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Inequality, Social Distance, and Giving

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Abstract

This paper demonstrates that economic inequality has a negative, causal effect on prosocial behavior, specifically, charitable giving. Standard theories predict that greater inequality increases giving, though income tax return data suggest the opposite may be true. We develop a new theory which, incorporating insights from behavioral economics and social psychology, predicts when greater inequality will lower charitable giving. We test the theory in an experiment on donations to a real-world charity. By randomizing the income distribution, we identify the effect of inequality on giving behavior. Consistent with our model, heightened inequality causes total giving to fall. Policy agendas that rely on charitable giving and other voluntary, prosocial behaviors to mitigate income and wealth inequality are likely to fail.

Keywords : Inequality, charitable giving, social distance, lab experiments
JEL Classification : C91; D31; D64; H23; N32

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There has been widespread concern that the income and wealth shares of the richest Americans have risen rapidly.[1] Economic inequality could inspire political disaffection, reduce social cohesion, and lessen equality of opportunity. We show that inequality reduces a crucial prosocial behavior, namely, charitable giving.[2]

By isolating the effect of inequality, we differentiate our research from related studies of the causal effects of other social pressures on giving behavior (Andreoni et al. 2017; DellaVigna et al. 2012; List 2011). Other empirical work has analyzed the relationship between inequality and giving, but has been correlational in nature, and the results have been ambiguous (Payne and Smith 2015; Duquette 2018). This is the first paper to identify the causal effect of economic inequality on giving to a charitable organization.

We present a new model that incorporates a behavioral role for "social distance" in the giving decision. Social distance is the idea that people feel less affinity with, or empathy for, others who are unlike them, and may behave less prosocially toward them. By analogy, we know ethnic or religious diversity has a negative effect on prosocial behavior and support for redistribution (Alesina and La Ferrara 2000; Luttmer 2001; Hungerman 2008; Dahlberg et al. 2012; Andreoni et al. 2016; Algan et al. 2016).[3] Like ethnic diversity, income and wealth inequality increase the "social distance" among neighbors and across places. Incorporating social distance effects into our model permits a flexible behavioral response to inequality, including decreased giving. By allowing a well-understood psychological mechanism to affect decisions, our model enhances the theoretical study of charitable giving and prosocial

[1] Piketty et al. (2018) document an increase in the share of pretax national income flowing to the top 1% of households rising from about 10% to about 20%. Saez and Zucman (2016) compute that the wealth share of the top 0.1% has risen from 7% to 22%. Other papers have used different methodologies to compute less rapid increases in inequality over the past decades (Kopczuk and Saez 2004; Auten and Splinter 2016).

[2] Charitable giving is a significant component of the economy, with total giving amounting to $410bn in 2017 (Giving USA Foundation 2018). By way of context, the output of the entire United States' agricultural sector was approximately the same size, $421bn (Bureau of Economic Analysis 2018).

[3] Models presented in Hungerman (2008) and Rotemberg (2014) focus on non-economic pathways of social distance, giving their models very different properties, as will be demonstrated in the following sections.

behavior.

We then test the predictions of the model in an experiment that presents subjects with an opportunity to donate to a partner charity under exogenously varied inequality conditions. Our findings are clear: increasing inequality significantly decreases total donations. A 1% increase in inequality decreases donations by about 0.2%. Motivated by previous literature finding that behavior may differ by income source (*e.g.* Fong 2007), we further test if it matters whether subjects earn their endowments, relative to pure unearned "house" money. It does not. In both cases, inequality lowers charitable giving.

Direct effects of economic inequality on prosocial behavior imply that inequality may be self-reinforcing. Charities play an important role in mitigating inequality, relieving poverty through provision of social services, and equalizing opportunity through education. If inequality reduces donations directly, such groups will likely cut back their services, further entrenching inequality. Moreover, to the extent that our findings hold true for other distributive mechanisms — if, for example, social distance decreases electoral support for redistributive public policy (Dahlberg et al. 2012) — then the implications of economic inequality could be larger still. Piketty (2014) has argued that the rise in inequality since the 1970s is self-reinforcing through the dynamics of investment returns; while we are not making such a broad claim, our findings do raise the possibility that inequality may be self-reinforcing through behavioral effects on individuals' actions.

This paper proceeds as follows: Section 1 reviews the theoretical and empirical literatures on charitable giving and behavioral responses to inequality. We present the main points of our theoretical model of social distance and giving in section 2, while reserving derivations and proofs for the appendix. We then explain the design of our experiment in section 3. The experimental data are summarized and described (§4) before we present our results (§5). Section 6 concludes.

1 Inequality and Altruism, in Theory and in Data

The benchmark models of charitable giving characterize a free-rider problem on a nonrival good. A direct implication of these models is that when inequality is high, a smaller number of richer people mitigates the free-riding problem and giving increases. A separate class of models describes individuals' inequality aversion and willingness to give up their own resources to improve equity, implying that greater inequality should increase giving *ceteris paribus*, at least among those who are above the average income. However, the empirical evidence, albeit suffering from omitted variable bias and thus not well-identified, suggests that inequality *reduces* charitable contributions, *especially* by those at the top of the income distribution. This mismatch between existing theoretical predictions and empirical observations motivates our development of a new theory which flexibly accommodates a variety of inequality-dependent behavioral effects and a laboratory experiment to test it.

1.1 Public goods models and inequality

Charitable giving is traditionally treated as a voluntary contribution to an economic public good. The classic public goods model describes a finite number of discrete agents who give to a nonrival good out of self-interest (Samuelson 1954), which leads to a free-riding problem wherein agents give until their private marginal benefit, which is weakly less than social marginal benefit, equals private marginal cost. In their simplest form, most early models found that total contributions are insensitive to the distribution of income (Warr 1983). In an important contribution, Bergstrom, Blume and Varian (1986) demonstrate that a transfer from non-contributors to contributors will increase provision when households can free-ride. In the limiting case, when resources are sufficiently concentrated with a single household, the free-riding problem is solved: the rich household is the only contributor. Conversely, underprovision of public goods is more severe when the resource distribution

is very equal.

These models have grown more sophisticated and realistic by adding terms for "warm glow" or "joy-of-giving" that capture utility from one's own contributions to a good, as well as "pure altruism," or utility in the total level of the public good irrespective of its source (Andreoni 1990). These extensions have improved the predictive value of public goods models in important ways, including predictions of imperfect crowd-out responses to government funding, tractable ways to study the effects of bundled public and private goods (Kotchen 2006), congruence to neuroimaging studies of charitable giving (Harbaugh et al. 2007), and behavioral effects of religious and ethnic diversity (Hungerman 2009) and "like-mindedness" (Rotemberg 2014). However, adding joy-of-giving terms to the model mitigates rather than eliminates the free-rider problem and the implied positive relationship between inequality and giving.

Even if pure altruism is an important preference, Ribar and Wilhelm (2002) demonstrate that it is likely irrelevant under real-world giving conditions where charities solicit gifts from thousands or even millions of potential donors. Since real-world donors to broad-based charitable causes know their own marginal contribution has a minimal effect on total giving, what giving does happen must be motivated almost entirely by joy-of-giving. But while this argument suggests that pure altruism should not generate a positive inequality-giving relationship, it does not predict a behavioral link between the income distribution and giving at all.

1.2 Inequality aversion and charitable giving

Inequality could affect charitable giving through behavioral pathways rather than free-riding on others' pure altruism. Behavioral models of "inequality aversion" seek to explain experimental results where players reject unequal divisions in dictator games at personal

cost (Fehr and Schmidt 1999; Bolton and Ockenfels 2000). Such findings cannot make sense if agents are indifferent to others' payoffs, but can make sense if players have a distaste for inequality.

Derin-Güre and Uler (2009, 2010) embed an inequality aversion term in an Andreoni (1990) warm glow model, and test their predictions with cross-sectional survey data on income, charitable giving, and social attitudes. Consistent with their model's predictions, they find that persons who are more concerned about the level of social inequality give more to charity.

By assumption, however, Derin-Güre and Uler provide a model that encompasses inequality-aversion preferences and so cannot predict that inequality leads to lower giving. And while Derin-Güre and Uler effectively make the case that heterogeneous preferences against inequality across households correlate with charitable contributions, their empirical test does not exclude the possibility that changes in inequality (holding that distribution of preferences constant) could lead to lower charitable contributions. Therefore both the theory and the experiment presented in this paper are a novel exploration of the relationship between inequality and charitable giving that does not speak to or contradict Derin-Güre and Uler's findings.

1.3 Inequality and giving in the data

Empirical evidence on the relationship between inequality and charitable contributions is scanty, but consistent with a negative relationship. Duquette (2018) documents a strong negative correlation between income inequality and giving of top earners in US and Canadian historical data. Since high income households are the very parties who both public goods and inequality aversion models predict will increase giving the most in response to inequality, Duquette's findings are surprising. Payne and Smith (2015) find that changes

in neighborhood-level inequality is positively associated with total charitable giving in Canada, although with important nonlinearities and interactions that admit a different association among high earners.

Inequality also causes changes in behavior not predicted by the prevailing models in experimental settings. Lab experiments with voluntary within-experiment redistribution find that greater inequality of endowments generally *decreases* contributions (Chan et al. 1996; Buckley and Croson 2006; Côté et al. 2015). This effect is causal; when endowments are randomized, the players randomly awarded more funds give lower shares of income to the within-experiment public goods (Anderson et al. 2008; Chan et al. 2008).[4]

1.4 Inequality, social distance and a new model of giving

While a distaste for inequality sounds plausible, it is less obvious why giving might *decrease* in response to a decrease in others' endowments. Theories that permit a giving-reducing role for inequality are difficult to find; we know only of Mayo and Tinsley (2009), who propose a model wherein high-income households give less under rising inequality because income-shaped perceptions of relative returns to luck and skill affect perceptions of merit and reduce generosity. (For this reason our experimental framework will test for differential responses when endowments are strictly luck-based and when they are in part earned via completion of a task.)

We theorize that inequality reduces giving through the combination of two well-established facts: (1) social pressure to give is a major influence on the probability of giving and the size of the gift, and (2) social pressures are weaker when groups are more diverse, including income or wealth diversity.

It is well-known that charitable solicitations increase the likelihood and amount of

[4]Adding some subtlety, Uler (2011) introduces a tax to the public goods game and finds that while greater pre-tax inequality decreases contributions, greater after-tax inequality increases total contributions.

charitable giving (List 2011; Meer and Rosen 2011; Edwards and List 2014). Though part of the role of fundraising is the asking itself — reminding the donor of the charity's existence and signaling that money would help — campaigns that help prospective donors to empathize with recipients are more successful (Einolf et al. 2013; Fong and Oberholzer-Gee 2011; Fong and Luttmer 2011; Andreoni and Rao 2011). For this reason, wherever possible fundraising appeals focus on a representative beneficiary of the organizations' programs.

