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Abstract

Extensive research in economics explores generosity in monetary allocations. However, generosity often involves the allocation of non-monetary goods or experiences. Existing evidence suggests that generosity may be higher in such contexts, though no direct comparison exists. Here, we compare generosity in decisions that vary whether allocations are monetary or non-monetary. In two experiments, generosity is significantly higher in non-monetary contexts. Thus, the typical monetary laboratory dictator game may underestimate generosity in many non-laboratory contexts where allocations are non-monetary. We find weaker relationships between individuals' allocation decisions across monetary and non-monetary contexts than for allocations that hold constant the monetary nature of the context.

JEL-Code: D030, D640, C910.

Keywords: altruism, generosity, non-monetary, harm, experiment.

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I. Introduction

Considerable research in economics seeks to understand when and why individuals engage in costly, other-regarding behavior (see, for example, Fehr and Schmidt, 1999; Andreoni and Miller, 2002; Benabou and Tirole, 2006; Ellingsen and Johannesson, 2011). Much of this research examines the extent to which people are willing to share money with others, often studying behavior in laboratory dictator games (Forsythe, *et al.*, 1994; Frey and Bohnet, 1995; Andreoni and Vesterlund, 2001) and in natural settings such as charitable donations (Falk, 2007; Karlan and List, 2007; DellaVigna, List and Malmendier, 2012). The focus on sharing money is understandable, as monetary donations constitute an economically significant and easily measurable example of other-regarding behavior.[1]

While the sharing of monetary wealth constitutes an appropriate focus for economic research on generosity, it is nevertheless surprising that alternative forms of costly other-regarding behavior have been relatively neglected in economics. One regularly observes costly generous behavior in non-monetary contexts. For example, individuals often incur or risk harm in order to lessen the harm to others. Consider two extreme examples: Moira Smith, a New York City policewoman, lost her life after running back into the World Trade Center on September 11, 2001 to rescue others; Irena Sendler risked her life, and was ultimately tortured for, helping Jewish children escape the Nazis during World War II. Moreover, such high degrees of generosity, whereby people incur significant risk or harm in order to help others, may in fact be common in life-and-death situations (Fischhoff, 2005; Frey, Savage, and Torgler, 2011). People also regularly voluntarily endure the certain harm of blood, organ, and bone marrow donations in order to reduce the harm to others—in the United States alone, about 6,000 organ donations per year come from living donors (OrganDonor.gov, 2014). In more routine examples, workers in firms and neighbors in communities regularly spend considerable time voluntarily helping one another. Hence, given the frequency and consequences of decisions involving non-monetary generosity, both heroic and mundane, it is surprising that other-regarding behavior in these domains has not been more widely investigated by economists.[2]

[1] In 2013, for example, 1.4 billion people around the world reported donating money to a charity (Charities Aid Foundation, 2014). In the United States, total 2013 charitable donations have been estimated at $335 billion, or $2,974 per household and roughly 2 percent of GDP (Giving USA, 2014).

[2] A large part of the existing related economic literature studies the relationships between donating money and volunteering time, and particularly the extent to which the two are substitutes or complements (Brown and Lankford, 1992; Duncan, 1999; Andreoni, 2006).

Some psychology experiments also document high levels of personal sacrifice for the welfare of others in non-monetary contexts (Batson, *et al.* 1981, 1983 and 1988; Toi and Batson, 1982; Schaller and Cialdini, 1988; Hein, *et al.*, 2010). In these experiments, a majority of subjects often volunteers to incur significant costs to help another person in need. For example, Batson, *et al.* (1983), conduct a study in which subjects are given the opportunity of volunteering to accept electric shocks intended for another purported subject—in reality, an experimental confederate. In the first experiment reported in the paper, 64 percent of subjects across all experimental conditions volunteer to take shocks intended for the victim, and this proportion is 86 percent in two conditions in which a questionnaire manipulates the perceived similarity between the subject and the fictitious victim. In another study (Toi and Batson, 1982), the proportion of student subjects volunteering to give up their time to help another student who has (purportedly) suffered a serious accident and fallen behind on schoolwork is above 70 percent in three of four experimental conditions. In comparison with typically more modest rates of generosity in experimental monetary dictator games, these proportions appear high and raise the possibility that people may be more generous in contexts involving sharing the burden of non-monetary harm. However, the degrees of generosity in these very different types of contexts are hard to compare, since there are many important reasons why they may differ.[3]

To better understand the relationship between generosity in different contexts, we conduct laboratory experiments that vary the medium over which allocation choices are made. In particular, we compare generosity in monetary allocation contexts—i.e., the standard dictator game—with generosity in contexts involving non-monetary allocations such as the distribution of physical discomfort. There are many dimensions along which allocation contexts may vary, as is evident when comparing any of the above non-monetary choice contexts with monetary dictator games. This is also true when comparing households' monetary charitable donations with their volunteering of time (Brown and Lankford, 1992; Duncan, 1999). Instead of comparing across natural contexts that vary in multiple dimensions, our goal is to compare monetary and non-monetary allocation decisions while keeping constant as many features as possible—including the beneficiaries of generous acts, choice environments and procedures, and the significance of the stakes—in order to understand whether the domain over which allocations

[3] For example, in the above studies, the design often attempts to create the impression that the cost of helping is lower than the benefit for the victim. Moreover, the use of deception in these kinds of studies in psychology means that subjects' costly generous acts are not ultimately implemented.

are made affects the degrees of observed generosity. We therefore study sharing in a laboratory environment, where we can control most features of the decision context, while varying one aspect of the context at a time.

We begin, in Experiment 1, by comparing the standard (monetary) dictator game to a situation where the dictator may choose to incur a non-monetary harm in order to mitigate a similar harm to another person. Specifically, the non-monetary allocation in our first study involves subjects distributing time spent with one's hand immersed in ice water—an unpleasant and painful experience. We choose this comparison for our initial study because the non-monetary allocation task shares properties with many of the contexts described above, in which one person decides how much of a non-monetary physical harm or discomfort to share with others. Our findings confirm a substantial difference in generosity between the two contexts. Dictators take on a much larger share of the painful experience—on average, 50 percent more—than the proportion of money they share. Moreover, our within-subject design allows us to compare each individual's generosity across the two contexts; we find that significantly more people exhibit greater generosity in the non-monetary harm context than in the monetary one.

While Experiment 1 serves as a valuable starting point for studying how generosity varies across contexts, it leaves many important issues unanswered. In particular, the harm allocation potentially differs from a monetary dictator game in several ways beyond the monetary vs. non-monetary medium over which allocations are made. For example, the two kinds of decisions differ in whether the allocation involves a positive windfall gain (in the monetary dictator game) or a negative experience in the harm allocation task. Additionally, one allocation is over a highly familiar resource (money) and the other over a very unusual one (time spent with a hand immersed in ice water). Aside from mere familiarity, the nature of preferences and beliefs might differ substantially. For instance, utility from small increases in wealth levels may be more linear than disutility from spending additional seconds with one's hand immersed in ice water, or subjects may believe that the costs of different units of harm differ between the dictator and the recipient. Any of these possibilities may account for why people behave differently in the two contexts.

Experiment 2 addresses the above potential confounds, to more carefully understand how generosity changes between monetary and non-monetary contexts. For this study, we change the non-monetary context to one in which subjects allocate time spent doing a boring, tedious task.

Time is a particularly appropriate medium for comparisons with money for several reasons, making the comparison in our second experiment clearer than the more exploratory one in Experiment 1. First, allocating one's time is as ubiquitous in daily life as is money, with individuals regularly confronted with scarcity in both. Second, and relatedly, people regularly engage in tradeoffs between time and money, and these are often well understood, linear, and similar for large groups of people.[4] For instance, most subjects participating in laboratory experiments are already engaging in tradeoffs between money and time with implicit hourly rates. Third, we can easily manipulate the context to frame both as positive (increases in money or free time) or negative (losses of money or free time) allocations, which is important for understanding the relative importance of monetary vs. non-monetary and positive vs. negative features of the context, which vary simultaneously in our first experiment. Using this cleaner design, we confirm the main findings from Experiment 1. Most importantly, participants in our experiment are more generous in decisions involving time than in those involving money, and this monetary vs. non-monetary dimension is much more important for determining generosity than whether a decision involves a gain or loss relative to a status quo.

By using within-subjects designs, our experiments also allow us to explore relationships between how generous individuals are in monetary and non-monetary domains. Surprisingly, we find only weak relationships between how generous an individual is in monetary and non-monetary contexts. Hence, observing an individual acting generously in a monetary allocation context may provide very little information about how generous that individual will be in another, non-monetary context. Moreover, a single social preference type may be unable to account for changes in individuals' generosity across contexts.

The remainder of this paper is structured as follows. The next section describes the basic framework we will use for testing generosity across contexts, and presents our research questions and hypotheses. Sections III and IV present the designs and results of Experiments 1 and 2,

[4] A few existing studies investigate social preferences in contexts involving time allocation. However, none make the comparison at the center of our paper, between generosity in monetary and non-monetary contexts. Like us, Noussair and Stoop (2012) use a dictator game in which participants make choices that affect the time at which they and their paired partner may leave the experiment. In a related study by Danilov and Vogelsang (2014), dictators can spend time executing a tedious task in order to increase the earnings of receivers. Consistent with our central hypothesis, participants in these studies are more generous than in other dictator game studies that use money as the reward medium, though this requires making comparisons across studies and populations. Other experiments study strategic games, such as ultimatum games and public good games, in which part of the outcome payoffs are in waiting time (Ellingsen and Johanesson, 2009; Berger *et al.*, 2012; Neugebauer and Traub, 2012). These studies generally find (weakly) more pro-social behavior in contexts involving time than those involving money.

respectively. Section V discusses and provides an interpretation for the combined results, and Section VI concludes.

II. Research Questions and Hypotheses

Our research focuses on two principal questions. First, *does the degree of generosity in individual behavior vary across allocation contexts?* Our design employs a very simple dictator-game context, in which strategic considerations and beliefs about others' actions are irrelevant. Hence, the only decision facing subjects is how much of something desirable or something undesirable they take for themselves and how much they give to another subject.

