

## Moral signaling through donations of money and time

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### ABSTRACT

Prosocial acts typically take the form of time- or money-donations. Do third-parties differ in how they evaluate these different kinds of donations? Here, we show that people view time-donations as more morally praiseworthy and more diagnostic of moral character than money-donations, even when the resource investment is comparable. This moral preference occurs because people perceive time-donations as signaling greater emotional investment in the cause and therefore better moral character; this occurs despite the (correct) belief that time-donations are typically less effective than money-donations (Study 1). This effect in turn is explained by two mechanisms: People believe that time-donations are costlier even when their objective costs are equated, which happens because people rely on a lay theory associating time with the self (Study 2). The more signaling power of time-donations has downstream implications for interpersonal attractiveness in a dating context (Study 3A), employment decisions (Study 3B), and donor decision-making (Study 3). Moreover, donors who are prompted with an affiliation rather (versus dominance) goal are likelier to favor time-donations (Study 4). However, reframing money-donations in terms of time (e.g., donating a week's salary) reduced and even reversed these effects (Study 5). These results support theories of prosociality that place reputation-signaling as a key motivator of moral behavior. We discuss implications for the charity market and for social movements, such as effective altruism, that seek to maximize the social benefit of altruistic acts.

### 1. Introduction

Meet Joan and Jane. They both work in finance; they are economically well-off; and they want to give back. Joan volunteers for 40 hours with a charity that builds houses for families in poor areas. Jane does not volunteer, but instead she donates 40 hours' of her wages to a charity that hires local carpenters to build houses. While clearly Joan and Jane both did a great thing, we can nonetheless ask: Which of them did the *better* thing?

On the one hand, one might argue that Joan behaved more morally. Joan got her hands dirty—she built something with her own two hands, probably met many of the people she helped, and arguably gave a piece of her *self*. Jane just sat in her office and did her job; she might not have given a second thought to the people she helped. Joan seems more emotionally invested.

On the other hand, there is also a good argument that Jane behaved more morally. Jane is a highly remunerated professional and she is presumably good at what she does. Relative to a carpenter, she is probably far less efficient at building houses. But relative to a carpenter,

she probably earns more money in her day job: She could hire *several* carpenters by working her finance job and donating some of the income. Jane probably helped more people.

This paper asks: For donations of time and money that are equivalent in the resources sacrificed, which do people view as more morally praiseworthy? There are plausible arguments for either possibility. Although the answer is not obvious, it matters, both theoretically and practically.

A growing literature looks at factors influencing donation decisions (e.g., Ariely, Bracha, & Meier, 2009; Baron & Szymanska, 2011; Berman, Barasch, Levine, & Small, 2018; Cryder, Botti, & Simonyan, 2017; Small, Loewenstein, & Slovic, 2007; Zlatev & Miller, 2016). One stream of work looks at the differences between time- and money-donations, finding that, relative to money-donations, appeals for time-donations are more effective (Liu & Aaker, 2008), donors view time-donations more abstractly (Macdonnell & White, 2015), and time-donations are more strongly influenced by social expectations (Lee, Piliavin, & Call, 1999). A separate stream of work looks at third-party evaluations of prosocial actors (e.g., Barasch, Levine, Berman, & Small, 2014; Johnson, 2020;

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Klein & Epley, 2014; Newman & Cain, 2014). Since prosocial behavior is often motivated by the desire to maintain a good reputation (Griskevicius, Tybur, & van den Bergh, 2010; Sperber & Baumard, 2012), these third-party perceptions are likely to sharply influence donation decisions.