These appeals increase donations by giving the prospective donor empathy for the recipient, putting him or her "in the shoes" of the needy party. Thus, empathy boosts the psychic reward for making a contribution — or, possibly, increases the prickle of guilt for not giving (DellaVigna et al. 2012).[5] Psychologists have found extensive empirical evidence that altruistic choices are driven by visceral empathetic responses, rather than more abstract concerns like self-image, fear of social shunning for inaction, or afterlife optimization (Batson 2011). Subjects in fMRIs exhibit processing in brain regions that govern ingroup/outgroup decisions when deciding whether to give, and the nature of this response is affected by subjects' perceived socioeconomic status (Moll et al. 2006; Ma et al. 2011).

This sensitivity to the overlap between one's perceived ingroup and society in general is essential for understanding how income dispersion affects the sensitivity of prospective donors to fundraising appeals. In many contexts, social distance (including income inequality) reduces prosocial behavior and social cohesion. Communities with higher income inequality and racial heterogeneity have lower spending on public goods and lower participation in voluntary and civic organizations (Alesina et al. 1999; Alesina and La Ferrara

[5]Indeed, the idea that human emotions respond to observed joy or pain in others is quite old; Adam Smith wrote a version of it in his *Theory of Moral Sentiments* (1759) years before he wrote *The Wealth of Nations* (1776).

2000; Boustan et al. 2012), although with the possibly beneficial side effect that diverse communities are less prone to funding crowd-out (Hungerman 2009). Luttmer (2001) demonstrates that support for redistribution of income is decreasing in the share of one's community that receives welfare, but increasing in the share of one's racial group that receives welfare. The effect of social distance appears even in the simplest laboratory contexts (Charness et al. 2007; Charness and Gneezy 2008).

We therefore proceed by describing a new model of charitable giving which is entirely focused on "warm glow," with a behavioral influence of the income distribution on utility that is not constrained to exhibit inequality aversion in advance. We discuss different ways that behavioral influences might manifest in our model before testing among competing cases in our experiment.

2 A distribution-dependent theory of philanthropy

Imagine an economy with an infinite number households denoted $i \in [0, 1]$ distributed uniformly over the unit line. This economy has two goods, consumption (x_i) and warm glow from charitable giving (g_i). The production of total public goods from individual contributions is not affected by any household's choice, and so in the spirit of Ribar and Wilhelm (2002) we omit total public goods production from the utility function.[6] Households' warm glow response to giving may be shaped by an unequal distribution of endowments and their own place within it, measured by statistic ϕ_i. Households optimize an additively separable utility function $u(x_i) + v(g_i; \phi_i)$ that is identical for all i, with the properties that u is

[6] That is, though total giving is possibly still valuable to the household, total giving $G \equiv \int_0^1 g_i$ won't show up in the first order condition because no individual household has mass and therefore $dG/dg_i = 0$. Compare to Hungerman (2009) who presents a model of giving to a public good with "pure altruism" and crowd-out that is influenced by social distance that is a function of ethnic or religious diversity.

increasing and concave in x_i and v in g_i.[7]

Households choose their consumption and giving subject to a budget constraint with endowment ω_i and price of charitable giving p. We can think of p as the (pre-tax) cost of giving a dollar to charity relative to (after-tax) consumption, or in the context of a fundraising experiment as the price implied by a contribution match.

$$\omega_i \geq x_i + pg_i \tag{1}$$

We further assume that charitable giving cannot take negative values, $g_i \geq 0$.

The last piece of this model is the distribution of incomes. Without loss of generality, let us assume that households are ordered by income so that $i \geq j \Leftrightarrow \omega_i \geq \omega_j \ \forall i, j$.

2.1 Optimal decisions

Taking constrained first-order conditions of the household's problem,

$$\max_{x_i, g_i} u(x_i) + v(g_i; \phi_i) \text{ s.t. } \omega_i \geq x_i + pg_i \text{ and } g_i \geq 0 \tag{2}$$

yields a first order condition for interior optima

$$pu'(x_i) = v'(g_i; \phi_i), \tag{3}$$

while for non-donors, we know that at the margin they would prefer additional consumption beyond their entire endowment to any amount of giving. In the following discussion we

[7] That is, utility derivatives have the standard properties

$$u_{ix} > 0, \ v_{ig} > 0, \ u_{ixx} \leq 0 \text{ and } v_{igg} \leq 0$$

will focus the following discussion on the comparative statics of the interior case.[8]

2.2 Distribution-dependent utility and giving

So far we have been non-specific about the form or importance of extra parameter ϕ_i. Many possible pathways for influence of income inequality on giving seem plausible by introspection and are supported by an existing social science literature. We will focus on two possible behavioral pathways described by the behavioral influence of the variance of the endowment distribution on the marginal utility of giving. Our empirical design will be able to test for the effect of both pathways simultaneously relative to a third, null case where the distribution of resources does not affect giving at all. That is,

Case 0: Irrelevance of Inequality. For all possible distributions $\{\omega_i\}$ and all i, $v(g_i, \phi_i) = v(g_i)$. Households to not receive different utility in giving or make different decisions due to changes in others' endowments.

Case 1: Inequality aversion. Households are aware of the degree of income inequality, measured as the variance of endowments $\left(\phi_i = \int_0^1 (\omega_j - \bar{\omega})^2 dj, \text{where } \bar{\omega} \text{ is the mean}\right)$, and all else equal receive more satisfaction from giving when inequality is *greater* $\left(\frac{\partial v_i'}{\partial \phi_i} > 0\right)$. This case is consistent with a sizable literature that finds experimental participants are willing to incur costs to themselves to reduce within-experiment inequity.

Case 2: Social distance. Households are aware of the degree of income inequality $\left(\phi_i = \int_0^1 (\omega_j - \bar{\omega})^2 dj\right)$, and all else equal receive more satisfaction from giving when inequality is *lesser* $\left(\frac{\partial v_i'}{\partial \phi_i} < 0\right)$. This is consistent with a literature that finds that people are less prosocial when they live in neighborhoods with people who are more economically or racially diverse.

These two cases do not exhaust all possible behavioral responses of giving to the income

[8] In the experiment described in later sections of this paper, over 99 percent of participants made a strictly positive charitable contribution in at least one round of the game.

distribution; for example, it may be that donors respond to the skewness of the distribution, or that the sign of $\frac{\partial v_i'}{\partial \phi_i}$ changes in complex ways with income, or that in a real-world environment donors respond to imperfect "rules of thumb" that inaccurately capture the income distribution. Rather, we view this model as a fresh starting point for incorporation of the income or wealth distribution into joy-of-giving utility functions. (In the appendix to this paper, we will extend the regression model used to analyze our experimental data to test for the importance of some other moments of the endowment distribution for giving; inclusion of these other regressors explains little additional variation in giving behavior and does not meaningfully change the magnitudes or statistical significance reported for our treatment variables.)

2.3 Comparative statics

We now briefly explain the effects of changes in inequality and other parameters of interest on giving under this utility function. Details of the proofs and demonstrations of each result are provided in the appendix.

Proposition 1. *An increase in the price of giving p reduces g.*

This follows naturally from the normality of both goods in a two-goods model.

Proposition 2. *An increase in the endowment of a particular household increases that household's giving.*

A shift in a single household's endowment does not affect the variance of endowments, and so all candidate utility functions respond to an income shock through the traditional channel of an outward-shifted budget constraint, purchasing more of both normal goods.

Proposition 3. *An uniform increase in endowments of* all *households increases their giving.*

Again, a uniform increase in income leaves the variance unchanged, so only wealth/income effects matter.

Proposition 4. *If the marginal utility of giving is increasing in the variance of endowments, and inequality increases (decreases) without a change in the mean (a mean-preserving spread), the change in incomes will increase (decrease) donations for those above (below) the mean income.*

A mean-preserving spread by definition increases variance without changing the mean or the sum of all endowments. If households have a behavioral response to inequality, then it will be of the same sign for all households (with the positive or negative sign of that effect being the distinction between cases 1 and 2). However, a mean-preserving change in the income distribution by definition makes some households better off; this creates an income effect as in proposition 2 that may offset the behavioral effect of the redistribution. Depending on the signs of the change and of the marginal utility of inequality, one half of the distribution will have an ambiguous effect on their giving level.

Proposition 5. *If the marginal utility of giving is increasing (decreasing) in the variance of endowments, then an increase in inequality increases (decreases) giving net of endowment effects.*

By analogy, the change in giving behavior from an increase in inequality has an income effect (on actual endowments) and a shadow "price" effect (because the marginal utility of giving changes with a shock to ϕ); analogous to a compensated price shock, the effect of a change in ϕ *net of the income effect* follows from the relationship between inequality and joy-of-giving. If a change in the income distribution lowers the marginal utility of giving, those whose absolute endowments rise may still give more to the extent that their greater incomes more than offset the substitution effect, but they will spend a greater proportion

of their endowments on consumption at the margin. For households who are worse off after a redistribution, both the income and the substitution effects are in the direction of a giving decrease.

2.4 Summary of Theoretical Predictions

In summary, the theory presented above presents an alternative framework for thinking about how inequality might affect giving decisions, based on well-documented findings from social psychology and behavioral economics. In the null case, households trade off their own consumption and the warm glow from giving without reference to the income distribution, similar to the large-population public goods model of Ribar and Wilhelm (2002). If households experience a social distancing effect as inequality increases, then this can be modeled as diminishing marginal warm glow with respect to inequality, and will tend to give less as endowments grow more dispersed, all else equal. On the other hand, if households primarily experience heightened inequality aversion when inequality increases, then we model this effect as an increase in marginal warm glow, and households will give more at the margin as inequality increases.

In our experimental setting, we test for all of these possibilities with versions of shocks to participants' endowments and to the variance in endowments.

3 Experimental Design

Given both the stylized facts about giving and the Propositions from Section 3.3, the primary objective of the laboratory experiment was to cleanly identify how people's willingness to donate depends on a within-experiment endowment distribution. An important feature of this setup is its focus on a real, external charity: unlike related literature that looks at how the within-experiment distribution affects within-experiment redistribution,

we collaborated with a real charity as the recipient of donations. This has the benefit of isolating the behavioral effect of relative placement on giving from concerns about group identity and other unobservables.