Specifically, assume that Δw represents an aggregate change in wealth, or well being along a measurable dimension, for a pair of individuals, A and B. The dictator, A, chooses a share, $s_A \in [0,1]$, of the wealth change for herself, thereby imposing the remaining share, $s_B = 1 - s_A$, on B. Let $v_A(s, \Delta w)$ represent A's personal value from share $s = s_A$ of wealth change Δw and define $v_B(s, \Delta w)$, when $s = s_B$, similarly for B. Assume that identical marginal wealth changes are equally valuable to both individuals over all possible share allocations; i.e., $v_A(s, \Delta w) = v_B(s, \Delta w)$, for all s. This assumption is satisfied, implicitly, in symmetric monetary dictator games where there is no reason to believe that one subject values a given change in wealth more than the other. In such a context, we denote the dictator's generosity as $g = 1 - s_A$ whenever $\Delta w > 0$, as in the standard dictator game, and as $g = s_A$ whenever $\Delta w < 0$. That is, a dictator is generous when sharing more of a positive change, like an increase in wealth, and when taking on a greater share of some negative change in outcomes. Following from the definition of g, let $s_A(g, \Delta w)$ and $s_B(g, \Delta w)$ be, respectively, the shares that a dictator allocates to herself and to the recipient in context Δw in order to exhibit generosity g.

Finally, consider two such allocation decisions, over two different types of changes, $\Delta w'$ and $\Delta w''$, and assume that outcomes produced by identical degrees of generosity exhibited by the dictator are equally valued by each individual in both contexts—i.e., $v_i(s_i(g, \Delta w'), \Delta w') = v_i(s_i(g, \Delta w''), \Delta w'')$, for $i = A, B$ and for all g. That is, the two dictator-game contexts are identical in terms of the value individuals place on what is being allocated. Given that this condition is satisfied, any social preference model that starts from players' personal valuations over outcomes (i.e., outcome-based models that treat v_A and v_B as individual payoffs) will predict the same degrees of generosity in the two contexts (Fehr and Schmidt, 1999; Bolton and

Ockenfels, 2000).[5] Moreover, given the equality of actions and valuations in the two contexts—and, hence, of the inferences about types and preferences that can be drawn about actions—social signaling models also yield similar predictions for the two choice contexts (Benabou and Tirole, 2006). The point is that—as long as the two dictator games are identical in terms of the valuations of the outcomes—then social preference models will make identical predictions for the two environments. Hence, our experiments test the null hypothesis, based on social preference models, that simply changing the context over which allocations are made, without other substantive changes to valuations, should yield no effect on behavior.

H_0: Generosity will not differ across comparable contexts.

Our primary objective is to compare generosity in monetary and non-monetary contexts. As we note in the introduction, evidence from natural settings and psychology experiments provide a speculative indication that generosity may be higher in non-monetary contexts. This is further supported by evidence that money may exert a detrimental influence on human pro-social behavior (Pfeffer and DeVoe, 2009; Ellingsen and Johanneson, 2009; Mogilner, 2010; Gasiorowska and Helka, 2012). For example, Vohs, Mead and Goode (2006) found that priming participants with money (for example, by unscrambling phrases containing words such as "high paying salary") led to self-sufficient and self-regarding behavior in terms of wanting less help from others, giving less help to others, and preferring distance from others. Further, DeVoe and Iyengar (2010) found that subjects rated hypothetical employee performance bonuses that rewarded employees unequally as much more fair when the bonus involved money (or redeemable reward points) than when it involved time (vacation days) or food. In a field setting, Kube, Maréchal and Puppe (2012) demonstrated that workers distinguish between monetary and non-monetary gifts from an employer, responding much more positively to the latter. Brown, Meer and Williams (2013) showed that people donate more to charity when their work output goes directly to charity, as money, than when they receive their work output first and then make a monetary donation. Thus, there is considerable reason to believe that people's inclinations to act pro-socially may be weaker in contexts involving money, compared to other kinds of decisions. This yields our primary alternative hypothesis.

[5] A type-based reciprocity model (Levine, 1998) also generates identical predictions whenever the distribution of types is not affected by the context. Models of intentions-based reciprocity trivially generate identical predictions for the two environments (Rabin, 1993; Dufwenberg and Kirchsteiger, 2004).

H_A: Generosity will be greater in non-monetary contexts than in monetary ones.

As a second research question, we ask, *is there a relationship between an individual's generosity in monetary and non-monetary allocations*? Social preference models assume that generous behavior in different contexts results from the same underlying mechanisms. For example, people who care about equality in one context should care about equality in other contexts as well. Therefore, even if H_0 is not supported because some feature of the context causes changes in levels of generosity, we might expect a relationship between individuals' relative generosity—those who are more generous than others in one context should also be more generous in other contexts as well. While, not formulating a formal hypothesis for this research question, our analysis explores this important question.

The questions above are related to other work that attempts to identify relationships between pro-social behavior in different contexts.[6] For example, Benz and Meier (2008) find that Swiss students who make greater donations to charities in a classroom experiment also donate more to charities outside of an experimental setting; other studies also find relationships between pro-social behavior in experimental and natural environments (e.g., Rustagi, Engel and Kosfeld, 2010; Carpenter and Seki, 2011; Fehr and Leibbrandt, 2011). Such relationships are sometimes present for some behaviors and absent for others. For instance, Carpenter and Myers (2010) find that the amount donated to charity in a dictator game is correlated with the willingness to become a volunteer firefighter, but not with the propensity to actually respond to emergency calls. Other studies similarly find support for such behavioral relationships in some comparisons but not in others (Karlan, 2005; Laury and Taylor, 2008), and some studies find very little correspondence between pro-social behavior in lab and field settings (Stoop, Noussair and Van Soest, 2012). Of course, in making the comparisons between experimental and natural (non-experimental) choice environments, various aspects of the choice context may change. For example, as Carpenter and Myers (2010) note, in settings such as volunteer firefighting, image-based motivations may be present in some types of behaviors more than in others. Or a comparison between public good games and the fishing behavior of fishermen may ignore a desire to "win" by catching more real fish in the natural context that is not present in decisions outside of that context (Stoop, Noussair

[6] Also related is research that attempts to identify the relationships between other forms of preferences across choice contexts, including risk (Einav, *et al.*, 2012) and time preferences (Chabris, *et al.*, 2008; Meier and Sprenger, 2012).

and Van Soest, 2012). Other factors, such as repeated interaction, incentives and beliefs likely regularly vary when comparing laboratory and non-laboratory contexts.

We adopt a different approach to understand how generosity differs across contexts. Our primary goal is not to compare generous behavior in laboratory and "natural" environments, between which many things may change (cf. Levitt and List, 2007). Rather, we hold constant the laboratory environment, and change as little as possible to identify more precise characteristics of a choice context that affect pro-social behavior. Hence, all our measurements are conducted in laboratory settings using almost identical instructions and choice procedures, one-shot decisions and similar degrees of anonymity between participants. Our goal is to create abstract environments in which the valuations over outcomes for both parties are as similar as possible—i.e., where $v_i(s_i(g, \Delta w'), \Delta w') = v_i(s_i(g, \Delta w''), \Delta w'')$. Also, to avoid the possibility that associations with natural contexts creep into our experiments and influence behaviors in unintended ways, we employ abstract tasks, dictator games, with little direct correspondence to real-world behavior.[7]

III. Experiment One

We begin with an experiment that compares generosity in a standard monetary context—a laboratory dictator game over monetary allocations—to generosity in a similar non-monetary setting in which the dictator game allocations are over an uncomfortable experience. Specifically, in the experiment, each participant made two allocation decisions: a division of money ($6) and a division of a harmful experience (putting one's hand in ice water for 60 seconds). We varied the order in which participants made the two decisions.

A. Experimental Design

Participants from the Pittsburgh community were recruited from the Center for Behavioral Decision Research subject pool. Each session had between ten and eighteen participants. Participants were randomly assigned sequential ID numbers that were unknown to other participants. The ID numbers determined subjects' roles.

[7] That is, we could have created richer contexts for the decisions faced by our subjects, by associating some environments more closely with "helping a victim" or using terms like "volunteering" or "donations." Instead, we follow Smith (1976) to try to create environments that eliminate such realism for the sake of more precise control over valuations.

All participants jointly listened to initial instructions, which were read aloud (sample instructions are provided in the Appendix). Subjects were told that they would be paid $5 in cash at the end of the experiment, and that they might also receive an additional sum of money in cash at that time. Participants were informed that they would be split into two rooms, based on whether they had an odd or even participant ID number, and that each odd-numbered participant (dictator) would make a decision that would affect an even-numbered participant (recipient), but that even-numbered participants would not make any choices that affected the odd-numbered participants. They were asked not to communicate with others and to raise their hand if they had any questions during the experiment. Participants were assured that their choices throughout the experiment would be anonymous. Experimenters then took even- and odd-numbered participants into separate rooms. Once separated, participants were instructed to read the informed consent document carefully. The consent ensured that no participant had any prior medical issues, such as frostbite, that would interfere with their participation in the experiment.[8]

Dictators completed two main choice tasks: an allocation of $6 (money) and an allocation of 60 seconds of ice-water immersion (harm). A research assistant, who was unaware of the experimental hypotheses, guided the dictators through the instructions by reading them aloud and asking for any questions. Dictators were told that they would make two decisions, and that only one would count based on the outcome of a fair coin flip. Dictators first received instructions for one of the two tasks—money or harm—made decisions in that context, and then received instructions for the other context. Both dictators and recipients received detailed instructions describing both of the allocation tasks.

In the *money* allocation choice, dictators divided $6.00, in 50-cent increments, between themselves and their paired recipients. On the same page as the instructions, dictators wrote the amount of money they allocated to the other person, as well as the amount they allocated to themselves.[9] If the money task was selected at the end of the experiment, then the paired recipient was informed about the money shared with him or her by the dictator, and paid this amount in cash. The corresponding dictator received the remaining payment in cash privately.

[8] One participant, upon reading the informed consent, decided to discontinue his participation. This participant, who was in the role of dictator, and the participant's matched receiver are excluded from the data.

