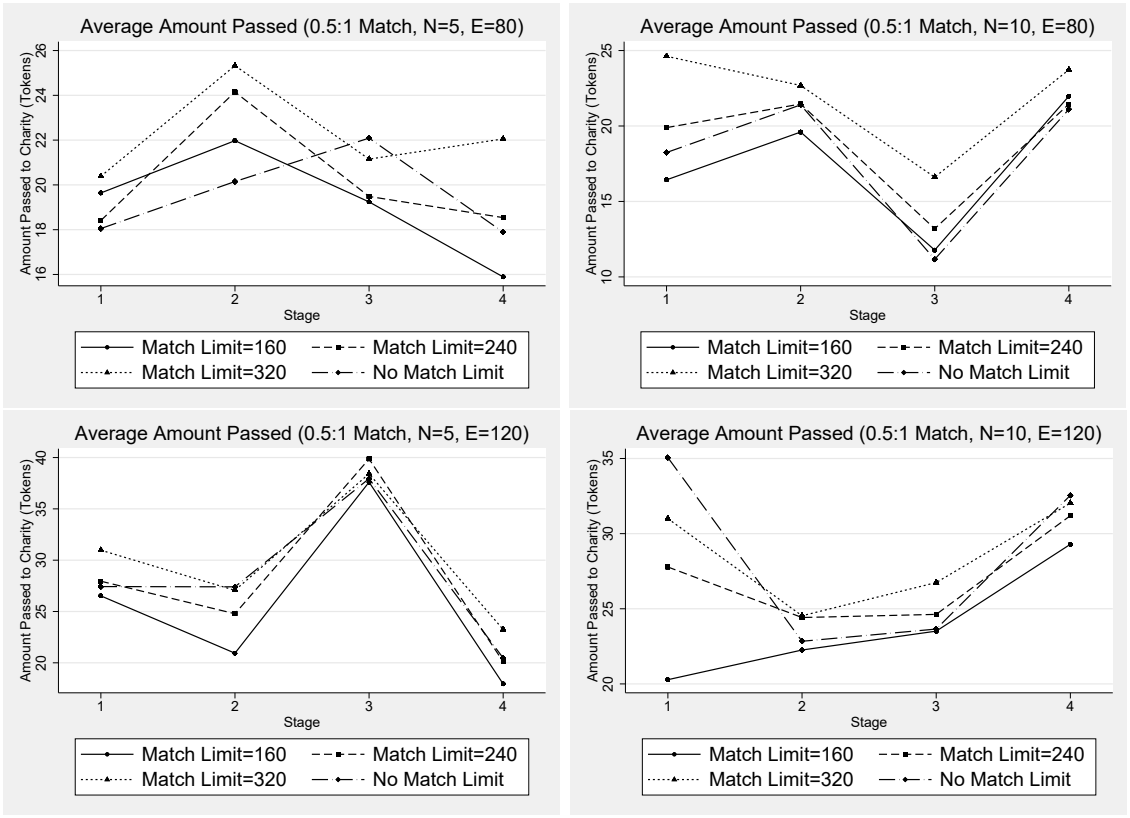
Notes: Top panels: Endow=80. Bottom panels: Endow=120. Left-side panels: N=5. Right-side panels: N=10. Figure plots the average amount passed (i.e., out-of-pocket donation) by all subjects in each stage for each match rate, graphed separately for each group size/endowment combo. Here, 'stage' refers to the stage order (e.g., the first stage, the second stage, etc.) that subjects complete the main stage of the experiment in, not the unique group size and endowment combination that defines the different stages. The purpose of plotting each group size/endowment combination separately is to provide insight into the extent to which subject behavior changes over time (i.e., across stages of the experiment), while holding the group size and endowment constant. Without controlling for group size and endowment, the averages across stages may vary simply as a result of variation in the number of subjects facing each group size and endowment in each stage.

Figure C.4: Average amount passed for each group size/endowment combo in each stage, graphed separately for each match rate.



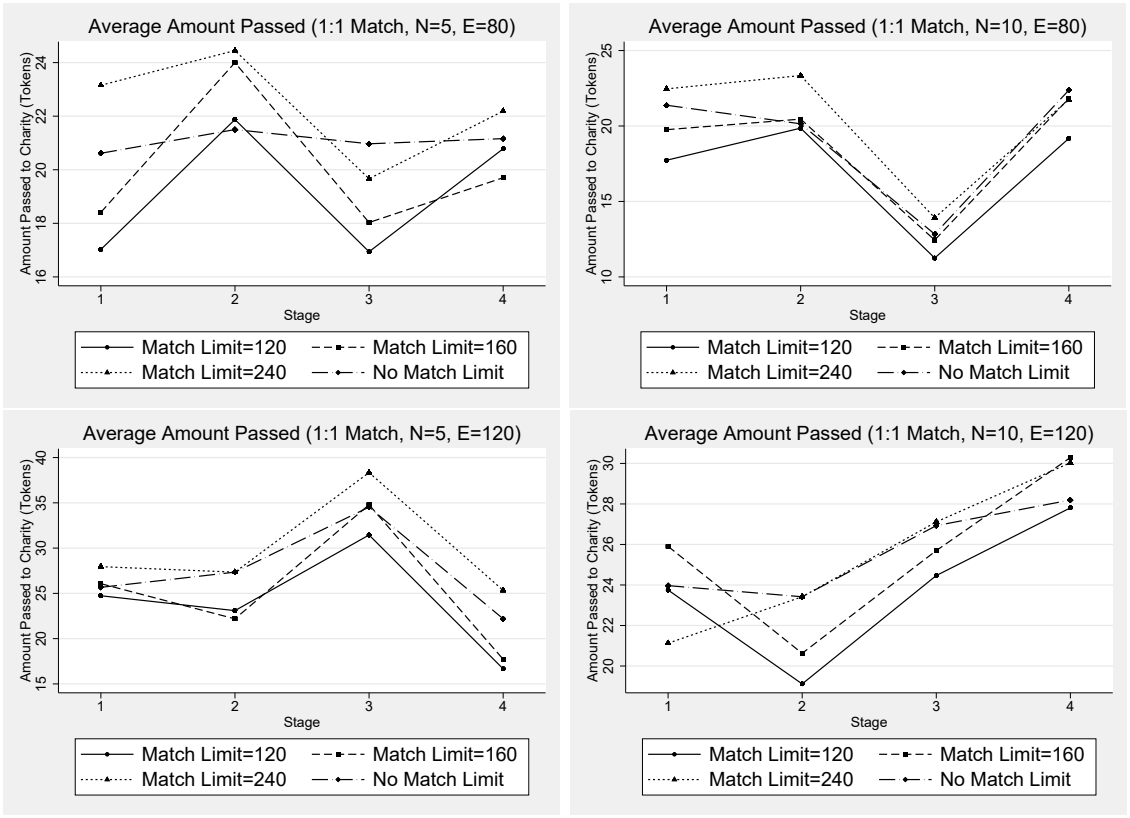
Notes:

Figure C.5: Average amount passed in 0.5:1 match-rate questions in each stage, graphed separately for each group size/endowment combo.



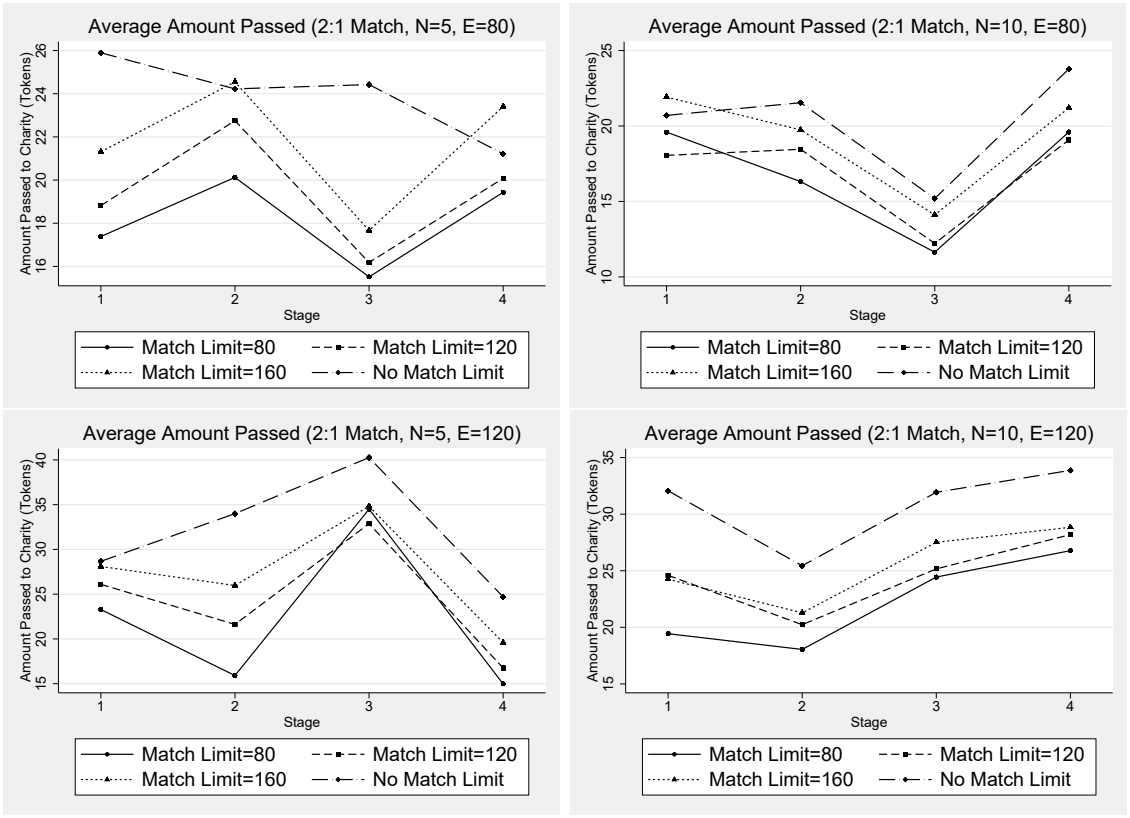
Notes:

Figure C.6: Average amount passed in 1:1 match-rate questions in each stage, graphed separately for each group size/endowment combo.



Notes:

Figure C.7: Average amount passed in 2:1 match-rate questions in each stage, graphed separately for each group size/endowment combo.



Notes:

D Experiment Materials

D.1 Survey questions

The following questions were included as part of a survey subjects were asked to complete after completing the main task and follow-up tasks of the experiment, but before being informed of their bonus payment amount. A response was required for each question.

1. What is your age in years? **[subjects enter an integer value into a text-entry box]**
2. What is your gender?
    a) Male
    b) Female
    c) Other
3. What is you best estimate of your family's annual Income? In addition to your own personal earnings, include income earned by your parents and/or guardians if they give you financial support in whole or in part.
    a) Less than $50,000
    b) Between $50,000 and $75,000
    c) Between $75,000 and $100,000
    d) Between $100,000 and $150,000
    e) Between $150,000 and $200,000
    f) More than $200,000
    g) Don't know/Prefer not to answer
4. How would you describe your political views?
    a) conservative
    b) moderate
    c) liberal
    d) unsure/undecided
    e) prefer not to say
5. How important is religion in your life?
    a) very important
    b) important
    c) somewhat important

d) not important

6. During the past 12 months, how much money have you donated to charitable causes?

   a) Less than $20

   b) Between $20 and $50

   c) Between $50 and $100

   d) More than $100

7. How well do you know **charity: water**? Please rate your prior knowledge on a 0 to 10 scale, where 0 indicates no prior information at all and 10 indicates perfect knowledge: [**subjects enter an integer value (between 0 and 10) into a text-entry box**]