The second objective was to test how price sensitive donations are, captured by varying the rate at which we match donations. This was of concern to our collaborating charity, and of increased policy relevance given the increase in the standard deduction in the US tax code.[9]

A final objective was to test if the above two objectives differed between luck-based and reward-based distributions, as suggested by Luccasen and Grossman (2017). We tested this by implementing an additional effort task at the start of half the sessions. The effort task based on Gill and Prowse (2012) rewarded participants with increased tokens based on the number of sliders they could precisely position under time pressure.

An application to conduct an experiment involving human subjects was approved by the University of Tennessee's Institutional Review Board (application reference IRB-17-03776-XP) in May 2017. Subsequently the experiment was conducted at the University of Tennessee's Experimental Economics Lab, and was implemented using z-Tree (Fischbacher 2007).

One-hundred and twenty participants took part in the experiment, held over six sessions in September 2017. Participants were drawn from the UT Experimental Economics mailing-list, the vast majority of which were full-time undergraduates at the university.

Participants were told the purpose of the study was to "examine how inequality and subsidies affect charitable-giving", but not the specific research question. They were wel-

[9]Public Law 115–97, known colloquially known as the Tax Cut and Jobs Act (a short title removed from the final bill), increased the standard deduction of the individual federal income tax significantly while eliminating or substantially reducing many itemized deductions. As a result, the share of itemizers is expected to fall from 26 percent of all tax units to 11 percent (Tax Policy Center 2018). Filers who do not itemize do not receive a federal tax deduction for charitable contributions.

comed to the lab and thanked for the willingness to participate. They were informed the experiment was in conjunction with United Way of Greater Knoxville, and provided a short summary of their objectives ("many programs, ranging from delivering hot meals to elderly citizens, to providing job training to people with intellectual disabilities.") United Way were invited to collaborate in the experiment because they are large and relatively uncontroversial organization in the community, providing assistance to more than 100,000 people (20%) in Knox County every year. Despite this, knowledge of the organization was quite low: in a post-experiment survey, 58% of participants reported being 'Not Familiar at all' or 'Not particularly familiar' with the charity. Copies of the annual report and promotional materials were available to participants, but take-up was very low.

Participants were provided with an informed consent sheet, and given instructions. Participants were told in advance that donations will be incentivized with a varying match rate. They were also informed that they will be told how many tokens they have been allocated, and some information about how many tokens other people were allocated. The full list of instructions are provided in an appendix, but the key provisions were:

> "In this experiment, the computer will allocate a number of tokens to each of you. In each round you will be told how many tokens you received, and some information on how many tokens other people in the experiment received. Tokens are worth money, and will be converted into cash at the end of the experiment. Each token is worth 5 (3) cents, and so you can think of 100 tokens being worth 5 (3) dollars.
>
> You will be asked how many of these tokens you are willing to donate to United Way.
>
> To incentivize donations, you will see on-screen that we will match any donations with a varying amount. For example, you might see 'For every token you donate, we will match this with two more.' This means United Way would receive three tokens in total for every one you donate. The amounts donated will remain confidential.
>
> We will analyze how participants' donations depend on this information. We will run several rounds of this experiment. From these, the computer will select two to count for real, and payments will be based on those two rounds. At the end of the last session, you will be asked to fill out a questionnaire and paid for the tokens from the two selected rounds, in addition to the $5 show-up fee. Everybody will be paid in private after showing the record sheet. You are under no obligation to tell others how much you earned."

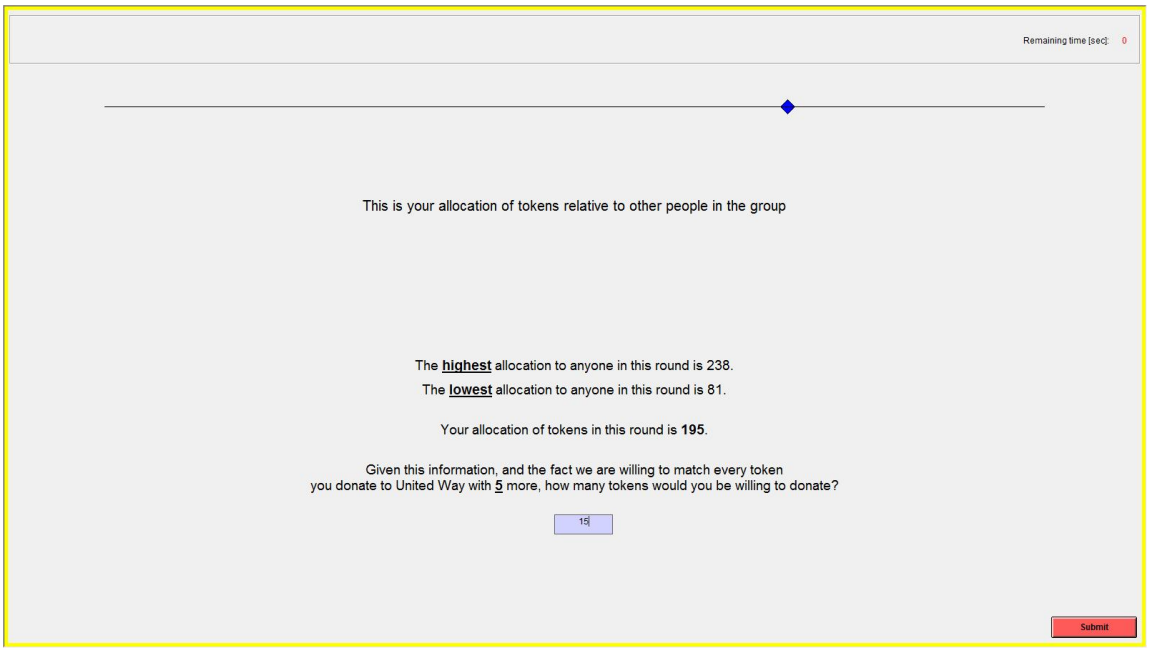
All sessions began with clearly-specified practice rounds. In sessions where participants conducted the slider task to allocate tokens, an additional paragraph of instructions were read aloud, and a practice round of the task were included.

The first treatment is the allocation of tokens. This is the experimental analogue of Proposition 2. By way of a simple income effect, it is expected there is a positive relationship between tokens and contributions. The second treatment, endowment inequality, is more subtle. This links back to Proposition 4, and the ϕ parameter of the utility function in Section 3. Participants are told the highest and lowest token allocation each round. This revelation is truthful, and reflects the fact that the number of tokens were drawn from distributions of length varying across rounds. This serves to make dispersion of token endowments, as well as the the subject's own allocation of tokens, salient. The distribution of tokens is clear through the figure towards the top of the screen, demonstrated in Figure 1. The subject's own endowment relative to the min and max is plotted to help visualize the distance to the minimum and maximum points.

As demonstrated in Figure 1, subjects are told their allocation, the maximum allocation, and the minimum allocation in each round. The figure towards the top illustrates their relative position in graphical form, showing their position relative to others.

The third treatment is a donation match. This affects the price of giving, as per Proposition 1. Immediately above the input box for the number of tokens to be donated, participants are informed of the match rate. Participants had been told they would face a varying match rate. In this particular example, the match rate is 5. The full list of match rates is outlined in Table 1. The specific instructions read "Your allocation of tokens in this round is **195.** Given this information, and the fact we are willing to match every token you donate to United Way with **5** more, how many tokens would you be willing to donate?"

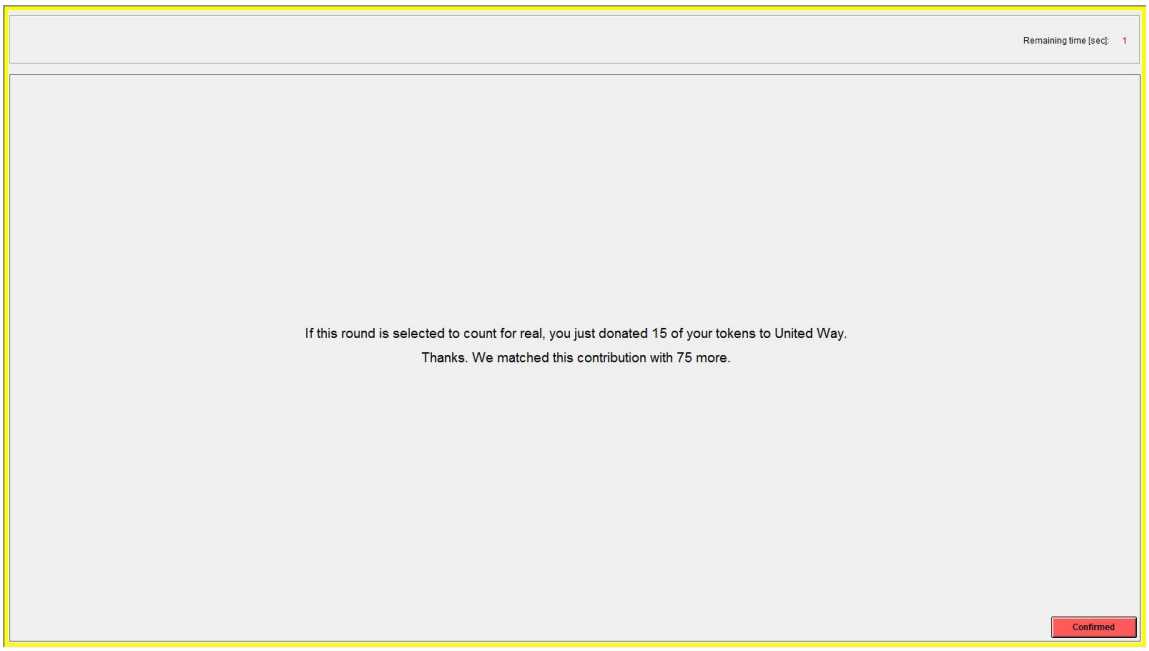
Figure 1: Primary experimental screen



In the example, the user indicates they will donate 15 tokens. After submitting the number of tokens, a confirmation screen repeats the donation level, and makes explicit that the matches increase the donations. This is shown in Figure 2.

Table 1 below shows the full details of the distributions for the experiment. Consider the fifth and sixth round of the unearned income treatment sessions. Participants were separated into two groups randomly by z-Tree. For example, in rounds 5 and 6, Group 1 participants drew an endowment worth between 200 and 500 tokens, and were prompted to donate based on match rates of $2x$ or $8x$. Group 2's endowments came from the same distribution, but the match rates were reversed ($8x$ or $2x$). Thus within the two rounds, endowments are drawn and remain constant, but match rates vary, and the order of the match rates vary. This has the effect of identifying the effect of the match rate from within

Figure 2: Confirmation Screen



person-round variation, i.e. only the match rate changes.