[9] The instructions reminded subjects that the two amounts had to sum to $6. If the amounts did not, the specified allocation to the other was implemented and the dictator received the remainder.

In the *harm* allocation choice, dictators divided 60 seconds of time spent with a hand immersed in ice water, at a temperature of 3-5 degrees Celsius, in 5-second increments. Prior to completing this allocation decision, dictators were called one-by-one into a separate room and submerged their hand in a bucket of ice water for 5 seconds. They were told that recipients would similarly experience a 5-second trial immersion. This was done to ensure familiarity with the discomfort of the experience.[10] Dictators then privately completed their allocation decisions, by specifying the amount of time of ice water immersion they allocated to the other person and to themselves. They were informed that if the harm choice were to be selected to count at the end of the experiment, the associated dictator and recipient would separately experience the specified amount of ice-water immersion determined by the dictator's allocation choice.

At the end of the experiment, after making both the allocation decisions for money and harm, dictators completed a second-price auction where the lowest bidder in a session received a payment (determined by the amount bid by the second-lowest bidder) to immerse his or her hand in ice water for 60 seconds. We use the bids in this auction to identify each subject's valuation, measured as the minimum Willingness to Accept (WTA), for the ice-water immersion experience and to control for possible heterogeneity in the disutility from this experience.

In the other room, a different experimenter guided receivers (even-numbered participants) through their instructions. Receivers were informed about the two allocation decisions being completed by dictators, one at a time. After learning about the harm task, receivers experienced 5 seconds of immersing their hand in ice water and then participated in the second-price auction to determine their minimum WTA for 60 seconds of ice-water immersion. Receivers also provided expectations about the dictators' allocation decisions, though they were not provided any monetary incentives for accuracy.

After all of the dictators completed their choices, the second-price auction, and a follow-up questionnaire, the experimenter flipped a fair coin and allowed each dictator to call the coin in the air. Dictators were told ahead of time that if they called it correctly the money allocation would count and, otherwise, the harm allocation would be enforced. A record of each dictator's decisions and the result of the coin flip was transferred to the receivers' room, and the receivers were given the allocations of either money or ice-water immersion produced by their paired

[10] A study by Mitchell, MacDonald, and Brodie (2004) found the smallest differences in pain tolerance between men and women at 3 degrees Celsius. Most men and women rated this experience between a 45 and 90 on a visual analog scale ranging from 0 (no discomfort) to 100 (worst discomfort possible).

dictators. Dictators were then taken into a separate room, one at a time, to receive their allocations. For money allocations, participants were paid immediately in cash. For harm allocations, participants submerged their hand into an insulated water cooler containing water and ice maintained at a temperature between 3-5 degrees Celsius. Time was calculated using a digital stopwatch. In the case of receivers, each individual was shown the result of her assigned dictator's choice and the outcome of the coin flip, and received the requisite allocation in the presence of the other receivers so that they could leave quickly. The anonymity of the dictator was not compromised by this procedure.

In total, we collected choices from 108 participants, or 54 dictator-receiver pairs. Twenty-six of the dictators (48 percent) were female. Twenty-six of the dictators completed the money allocation first, while the remainder completed the harm allocation first.[11]

B. Results

For the analysis below, we transformed each allocation decision made by a dictator into a Generosity Index (G_i). For the money allocation, G_i^M is equal to the proportion of the total monetary endowment that was *given* to the other participant. For the harm allocation, G_i^H is equal to the proportion of the total time of ice-water immersion *kept* for oneself.

In contrast with the null hypothesis, dictators were, on average, much more generous in their nonmonetary divisions of harm than when dividing money, with mean $G_i^H = 0.48$ ($SD = 0.28$) and mean $G_i^M = 0.30$ ($SD = 0.20$). This difference is significant in a paired-samples t-test for differences in means ($t\,(53) = 4.27$, $p < 0.0001$).

Figure 1 presents the empirical cumulative distributions of G_i for each condition. The proportion of entirely selfish ($G_i = 0$) behavior is slightly higher for money than for harm (17% and 13%, respectively) and the proportion of people distributing the money or harm equally is lower for money than for harm ($G_i = 0.5$, money: 35%, harm: 41%). Overall, there is more

[11] Prior to conducting this experiment, we ran a small pilot study. Procedures were similar except for small differences in methods: each participant was both a receiver and a dictator, participants did *not* experience the cold water before making their allocations, and willingness to accept was not elicited. Twenty-four members (11 females) ages 18-61 years ($M = 27$ years, $SD = 10.9$ years) of the Pittsburgh community were recruited for this experiment. Most of the participants (58%) took more than half of the money for themselves with the remainder splitting the money equally. In contrast, a minority (29%) gave the other person more than half of the pain; most (58%) split the pain equally; and a few (13%) took more than half of the pain on themselves. The data were consistent with our alternative hypothesis: participants were on average more generous in their divisions of time putting one's hand in ice water ($M = 0.48$, $SD = 0.16$) compared to their divisions of money ($M = 0.34$, $SD = 0.19$).

generous behavior in the harm context than for money. Most strikingly, while only one person (2%) gave more than half the money, 16 people (30%) kept more than half the harm.

Figure 2 presents the joint distribution of generosity in the money and harm contexts, by subject. The horizontal axis corresponds to possible degrees of generosity in the sharing of harm (G_i^H), while the vertical axis corresponds to generosity in the sharing of money (G_i^M). The size of each marker indicates the number of subjects represented by that data point. The two most frequent joint outcomes correspond to subjects dividing equally in both contexts ($G_i^H = G_i^M = 0.5$, 12 cases or 22%) and to subjects behaving completely selfishly in both contexts ($G_i^H = G_i^M = 0$, 6 cases or 11%). Overall, twenty-two subjects (41%) made the same decision both times. Among those subjects who changed their behavior across contexts, twenty-five (46%) were more generous when allocating harm than money and only seven (13%) were more generous for money than harm.[12] A chi-square test indicates that this asymmetry in proportions is unlikely given a null-hypothesis of equality of distributions ($\chi^2(2) = 8.44$, $p = 0.015$).

Combining the above observations yields our first main finding regarding the relative degrees of generosity in monetary allocations and those involving harm:

> *Result 1: Dictators are typically more generous when allocating harm than when allocating money.*

Thus, consistent with our alternative hypothesis, we find a different pattern of behavior in the domain of nonmonetary allocations of harm than in the standard monetary Dictator game. The fact that generosity is greater in the allocation of harm is consistent with earlier psychological studies, in which people were highly generous in taking on harm. Moreover, this suggests that identifying the degree of generosity in monetary domains may not allow a direct extrapolation to generosity in other, non-monetary, contexts such as the allocation of harm.

Of course, one important consideration in interpreting the above result is that we assume that participants find immersing one's hand in ice water unpleasant, rather than enjoyable. There are at least three reasons to think that this is, in fact, the case. First, the aggregate distributions of choices seem inconsistent with the interpretation that dictators simply keep more time because they believe it is enjoyable. For example, only three subjects (6%) keep

[12] The fact that 22 of 54 subjects behaved consistently across contexts means that the change in behavior among those subjects who do not behave consistently is larger than the aggregate analysis suggests. When looking only at this subsample, mean $G_i^H = 0.60$ ($SD = 0.25$) is over twice as high as mean $G_i^M = 0.29$ ($SD = 0.18$).

all the time for themselves, which is considerably lower than the proportion of purely selfish behavior in the monetary context (9 subjects, or 17%). Moreover, among the 9 subjects who are completely selfish in the monetary dictator game 6 (67%) also give all the ice-water time to the recipient (see Figure 2), suggesting that this is an appropriate interpretation of self-regarding behavior. Second, if dictators believed the ice-water-immersion task to be enjoyable, then we would expect them to require zero compensation for the experience. Only two dictators gave WTA values of $0 in the second-price auction, and dictators had a mean WTA in dollars for immersing their hands in ice water for sixty seconds of $5.91 (*SD* = 7.92), which differs significantly from zero (t (53) = 5.48, $p < 0.001$), and a median WTA of $4.25.[13] Hence, for an overwhelming majority of dictators, the experience seems to be aversive. Third, the relationship between WTA values and generosity in allocating harm is weak, at best, and does not account for the difference in generosity between contexts. Figure 3 shows the relationship between an individual dictator's WTA and that individual's generosity in the allocation of harm. Participants who viewed the ice water experience as more aversive, as indicated by a greater WTA, were only slightly less generous in their allocations of harm.[14] Thus, most dictators seemed to find the ice-water-immersion experience aversive and the degree to which they did so had little relationship with their decisions of how to allocate harm between themselves and the recipient.

To more precisely test for differences between the monetary and harm allocations, we conducted the regressions reported in Table 1. In each model, the measured generosity (G_i^H or G_i^M) is the dependent variable. The primary explanatory variable is whether the allocation involved money (0) or harm (1). The first model accounts for individual differences by including subject fixed effects. To account for the role of individual characteristics and circumstances in generosity, the second model does not include fixed effects, but instead introduces individual-specific explanatory variables, including the order in which the dictator saw the two choices (either money then harm (0) or harm then money (1)), an interaction term between context and order, individual-specific controls for gender, age, and valuation of the ice-water immersion experience (WTA). Finally, Model 2 also includes the interaction between WTA and harm

[13] Consistent with earlier research (Mitchell, MacDonald, and Brodie, 2004), we find that men (mean WTA = 4.45, SD = 5.24) find the experience less aversive than women (mean WTA = 7.49, SD = 9.80), though this difference is not statistically significant (t(52) = 1.42, p = 0.16)..

[14] The OLS coefficient obtained in a regression of Gi^H on WTA is -0.0072 (s.e. = 0.0047) and is not statistically significant (t (52) = 1.52, p = 0.134). The relationship between WTA and G_i^H is even weaker when we remove the one outlier (WTA = $50). In this case, there is a small positive, but statistically insignificant, correlation between WTA and G_i^M.

context, to account for the fact that WTA for the harmful experience may partly account for allocation behavior in that context. This model also includes robust standard errors, clustered by subject. Model 3 replicates Model 2, but excludes the two dictators who provided WTA values of $0, perhaps indicating that they did not find the ice-water immersion task aversive.