8. How well did you understand how your earnings are calculated in this experiment? Please rate your understanding on a 0 to 10 scale, where 0 indicates no understanding at all and 10 indicates a perfect understanding: [**subjects enter an integer value (between 0 and 10) into a text-entry box**]

9. How well did you understand how your total donation is calculated in this experiment? Please rate your understanding on a 0 to 10 scale, where 0 indicates no understanding at all and 10 indicates a perfect understanding: [**subjects enter an integer value (between 0 and 10) into a text-entry box**]

10. While making your donation decisions in this experiment, how confident were you that your donation (and any applicable matching donation) will actually be donated to **charity: water** on your behalf? Please rate your level of confidence on a 0 to 10 scale, where 0 indicates no confidence at all and 10 indicates complete confidence: [**subjects enter an integer value (between 0 and 10) into a text-entry box**]

D.2 Donation follow-up task

Donation Follow-up Task

Please answer the following questions. For each question, select whether you prefer Option A or Option B.

Option A will always be *the Charity receives a $1 donation with probability 50%, and a $0 donation otherwise.*

Option B will be *the Charity receives a donation of some dollar amount*. As you proceed down the rows of the list, the amount of the donation received by the Charity will increase from $0 to $1.

For each row, all you have to do is decide whether you prefer Option A or Option B. Indicate your preference by selecting the corresponding button. **Most people begin by preferring Option A and then switch to Option B, so one way to complete this list is to determine at which row you prefer to switch from Option A to Option B.**

At the conclusion of the experiment, one row will be randomly selected, and a donation will be made to the Charity on your behalf based on the decision you have made in the selected row. If you have selected the lottery option (Option A) in the randomly selected row, the computer will flip a coin to determine the outcome of the lottery. All donations will actually be donated to the Charity, and you will be informed of the outcome of this process at the conclusion of the experiment. **(Note that any donations provided to the Charity in this task are provided by the experimenter and do not affect your earnings.)**

	Select your preferred option.		
	Option A	Option B	
$1 donation with probability 50%, and $0 donation otherwise	○	○	$0 donation
$1 donation with probability 50%, and $0 donation otherwise	○	○	$0.10 donation
$1 donation with probability 50%, and $0 donation otherwise	○	○	$0.20 donation
$1 donation with probability 50%, and $0 donation otherwise	○	○	$0.30 donation
$1 donation with probability 50%, and $0 donation otherwise	○	○	$0.40 donation
$1 donation with probability 50%, and $0 donation otherwise	○	○	$0.50 donation
$1 donation with probability 50%, and $0 donation otherwise	○	○	$0.60 donation
$1 donation with probability 50%, and $0 donation otherwise	○	○	$0.70 donation
$1 donation with probability 50%, and $0 donation otherwise	○	○	$0.80 donation
$1 donation with probability 50%, and $0 donation otherwise	○	○	$0.90 donation
$1 donation with probability 50%, and $0 donation otherwise	○	○	$1 donation

Figure D.1: Donation follow-up task example screen

D.3 Payment follow-up task

Payment Follow-up Task

Please answer the following questions. For each question, select whether you prefer Option A or Option B.

Option A will always be *you receive a $1 payment with probability 50%, and a $0 payment otherwise.*

Option B will be *you receive a payment of some dollar amount*. As you proceed down the rows of the list, the amount of the payment you receive will increase from $0 to $1.

For each row, all you have to do is decide whether you prefer Option A or Option B. Indicate your preference by selecting the corresponding button. **Most people begin by preferring Option A and then switch to Option B, so one way to complete this list is to determine at which row you prefer to switch from Option A to Option B.**

At the conclusion of the experiment, one row will be randomly selected, and you will be paid based on the decision you have made in the selected row. If you have selected the lottery option (Option A) in the randomly selected row, the computer will flip a coin to determine the outcome of the lottery. You will be informed of the outcome of this process at the conclusion of the experiment.

	Select your preferred option.		
	Option A	Option B	
$1 payment with probability 50%, and $0 payment otherwise	○	○	$0 payment
$1 payment with probability 50%, and $0 payment otherwise	○	○	$0.10 payment
$1 payment with probability 50%, and $0 payment otherwise	○	○	$0.20 payment
$1 payment with probability 50%, and $0 payment otherwise	○	○	$0.30 payment
$1 payment with probability 50%, and $0 payment otherwise	○	○	$0.40 payment
$1 payment with probability 50%, and $0 payment otherwise	○	○	$0.50 payment
$1 payment with probability 50%, and $0 payment otherwise	○	○	$0.60 payment
$1 payment with probability 50%, and $0 payment otherwise	○	○	$0.70 payment
$1 payment with probability 50%, and $0 payment otherwise	○	○	$0.80 payment
$1 payment with probability 50%, and $0 payment otherwise	○	○	$0.90 payment
$1 payment with probability 50%, and $0 payment otherwise	○	○	$1 payment

Figure D.2: Payment follow-up task example screen

D.4 Main task example decision sheet: N=5, Endow=80

Below are 13 allocation problems. Read each allocation problem carefully. For each allocation problem, you must decide how to allocate the endowment listed in column (1) between yourself and *charity: water* ("the Charity").

Remember that only one of the problems will be randomly selected to determine payment. If you would like to review the instructions, click here: Instructions.

In this stage, you are grouped with 5 other participants, and you are each endowed with 80 Tokens.