As discussed above, the final objective of the experiment was to test if responses systematically varied between random-based endowments and effort-based endowments, cf. Erkal et al. (2011). This was motivated by concerns in the literature that experimental participants treat endowments that are randomly distributed differently to 'earned income'. This treatment was implemented in half of the sessions, where the experimental rounds outlined above were prefaced with a slider effort task (Gill and Prowse 2012). A screen shot of this task is shown below in Figure 3.

The slider task has participants position sliders at precise points on the screen, rewarding those who successfully position a greater number in a given amount of time. This is a relatively simple manual task without time pressure, and so the reward is based primarily

Table 1: Allocation distributions and match rates for unearned income treatments

Round Number	Endowment distribution	Match rates
1 & 2	$U[50, 300]$	1, 5
3 & 4	$U[0, 1000]$	2, 0
5 & 6	$U[200, 500]$	2, 8
7 & 8	$U[200, 800]$	1, 6
9 & 10	$U[100, 400]$	10, 5
11 & 12	$U[0, 200]$	0, 6
13 & 14	$U[0, 300]$	2, 3
15 & 16	$U[100, 200]$	0, 3
17 & 18	$U[100, 500]$	1, 2
19 & 20	$U[100, 300]$	4, 2
21 & 22	$U[50, 500]$	0, 1
23 & 24	$U[0, 200]$	4, 1

Figure 3: Slider Screen

on doing it quickly. This has been used previously as a pure effort task (Gill and Prowse 2012). In effort-task sessions, participants' tokens were still drawn randomly from an interval, but those who completed above-median scores in a particular session had that number doubled, while people with below-median scores had no adjustment made.[10]

The rest of the experiment proceeded as discussed above. We will show later that the results fail to reject a null of this treatment having no effect, cohering with other work in the area (Cherry et al. 2005). As the interaction effects of effort scores with the other treatments are all statistically insignificant, we will simply conclude that there is no evidence that the results systematically differ between random-allocations and effort-allocations.

4 Data Description

Summary statistics of the experiment are presented below. The experiment lasted 24 rounds, generating 2,880 observations on contributions. The value of the tokens were either \$0.03 or \$0.05, depending on the session. The average endowment was 260 tokens per round, and 49 (19%) of those are contributed on average. To account for zero-contributions, we use the inverse hyperbolic sine transformation to generate log-like values.[11] Two rounds

[10] In the effort-task sessions, random draws were from a distribution with the same minimum but half the width of the uniform distributions reported in Table 1, with the above-median participants then having their random draws doubled. This adjustment changed the sampling distribution from which endowments were drawn from, but preserves the theoretical min and max, which are the important statistics for the visual presentation of endowment dispersion (Figure 1).

[11] The inverse hyperbolic sine function,

$$\operatorname{arcsinh} x = \ln\left(x + \sqrt{x^2+1}\right),$$

converges quickly to $\ln x + \ln 2$ for positive values of x. Since $\ln 2$ is absorbed into a constant term in a regression specification, a regression using inverse hyperbolic sine transformation will give very similar results to a log-transform, and we thus informally refer to "log" values for this function throughout this manuscript. The primary advantage of the inverse hyperbolic sine over the natural logarithm is that it is defined, continuous and differentiable at $x = 0$.

were randomly selected to count for payment, meaning the average earnings (including $5 the show-up fee) was about $22. To vary the price of charitable giving, contributions were matched with external funds at an average rate of 2.7, varying from zero match to a 10:1 match. Reflecting the student population, the average age was 21 and largely identified as from middle-class households. In a post-experiment questionnaire, participants reported that they understood the experiment and were adequately compensated for their time.

Table 2: Summary statistics of Philanthropy Experiment

	Mean	Std. Dev	N	Min	Max
Session ID	3.27	1.73	2,880	1	6
Person ID	60.50	34.65	2,880	1	120
Experimental Period	12.50	6.92	2,880	1	24
Endowment (tokens)	260.12	183.17	2,880	2	998
Match rate	2.72	2.42	2,880	0	10
Contribution (tokens)	48.62	82.36	2,880	0	850
Contribution, % of tokens	19.07	24.29	2,880	0	100
Log of contributions	3.40	1.77	2,880	0	7
Extent of inequality	343.67	214.18	2,880	73	987
Distance to Highest Endowment	187.71	178.94	2,880	0	987
Distance to Lowest Endowment	155.96	160.88	2,880	0	987
Age	20.72	1.99	2,880	18	32
Male	0.57	0.50	2,880	0	1
Married	0.02	0.13	2,880	0	1
First experiment	0.38	0.48	2,880	0	1
Social Class (1-5 scale)	2.93	1.01	2,880	1	5
Well compensated (1-5 scale)	4.23	0.92	2,880	1	5
Understand experiment (1-5 scale)	4.35	0.90	2,880	1	5
Exchange rate (USD/tokens)	0.04	0.01	2,880	0.03	0.05
Economics courses taken	1.77	2.05	2,880	0	12

5 Results

In this section, we present our experimental results. We begin with graphical explorations of simple relationships between giving by experiment subjects and treatments of interest in the raw data before proceeding to simultaneous testing of our treatments in a multivariate regression. We conclude with a hurdle model examination of intensive- and extensive-margin decision-making and a test for the importance of a work task in giving behavior.

5.1 Visual Associations Between Giving and Treatments

Before proceeding to our main analysis, we explore the relationships between giving and selected treatments: the matching incentive and the dispersion of the income distributions.[12]

Figure 4 plots the distribution of giving behavior as a dot-and-whisker plot for each individual match rate offered in the experiment. It is evident that increasing matches increases donations and, with one exception, monotonically. That one exception is a match rate of 5 which, interestingly, encourages more donations than a rate of 6 or 8. We assume this is because of the salience of the number five in the base 10 number system, but cannot be sure. A tenfold match rate only encourages 14% more ($0.96-0.82 = 0.14$) donations than a fivefold match rate, indicating that while matches do succeed in encouraging donations, they are an expensive method of doing so.

Figure 5 presents a scatterplot of average contribution in tokens as a function of the width of the within-round token distribution. Inequality is measured by the differences between the min and max of the distribution within rounds. For ease of visibility, we use twenty bins so that rounds of similar inequality are averaged together into a single marker. To account for higher average endowments in wider distributions, giving is re-

[12] A plot of giving against one's own endowment shows a very strong, and unsurprising, positive association and is omitted for brevity.

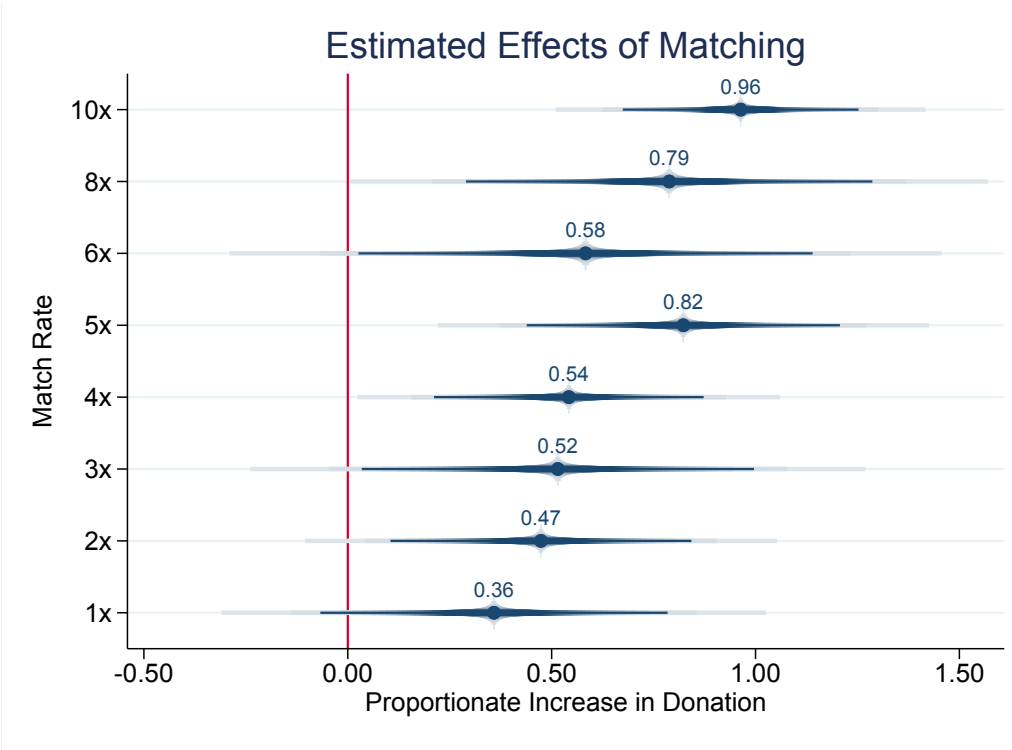


Figure 4: Estimated treatment effects of randomly-assigned match rate on donations. Omitted category is no match. The point estimates are specified for each match rate, in the middle of the estimate's 95% confidence interval.

gressed on individual endowment and the residuals averaged to construct this plot.[13] A line fits the relationship through the binned-scatterplot. There is an obvious negative relationship between endowment inequality and participants' average generosity. This negative relationship, which conditions on one's own endowment, is striking and is perhaps the main result of the entire paper. The variables here are reported in levels; a similar analysis conducive to an elasticity interpretation finds that a 1% increase in the width of the distribution decreases donations by 0.25%.

[13]For example, as Table 1 reports, rounds 11 and 12 drew from a $U[0, 200]$ distribution, while rounds 3 and 4 drew from a $U[0, 1000]$ distribution. Residualizing giving with respect to endowment allows us to plot the correlation between bin width and giving without allowing the fivefold increase in expected endowment across these two rounds to confound the relationship.