Across Models 1 through 3, we find that generosity is greater in the harm context, and that this is robust to order effects and when controlling for individual characteristics. Model 3 shows that this relationship holds equally strongly using only subjects who require monetary compensation for additional time in the ice-water immersion task. While Models 2 and 3 indicate that subjects who are willing to accept less for ice-water immersion experience also appear more generous, this is driven mainly by the one WTA outlier of $50—Model 4 shows that omitting this observation makes the coefficient on the Harm context X WTA interaction term statistically insignificant. Thus, this regression analysis supports Result 1. Consistent with the alternative hypothesis, subjects appear to be much more generous in the allocation of harm than in allocating money, even after accounting for their valuation of harm.

We now turn to our second research question, which deals with the relationship between an individual's generosities across the two allocation contexts. Figure 2 reveals little apparent relationship between a dictator's allocation of money and harm for most subjects. As we note above, only twenty-two "consistent" subjects (41%) made the same decision for harm and money. Moreover, the correlation between generosity for harm and money is not statistically significant ($r = 0.143$, $t\,(52) = 1.044$, $p = 0.301$).[15] Thus, we have our second main result:

> *Result 2: We find no significant relationship between an individual's generosity in allocating harm and money.*

This result suggests that a single social preference cannot account for the majority of individual subjects' behavior in the two contexts. Instead it appears that most subjects approach the two decisions differently, in a way that is not easily predicted across domains.

C. Discussion

Experiment 1 provides evidence that people act more generously in a non-monetary harm context than in a standard monetary dictator game. The experiment satisfies many of the

[15] The correlation was also not significant using correlation between ranks: Spearman's $\rho = 0.056$, $p = 0.69$.

conditions necessary to conduct a test of generosity across contexts. It uses identical populations and choice elicitation procedures for measuring generosity in the two contexts. Moreover, the mean WTA for 60 seconds of ice-water immersion provided by all subjects, dictators and recipients, is \$6.42, which is close to the monetary amount to be allocated in the dictator game (\$6). Hence, on average, subjects find the valuations of relative outcomes comparable in the two contexts. Moreover, there is no significant difference in the valuations of dictators and recipients—the mean WTA for dictators is \$5.91 (*SD* = 7.92) and for receivers it is \$6.93 (*SD* = 10.50).[16] While there is heterogeneity in how much dictators dislike the ice-water immersion task, the regression analysis shows that this cannot account for the differences in generosity.

However, the test in Experiment 1 is not perfect, in that there are other possible interpretations for the differences in behavior. For starters, the comparison is between one highly familiar allocation medium (money) and a highly unfamiliar one (ice-water immersion). In addition, this comparison changes two things at once, by comparing a positive monetary endowment ($\Delta w > 0$) with a negative non-monetary one ($\Delta w < 0$). Moreover, even if dictator's monetary valuations for 60 seconds of ice-water immersion do not explain the behavioral difference, non-linearity in how dictators value, or expect to value, different segments of the total 60-second allocation might nevertheless explain some change in behavior. For example, dictators may believe that the first 30 seconds are much easier to bear than the second 30-second interval. Additionally, even if dictators' own valuations do not account for the behavioral change, their beliefs about how much recipients dislike the task may be important. Hence, a more appropriate comparison should attempt to compare monetary and non-monetary contexts that utilize similarly familiar reward media, hold constant whether the allocation is a gain or a loss, and use allocations more commonly known to be comparable in value and that generally have linear valuation in terms of each other.

IV. Experiment Two

Our second experiment extends the design of Experiment 1 to determine the robustness of our findings, to provide a comparison that holds more features of the two contexts constant, and also to obtain a better understanding of what elements of the money-versus-harm allocation contexts drive the differences in observed generosity. In particular, we separate the effects of

[16] The 95% confidence interval for the difference in means includes zero (t (106) = 0.57, p = 0.57).

monetary versus non-monetary allocations from the effects of allocating welfare gains versus losses. To test robustness, we use a different subject population, employ slightly different procedures and, most importantly, use a different medium in the non-monetary context. To hold important factors constant, we use a non-monetary medium, time, that is familiar to subjects, that shares many properties with money, and for which conversions into money are often linear. We also elicit more precise measures of individual valuations and beliefs about others' valuations.

A. Experimental Design

Experiment 2 includes the kinds of allocation choices from Experiment 1—money versus harm—but also extends the studied contexts in a 2 X 2 design that independently varies two features of the context. The first feature involves varying whether the allocation is monetary or non-monetary, while the second involves whether the allocation involves a positive or negative change to subjects' initial endowments.

We conducted the experiment using a different population, in Zurich, Switzerland. Subjects began the experiment with an initial monetary endowment of 45 Swiss Francs (CHF). They also began with the requirement that, at the end of the experiment, they would have to spend 30 minutes of waiting time, sitting in an isolated booth, performing a tedious, repetitive task on a computer.

Through the dictator allocation choices, subjects' wealth and waiting time could increase or decrease. More precisely, we considered four contexts in which dictators allocated either a gain or a loss from the initial endowments:

- In the *Monetary-Positive (M+)* allocation, dictators allocated a gain of CHF 20, in CHF 1 increments, between themselves and their paired recipients.
- In the *Monetary-Negative (M-)* allocation, dictators allocated a loss of CHF 20, in CHF 1 increments. The principal difference between these first two treatments, therefore, dealt with whether the units allocated increased or decreased subjects' earnings beyond the CHF 45 initial wealth.
- In the *Non-monetary-Positive (NM+)* allocation, dictators decided how to divide a total of 20 minutes of gained free time between themselves and their paired receiver in 1-

minute increments.[17] This gained free time reduced the initial 30-minute waiting time period.

- In the *Non-monetary-Negative (NM-)* allocation, which is the most comparable to the harm condition from Experiment 1, dictators decided how to divide a total of 20 minutes of additional waiting time between themselves and their paired receiver in 1-minute increments. This additional waiting time increased the initial 30-minute waiting time period.

Each dictator made all four of the above allocation decisions, the order of which was counterbalanced by session. Specifically, each dictator saw, first, either the two monetary or non-monetary allocations, with the order of positive and negative counterbalanced in half the sessions. Then, dictators saw the two other types of monetary or non-monetary allocations, again with positive and negative counterbalanced. More precisely, there were four treatment orders: M-/M+/NM-/NM+, M+/M-/NM+/NM-, NM-/NM+/M-/M+, and NM+/NM-/M+/M-, which varied by session.

Subjects were told that at the end of the experiment, one of the four allocation decisions for each dictator-receiver pair would be randomly chosen (with equal probability) and fully executed by the experimenter. That is, for each pair, the pair's wealth would either increase (*M*+) or decrease (*M*-), or their waiting time would increase (*NM*-) or decrease (*NM*+) according to the allocations specified by the dictator. Participants knew that each dictator would make decisions that would affect himself and his assigned receiver but that receivers would not make any choices that affected any dictator.[18] Participants were assured that their decisions throughout the experiment would be kept anonymous.

After making all allocation choices, dictators and receivers completed second-price sealed-bid auctions to elicit their minimum WTAs for different additional amounts of waiting time. Specifically, each subject had to submit a bid for each of four additional waiting time amounts—of 5, 10, 15 and 20 minutes. In each session, we conducted separate auctions among

[17] We established a CHF 1 to 1-minute mapping across the contexts based on the results of a pilot session, in which subjects stated their willingness to accept additional increments of time spent performing the waiting task in exchange for money, in a second-price auction. The results showed an approximate average conversion of 1 to 1. The usual hourly payment for active participation in experiments is approximately CHF 25-30 for this subject pool. The higher monetary equivalent for time spent performing this particular task likely reflects its highly boring and tedious nature.

[18] While dictators made each allocation decision, receivers reported what they believed their paired dictator would allocate. Their guesses did not affect outcomes for them or any dictators and were therefore not incentivized.

dictators and receivers, so they could not affect one another through their bids. When participants stated their WTAs for spending additional amounts of waiting time, they were not yet informed of any choices or outcomes from the dictator games. Thus, they did not know which decision was selected to count, how long they would wait at the end of the experiment, nor how much their payoff would be. Within each group—dictators or receivers—one of the four additional waiting times was randomly selected, and the participant who bid the most for that waiting time was paid the second-highest bid and had the selected time added to his or her waiting time at the end of the experiment.

We then asked participants to guess the median bids, for each of the four possible amounts of additional waiting time, entered by the other group—i.e., dictators guessed the median bids for receivers, and vice versa. Thereafter, the computer randomly selected one of the amounts, calculated the median bid for each group, and participants received an additional CHF 2 if their guess was within +/- 1.0 of the actual median for the other group. These bids and estimates provide us with information on subjects' valuations of different increments of waiting time, and of their beliefs of other subjects' valuations.

Finally, participants answered several socio-demographic questions and were then informed by their computer screen of the outcomes for the selected dictator game and auctions. The screen showed them their total accumulated earnings and waiting time.

At the end of the experiment, we executed the waiting time phase. We did not want subjects to learn when other subjects left the experiment, since this would provide information on dictators' allocations. Therefore, during the waiting time, all participants were required to wear headphones, which played sounds like rainfall and white noise. They were also seated in cubicles that were surrounded on three sides by partition walls and on the fourth side by a dark curtain. This meant that they could neither detect when someone else was leaving the experiment, nor could they observe which cubicles were empty as they left. The experimenter collected participants' personal possessions and phones upon arrival and subjects had no access to the internet at any point in the experiment. During the waiting time, subjects saw a blank screen. Every 20 seconds, a button appeared somewhere on the screen and the subject had to click on the button within 10 seconds in order for the timer to count down that 30-second interval. Otherwise, a warning message appeared telling the subject that the waiting time had not decreased. Once a subject's waiting time expired, the experimenter came to that subject's

cubicle, handed the subject his or her belongings, led the subject out of the laboratory, and privately paid the subject.

To give participants experience with the precise task to be performed during the waiting time, all participants experienced one minute of the waiting time activity at the beginning of the experiment. At this point, subjects were given the option of leaving the experiment if they were not willing to perform this activity for longer periods at the end of the experiment.