Yet, little is known about how third-parties perceive those who donate time versus money: Which type of donation is more effective for signaling moral reputation? One related study looked at donors' own attitudes toward their donations of time versus money (Reed, Aquino, & Levy, 2007). Time-donations are tightly bound with moral self-identity: People who identify strongly as a moral person tend to view time-donations as more self-expressive and therefore more moral (see also Reed, Kay, Finnel, Aquino, & Levy, 2016). In other words, time-donations produce a “warmer glow” (Andreoni, 1990) to donors than do money-donations. But altruism is motivated not just by how we see ourselves, but by how others see us (Griskevicius et al., 2010; Glazer & Konrad, 1996), and the signals we send to ourselves may differ from those we send to others. Indeed, third-parties might view inefficient but self-expressive donations as narcissistic rather than praiseworthy. Since our self-images and social reputations are both valuable, it is important to disentangle them.

This issue also has practical implications. The *effective altruism* movement (MacAskill, 2015; Singer, 2015) seeks out the most efficient ways to help others. Effective altruists point out that the most effective charities may be thousands of times more effective than ineffective charities—indeed, ineffective charities can cause more harm than good. Pertinent to the current discussion, effective altruists often advocate *earning-to-give*—donating income from a lucrative career like banking—over more transparently altruistic careers (Singer, 1972). For example, if an investment banker donates even 10% of her income to a high-effectiveness charity, she can help many more people than if she volunteered directly. Thus, effective altruists often critique charities such as Habitat for Humanity, which brings highly compensated professionals to perform manual labor that could be more efficiently performed by carpenters. Mapping out the psychology underlying beliefs about time- versus money-donations may help to explain the popularity of ineffective, volunteer-based charities and to design nudges that might encourage people to donate more effectively.

### 1.1. Theoretical framework

To derive predictions, we contextualize the specific issue about how social perceivers might reason about time- versus money-donations in terms of the broader theoretical landscape in moral psychology.

The two dominant approaches in both normative ethics and moral psychology have long been *consequentialist* or *outcome-based* approaches (e.g., Bentham, 1907/1789; Mill, 1998/1861; Singer, 2011) and *deontological* or *rule-based* approaches (e.g., Aquinas, 2000/1274; Kant, 2002/1796; Nagel, 1979). To a first approximation, consequentialism evaluates actions based on how well they maximize positive and minimize negative consequences, whereas deontology evaluates actions based on how well they conform to moral rules. Although these approaches often coincide, ethicists and moral psychologists have devised cases (such as the famous trolley problem; Foot, 1967) to distinguish between these approaches as accounts of moral intuitions. The psychological literature has not settled on either consequentialism or deontology as descriptively superior, but instead suggests that aspects of moral judgment are captured by each approach (e.g., Baron & Hershey, 1988; Baron & Spranca, 1997; Bartels & Pizarro, 2011; Conway & Gawronski, 2013; Cushman, 2008; Greene et al., 2001, 2008; Kahane et al., 2015, 2018; Tetlock, Kristel, Elson, Green, & Lerner, 2000).

More recently, a third, *virtue ethics* or *person-based* approach (e.g., Anscombe, 1958; Hursthouse, 1999; but see Aristotle, 1999/350 BCE and Smith, 1759 for ancient roots) has begun to attract attention as an alternative to consequentialist and deontological approaches in both normative ethics and moral psychology (Goodwin, Piazza, & Rozin,

2014; Uhlmann, Pizarro, & Diermeier, 2015). In contrast to both consequentialism and deontology which emphasize different aspects of acts (i.e., their outcomes and conformity with rules), virtue ethics approaches focus on what acts reveal about a person's *character*—the extent to which the person is an exemplar of virtues such as courage, generosity, justice, and loyalty. This approach has several attractive features. It builds natural bridges to literature in social psychology on person perception (e.g., Anderson, 1965; Asch, 1946; Johnson & Ahn, 2021) and in cognitive psychology on explanatory reasoning (e.g., De Freitas & Johnson, 2018; Johnson, Valenti, & Keil, 2019; Lombrozo, 2016). Moreover, it explains a number of results that are puzzling under both consequentialist or deontological accounts. For example, people negatively evaluate others who benefit from misfortune even if they did not contribute to the misfortune (Inbar, Pizarro, & Cushman, 2012) and view “altruistic” acts as worse than doing nothing at all if the actor also benefits (Newman & Cain, 2014). Finally, this account dovetails with the many demonstrations of the privileged psychological status of moral character information: It is even more important than interpersonal warmth in social judgment (Goodwin et al., 2014), especially likely to be essentialized (De Freitas, Tobia, Newman, & Knobe, 2017; Strohminger & Nichols, 2014), and appears to draw on greater cognitive processing resources compared to other, logically equivalent computations (Johnson, Murphy, Rodrigues, & Keil, 2019).