	Enter the number of Tokens you would like to pass to the Charity. Pass	The total number of Tokens held for yourself. Your Earnings	Total donation received by the Charity if a match **is not** received. Total Donation (if **no match**)	Total donation received by the Charity if a match **is** received. Total Donation (**with match**)
1.) You, and each of the 5 other members of your group, are endowed with 80 Tokens.	7	73	7	N/A
2.) You, and each of the 5 other members of your group, are endowed with 80 Tokens. The experimenter will match donations at a 2:1 rate up to a match limit of 80 Tokens.	0	80	0	0
3.) You, and each of the 5 other members of your group, are endowed with 80 Tokens. The experimenter will match donations at a 2:1 rate up to a match limit of 120 Tokens.	15	65	15	45
4.) You, and each of the 5 other members of your group, are endowed with 80 Tokens. The experimenter will match donations at a 2:1 rate up to a match limit of 160 Tokens.	11	69	11	33
5.) You, and each of the 5 other members of your group, are endowed with 80 Tokens. The experimenter will match all donations at a 2:1 rate.	13	67	N/A	39
6.) You, and each of the 5 other members of your group, are endowed with 80 Tokens. The experimenter will match donations at a 1:1 rate up to a match limit of 120 Tokens.	28	52	28	56
7.) You, and each of the 5 other members of your group, are endowed with 80 Tokens. The experimenter will match donations at a 1:1 rate up to a match limit of 160 Tokens.	44	36	44	88
8.) You, and each of the 5 other members of your group, are endowed with 80 Tokens. The experimenter will match donations at a 1:1 rate up to a match limit of 240 Tokens.	26	54	26	52
9.) You, and each of the 5 other members of your group, are endowed with 80 Tokens. The experimenter will match all donations at a 1:1 rate.			N/A	
10.) You, and each of the 5 other members of your group, are endowed with 80 Tokens. The experimenter will match donations at a 0.5:1 rate up to a match limit of 160 Tokens.				
11.) You, and each of the 5 other members of your group, are endowed with 80 Tokens. The experimenter will match donations at a 0.5:1 rate up to a match limit of 240 Tokens.				
12.) You, and each of the 5 other members of your group, are endowed with 80 Tokens. The experimenter will match donations at a 0.5:1 rate up to a match limit of 320 Tokens.				
13.) You, and each of the 5 other members of your group, are endowed with 80 Tokens. The experimenter will match all donations at a 0.5:1 rate.			N/A	

Figure D.3: Main task example screen: N=5, Endow=80

D.5 Main task example decision sheet: N=10, Endow=80

Below are 13 allocation problems. Read each allocation problem carefully. For each allocation problem, you must decide how to allocate the endowment listed in column (1) between yourself and *charity: water* ("the Charity").

Remember that only one of the problems will be randomly selected to determine payment. If you would like to review the instructions, click here: Instructions.

In this stage, you are grouped with 10 other participants, and you are each endowed with 80 Tokens.

	Enter the number of Tokens you would like to pass to the Charity. Pass	The total number of Tokens held for yourself. Your Earnings	Total donation received by the Charity if a match **is not** received. Total Donation (if **no match**)	Total donation received by the Charity if a match **is** received. Total Donation (**with match**)
1.) You, and each of the 10 other members of your group, are endowed with 80 Tokens.	6	74	6	N/A
2.) You, and each of the 10 other members of your group, are endowed with 80 Tokens. The experimenter will match donations at a 2:1 rate up to a match limit of 80 Tokens.	12	68	12	36
3.) You, and each of the 10 other members of your group, are endowed with 80 Tokens. The experimenter will match donations at a 2:1 rate up to a match limit of 120 Tokens.	14	66	14	42
4.) You, and each of the 10 other members of your group, are endowed with 80 Tokens. The experimenter will match donations at a 2:1 rate up to a match limit of 160 Tokens.	18	62	18	54
5.) You, and each of the 10 other members of your group, are endowed with 80 Tokens. The experimenter will match all donations at a 2:1 rate.	10	70	N/A	30
6.) You, and each of the 10 other members of your group, are endowed with 80 Tokens. The experimenter will match donations at a 1:1 rate up to a match limit of 120 Tokens.	5	75	5	10
7.) You, and each of the 10 other members of your group, are endowed with 80 Tokens. The experimenter will match donations at a 1:1 rate up to a match limit of 160 Tokens.	33	47	33	66
8.) You, and each of the 10 other members of your group, are endowed with 80 Tokens. The experimenter will match donations at a 1:1 rate up to a match limit of 240 Tokens.	17	63	17	34
9.) You, and each of the 10 other members of your group, are endowed with 80 Tokens. The experimenter will match all donations at a 1:1 rate.			N/A	
10.) You, and each of the 10 other members of your group, are endowed with 80 Tokens. The experimenter will match donations at a 0.5:1 rate up to a match limit of 160 Tokens.				
11.) You, and each of the 10 other members of your group, are endowed with 80 Tokens. The experimenter will match donations at a 0.5:1 rate up to a match limit of 240 Tokens.				
12.) You, and each of the 10 other members of your group, are endowed with 80 Tokens. The experimenter will match donations at a 0.5:1 rate up to a match limit of 320 Tokens.				
13.) You, and each of the 10 other members of your group, are endowed with 80 Tokens. The experimenter will match all donations at a 0.5:1 rate.			N/A	

Figure D.4: Main task example screen: N=10, Endow=80

D.6 Main task example decision sheet: N=5, Endow=120

Below are 13 allocation problems. Read each allocation problem carefully. For each allocation problem, you must decide how to allocate the endowment listed in column (1) between yourself and *charity: water* ("the Charity").

Remember that only one of the problems will be randomly selected to determine payment. If you would like to review the instructions, click here: Instructions.

In this stage, you are grouped with 5 other participants, and you are each endowed with 120 Tokens.