We recruited a total of 188 participants from the subject pool of the University of Zurich and the Swiss Federal Institute of Technology Zurich. We ran a total of eight sessions, two of each choice order, with 22 to 24 participants each. At the beginning of each session and before entering the laboratory, participants drew a random number, which directed them to a private cubicle in the laboratory. Participants entered privately, one at a time, placed their possessions in a bag that they handed to the experimenter, and then entered their curtained cubicle. They remained in their private cubicle for the whole experiment. All instructions were displayed to the participants on their computer screen and broadcast via the audio system in the laboratory.[19] Instructions were read for each decision separately (see Appendix). Fifty-three of the dictators (56%) and fifty of the receivers (53%) were male. Participants came from a wide area of academic disciplines. The mean age was 23.1 years, ranging from 18 to 44 years.

B. Results

Following the analysis in Experiment 1, we transformed the allocation decisions made by each dictator into four Generosity Indices (G_i): Monetary-Positive (G_i^{M+}), Monetary-Negative (G_i^{M-}), Non-monetary-Positive (G_i^{NM+}), and Non-monetary-Negative (G_i^{NM-}). Figure 4 shows the cumulative empirical distributions for generosity in each context. Table 2 provides summary statistics of the degree of generosity across different contexts.

We again see that generosity varies across contexts. Consistent with Experiment 1, generosity is greater in the allocation of harm than in the allocation of positive wealth changes ($G_i^{NM-} > G_i^{M+}$). The difference in means (0.10) is smaller than in Experiment 1 but still statistically significant (t(93) = 3.54, p = 0.001). Moreover, while only 29 percent of subjects

[19] Our design thus creates a Highly Replicable Laboratory Environment (Bartling, Engl & Weber, 2014), in which subjects receive identical instructions (on the screen and via pre-recorded audio files) across sessions. This also facilitates direct replication by other researchers.

exhibited generosity of at least 0.5 when making a positive monetary allocation, 44 percent did so when allocating harm.

The results of Experiment 2 also indicate that the main factor responsible for the difference in generosity between monetary gains and non-monetary harm is the monetary versus non-monetary dimension, rather than whether the allocation involves a gain or a loss. Subjects are more generous in both non-monetary domains, where mean generosity across positive and negative allocations ($G_i^{NM} = 0.35$), is higher than in the positive and negative allocation of money ($G_i^{M} = 0.24$). However, there is little difference in generosity within the monetary and non-monetary contexts, based on whether the allocation involves a gain or a loss relative to the status quo.

Table 3 reports regressions that explore how generosity changes across contexts. The dependent variable is the generosity exhibited in a particular context, and the first two explanatory variables identify each of the treatment dimensions, relative to the omitted context, Monetary-Positive, and the third explanatory variable measures the interaction between these treatment variables. Model 1 accounts for individual differences through subject-specific fixed effects, while the remaining models do so through controls and clustered standard errors. Across all models, the effect of non-monetary context is positive and statistically significant, indicating that subjects are more generous in non-monetary contexts than in monetary ones. The coefficients for the Negative frame and for the interaction term are smaller and never statistically significant, indicating that the positive vs. negative distinction has little effect on behavior.[20]

Looking at individual behavior, twenty-four of the 94 dictators exhibited identical generosity across all four contexts. Nine of these subjects allocated equitably across all decisions ($G^i = 0.5$), while seven behaved entirely selfishly ($G^i = 0.0$).[21] Thus, as in Experiment 1, an overwhelming majority of subjects who were consistent were either entirely egalitarian or selfish. Also as in Experiment 1, among those subjects who were inconsistent, more subjects, 26 (37%), were always more generous in non-monetary contexts than in monetary ones, relative to 9

[20] To test the difference in generosity between the positive monetary allocation (G^{M+}) and the allocation of harm (G^{NM-}), reflecting the comparison in Experiment 1, we test the restriction that the first three coefficients in Model 1 sum to zero. This restriction is rejected ($F(3,278) = 13.79$, $p = 0.000$).

[21] Of the remaining eight subjects, seven consistently allocated amounts between $G^i = 0.05$ and $G^i = 0.4$ and the remaining subject always acted very generously ($G^i = 0.95$).

(13%) who were always more generous in monetary contexts. The higher frequency of the former category is unlikely to result from chance ($z = 2.87$, $p < 0.01$).

Model 2 adds a variable, Order, which measures the position within a session during which a particular choice was faced. This has a negative and statistically significant coefficient. That is, generosity appears to decrease over the course of a session.[22] While the coefficient for non-monetary is nevertheless statistically significant in this regression, even when controlling for order, there is still the possibility that order effects somehow drive the main results. To address this possibility, we consider the degrees of generosity exhibited in the first decision confronted by a subject, before that subject has familiarity with any of the other allocation contexts. In this between-subjects comparison, we observe a similar pattern to that above—subjects are more generous in the non-monetary choice contexts than in the monetary ones ($G^{M+} = 0.30$; $G^{M-} = 0.20$; $G^{NM+} = 0.39$; $G^{NM-} = 0.44$), with the aggregate monetary versus non-monetary comparison being significant ($G^{M} = 0.25$; $G^{NM} = 0.41$; $t_{(92)} = 3.73$, $p < 0.001$).

Models 3 through 5 replace subject fixed effects with subject random effects and control for individual characteristics. Specifically, we include gender, age, whether the subject reports having donated money in the past year, a binary variable indicating whether the subjects' self-reported wealth is above or below the median of all subjects, a binary variable indicating whether the subject knew any other subjects in the session, and a binary variable indicating the subject attends religious service. The coefficients for these variables indicate that older subjects and subjects who reported making charitable donations exhibit greater generosity.

In Model 4, we add a measure of the personal disutility from waiting time. Specifically, we include the subjects' stated willingness to accept for 20 minutes of additional waiting time at the end of the experiment, elicited in an incentive-compatible second-price auction. We also

[22] Looking more closely at the data, it appears that there is an interesting potential explanation for this relationship. The effect of Order is largely confined to the nonmonetary contexts, with subjects who encounter non-monetary decisions in the first half of the experiment acting much more generously ($G_i^{NM} = 0.42$) than subjects who make nonmonetary decisions in the second half of the experiment ($G_i^{NM} = 0.27$), after they have experienced monetary allocation contexts. While both of these are higher than the generosity in monetary contexts in both the first half ($G_i^{M} = 0.23$) and second half ($G_i^{NM} = 0.25$) of the experiment, the difference for the second half is quite small, and statistically insignificant. Looking even more closely, it seems that the big change in behavior for the non-monetary contexts occurs between the second ($G_i^{NM} = 0.43$) and third ($G_i^{NM} = 0.29$) decisions. Recall, from our design, that subjects making non-monetary decisions as their second decision had not yet made any monetary decisions, while subjects making non-monetary decisions as their third decision had seen both monetary decisions. Therefore, a speculative interpretation of this finding is that the lower generosity exhibited in the monetary context spills over into the non-monetary decisions, but not vice versa. Of course, these observations are entirely post hoc and should be interpreted cautiously. However, they are consistent with research we reviewed earlier indicating that priming people to think of money changes their social behavior in non-monetary contexts (Vohs, Mead and Goode, 2006).

include the interaction of this variable with non-monetary context, to see if it accounts for behavior in one context more than in the other. Subjects who provide higher WTA values—indicating a greater disutility from the waiting time in terms of money—are less generous. While statistically significant, the coefficient is small. Moreover, this does not explain behavior significantly better in the non-monetary context, nor does it reduce the significance of the non-monetary treatment effect.[23] Finally, in Model 5 we add as an explanatory variable how much compensation dictators thought the median receiver would require for 20 minutes of additional waiting time. This also does not account for the non-monetary treatment effect, indicating that it is not dictators' beliefs about how unpleasant receivers would find the waiting time experience that explains the change in generosity across contexts.

Result 3: Dictators are typically more generous in non-monetary allocations than in monetary allocations.

As we note earlier, the quality of our design depends on some important assumptions regarding the valuation of the non-monetary allocation context relative to the value of money. First, it is necessary that dictators perceive the additional waiting time as unpleasant, otherwise they might appear to act "generously" when, in fact, they are taking on more waiting time because they (expect to) enjoy it. In fact, every dictator gave at least one WTA value higher than CHF 0 for at least one of the four possible additional waiting time amounts, and 92 of 94 dictators (98 percent) indicated a positive WTA value for all possible time intervals. Hence, on average, dictators require additional compensation for waiting time. Table 4 summarizes the mean and median marginal WTA values provided by dictators for the different possible additional waiting time intervals. Specifically, for each time interval, we subtracted the WTA value provided by a subject in the second-price auction from the value for the previous interval. The values tend to be large and positive, again indicating that subjects perceived waiting time as unpleasant.

[23] In additional regressions, not reported here, we also included variables for the marginal willingness to accept for each additional 5-minute interval—e.g., the marginal increase in WTA for 0 to 5 minutes, 5 to 10 minutes, 10 to 15 minutes and 15 to 20 minutes. We include these variables both separately and jointly. While they vary in their significance, they do not substantively change the magnitude or statistical significance of the non-monetary treatment variable. We also elicited a qualitative self-report measure of how unpleasant subjects believed the waiting time experience would be. This variable does not predict generosity—neither on aggregate nor in the non-monetary condition-and its inclusion does not change the other results.

Second, for direct comparability between the monetary dictator game and the non-monetary allocation context, it is desirable that the relationship between money and waiting time be fairly linear. Table 4 shows that the relationship between marginal WTA for each additional 5-minute waiting time interval is fairly constant, and close to a one-to-one relationship. For example, the median WTA values for every time interval are very close to 5. Model 1 in Table 5 presents a regression of the dictators' marginal WTA values on time interval (e.g., on column in Table 4). The time interval coefficient is statistically indistinguishable from zero. Moreover, the constant does not statistically differ significantly from five. That is, we fail to reject that all marginal WTA values for 5-minute intervals equal 5 CHF. Therefore, we conclude that our design did a fairly good job of producing two contexts in which dictators perceive the valuation to be fairly linear and close to one-to-one.