Let's now consider what these approaches imply about third-party judgments of time versus money donations. (We focus on consequentialist and virtue ethics approaches here, as deontological approaches do not make clear predictions about this case, mainly because these approaches tend to focus on violations of moral rules and hence on negative acts.) Consequentialist philosophers such as Peter Singer (1972) have in fact written on precisely this issue. Since volunteering time is usually less effective than donating the money one could have earned in that time (Singer, 1972), consequentialists would view money-donations as more praiseworthy than equivalent time-donations. (This assumes that people correctly view the money-donation as more effective; see Studies 1 and 2.) Some findings seem to support this prediction. When evaluating the quality of decisions, people rely on the consequences even when they are not foreseeable (Baron & Hershey, 1988) and demand optimality in moral decision-making (De Freitas & Johnson, 2018; Johnson & Rips, 2015). Most directly, when asked to compare a large donation to a relatively ineffective charity versus a small donation to a relatively effective charity, people identify the smaller but effective donation as more praiseworthy when the two options are placed side-by-side (Johnson, 2020).

However, we hypothesized that person-based processes would loom larger in this case. This is because altruistic behavior appears to have evolved in part for signaling moral reputation—our trustworthiness and cooperativeness (Goodwin et al., 2014; Miller, 2007; Nowak & Sigmund, 2005; Sperber & Baumard, 2012; Uhlmann et al., 2015). On this view, humans behave altruistically (i.e., taking a personal cost to produce a social benefit) because they expect others to observe this behavior, infer their prosocial moral character, and reward them socially because they expect such social rewards to be repaid in the future. Many results support the idea that prosocial behaviors are at least partly motivated, consciously or unconsciously, by social signaling. For example, people are likely to take pro-environmental actions when they are in public settings (Griskevicius et al., 2010) and donors to public organizations frequently donate the minimum amount required to be listed in a particular donation category (e.g., donating \$100 to be listed in the \$100–\$249 category; Harbaugh, 1998).

Thus, a person-based approach emphasizes that time and money donations would be evaluated based on what these acts signal about underlying moral character—but what would drive these character evaluations? One possibility is that time-donations are seen as more diagnostic of emotional investment compared to money-donations. The philosophy literature on virtue ethics highlights emotional processes. Hursthouse (1999), harkening back to Aristotle's view of emotions,

emphasizes that a virtuous person feels the ‘right’ emotions both as motivations to act and as reactions to having acted virtuously. This is because, on the one hand, emotions reflect an underlying system of evaluative and motivational principles which may be more or less conforming with virtuous behavior; yet on the other hand, emotions are not readily ‘re-trained’ and hence their effects on our behavior are stable and long-lasting. Plausibly, this view implies that a virtuous donor would feel an emotional pull toward helping the beneficiaries of their actions, which seems better exemplified by donors of time.

This Aristotelian view of emotions proved remarkably prescient given advances in affective science (e.g., Damasio, 1994), and the links between emotions and moral behavior (e.g., Singer & Lamm, 2009; Teper, Zhong, & Inzlicht, 2015). Consequentialist and deontological approaches are much less friendly toward emotions; indeed, the greater emotional processing invoked in ‘personal’ versions of the trolley problem (e.g., pushing someone off a bridge) more than in ‘impersonal’ versions (e.g., pulling a lever) is thought to interfere with consequentialist reasoning (Greene, Sommerville, Nystrom, Darley, & Cohen, 2001).