	Enter the number of Tokens you would like to pass to the Charity. Pass	The total number of Tokens held for yourself. Your Earnings	Total donation received by the Charity if a match **is not** received. Total Donation (if **no match**)	Total donation received by the Charity if a match **is** received. Total Donation (**with match**)
1.) You, and each of the 5 other members of your group, are endowed with 120 Tokens.	10	110	10	N/A
2.) You, and each of the 5 other members of your group, are endowed with 120 Tokens. The experimenter will match donations at a 2:1 rate up to a match limit of 80 Tokens.	15	105	15	45
3.) You, and each of the 5 other members of your group, are endowed with 120 Tokens. The experimenter will match donations at a 2:1 rate up to a match limit of 120 Tokens.	20	100	20	60
4.) You, and each of the 5 other members of your group, are endowed with 120 Tokens. The experimenter will match donations at a 2:1 rate up to a match limit of 160 Tokens.	20	100	20	60
5.) You, and each of the 5 other members of your group, are endowed with 120 Tokens. The experimenter will match all donations at a 2:1 rate.	21	99	N/A	63
6.) You, and each of the 5 other members of your group, are endowed with 120 Tokens. The experimenter will match donations at a 1:1 rate up to a match limit of 120 Tokens.	31	89	31	62
7.) You, and each of the 5 other members of your group, are endowed with 120 Tokens. The experimenter will match donations at a 1:1 rate up to a match limit of 160 Tokens.	25	95	25	50
8.) You, and each of the 5 other members of your group, are endowed with 120 Tokens. The experimenter will match donations at a 1:1 rate up to a match limit of 240 Tokens.	37	83	37	74
9.) You, and each of the 5 other members of your group, are endowed with 120 Tokens. The experimenter will match all donations at a 1:1 rate.			N/A	
10.) You, and each of the 5 other members of your group, are endowed with 120 Tokens. The experimenter will match donations at a 0.5:1 rate up to a match limit of 160 Tokens.				
11.) You, and each of the 5 other members of your group, are endowed with 120 Tokens. The experimenter will match donations at a 0.5:1 rate up to a match limit of 240 Tokens.				
12.) You, and each of the 5 other members of your group, are endowed with 120 Tokens. The experimenter will match donations at a 0.5:1 rate up to a match limit of 320 Tokens.				
13.) You, and each of the 5 other members of your group, are endowed with 120 Tokens. The experimenter will match all donations at a 0.5:1 rate.			N/A	

Figure D.5: Main task example screen: N=5, Endow=120

D.7 Main task example decision sheet: N=10, Endow=120

Below are 13 allocation problems. Read each allocation problem carefully. For each allocation problem, you must decide how to allocate the endowment listed in column (1) between yourself and *charity: water* ("the Charity").

Remember that only one of the problems will be randomly selected to determine payment. If you would like to review the instructions, click here: Instructions.

In this stage, you are grouped with 10 other participants, and you are each endowed with 120 Tokens.

	Enter the number of Tokens you would like to pass to the Charity. Pass	The total number of Tokens held for yourself. Your Earnings	Total donation received by the Charity if a match **is not** received. Total Donation (if **no match**)	Total donation received by the Charity if a match **is** received. Total Donation (**with match**)
1.) You, and each of the 10 other members of your group, are endowed with 120 Tokens.	11	109	11	N/A
2.) You, and each of the 10 other members of your group, are endowed with 120 Tokens. The experimenter will match donations at a 2:1 rate up to a match limit of 80 Tokens.	15	105	15	45
3.) You, and each of the 10 other members of your group, are endowed with 120 Tokens. The experimenter will match donations at a 2:1 rate up to a match limit of 120 Tokens.	10	110	10	30
4.) You, and each of the 10 other members of your group, are endowed with 120 Tokens. The experimenter will match donations at a 2:1 rate up to a match limit of 160 Tokens.	20	100	20	60
5.) You, and each of the 10 other members of your group, are endowed with 120 Tokens. The experimenter will match all donations at a 2:1 rate.	31	89	N/A	93
6.) You, and each of the 10 other members of your group, are endowed with 120 Tokens. The experimenter will match donations at a 1:1 rate up to a match limit of 120 Tokens.	33	87	33	66
7.) You, and each of the 10 other members of your group, are endowed with 120 Tokens. The experimenter will match donations at a 1:1 rate up to a match limit of 160 Tokens.	25	95	25	50
8.) You, and each of the 10 other members of your group, are endowed with 120 Tokens. The experimenter will match donations at a 1:1 rate up to a match limit of 240 Tokens.	17	103	17	34
9.) You, and each of the 10 other members of your group, are endowed with 120 Tokens. The experimenter will match all donations at a 1:1 rate.			N/A	
10.) You, and each of the 10 other members of your group, are endowed with 120 Tokens. The experimenter will match donations at a 0.5:1 rate up to a match limit of 160 Tokens.				
11.) You, and each of the 10 other members of your group, are endowed with 120 Tokens. The experimenter will match donations at a 0.5:1 rate up to a match limit of 240 Tokens.				
12.) You, and each of the 10 other members of your group, are endowed with 120 Tokens. The experimenter will match donations at a 0.5:1 rate up to a match limit of 320 Tokens.				
13.) You, and each of the 10 other members of your group, are endowed with 120 Tokens. The experimenter will match all donations at a 0.5:1 rate.			N/A	

Figure D.6: Main task example screen: N=10, Endow=120

D.8 Instructions

Introduction. Thank you for participating in this online experiment. This experiment is interested in studying how individuals make decisions. You will be making decisions individually. Your decisions and earnings during the experiment will be confidential and will only be associated with an ID number.

Compensation. You will be compensated for your participation. At the end of the experiment, you will receive a show-up reward of $9. This show-up reward is not contingent on the decisions that you make during the experiment, and it will be yours to keep just for participating. You will automatically receive this payment through Prolific upon completion of the experiment.

In addition to the show-up reward, you will also have an opportunity to earn additional money, which will be paid to you through Prolific in the form of a bonus payment. The amount of your bonus payment will depend on the decisions you make in the experiment and luck, as will be explained in detail below.

During the experiment, your earnings will be calculated in Tokens. At the end of the experiment the total amount of Tokens you have earned will be converted to US Dollars at the following rate:

10 Tokens = 1.00 US Dollar

Your $ earnings (including the $4 show-up reward and any bonus payments you earn) will be paid to you in private through Prolific. The show-up reward will be paid automatically once you have registered your submission in Prolific. Your bonus payment will be paid through Prolific within 1-2 business days after your submission has been received. **Bonus payments are backed by the University of Maryland and are guaranteed to be paid to you within 1-2 business days after you register your survey response in Prolific.** If you do not receive your bonus payment with 2 business days, or if you believe an error has been made regarding your bonus payment, please reach out to the research team using the contact information provided in the Consent Form.