Third, it is also necessary for dictators to believe that receivers also find the waiting time unpleasant. Recall that dictators also predicted the median WTA values provided by receivers, with incentives for accuracy. No dictator ever guessed a value of zero for any of the WTA estimates, indicating that they always believed the median receiver would require compensation for waiting time. The final row of Table 4 presents the mean marginal WTA estimated form these guesses, for each additional 5-minute time interval. This row shows values that are, again, far from zero and generally close to 5. Model 2 in Table 5 estimates whether there is a significant trend in these value estimates, again finding both a statistically insignificant time trend and a constant statistically indistinguishable from 5. Hence, it appears that dictators, on average, believe receivers also have linear valuations that are close to one-to-one.

One more observation from Table 4 is worth mentioning. Note that, where the dictators' WTA values and their estimates of the receivers' WTA differs, it tends to be that dictators perceive receivers to place *lower* cost on waiting time, relative to the value of money, than dictators themselves. Thus, this goes against the notion that dictators are more generous in the non-monetary context because they believe receivers suffer more from additional waiting time.

Finally, we consider the additional question of whether one can predict a subject's generosity in one context by her behavior in another. Figure 5 shows the pairwise distributions of measured generosity across all treatment combinations in our experiment. Visual inspection suggests more observations along the 45-degree diagonal when comparing the two non-monetary allocation contexts than in most other cells. Table 6 presents the correlations between observed

degrees of generosity in the four contexts. Consistent with our observation from Figure 5, the correlation is very large and statistically significant for the gain and loss allocation decisions in the non-monetary context. Moreover, the two allocation decisions within the monetary contexts are also significantly positively related. Thus, one can predict how well an individual will share in one (non-)monetary context by how much that individual shares in another (non-)monetary context. The remaining four correlations are statistically significant, but roughly half as large. Thus, when predicting generosity across contexts, the explanatory power is lower when the monetary vs. non-monetary nature of the context changes.

Recall that 24 of the 94 dictators never change their behavior across any of the four contexts. To study the extent to which the positive correlations in the top panel of Table 6 are driven by subjects who never change their behavior, the second panel considers only those subjects who were inconsistent in their generosity at least once. That is, given that a subject exhibited different generosity in at least two different contexts, how well does generosity in one context predict behavior in other contexts. The correlations within monetary and non-monetary contexts are again positive and statistically significant. But, the relationship is much weaker in both magnitude and statistical significance when comparing across monetary and non-monetary contexts, with correlations always positive but never exceeding 0.20. Hence, among those subjects who change their behavior, there is little ability to explain how much they share in a monetary context based on how much they share in a non-monetary context.

To get a better sense of how individual choices varied across contexts, we conducted exploratory analyses of co-variation in choices in two ways. First, we conducted a principal components analysis of the four generosity measures. We retained the two factors that explained the greatest variance, which jointly account for 89 percent of the variance. Each of these factors has an eigenvalue of at least 0.98. As seen in Table 7, these two factors roughly correspond to monetary and non-monetary allocations. Thus, a simple division of behavior in the four contexts we study, into monetary and non-monetary contexts, explains a great deal of the observed variation in behavior.

We also examined the relationship between the participants' four decisions using cluster analysis. This approach attempts to determine whether there exist different patterns of decisions across the four contexts that cannot be captured purely by linear regression. We employed k-means clustering in Stata. We allowed for both three clusters (k=3) and four (k=4). In both cases,

the distribution of subjects is roughly evenly divided across the clusters. Figures 6 shows the mean amount of generosity, in each context, for subjects classified into a particular cluster. In both panels, Cluster 1 corresponds to subjects who dramatically change their behavior across monetary and non-monetary contexts, acting much more generously in the latter. These subjects comprise 20 to 30 percent of the sample and appear to be the primary drivers of our main results. The subjects in the remaining clusters are generally stable in their degree of generosity across contexts, but vary in how generous they were. Hence, consistent with our earlier analyses of consistent and inconsistent subjects, we observe heterogeneous subject behavior—many subjects do not systematically change their behavior across contexts. But, those who change their behavior do so quite dramatically.

V. Discussion

Economists have devoted considerable attention to studying generosity in monetary allocations. However, notwithstanding the importance and prevalence of other-regarding behavior in individuals' decisions regarding non-monetary allocations, often in the allocation of harm, there is a surprising paucity of carefully controlled economic studies in this domain.

Here, we explored this topic by extending the existing experimental dictator-game paradigm into this understudied realm. The reliance on this workhorse of experimental economics allows us to explore allocation decisions across contexts in a controlled and well-understood framework. It also allows us to calibrate our results to earlier work, demonstrating that the generosity observed in our monetary contexts is similar to that found in previous laboratory research (Camerer, 2003, Chapter 2; Engel, 2011; Cooper and Kagel, forthcoming)

While allocations of money were similar to what has been observed in the literature, we found generosity to be considerably higher in non-monetary contexts. Participants in Experiment 1 were substantially more generous when allocating harm compared to money. Experiment 2 more carefully controls for familiarity and valuations across contexts, and again finds that allocations in non-monetary contexts are significantly higher. Pooling data across both experiments, we estimate a mean generosity that is over 50 percent higher in non-monetary ($G_i^{NM} = 0.40$) than monetary ($G_i^{M} = 0.26$) contexts.

The observation that individuals are relatively generous when allocating non-monetary harm is consistent with related psychological experiments measuring generosity in different

domains (Batson, *et al.*, 1988; Schaller and Cialdini, 1988). However, these prior studies are not directly comparable to the large literature on monetary allocations using the dictator game, and have large methodological differences. Our study demonstrates high generosity in non-monetary allocation decisions using the types of controlled, abstract environments employed in experimental economics. In making comparisons of behavior across contexts, we keep basic choices as similar and comparable as possible, varying little else beyond the medium in which the allocation is being made. We also employ a within-subjects design, to make comparisons across contexts even more direct.

Importantly, our main result also addresses the argument that standard monetary dictator games may overstate the degree of generosity outside the laboratory (Levitt and List, 2007). This conclusion is suggested by experiments that change features of the dictator game to yield less generosity (Cherry, Frykblom and Shogren, 2002; List, 2007). In contrast, we find that a version of the dictator game that changes the resource allocated yields considerably higher generosity. This suggests that the vast literature on dictator games using monetary allocations may *underestimate* the degree of generosity in some naturally occurring contexts.

Our data also reveal that the link between a given individual's generosity across domains is somewhat weak. A minority of participants have perfectly consistent preferences across contexts. For example, in Experiment 1, 41 percent of subjects exhibited perfect consistency between the two decisions, while in Experiment 2, 26 percent did so. However, for those subjects whose behavior changes across contexts, the relationship is very small when one compares monetary and non-monetary contexts. Hence, the idea of a social preference type—whereby a subject displays similar degrees of generosity across different, but comparable, contexts—may only partially account for individuals' tendencies to act generously. In particular, some individuals may change their behavior across contexts in a manner that is difficult to explain with a single social preference function.

What do these results mean for theories of social preferences? At one extreme, researchers have attempted to model all social preferences under a single parametric model, meaning different contexts can be exactly equated given a few individual-specific but context-independent parameters. That is, under this approach, there is a single social preference for each person, and all other-regarding decisions for this person are predictable once this preference structure is known. The evidence above suggests that this approach may have limited descriptive

value across contexts. At the opposite extreme, if each participant's behavior in one context provides no information about behavior in other contexts, one worries that researchers might have to create a unique model for each individual for each context. In between these two extremes, perhaps behavior in one context provides partial information about behavior in other contexts. Such a model that includes some characteristics of the individual, as well as features of the context, might prove valuable in accounting for our results, and other results demonstrating instability in pro-social behavior (Krupka and Weber, 2013).

VI. Conclusion

We observe individuals' interpersonal allocation choices across different contexts. We find that generosity varies substantially across these contexts, with individuals behaving considerably more generously in non-monetary contexts, including the allocation of harm, than in those involving money. We also find that an individual's generosity is often difficult to predict across contexts, particularly with generosity in monetary contexts sometimes having little predictive power for generosity in non-monetary contexts.

Our results present a challenge for the theoretical literature on pro-social preferences. Much of economic theory relies on the presumption that a single, well-specified preference function should be able to capture behavior across large swaths of choices. Here, we observed individuals who made selfish choices in the monetary domain choosing to be rather generous in the non-monetary domain. Such behavior is not easily captured by a single, traditional preference function for altruism or equality, nor does it naturally arise in the various modified preference functions that have been suggested in the study of pro-social behavior.

Over the past few decades, economists have built up a solid theoretical, empirical, and experimental understanding of how people make choices in the context of monetary goods. However, as we seek to understand more and more of our social world, we need to account for behavior in a variety of contexts, including those that vary in the monetary versus non-monetary consequences of individuals' actions. The work here suggests that our understanding of behavior in the former kind of context, while quite useful in and of itself, may not easily account for behavior arising in other contexts. Given the ubiquity and importance of choices that occur in these alternative contexts, further developing a useful theoretical and empirical understanding seems warranted.