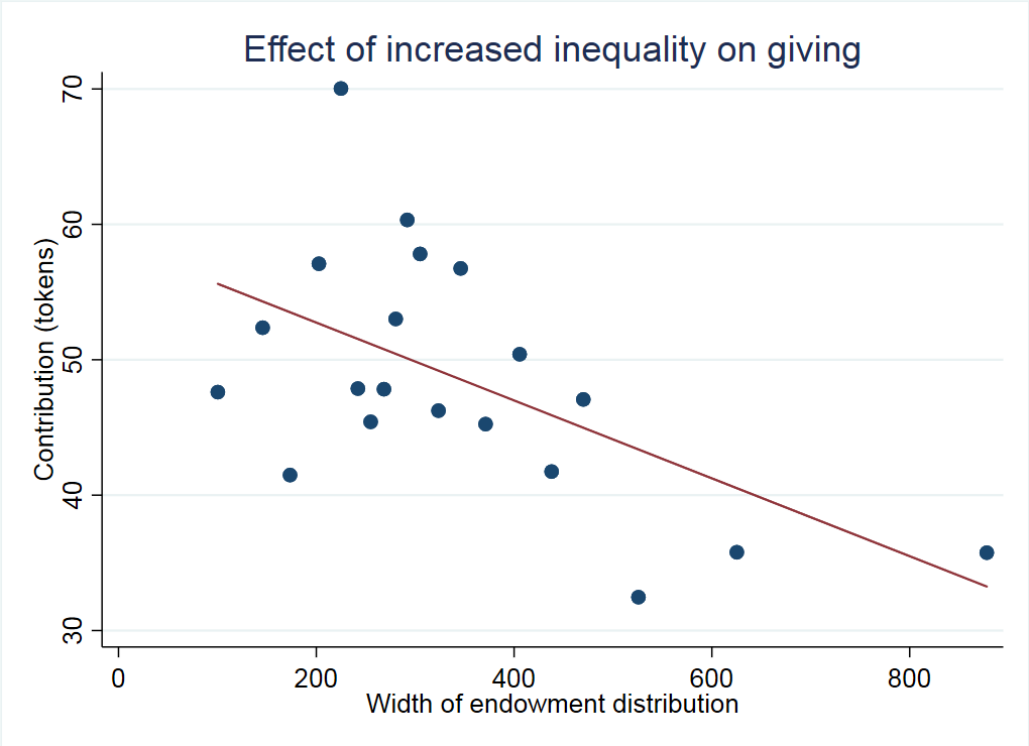


Figure 5: Average tokens donated relative to dispersion of the distribution, holding endowment constant. Giving is declining in inequality.

Next, we test for these and other treatments' effects on contributions simultaneously, in a multivariate setting.

5.2 Multivariate Hypothesis Testing

While patterns visible in the raw data suggest that match rates and inequality have effects on giving, our main research question is whether these associations are observed in a multivariate regression of giving on these treatments and sets of control variables simultaneously. Table 3 presents these estimates. We include five specifications of the primary question: how do the treatments affect contributions to charity? Column 1 reports the regression of contributions on the participant's token endowment and match rate and the within-round

dispersion of the distribution of tokens.[14] Columns 2, 3 and 5 add standard control variables on the participant's sociodemographics and economics course experience;[15] columns 3 and 4 add fixed-effects for the experimental session and for the subject, respectively (testing for any common within-round or within-subject confounding unobservables), while column 5 is a random effects specification.

We see that the results are consistent across specifications. The use of random versus fixed effects does not change the estimates meaningfully, as expected given the experimental nature of the setup. As the outcome variable is the log of contributions, we can interpret the coefficients in percentage terms.

Consider the random effects model shown in Column 5. The first result is that contributions are increasing in income. This is unsurprising, although the magnitude is interesting. The mean number of tokens was approximately 250; our estimates indicate that exogenously increasing this by 100 sees donations increase by 36%.[16] In terms of levels, this is about sixteen tokens. Do note the relatively high contribution rate is encouraged by matching grants.

The second result is that the matches ("For every token you donate, we will match it with x more") succeed in eliciting greater giving, although it is expensive to do so. In our fixed effect model of Column 4 we find a coefficient of 0.092, meaning increasing the match rate from e.g. 2 to 3 causes donations to increase by 9.2%.[17] We plot the coefficient

[14] A table in the appendix adds the visual midpoint of the distribution to set of treatments; the findings with respect to price, own endowment, and inequality are unchanged, and visual midpoint is not strongly associated with giving behavior.

[15] The full list of control variables are age, sex, marital status, self-reported social class, a dummy variable for previous experience with experiments, Likert scales for satisfaction with compensation and level of understanding of the experiment, and the number of economics courses taken. Results are shown in the appendix.

[16] Of course as log specifications are only precise for marginal changes, it is more accurate to say a one-unit increase in tokens leads to donations increasing by 0.36%.

[17] The literature on charitable giving and tax policy typically models this variable not as a match but as a "tax price" of one minus the marginal tax rate (for filers eligible to itemize). The transformation of a match rate m to 1 into an implicit price p is $p = \frac{1}{1+m}$. For our mean match rate of 2.7 and a representative

Table 3: Effects of various treatments on percent of contributions donated

	(1)	(2)	(3)	(4)	(5)
Endowment ('00s)	0.40***	0.43***	0.42***	0.36***	0.36***
	(0.042)	(0.037)	(0.036)	(0.026)	(0.013)
Match rate	0.081***	0.088***	0.086***	0.092***	0.092***
	(0.015)	(0.016)	(0.016)	(0.017)	(0.0076)
Extent of inequality ('00s)	-0.072**	-0.096***	-0.095***	-0.060***	-0.061***
	(0.023)	(0.015)	(0.013)	(0.0074)	(0.011)
Control variables		✓	✓		✓
Experimental session FE			✓		
Participant FE				✓	
Random Effects					✓
Observations	2,880	2,880	2,880	2,880	2,880
Adjusted R^2	0.153	0.284	0.297	0.287	0.287

Standard errors in parentheses. SEs in Models 1–4 clustered at the session level.

$^{***}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$

estimates for each of the offered match rates in Figure 4.

Of particular interest, however, are the results on the width of the distribution of tokens itself. The variable denoted "Extent of inequality" is defined as the difference in hundreds of tokens between the min and max of the empirical distribution, and is presented to the subjects as a simple proxy for the dispersion of the endowment distribution. The interpretation of these coefficients is thus the causal effect of increasing the dispersion of the distribution, holding both one's own endowment and the match rate fixed.

In all cases, the coefficient is negative, significant and in line with our theoretical predictions. Expanding inequality lowers giving. The coefficient on increasing inequality

semi-elasticity of match rate of 0.85, this translates to a tax elasticity of contributions of -0.32, lower than has typically been found in tax return data, but consistent with findings of a low response to match rates from fundraising field experiments (*e.g.* Karlan and List 2007, Karlan, List and Shafir 2011, Hungerman and Ottoni-Wilhelm 2017, Huck and Rasul 2011, Huck et al. 2015).

from Column 2 implies that expanding the extremes of the distribution by 50 tokens on either side causes giving to fall by about 9.6%. In the latter specifications the effect size, at around 6%, is still quite large.

We consider this quite a remarkable result. Increasing inequality of distributions lowers giving. While some previous research has found inequality decreases giving within participants of an experiment, we believe this is the first paper to show this extends to a real-world charity setting. As this result cannot be attributed to within-group redistributive motives, this is clear evidence of a real behavioral effect of inequality influencing choices.

Returning to our theoretical framing, the results support a social distancing mechanism in the utility function (case 2): when the dispersion of incomes is increased, then in the raw data and conditional on other controls, giving decreases. This finding also rejects the null (case 0) of a preference function that is indifferent to the distribution of endowments, as well as case 1's suggestion of a positive relationship between variance and giving driven by inequality aversion.

5.3 Extensive and Intensive Margin Decisions

Given that over a fifth of observations consisted of zero contributions, we researched differences between the intensive and extensive margin decisions of participants. We employ the exponential hurdle model proposed by Cragg (1971) which provides separate estimation equations for clearing the hurdle of zero contributions and the intensive margin of how much thereafter to donate. The set of independent variables in this model are identical to those in Table 3, Column 2. Results are shown in Table 4.

The first column displays results from a probit of zero or non-zero contributions. The results are qualitatively consistent with the earlier analysis, namely positive effects of own income/endowment and match rates, and a negative effect of inequality. Holding the other

Table 4: Hurdle model results

	(1) Extensive Margin	(2) Intensive Margin
Endowment ('00s)	0.14***	0.40***
	(0.023)	(0.040)
Match rate	0.18***	0.0084
	(0.032)	(0.0073)
Extent of inequality ('00s)	-0.032**	-0.089***
	(0.012)	(0.016)
Control variables	✓	✓
Observations	2,880	2,880

Results of Cragg exponential hurdle model on extensive margin (zero/positive) contributions, and intensive margin (how many positive) tokens are donated. Match rates encourage people over the hurdle, but have insignificant effects thereafter.

factors constant, higher inequality increases the likelihood of not donating anything. The second column displays results from an exponential model on how many tokens to donate conditional on donating a strictly positive amount. The results are again similar to the earlier analysis with positive effects of own endowment and match rates, and a negative effect of inequality. Interestingly, match rates become insignificant conditional on donating a strictly positive amount. This in consistent with the relatively flat gradient seen in Figure 5, namely that match rates do inspire additional contributions but are an expensive way to do it.

5.4 External Validity and a Work Task

Given the artificial nature of lab experiments, it is natural to be skeptical of the external validity of the findings. One concern is how likely the results are to be replicated outside of the controlled environment. We have two responses to this.

Our first response was to incorporate both earned and randomly allocated income sessions into the experiment. In half of the sessions, participants' endowments were completely random. In the other half, as discussed in Section 3, participants first engaged in an effort task that rewarded high-achievers. The task, proposed by Gill and Prowse (2012), is explicitly designed to require effort and induce feelings of reward.

Table 5 shows the effects of our matching and distribution-width treatments interacted with the effort task. Unlike the primary treatments, none of the interaction effects are statistically significant at the conventional 95% level. We cannot conclude that the effort task made any noticeable difference to participant behavior. We included the effort task expecting it to provide some insight, and were surprised by the null result. That said, it is somewhat reassuring that the results are robust.

Our second response to external validity concerns is that the experiment was primarily motivated by an existing feature of real-world data, the negative association between inequality and giving rates documented in Duquette (2018). Those associations do not prove a causal relationship between the two, and it has been an open question whether this relationship was an interesting correlation or something deeper. It is in this context that a controlled environment for testing causal mechanisms is particularly useful, and mitigates against oft-quoted arguments against lab experiments.

Table 5: No noticeable effects of effort task

	(1)	(2)	(3)	(4)	(5)
Endowment ('00s)	0.37***	0.40***	0.39***	0.34***	0.34***
	(0.080)	(0.080)	(0.082)	(0.035)	(0.018)
Match rate	0.078***	0.093***	0.092***	0.096***	0.097***
	(0.015)	(0.014)	(0.019)	(0.021)	(0.0094)
Extent of inequality ('00s)	-0.092**	-0.082*	-0.080**	-0.054***	-0.054***
	(0.032)	(0.034)	(0.028)	(0.0048)	(0.014)
Endowment × *Effort task*	0.058	0.052	0.063	0.047	0.047*
	(0.082)	(0.091)	(0.094)	(0.043)	(0.026)
Match rate × *Effort task*	0.016	-0.013	-0.015	-0.012	-0.013
	(0.025)	(0.012)	(0.029)	(0.031)	(0.016)
Extent of inequality × *Effort task*	0.034	-0.027	-0.027	-0.010	-0.012
	(0.046)	(0.048)	(0.038)	(0.014)	(0.022)
Control variables		✓	✓		✓
Effect type	None	None	Session	Individual	Random
N	2,880	2,880	2,880	2,880	2,880

6 Discussion

Rising inequality has been studied extensively by economists, largely to describe and document its evolution over time (Piketty et al. 2018; Saez and Zucman 2016). No doubt because it is challenging to find exogenous changes in inequality in naturally occurring data, less work has been done on inequality's causal effects.