The Charity. During the experiment you will be provided with opportunities to make donations to **charity: water**, a nonprofit organization that works to bring safe and clean drinking water to the more than 700 million people in the world living without access to clean water. The majority of people without access to clean water live in isolated rural areas, and they must spend hours every day walking many miles to collect water for their families. This water often carries diseases that lead to sickness. **charity: water** works with local experts and community members to install sustainable water solutions, including wells, piped water systems, BioSand Filters, and

systems for harvesting rainwater. 100% of any donations you provide to **charity: water** will go toward funding water projects.

Allocation Decisions. In this experiment, you will be presented with various allocation decision problems. In each problem, you will be endowed with a certain number of Tokens, and you will be asked to allocate these Tokens between yourself and *charity: water* ("the Charity"). You will do this by deciding the number of Tokens that you would like to pass to the Charity. You cannot pass a negative number of Tokens, and you cannot pass more Tokens than what you are endowed with in any given problem. Any Tokens you choose to pass will be donated to the Charity. Any Tokens you do not pass will be paid to you after the completion of the experiment.

In some problems a *matching grant* will be provided by the experimenter. *Matching grants* are common among fundraisers, and you have likely encountered them before. Fundraisers using a *matching grant* may solicit donations with a message along the lines of, "Any donations you provide will be matched by a generous donor up to $100,000." To ensure that you understand how the *matching grants* provided throughout this experiment affect your donations, we provide a brief overview of their basic features.

Matching Grants. A matching grant is a commitment by a *lead donor* to match donations at an agreed upon rate (i.e., the *match rate*) up to some agreed upon limit (i.e., the *match limit*). In the example given above, the *match rate* is 1:1 (for each $1 you give, the charity receives a total of $2: your $1 and a matching $1 provided by the *lead donor*) and the *match limit* is $100,000 (the maximum amount of donations the *lead donor* is willing to match). When your donation receives a match, this increases the amount received by the charity as a result of your donation.

There are three defining features of any matching grant that are important to understand:

> *Lead donor*: this is the donor or entity responsible for providing the matching donations. Throughout this experiment, the lead donor will always be the experimenter. That is, all matching grants are provided by the experimenter.
>
> *Match rate*: the match rate is the rate at which your donation will be matched. There are three different match rates you will be presented with in this experiment:
>
> > **0.5:1.** A match rate of 0.5:1 means that for each $1 you donate, an additional $0.50 will be provided by the experimenter. Thus, for each $1 you donate, the charity will receive a total of $1.50 (your $1 plus a matching $0.50 provided by the experimenter).
> >
> > **1:1.** A match rate of 1:1 means that for each $1 you donate, an additional $1 will be provided by the experimenter. Thus, for each $1 you donate, the charity will receive a total of $2 (your $1 plus a matching $1 provided by the experimenter).

2:1. A match rate of 2:1 means that for each $1 you donate, an additional $2 will be provided by the experimenter. Thus, for each $1 you donate, the charity will receive a total of $3 (your $1 plus a matching $2 provided by the experimenter).

Match limit: the match limit is the maximum amount of donations the lead donor is willing to match. Once the match limit is met, the lead donor will no longer match any more donations. Whether or not the match limit is met depends on the total amount of donations provided by donors in the fundraiser.

Determining Whether Your Donation Will Receive a Match. Throughout the experiment, you will be randomly grouped with other participants. The size of your group may vary, but you will always be informed of the number of participants in your group. Whether or not your donation is matched will depend on the donation decisions of the participants in your randomly assigned group.

There are two possible cases:

Case 1: the total donations provided by the *other members* of your group are such that the match limit *is not* met. In this case, any donation you provide *will* receive a match.

Case 2: the total donations provided by the *other members* of your group are such that the match limit *is* met. In this case, any donation you provide *will not* receive a match.

Note that in both cases, whether or not your donation is matched depends entirely on the decisions of the *other members* of your group. That is, your choice of how much to donate has no impact on whether or not you receive a match.

To help illustrate this, consider the following examples:

Example 1: You are grouped with 3 *other* participants (N=3). The experimenter will match donations at a 1:1 rate up to a match limit of $6. Each of the other members of your group choose to donate $2 each. You choose to donate $1.

In this example, each of the other members of your group choose to donate $2. Since there are 3 other group members, this means their total donations are $6 (3 x $2 = $6). Therefore, the match limit of $6 has been met by the other members of your group, and your donation will *not* be matched.

Thus, as a result of your $1 donation, the total donation received by the charity will be $1.

Example 2: You are grouped with 2 *other* participants (N=2). The experimenter will match donations at a 2:1 rate up to a match limit of $5. Each of the other members of your group choose to donate $2 each. You choose to donate $2.

In this example, each of the other members of your group choose to donate $2. Since there are 2 other group members, this means their total donations are $4 (2 x $2 = $4). Therefore, the match limit of $5 has not been met by the other members of your group, and your donation *will* be matched.

Thus, as a result of your $2 donation, the total donation received by the charity will be $6 (your $2 plus a matching $4 provided by the experimenter).

Testing Your Understanding. To make sure you understand the process for determining whether or not your donation will be matched, please answer the following questions:

Question 1. You are grouped with 2 *other* participants (N=2). The experimenter will match donations at a 1:1 rate up to a match limit of $5. The other members of your group each donate $2. You choose to donate $3.

1a) Will your donation of $3 receive a match?

1b) What will be the total donation received by the charity as a result of your $3 donation?

Question 2. You are grouped with 4 *other* participants (N=4). The experimenter will match donations at a 0.5:1 rate up to a match limit of $4. The other members of your group each donate $1. You also choose to donate $1.