VII. References

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Table 1. Regressions of Generosity on Allocation Context (Experiment 1)

	(1)	(2)	(3)	(4)
	All subjects	All subjects	WTA > $0	WTA < $50
Harm context	0.184***	0.223***	0.215***	0.210***
	(0.043)	(0.063)	(0.064)	(0.074)
Order of choices (harm then money)		-0.062	-0.052	-0.061
		(0.053)	(0.055)	(0.053)
Harm context X Order of choices		0.068	0.036	0.071
		(0.086)	(0.085)	(0.085)
Female		0.025	0.029	0.025
		(0.053)	(0.053)	(0.052)
Age		0.005	0.004	0.006**
		(0.003)	(0.004)	(0.003)
WTA		0.002	0.002	0.003
		(0.004)	(0.005)	(0.006)
Harm context X WTA		-0.013***	-0.011**	-0.010
		(0.004)	(0.004)	(0.009)
Constant	0.299***	0.174*	0.191*	0.158*
	(0.030)	(0.097)	(0.104)	(0.085)
R^2	0.624	0.193	0.161	0.185
Observations (subjects)	108	108	104	106
	(54)	(54)	(52)	(53)

Dependent variable is measured generosity (G_i^H or G_i^M). Model 1 includes subject-specific fixed effects; Models 2 and 3 include subject-specific random effects and robust standard errors, clustered by subject. Model 3 excludes the one subject who provided a WTA of $50; Model 4 additional excludes subjects who provided WTA of $0. * - $p < 0.1$, ** - $p < 0.05$, *** $p < 0.01$*

Table 2. Summary statistics for generosity by context (Experiment 2)

	G_i^{M+}	G_i^{M-}	G_i^{NM+}	G_i^{NM-}
Mean	0.25	0.23	0.34	0.35
Median	0.25	0.25	0.35	0.40
$G_i = 0$	22%	24%	16%	15%
$G_i = 0.5$	28%	20%	30%	34%
$G_i > 0.5$	1%	3%	10%	10%

Table 3. Regressions of Generosity on Allocation Context (Experiment 2)

	(1)	(2)	(3)	(4)	(5)
Non-monetary	0.089***	0.089***	0.089***	0.112***	0.078**
	(0.022)	(0.021)	(0.023)	(0.034)	(0.037)
Negative	-0.021	-0.021	-0.021	-0.021	-0.021
	(0.024)	(0.023)	(0.017)	(0.017)	(0.017)
Non-monetary X Negative	0.026	0.026	0.026	0.026	0.026
	(0.033)	(0.032)	(0.020)	(0.020)	(0.020)
Order (position of allocation choice)		-0.029***	-0.029***	-0.027***	-0.028***
		(0.007)	(0.009)	(0.009)	(0.009)
$WTA_{20\ min}$				-0.002**	-0.001
				(0.001)	(0.002)
$WTA_{20\ min}$ X Non-monetary				-0.001	-0.003*
				(0.001)	(0.002)
Belief $WTA_{20\ min}$					-0.002
					(0.002)
Belief $WTA_{20\ min}$ X Non-monetary					0.004*
					(0.002)
Female			0.034	0.058	0.058
			(0.040)	(0.038)	(0.038)
Age			0.007**	0.009***	0.009***
			(0.004)	(0.003)	(0.003)
Donated to charity			0.084**	0.086**	0.086**
			(0.042)	(0.040)	(0.041)
Wealth			-0.005	0.000	0.000
			(0.043)	(0.043)	(0.043)
Familiar with other participants			0.028	0.056	0.056
			(0.040)	(0.040)	(0.039)
Attended religious services			0.055	0.055	0.055
			(0.039)	(0.036)	(0.037)
Constant	0.254***	0.327***	0.035	0.024	0.044
	(0.016)	(0.024)	(0.102)	(0.093)	(0.092)
R^2	0.656	0.676	0.139	0.179	0.185
Observations	376	376	376	376	376
(Subjects)	94	94	94	94	94

Dependent variable is measured generosity (G_i^{M+}, G_i^{M-}, G_i^{NM+}, or G_i^{NM-}). Models 1 and 2 include subject-specific fixed effects; Models 3 through 5 include subject-specific random effects and robust standard errors, clustered by subject. Donated to charity indicates making any donation to charity in the past year. Wealth indicates an above median response to the amount of money available for spending each month. Familiar with other participants indicates reporting knowing at least one other person in the session. Attended religious services indicates attending religious services in the past year. * - $p < 0.1$, ** - $p < 0.05$, *** $p < 0.01$

Table 4. Marginal required compensation for additional waiting time periods (responses by dictators)

	0-5 min.	5-10 min.	10-15 min.	15-20 min.
Mean WTA (dictators)	7.21 (1.29)	4.53 (0.51)	5.40 (0.54)	6.38 (0.66)
Median WTA (dictators)	4.98	4.65	5.00	5.00
Mean guess of receivers' median WTA	5.77 (0.78)	3.79 (0.25)	4.12 (0.24)	4.72 (0.34)

Standard errors in parentheses

Table 5. Regressions WTA and WTA estimates on time interval

	(1) Dictators' marginal WTA	(2) Dictators' estimates of receivers' WTA
Time interval	-0.164 (0.043)	-0.282 (0.234)
Constant	6.286*** (1.088)	5.306*** (0.584)
R^2	0.001	0.009
Observations (subjects)	376 (94)	376 (94)

Dependent variable is the marginal WTA for each additional 5-minute increase in waiting time. Time interval is coded 1, 2, 3, 4 to identify the marginal WTA for 0-5, 5-10, 10-15 and 15-20 minutes, respectively. Both models include robust standard errors, clustered by subject. * *- p < 0.1,* ** *- p < 0.05,* *** *p < 0.01*

Table 6. Correlations in generosity across contexts

All dictators (n=94)

	G_i^{M+}	G_i^{M-}	G_i^{NM+}	G_i^{NM-}
G_i^{M+}	1			
G_i^{M-}	0.70^{***}	1		
G_i^{NM+}	0.48^{***}	0.36^{***}	1	
G_i^{NM-}	0.37^{***}	0.36^{***}	0.84^{***}	1

Inconsistent subjects only (n=70)

	G_i^{M+}	G_i^{M-}	G_i^{NM+}	G_i^{NM-}
G_i^{M+}	1			
G_i^{M-}	0.49^{***}	1		
G_i^{NM+}	0.20^{*}	0.05	1	
G_i^{NM-}	0.05	0.07	0.76^{***}	1

Inconsistent subject are those for whom the measured generosity differs between at least two contexts. * *- $p < 0.1$,* ** *- $p < 0.05$,* *** *$p < 0.01$*

Table 7. Principal components analysis of the four allocation decisions

	Component 1	Component 2
G^{M+}	0.039	0.686
G^{M-}	-0.036	0.726
G^{NM+}	0.694	0.029
G^{NM-}	0.718	-0.029
Proportion of Variance	0.46	0.43
Cumulative Proportion	0.46	0.89

Orthogonal varimax rotation employed to facilitate interpretation of factors

Figure 1. Cumulative distribution of generosity by context (Experiment 1)

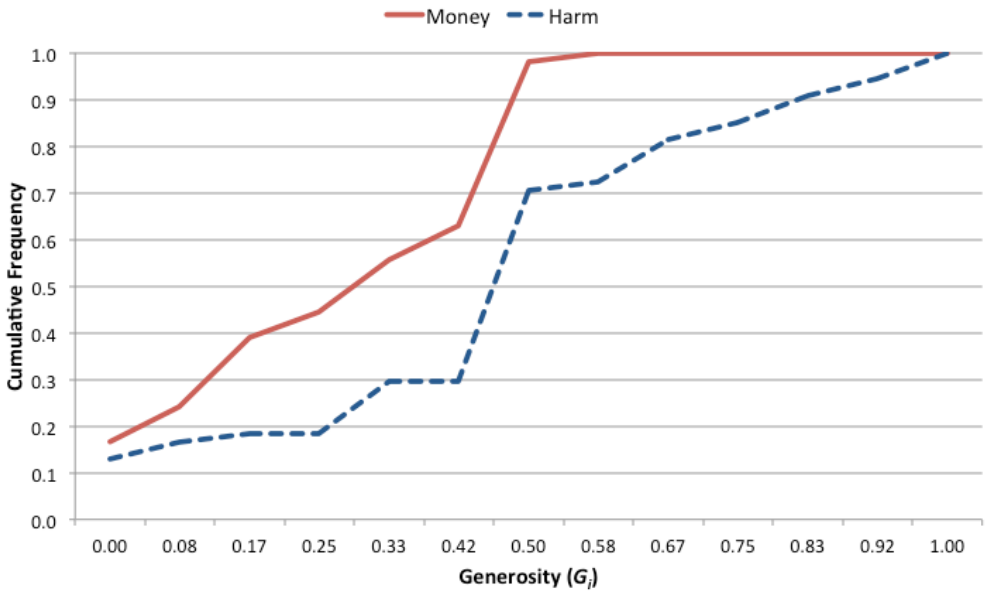


Figure 2. Joint distribution of generosity in harm and money by subject (Experiment 1)

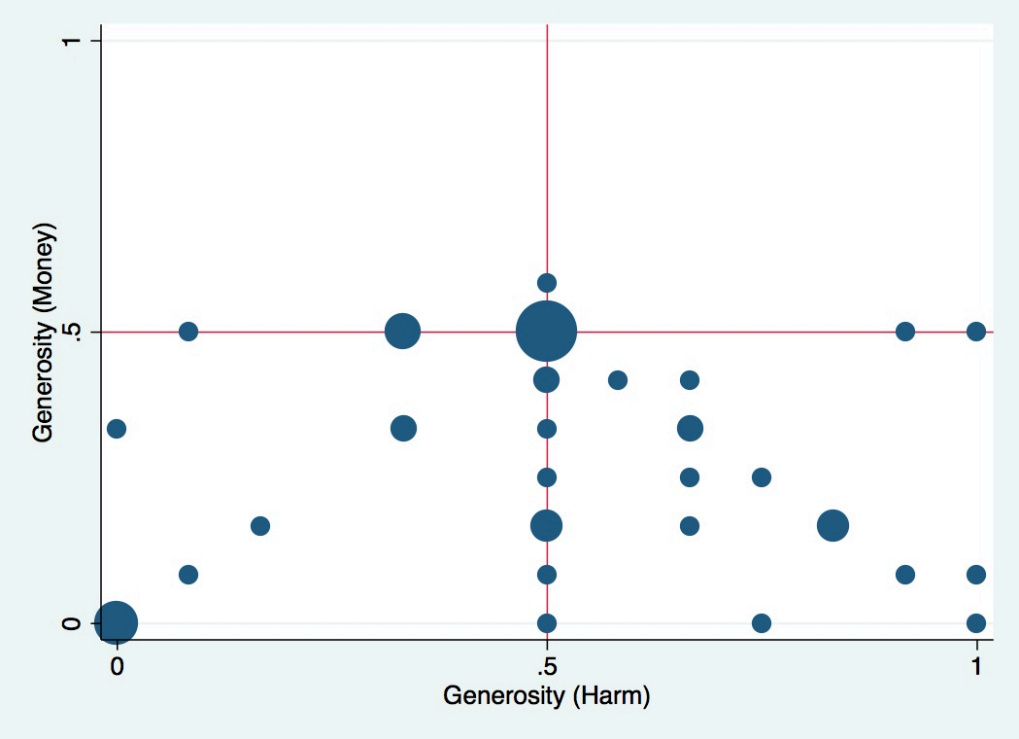


Figure 3. Scatter plot and linear correlation between dictators' Willingness to Accept money to put their hand in ice water for sixty seconds (x-axis) and the percent of time kept in the allocation of the ice-water experience (y-axis) (G_i^H).