This paper has demonstrated that economic inequality has a negative, causal effect on charitable giving. Our experiment used exogenous variation in the dispersion of the endowments participants received to identify the effect of inequality on gifts to a real charitable organization. We observe lower overall giving as the distribution of endowments becomes more unequal. We further identify income and matching effects consistent with

charitable giving as a normal good, with small match-effect magnitudes in line with the field experiment literature (*e.g.* Karlan, List and Shafir 2011, Huck, Rasul and Shephard 2015). Results are consistent across specifications, and independent of whether endowments are earned or unearned.

Though these findings were produced in a laboratory setting, the case for their external validity is strong on at least three grounds. First, variation in the distributions of a few dollars' worth of tokens are almost certainly less important and less salient than the actual distribution of income and wealth. Second, by offering subjects the opportunity to give to a United Way, we remove one of the barriers to external validity present for more traditional public goods games — subjects were giving real money to a real charity, at real cost to themselves. In this sense, our experiment was a hybrid between lab and field methodologies, as the laboratory acted solely as a tool to randomize inequality for an otherwise real decision process. Third, in their research comparing giving elasticities across settings, Eckel and Grossman (2008) found magnitudes from a field experiment "are very similar to (and insignificantly different from) [those from] lab experiments."

Our empirical results are inconsistent with the prevailing theory of voluntary public good provision, but are consistent with the theoretical framework developed in this paper. The model allows for behavioral changes in joy-of-giving motivation in response to shifts in the income distribution. We believe this work is the first step toward a new empirical and theoretical literature on charitable giving that focuses on inequality and other behavioral influences in addition to the classic questions of crowd-out and tax price of giving.

These findings are important both for understanding the economics of charitable giving and for public policy regarding inequality and social cohesion. If charitable giving is an expression of civic feeling lessened by disparate economic situations of potential donors, then voluntary contributions will not work against rising inequality; rather, inequality

will undermine charitable contributions. It is possible that civil societies have multiple equilibria, one of high social cohesion and high giving supporting each other, others of low giving and low social cohesion. Policies that support one of these while discouraging the other will have ambiguous results. While this paper has focused on charitable giving, we believe it likely that the negative, causal effect of inequality extends to other forms of prosocial behavior. If so, inequality imposes a direct, first-order social cost on the public that is currently not widely discussed or well-understood. We hope that future research will speak to these broader questions.

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A Appendix: A Model of Distribution-Dependent Joy-Of-Giving

This appendix derives the results of the model in detail.

A.1 General Properties of the Utility Function

While our paper focuses on, and finds empirical support for, joy-of-giving that depends on the dispersion of endowments, we deliberately write the ϕ_i term generally to permit extension to other behavioral dimensions in future research. In this section we consider the general properties of this utility function, both to enrich the reader's understanding and as a service to researchers interested in extending this work, before deriving properties specific to the function where ϕ_i measures endowment variance.

Let households i be uniformly distributed on the unit line with measure 1, $i \in [0, 1]$. Each household has endowment ω_i to allocate between personal consumption x_i and voluntary contributions to charity, g_i. Without loss of generality, let households be ordered by their endowments, so that $i \geq j \Leftrightarrow \omega_i \geq \omega_j \forall i, j$.

These households maximize a separable utility function,

$$U_i = u(x_i) + v(g_i; \phi_i), \tag{4}$$

which has the properties that both consumption and giving have positive, marginally decreasing payoffs, and that zero consumption is intensely displeasurable,

$$\begin{aligned} u'(x_i) &\geq 0 \quad v'(g_i) \geq 0 \\ u''(x_i) &\leq 0 \quad v''(g_i) \leq 0 \\ \lim_{x_i \to 0} u(x_i) &= -\infty. \end{aligned}$$

This decision is subject to the constraints that $g_i \geq 0$ and the budget

$$\omega_i \geq x_i + p g_i, \tag{5}$$

where p is the price of giving (determined by a matching incentive or a tax deduction).

One more argument affects the households' decision: ϕ is a sufficient statistic describing the distribution of endowments and the households' place within it, which we will here write

$$\phi_i = \phi\left(\omega_i, \{\omega_j\}_{j=0}^{1}\right).$$

A final general assumption: giving *nothing* gives the same joy-of-giving regardless of the income distribution: $v(0, \phi_i) = v(0, \phi_i^\star),\ \forall \phi_i, \phi_i^\star$.

A.2 First Order Condition

If the nonnegativity constraint on giving binds, then the household obviously chooses $x_i = \omega_i, g_i = 0$, and it must be the case that $u'(\omega_i) \geq v'(0; \phi_i)$.

At an interior solution the household will equalize marginal utility from the two goods, so that

$$v_i' = pu_i' \tag{6}$$

A.3 Comparative Statics

An infinitesimal change in parameters will not change the behavior of non-donors, but will have a corresponding effect on those who do give. Next, we derive the responses of donors to changes in p and ω_i.

Totally differentiate budget constraint (5),

$$dx_i = d\omega_i - pdg_i - g_i dp \tag{7}$$

and also the first order condition (3),

$$v_i'' dg_i + \frac{\partial v_i'}{\partial \phi_i} d\phi_i = u_i' dp + pu_i'' dx_i \tag{8}$$

Replace the x_i differential in (8) using equation (7) and group terms with the same differential to get an implicit function of g_i in terms of parameters and the preference function.

$$dg_i \left(v_i'' + p^2 u_i''\right) = dp \left(u_i' - pu_i'' g_i\right) + d\omega_i \left(pu_i''\right) - \frac{\partial v_i'}{\partial \phi_i} d\phi_i \tag{9}$$

Proposition 1: Price effect

Divide (9) by parameter differentials to get comparative statics in p with respect to price,

$$\frac{dg_i}{dp} = \frac{u_i' - pu_i'' g_i}{v_i'' + p^2 u_i''} \leq 0. \tag{10}$$

Because of the assumption of concave utility, price increases decrease giving. The distributional term drops out because $d\phi_i/dp = 0$.

Own-income shocks

A shock to one's own wealth is slightly more complicated,

$$\frac{dg_i}{d\omega_i} = \frac{pu_i''}{v_i'' + p^2 u_i''} + \frac{\partial v_i'}{\partial \phi_i} \frac{1}{v_i'' + p^2 u_i''} \frac{d\phi_i}{d\omega_i} \tag{11}$$

The first term is a traditional wealth effect, and is weakly positive. The second term captures changes driven by changes in the household's joy-of-giving caused by changes in *relative* income.

A small change to all endowments

Let some underlying parameter of the endowment distribution change infinitesimally. Then the accumulation of all of the changes in endowments can be written

$$\frac{dg_i}{d\omega_i} = \frac{pu_i''}{v_i'' + p^2 u_i''} + \frac{1}{v_i'' + p^2 u_i''} \int_{j=0}^{1} \frac{\partial v_i'}{\partial \phi_i} \frac{d\phi_i}{d\omega_j} dj \tag{12}$$

The first term is a traditional wealth effect, and is weakly positive. The second term captures changes driven by changes in the household's joy-of-giving caused by changes in the income distribution.

A.4 Variance-dependent Utility

Let households i be uniformly distributed on the unit line with measure 1, $i \in [0, 1]$. Each household has endowment ω_i to allocate between personal consumption x_i and voluntary contributions to charity, g_i. Without loss of generality, let households be ordered by their endowments, so that $i \geq j \Leftrightarrow \omega_i \geq \omega_j \forall i, j$.

Define ϕ_i as the variance of endowments,

$$\phi_i \equiv \int_0^1 (\omega_j - \bar{\omega})^2 dj, \tag{13}$$

where $\bar{\omega}$ denotes the mean, $\bar{\omega} \equiv \int_0^1 \omega_j dj$. Having specified this functional form for the behavioral influence of the income distribution on giving, we can now derive specific predictions.

Proposition 2: Own-endowment shock

Because the household is only concerned with the overall variance of endowments, changes to any single endowment (including their own) does not induce any behavioral effect:

$$\frac{d\phi_i}{d\omega_j} = \int_0^1 \left(\frac{d\omega_k}{d\omega_j} - \frac{d\bar{\omega}}{d\omega_j} \right)^2 dk = \int_j^j (1-0)^2 dk = 0$$

Setting the value of this term equal to zero in equation (11) returns

$$\frac{dg_i}{d\omega_i} = \frac{pu_i''}{v_i'' + p^2 u_i''}, \tag{14}$$

which is simply the household's response to an outward shift in the budget constraint without any behavioral role for the income distribution.

Also note that, by the envelope theorem, the total difference in giving with respect to changes in wealth is equal to the partial difference at the optimum, so that

$$\frac{dg_i}{d\omega_i} = \frac{pu_i''}{v_i'' + p^2 u_i''} = \frac{\partial g_i}{\partial \omega_i}. \tag{15}$$

Proposition 3: Uniform endowment change

Let us define a uniform increase in the distribution of income, so that for all i, $\omega_i' = \omega_i + a$, where a is a small constant. It follows that $\bar{\omega}' = \bar{\omega} + a$, and we denote by ϕ_i' household i's new summary statistic in the shifted income distribution. Plugging into the definition of ϕ_i,

$$\begin{aligned}
\phi_i' &= \int_0^1 \left(\omega_j' - \int \omega_k' dk\right)^2 dj \\
&= \int_0^1 \left(\omega_j + a - \left(\int \omega_k + a dk\right)\right)^2 dj \\
&= \int_0^1 (\omega_j + a - \bar{\omega} - a)^2 \, dj \\
&= \phi_i.
\end{aligned}$$

Under this utility function, a level shift in endowments does not change ϕ_i for any agent. Therefore, as in equation (14), any changes in giving are solely through the channel of a traditional endowment effect.