2a) Will your donation of $1 receive a match?

2b) What will be the total donation received by the charity as a result of your $1 donation?

Question 3. You are grouped with 3 *other* participants (N=3). The experimenter will match donations at a 2:1 rate up to a match limit of $5. The other members of your group each donate $1. You choose to donate $2.

3a) Will your donation of $2 receive a match?

3b) What will be the total donation received by the charity as a result of your $2 donation?

Great job! You've passed the test!

Now that you know how the matching subsidies work in this experiment, you are almost ready to begin. On the next page, we will go over the experiment procedures and present some example allocation decision problems.

Page Break

Experiment Procedures. We now briefly outline how this experiment will be conducted. This experiment consists of four (4) stages, each of which can be completed at your own pace. In each stage of the experiment, you will be grouped with other participants and each of you will be endowed with a certain number of Tokens. The size of your endowment and your group size will both remain constant within each stage of the experiment, but they may vary across different stages. At the beginning of each stage, you will be informed of your group size and the amount of your endowment.

Within each stage of the experiment, you will be presented with a list of allocation decision problems. For each problem, you must enter the number of Tokens you would like to pass to the charity. You will do this by typing the number of Tokens you would like to pass into the provided box for each problem. An example of the format used to present the allocation decision problems is shown below.

Example Allocation Decision Problems:

For each of the following Allocation Decision Problems, you are grouped with 5 other participants, and each of you are endowed with 80 Tokens.

	Enter the number of Tokens you would like to pass to the Charity. Pass	The total number of Tokens held for yourself. Your Earnings	Total donation received by the Charity if a match **is not** received. Total Donation (if **no match**)	Total donation received by the Charity if a match **is** received. Total Donation (**with match**)
1.) You, and each of the 5 other members of your group, are endowed with 80 Tokens.				N/A
2.) You, and each of the 5 other members of your group, are endowed with 80 Tokens. The experimenter will match donations at a 1:1 rate up to a match limit of 160 Tokens.				
3.) You, and each of the 5 other members of your group, are endowed with 80 Tokens. The experimenter will match all donations at a 2:1 rate.			N/A	

Each allocation decision problem you will be presented with will be different, so it is important that you carefully read each problem before making your decision. Once you enter the number of Tokens you would like to pass to the Charity for a given problem, the computer will automatically calculate and display the corresponding values for the remaining columns.

Feel free to enter Pass values in the example problems above, and note how the remaining columns automatically fill after you do so. Each of the remaining columns is summarized below:

> *Your Earnings*: this column reports your earnings (in Tokens) for each allocation decision problem, based on your decision of how many Tokens to pass to the Charity. It is the number

of Tokens you hold for yourself, which is equal to your Endowment minus the amount you choose to Pass.

*Total Donation (if **no match**)*: this column reports the total donation (in Tokens) that will be received by the Charity if your donation **does not** end up being matched. This column is equal to the number of Tokens you choose to Pass.

*Total Donation (**with match**)*: this column reports the total donation (in Tokens) that will be received by the Charity if your donation **does** end up being matched. This column is equal to the number of Tokens you choose to pass **plus** the corresponding matching contribution made by the experimenter.

Note that in Example Problem 1 the *Total Donation (**with match**)* column displays "N/A" regardless of the number of Tokens you choose to Pass. This is because in this problem there is no match offered. Therefore, you know with certainty that your donation will not be matched, and the total donation received by the Charity will be equal to the value listed in the *Total Donation (if **no match**)* column.

Similarly, in Example Problem 3 the *Total Donation (if **no match**)* column displays "N/A" regardless of the number of Tokens you choose to Pass. This is because in this problem there is no match limit. Therefore, you know with certainty that your donation will be matched, and the total donation received by the Charity will be equal to the value listed in the *Total Donation (**with match**)* column.

For Example Problem 2, your donation may or may not be matched, depending on the decisions of your randomly selected group members. If the total donations of your group members do not exhaust the match limit of 160 Tokens, then your donation will be matched and the total donation received by the Charity will be equal to the value listed in the *Total Donation (**with match**)* column. If instead the total donations of your group members do exhaust the match limit, then your donation will not be matched and the total donation received by the Charity will be equal to the value listed in the *Total Donation (if **no match**)* column.

After you have entered decisions for all problems within a stage, you can submit your decisions. You will then advance to the next stage. In each stage, you will be assigned to a new random group. The size of your group may change between stages. Your endowment may also change between stages. It is important that you note these changes as you move from stage to stage. Other than changes in group size and endowment, all four stages are identical.

On the next page, we'll review how your bonus payment and total donation will be determined. After that, you'll be ready to complete the experiment.

Page Break

Determining Your Payment and Total Donation. Once you have entered appropriate decisions for each problem in all four stages, you will be able to submit your decisions. After submitting your decisions, **one stage will be randomly selected. From this randomly selected stage, one problem will then be randomly selected to determine your payment and the total donation received by the Charity.** That is, only one allocation decision problem from the entire experiment will be randomly selected to determine your bonus payment in this experiment. Your decision of how much to pass to the Charity in the randomly selected problem will determine the amount of your bonus earnings in this experiment. Your bonus earnings will be equal to the amount listed in the *Your Earnings* column of the decision problem randomly selected for payment.

You will be obligated to pass to the Charity the amount you have entered in the *Pass* column of the randomly selected problem. This amount, plus any matched funds provided by the experimenter (if applicable), will actually be donated to the Charity.

Informing You of Your Payment and Total Donation. You will be informed of which problem was randomly selected for payment at the end of the experiment. At that time, you will also be informed of your total bonus earnings based on your decision in the randomly selected problem. Your bonus earnings will be paid to you through Prolific within 1-2 business days after you complete the experiment and register your submission through Prolific. The show-up reward, which is in no way affected by your decisions in this experiment, will be automatically paid to you once you register your submission in Prolific.