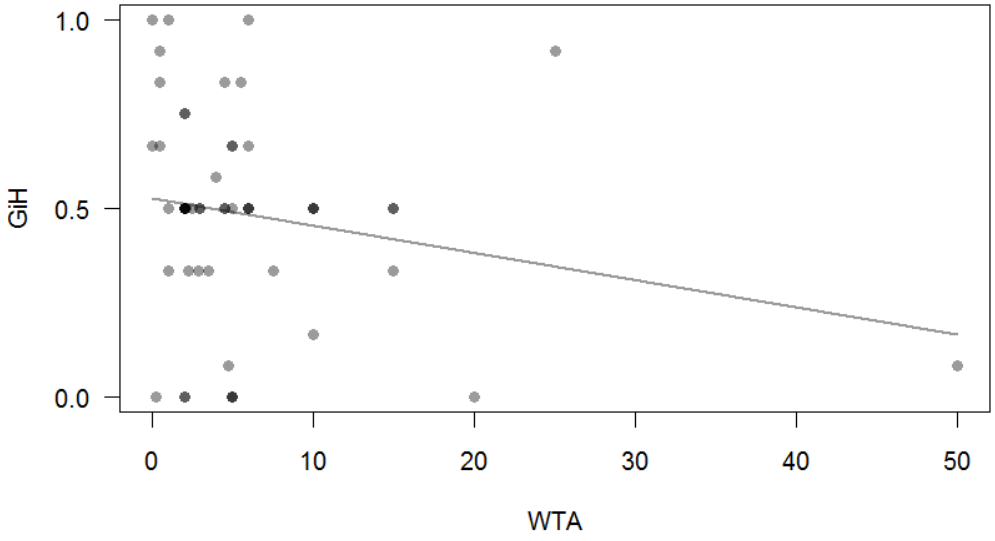


Figure 4. Cumulative distribution of generosity by context (Experiment 2)

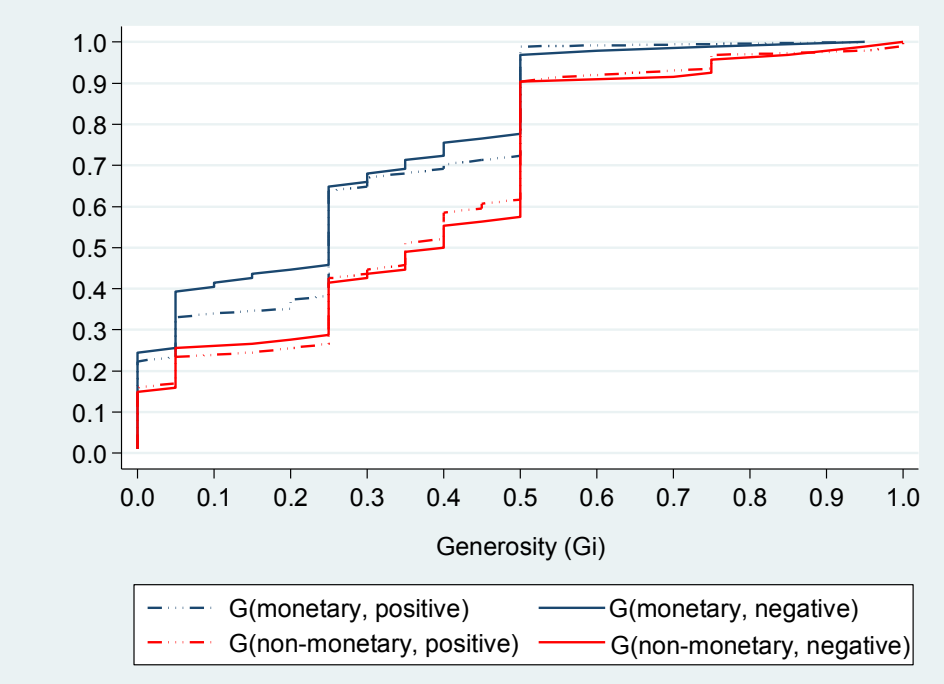
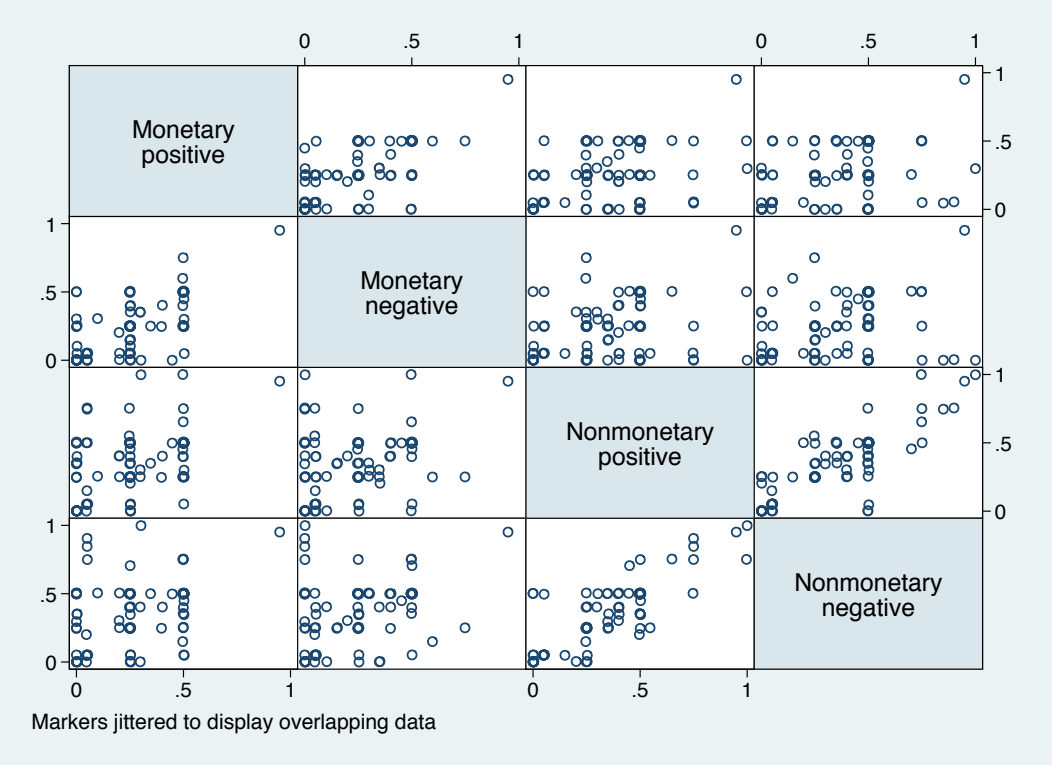


Figure 5. Pairwise distributions of generosity across contexts (Experiment 2)



For the lower triangle, the x-axis for the graph is the variable above the graph and the y-axis is the variable to the right of the graph. For the upper triangle, the x-axis for the graph is the variable below the graph and the y-axis is the variable to the left of the graph.

Figure 6A. Mean generosity exhibited by participants in each cluster, by context (k = 3).

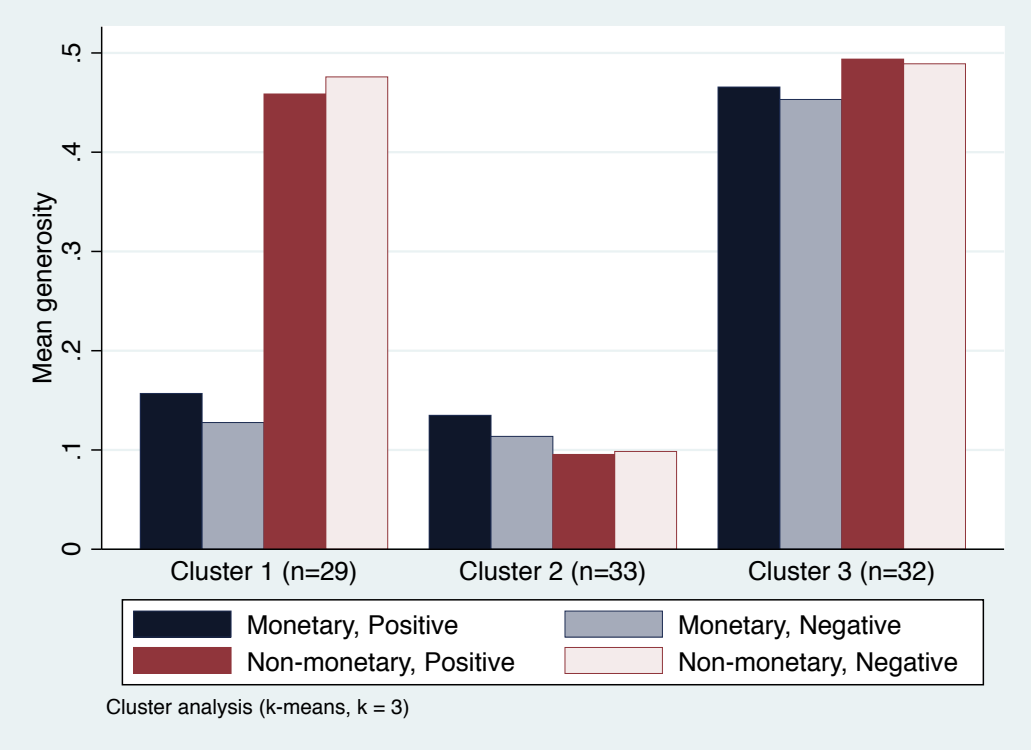


Figure 6B. Mean generosity exhibited by participants in each cluster, by context (k = 4).