Proposition 4: Mean-preserving increase in variance

Now consider a mean-preserving spread that is proportional to the original distribution's distance between i and the mean. Let $\omega_i' = \omega_i + b(\omega_i - \bar{\omega})$ for all i, where b is a small, positive constant. This does not change the mean of the distribution: $\bar{\omega}' = \int_0^1 \omega_i + b(\omega_i - \bar{\omega}) di = \bar{\omega} + b\bar{\omega} - b\bar{\omega} = \bar{\omega}$. However, individual households do experience changes in their absolute wealth and in ϕ_i. Below-mean households are poorer; above-mean households are richer.

From the definition of ϕ_i it follows that

$$\begin{aligned}\phi_i' &= \int_0^1 (\omega_j' - \bar{\omega}')^2 dj \\ &= \int_0^1 (\omega_j + b(\omega_j - \bar{\omega}) - \bar{\omega})^2 dj \\ &= \int_0^1 \left((1+b)(\omega_j - \bar{\omega})\right)^2 dj \\ &= (1+b)^2 \phi_i \geq \phi_i,\end{aligned}$$

so that the change to ϕ_i is the same for all i (indeed, ϕ_i is invariant across i). The effect of this shock on individual donor decisions can be seen by setting $dp = 0$ in equation (9),

$$dg_i \underbrace{\left(v_i'' + p^2 u_i''\right)}_{\ominus} = \underbrace{p u_i''}_{\ominus} d\omega_i - \frac{\partial v_i'}{\partial \phi_i} \underbrace{d\phi_i}_{\oplus}, \tag{16}$$

where the sign of the second derivatives and $d\phi_i$ are known, and so the knowability and direction of the sign of dg_i depends on $d\omega_i$ (which is a function of i's position relative to the mean) and the sign of $\frac{\partial v_i'}{\partial \phi_i}$ (which is determined by the shape of the preference function). Combining the two possible signs of these items for four possible cases, the sign of dg_i is reported in the following tabulation.

Change in marginal utility	Change in endowment	Change in giving
$\frac{\partial v_i'}{\partial \phi_i} \geq 0$	$\omega_i \geq \bar{\omega} \Leftrightarrow d\omega_i \geq 0$	$dg \geq 0$
	$\omega_i \leq \bar{\omega} \Leftrightarrow d\omega_i \leq 0$	ambiguous
$\frac{\partial v_i'}{\partial \phi_i} \leq 0$	$\omega_i \geq \bar{\omega} \Leftrightarrow d\omega_i \geq 0$	ambiguous
	$\omega_i \leq \bar{\omega} \Leftrightarrow d\omega_i \leq 0$	$dg \leq 0$

For either case of the sign of $\frac{\partial v_i'}{\partial \phi_i}$, the effect will be unambiguous on one side of the mean endowment and ambiguous on the other, because of opposite signs on the wealth and behavioral effects.

Proposition 5: Inequality and Conditional Giving

We now demonstrate that a change in ϕ_i causes a change in giving that, after controlling for changes to each agent's endowment, is of uniform sign. From equations (9) and (16), we know that a change in ϕ_i implies marginal changes

$$dg_i = d\omega_i \frac{p u_i''}{v_i'' + p^2 u_i''} - \frac{1}{v_i'' + p^2 u_i''} \frac{\partial v_i'}{\partial \phi_i} d\phi_i. \tag{17}$$

Divide by $d\omega_i$ and express ratios of differentials in terms of meaningful changes resulting from an increase in inequality.

$$\frac{dg_i}{d\omega_i} = \frac{pu_i''}{v_i'' + p^2 u_i''} - \frac{1}{v_i'' + p^2 u_i''} \frac{\partial v_i'}{\partial \phi_i} \frac{1}{\frac{d\omega_i}{d\phi_i}}. \tag{18}$$

Use equation (15) to subtract the partial effect of a change in wealth from both sides.

$$\frac{dg_i}{d\omega_i} - \frac{\partial g_i}{\partial \omega_i} = \frac{pu_i''}{v_i'' + p^2 u_i''} - \frac{1}{v_i'' + p^2 u_i''} \frac{\partial v_i'}{\partial \phi_i} - \frac{pu_i''}{v_i'' + p^2 u_i''} \tag{19}$$

$$= \frac{-1}{v_i'' + p^2 u_i''} \frac{\partial v_i'}{\partial \phi_i} \frac{1}{\frac{d\omega_i}{d\phi_i}}. \tag{20}$$

This gives us an expression for the change in giving with respect to a change in the income distribution, net of the endowment effect.

$$\left(\frac{dg_i}{d\omega_i} - \frac{\partial g_i}{\partial \omega_i} \right) \frac{d\omega_i}{d\phi_i} = \frac{-1}{v_i'' + p^2 u_i''} \frac{\partial v_i'}{\partial \phi_i}. \tag{21}$$

Because price is strictly positive and second derivatives of the utility function negative, the sign of this expression is known and is the same as the sign of $\frac{\partial v_i'}{\partial \phi_i}$. The conditional effect of inequality on giving is of the same sign for all i and follows from this expression. When greater inequality increases the marginal utility from giving ($\frac{\partial v_i'}{\partial \phi_i} \geq 0$), then an increase in inequality ($d\phi_i \geq 0$) leads to greater giving, conditional on endowment. When marginal utility is declining in inequality, the expression has the opposite sign, and conditional giving is lower.

B Appendix: Informed Consent Document

Informed-Informational Document about Research

You are being asked to participate in the research project described below. Your participation in this study is entirely voluntary and you may refuse to participate, or you may decide to stop your participation at any time. Should you refuse to participate in the study or should you withdraw your consent and stop participation in the study, your decision will involve no penalty or loss of benefits to which you may be otherwise entitled. You are being asked to read the information below carefully, and ask questions about anything you don't understand before deciding whether or not to participate.

Title: Philanthropy Experiment 2017

Principal Investigator(s): Enda Patrick Hargaden, Ph.D.

PURPOSE OF THE STUDY

The purpose of this research is to examine how inequality and subsidies affect charitable-giving.

PROCEDURES

The research procedures are as follows: You will receive all the instructions describing your task and your payoffs from this task on your computer screen. All information is correct and true. Our research protocols specifically forbid us from providing incorrect or misleading information. You have the right to raise your hand and ask questions about the experiment protocols at any time. Your decisions will remain confidential and your choices will not be identified.

EXPECTED DURATION

The total anticipated time commitment will be approximately 60 minutes.

RISKS OF PARTICIPATION

There are no anticipated risks associated with participation in this project.

BENEFITS TO THE SUBJECT

There is no direct benefit received from your participation in this study, but your participation will help the investigator(s) better understand how economic institutions directly influence the decision making of its members.

CONFIDENTIALITY OF RECORDS

Every effort will be made to maintain the confidentiality of your study records. The data collected from the study will be used for educational and publication purposes, however, you will not be identified by name. For federal audit purposes, the participant's documentation for this research project will be maintained and safeguarded by Enda Hargaden for a minimum of three years after completion of the study. After that time, the participant's documentation may be destroyed.

FINANCIAL COMPENSATION

Your earnings are determined by the decisions you make in this experiment and are clearly explained in the instructions. At the end of the session, you will be paid privately and in cash.

INVESTIGATOR'S RIGHT TO WITHDRAW PARTICIPANT

The investigator has the right to withdraw you from this study at any time.

CONTACT INFORMATION FOR QUESTIONS OR PROBLEMS

The investigator has offered to answer all your questions. If you have additional questions during the course of this study about the research or any related problem, you may contact the Principal Investigator, Enda Hargaden, Ph.D., at phone number 865-974-8802 or by email at enda@utk.edu. If you have any questions about your rights as a research participant, you may also contact the Office of Compliance at phone number 865-974-7697 or by email at irb@utk.edu.

You have agreed to waive your signature on this form. Your voluntary participation is indicated by clicking the appropriate button on your screen to begin the experiment, and you may cease your participation at any time. In order to ensure anonymity of all respondents, please do not speak to those around you and direct any questions to the moderator by raising your hand. Such participation does not release the investigator(s), institution(s), sponsor(s) or granting agency(ies) from their professional and ethical responsibility to you.

C Appendix: Instructions

I welcome everyone to the UT Experimental Economics Laboratory. My name is _____ and joining me is _____. We are researchers from the Department of Economics. We understand that many of you have busy schedules and thus really appreciate your willingness to participate.

In this study you will be asked to make a series of market-like decisions. Know that there are no right and wrong decisions. However, your earnings in this experiment are based on the decisions you make. What these means is that not everyone will make the same amount, and that some decisions will lead to higher earnings than others.

The money you will be paid with comes from a research grant, and this money can only be used to pay experiment participants. You will be paid, in cash, after the experiment is completed.

In some cases, the decision-making setting may be unfamiliar to you. This is normal. In writing the instructions for this experiment, we have done our very best to clearly describe to you all relevant information from which to base your decisions. It is important for the integrity of this research that you understand the instructions and we encourage you to ask questions as we go through the instructions.

There are two important protocols in experimental economics that we would like you to be aware of. First, we are forbidden from using deception. What this means is that the instructions contain only true information. There are no hidden tasks and the experiment works exactly as stated in the instructions.

Second, your decisions are confidential. What this means is that you have been randomly assigned an ID number. All decisions you make will be associated with this ID number and not your name. Therefore, when we analyze the data and present results your name in no way will be affiliated with this study.

We have provided everyone with a pencil, calculator, and paper. Use these items, if you wish, as you make your decisions.

Has everyone had a chance to read the "Informed Consent Sheet"? Is everyone comfortable with the risks involved with participation in this experiment?

We will now proceed by going through the instructions together. Please listen carefully as I read the instructions aloud. Do not hesitate to stop me at any time to ask a question.

The purpose of this experiment is to research people's willingness to donate to charity. Our collaborating partner for this experiment is United Way of Greater Knoxville, one of the largest charities in our community. United Way funds many programs, ranging from delivering hot meals to elderly citizens, to providing job training to people with intellectual disabilities. I have here a confirmation letter from United Way and some copies of their Annual Report if anyone would like to know more about the organization.

In this experiment, the computer will allocate a number of tokens to each of you. In each round you will be told how many tokens you received, and some information on how many tokens other people in the experiment received. Tokens are worth money, and will be converted into cash at the end of the experiment. Each token is worth 5 cents, and so you can think of 100 tokens being worth 5 dollars.

You will be asked how many of these tokens you are willing to donate to United Way.

To incentivize donations, you will see on-screen that we will match any donations with a varying amount. For example, you might see "For every token you donate, we will match this with two more." This means United Way would receive three tokens in total for every one you donate. The amounts donated will remain confidential.