All determinations regarding whether or not a participant's donation will receive a match will be made *at the conclusion of the study*, after *all* participants have submitted their responses. For this reason, we are unable to inform you at the conclusion of this experiment whether you will receive a match. Once all responses have been received, the experimenter will then randomly form groups and use these groups to determine whether or not a match will be provided to each participant. The exact procedure that will be used is detailed below.

Determining Whether Your Donation Will Receive a Match. The total donation received by the Charity will depend on whether or not your donation ends up receiving a match. Whether or not your donation receives a match will be determined in the following way:

(i) One allocation decision problem will be randomly selected to determine your payment. For example, let's assume *Stage 3: Problem 4* is randomly selected.

(ii) After the study is completed and responses have been received from all participants, we then randomly group you with other participants, where the number of group members is based

on the group size listed in your randomly selected decision problem. For example, if *Stage 3: Problem 4* has a group size of 10, then you will be randomly grouped with 10 other participants from the experiment.

(iii) We then sum the total donation decisions of your random group members *in your randomly selected decision problem*. That is, if your randomly selected decision problem is *Stage 3: Problem 4*, then we sum the donation decisions of your randomly selected group members in the same decision problem (*Stage 3: Problem 4*).

(iv) Based on the *match rate* and *match limit* provided in your randomly selected decision problem, we then determine if the total donations of your group members exhausts the match limit.

i. If the total donations of your group members does not exhaust the match limit, then your donation will be matched at the applicable match rate provided in your randomly selected decision problem. In this case, the total donation provided to *charity: water* on your behalf will be equal to the value listed in the *Total Donation (**with match**)* column of your randomly selected decision problem.

ii. If the total donations of your group members exhausts the match limit, then your donation will not be matched. In this case, the total donation provided to *charity: water* on your behalf will be equal to the value listed in the *Total Donation (if **no match**)* column of your randomly selected decision problem.

All donations provided by participants of this study, including any applicable matching contributions (as determined by the procedure detailed above), will be donated to *charity: water* in a single, lump-sum donation at the conclusion of the study. **This donation is backed by the University of Maryland and will actually be provided to the Charity.**

If you have finished reading through these instructions, you are free to continue to the experiment.

D.9 Quiz questions used in instructions

Testing Your Understanding. To make sure you understand the process for determining whether or not your donation will be matched, please answer the following questions:

Question 1. You are grouped with 2 *other* participants (N=2). The experimenter will match donations at a 1:1 rate up to a match limit of $5. The other members of your group each donate $2. You choose to donate $3.

1a) Will your donation of $3 receive a match?

Figure D.7: Quiz question 1 from experiment instructions before subject attempts to answer

Testing Your Understanding. To make sure you understand the process for determining whether or not your donation will be matched, please answer the following questions:

Question 1. You are grouped with 2 *other* participants (N=2). The experimenter will match donations at a 1:1 rate up to a match limit of $5. The other members of your group each donate $2. You choose to donate $3.

1a) Will your donation of $3 receive a match?

Not quite. Since the 2 other participants in your group both choose to donate $2, they provide a total donation of $4 (2 x $2 = $4). Since $4 is less than the match limit of $5, your donation will be matched.

Figure D.8: Example of screen presented to subjects after answering quiz question 1 incorrectly

Testing Your Understanding. To make sure you understand the process for determining whether or not your donation will be matched, please answer the following questions:

Question 1. You are grouped with 2 *other* participants (N=2). The experimenter will match donations at a 1:1 rate up to a match limit of $5. The other members of your group each donate $2. You choose to donate $3.

1a) Will your donation of $3 receive a match?

Yes

That's right! Since the 2 other participants in your group both choose to donate $2, they provide a total donation of $4 (2 x $2 = $4). Since $4 is less than the match limit of $5, your donation will be matched.

1b) What will be the total donation received by the charity as a result of your $3 donation?

$3

Not quite. Your donation will receive a 1:1 match. This means that for each $1 you donate, the experimenter will provide a matching $1. Thus, for each $1 you donate, the charity will receive $2 (your $1 plus the matching $1 provided by the experimenter).

Figure D.9: Example of screen presented to subjects after answering part *a* of quiz question 1 correctly and part *b* incorrectly

Question 2. You are grouped with 4 *other* participants (*N*=4). The experimenter will match donations at a 0.5:1 rate up to a match limit of $4. The other members of your group each donate $1. You also choose to donate $1.

2a) Will your donation of $1 receive a match?

No

That's right! Since the 4 other participants in your group all choose to donate $1, they provide a total donation of $4 (4 x $1 = $4). Since $4 is *greater than or equal to* the match limit of $4, the match limit has been met, and your donation will *not* be matched.

2b) What will be the total donation received by the charity as a result of your $1 donation?

$1.00

Correct! Because the match limit has been met by the other members of your group, you will *not* receive a match.

Only one more question to go!

Figure D.10: Quiz question 2 from experiment instructions, including correct answers and corresponding messages

Question 3. You are grouped with 3 *other* participants (N=3). The experimenter will match donations at a 2:1 rate up to a match limit of $5. The other members of your group each donate $1. You choose to donate $2.

3a) Will your donation of $2 receive a match?

Yes

That's right! Since the 3 other participants in your group all choose to donate $1, they provide a total donation of $3 (3 x $1 = $3). Since $3 is less than the match limit of $5, the match limit has not been met, and your donation will receive a match.

3b) What will be the total donation received by the charity as a result of your $2 donation?

$6

Correct! Your donation will receive a 2:1 match. This means that for each $1 you donate, the experimenter will provide a matching $2. Thus, if you donate $2, the charity will receive a total of $6 (your $2 plus a matching $4 provided by the experimenter).

Great job! You've passed the test!

Now that you know how the matching subsidies work in this experiment, you are almost ready to begin. On the next page, we will go over the experiment procedures and present some example allocation decision problems.

Figure D.11: Quiz question 3 from experiment instructions, including correct answers and corresponding messages