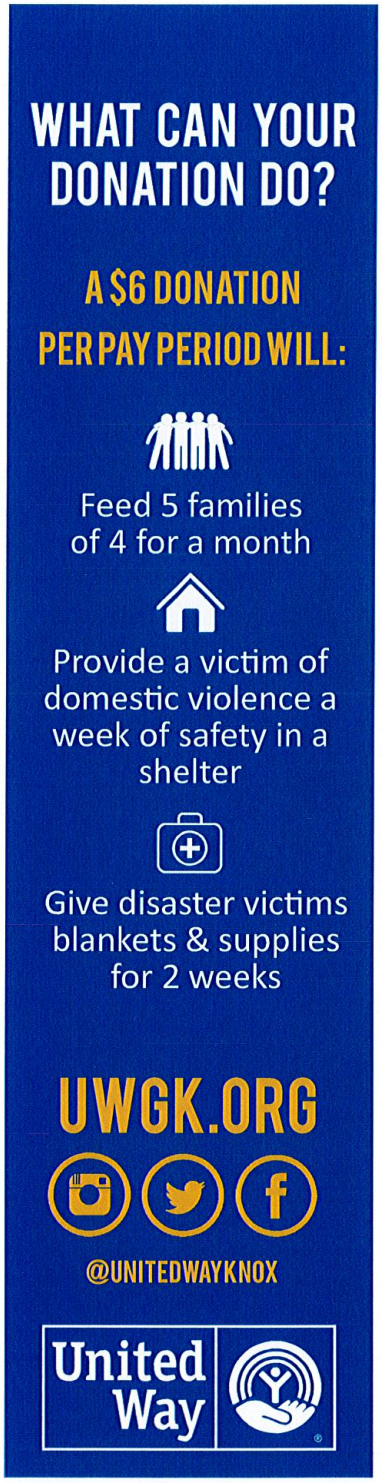
We will analyze how participants' donations depend on this information. We will run several rounds of this experiment. From these, the computer will select two to count for real, and payments will be based on those two rounds. At the end of the last session, you will be asked to fill out a questionnaire and paid for the tokens from the two selected rounds, in addition to the $5 show-up fee. Everybody will be paid in private after showing the record sheet. You are under no obligation to tell others how much you earned.

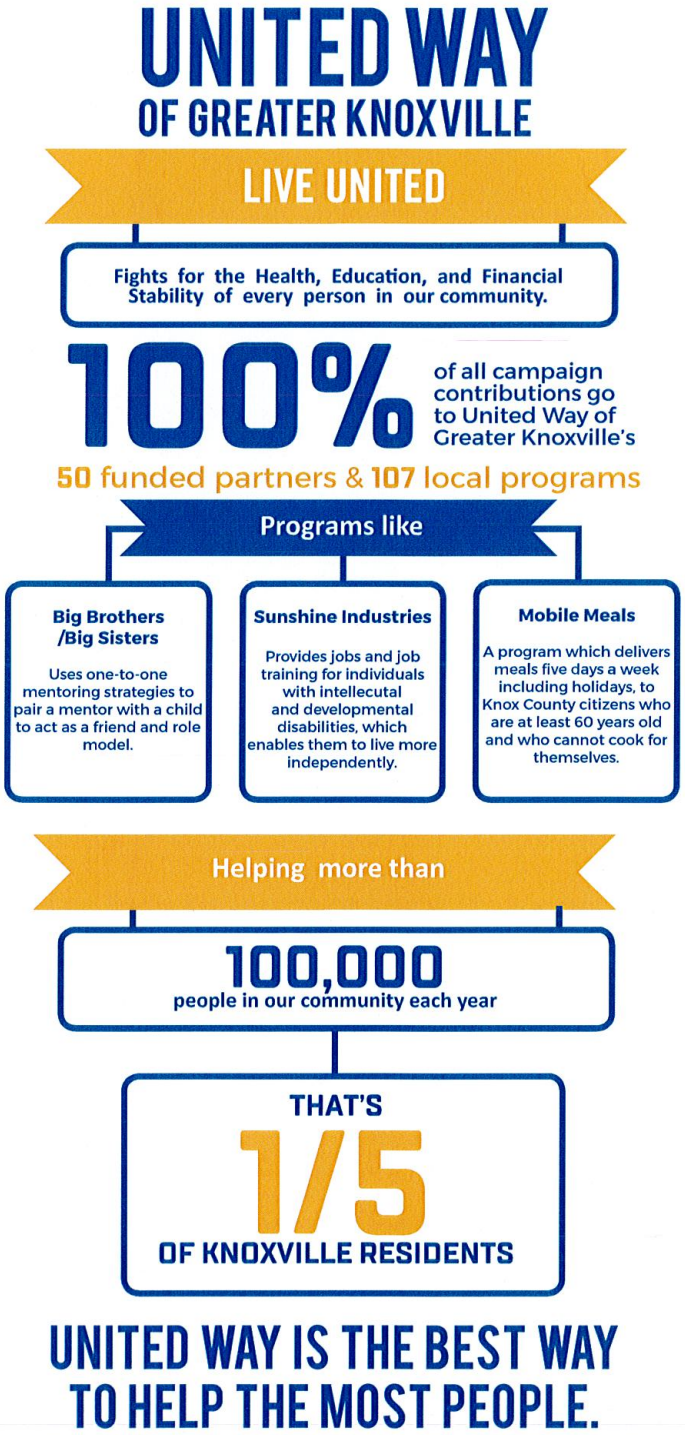
You are free to leave at any time and you will still receive the show-up fee.

[To determine how many tokens you receive, at the start of the game you will have to do a task. This is called the slider task. You will see many "sliders" on screen. These are scales that go from zero to one hundred. By using the mouse and/or the keyboard, you need to slide the pointer across and position it at exactly 50. The more of these you successfully position at 50, the higher your score, and the more tokens you will receive when we get to the experiment. We will do a practice round of this game, where you will have one minute to position as many slides as you can at exactly 50. This is just for practice, and will not count for real.]

We will first run two practice rounds to familiarize you with the experiment. These are for practice, and will not count for real.

D Appendix: Additional Informational Materials





1301 Hannah Avenue
Knoxville, TN 37921
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865-522-7312 fax
www.uwgk.org

United Way
United Way
of Greater Knoxville

Dear UT Experimental Economics Participant,

The purpose of this notice is to confirm that United Way of Greater Knoxville is an official partner in the study you are about to participate in. We are working with Prof Hargaden on this experiment. We have provided feedback on the wording of the questions to be asked. We assure you that this study has our support, and that any donations participants make are indeed real donations. If you would like to learn more about our work, we have provided Prof Hargaden with informational materials which you are welcome to view.

In addition to securing some additional funds for activities, this laboratory experiment will provide scientific evidence on people's perceptions about charitable giving. We thank you for participating in this research project.

Yours sincerely,

Ben Landers

Ben Landers
President & CEO of United Way of Greater Knoxville

LIVE UNITED™

E Appendix: Supplemental Regression Tables

Table 6: Effects of control variables on percent of endowment donated

	(1)	(2)	(3)
Endowment ('00s)	0.43***	0.42***	0.36***
	(0.037)	(0.036)	(0.026)
Match rate	0.088***	0.086***	0.092***
	(0.016)	(0.016)	(0.017)
Extent of inequality ('00s)	-0.096***	-0.095***	-0.061***
	(0.015)	(0.013)	(0.0075)
Age	-0.029	-0.036	-0.032
	(0.032)	(0.031)	(0.034)
Male	-0.39	-0.38	-0.39
	(0.23)	(0.25)	(0.24)
Married	0.73	0.67	0.70
	(1.15)	(1.15)	(1.15)
Social Class (1-5 scale)	-0.026	-0.031	-0.019
	(0.12)	(0.12)	(0.12)
First experiment	1.08***	1.10***	1.07***
	(0.18)	(0.25)	(0.18)
Well compensated (1-5 scale)	-0.038	-0.019	-0.034
	(0.13)	(0.11)	(0.13)
Understand experiment (1-5 scale)	0.0062	0.019	0.0071
	(0.089)	(0.078)	(0.092)
Economics courses taken	-0.086**	-0.082*	-0.085***
	(0.032)	(0.032)	(0.033)
Effect type	None	Session	Random
N	2,880	2,880	2,880

Table 7: Effects of inequality treatment in terms of elasticity interpretation

	(1)	(2)	(3)	(4)	(5)
Endowment ('00s)	0.38***	0.41***	0.41***	0.34***	0.34***
	(0.042)	(0.037)	(0.037)	(0.025)	(0.013)
Match rate	0.088***	0.095***	0.093***	0.097***	0.097***
	(0.016)	(0.016)	(0.016)	(0.017)	(0.0075)
Extent of inequality (log)	-0.14	-0.25***	-0.25***	-0.14***	-0.14***
	(0.073)	(0.042)	(0.047)	(0.020)	(0.036)
Control variables		✓	✓		✓
Experimental session FE			✓		
Participant FE				✓	
Random Effects					✓
Observations	2,880	2,880	2,880	2,880	2,880

Table 8: Effects of various treatments on level of contributions donated

	(1)	(2)	(3)	(4)	(5)
Endowment ('00s)	21.2***	22.3***	22.1***	19.1***	19.2***
	(3.90)	(3.88)	(3.80)	(3.28)	(0.66)
Match rate	1.43*	1.71**	1.68**	1.91**	1.90***
	(0.67)	(0.66)	(0.61)	(0.68)	(0.38)
Extent of inequality ('00s)	-2.49*	-3.43**	-3.22***	-1.57***	-1.65***
	(1.21)	(1.09)	(0.77)	(0.29)	(0.54)
Control variables		✓	✓		✓
Experimental session FE			✓		
Participant FE				✓	
Random Effects					✓
Observations	2,880	2,880	2,880	2,880	2,880

Table 9: Effects of various treatments on level of contributions donated

	(1)	(2)	(3)	(4)	(5)
Endowment ('00s)	21.1***	23.3***	22.9***	18.9***	19.1***
	(4.20)	(4.23)	(4.00)	(3.24)	(0.80)
Match rate	1.41	1.87**	1.81**	1.89**	1.89***
	(0.75)	(0.72)	(0.67)	(0.69)	(0.39)
Extent of inequality ('00s)	-2.70**	-1.80**	-1.95***	-1.77**	-1.77**
	(0.85)	(0.61)	(0.45)	(0.47)	(0.78)
Visual midpoint ('00s)	0.48	-3.84	-3.03	0.50	0.29
	(2.52)	(1.96)	(1.94)	(1.21)	(1.44)
Control variables		✓	✓		✓
Experimental session FE			✓		
Participant FE				✓	
Random Effects					✓
Observations	2,880	2,880	2,880	2,880	2,880