In addition to its fit with a broad virtue ethics framework, there is also empirical evidence that social perceivers use emotional investment as a cue to moral character. For example, when a player in an economic game self-describes as deciding based on emotion (rather than reason), that player is perceived as likelier to cooperate and as more prosocially motivated (Levine, Barasch, Rand, Berman, & Small, 2018). Similarly, when a person does something harmful and later does something good, that person is perceived more positively if the positive act is seen as motivated by remorse (e.g., guilt or shame; Johnson & Ahn, 2021). In the charity domain, when donors report feeling highly emotional about their cause, third-parties perceive them as more empathic and higher in moral character (Barasch et al., 2014). Although we are not aware of any direct demonstrations that time-donors are viewed as more emotionally invested, this seems intuitively plausible. Putting all this together, we hypothesize:

**H1a:** Time-donors (vs. money-donors) are seen as more emotionally invested in their cause.

**H1b:** The greater perceived emotional investment of time-donors leads to greater perceived (a) moral character of the donor and (b) praiseworthiness of the donation.

We can distinguish here between two potential—albeit, we shall see, inter-related—explanations for this hypothesized effect of donation-type on emotional investment (H1a).

First, people may think of one or the other resource as more (subjectively) costly even when their objective costs are equated. According to signaling theory, the costs one is willing to take on are diagnostic of one’s underlying preferences and traits because costs signal a willingness to commit resources (Gintis, Smith, & Bowles, 2001; Grafen, 1990; Zahavi, 1975). This prediction is borne out in studies of prosocial behavior specifically, which find that when a charity’s personal cost and social benefit are manipulated orthogonally, judgments of moral character (as well as praise) track cost rather than benefit in between-subjects designs (Johnson, 2020), consistent with costly signaling theory. This suggests that *if* people believe that time-donations are more personally costly even when their objective costs are equated, then people would think them more diagnostic of moral character. Thus:

**H2:** People believe that time-donations are subjectively costlier than money-donations.

But *why* might people have such a belief? This brings us to the second potential explanation for the effect of donation-type on emotional investment. There are several converging lines of evidence that suggest that people associate time with the self more than they associate money

with the self; that is, people seem to hold a “time = self” lay theory. For example, people enjoy products more when time rather than money is emphasized because time-emphasis increases the salience of experiences and personal connection with the product (Mogilner & Aaker, 2009). Similarly, activating the idea of time makes people more likely to spend time with friends and family rather than working (Mogilner, 2010)—activities more associated with the self and which tend to promote happiness—and more likely to behave ethically because time priming leads people to reflect on their self-identity (Gino & Mogilner, 2014). People often prefer to distribute resources according to willingness to spend *time* rather than money—against the recommendations of economic efficiency—because people believe that time investment is a stronger signal of preferences than money investment (Shaddy & Shah, 2018), and are less prone to zero-sum thinking when conceptualizing resources in terms of time (Johnson, Zhang, & Keil, 2021). Most directly, when evaluating their *own* donations, people view time-donations as more expressive of their moral self-identity than money donations (Reed et al., 2007, 2016). If time is indeed more associated with the self, then donations of time would indeed be more subjectively costly because one is giving away a greater part of the self. This converging set of results and theory suggests:

**H3a:** People have a stronger “time = self” than “money = self” lay theory.

**H3b:** The effect of time- versus money-donations on perceived personal cost, emotional investment, moral character, and praise will be greater for individuals higher in the “time = self” lay theory.

These hypotheses were tested in Studies 1 and 2. In addition, Studies 1 and 2 examine whether people also believe that time-donations or money-donations are more effective in producing benefits for those they are helping, as one might expect from a halo effect, or whether instead people share Singer (1972) view that money-donations are more effective.

Study 3 examines downstream consequences of moral signaling for interpersonal relations. Moral character traits such as trustworthiness and honesty predict perceptions of in-group and out-group members better than social warmth (e.g., friendliness) or competence (e.g., intelligence) (Brambilla, Sacchi, Rusconi, Cherubini, & Yzerbyt, 2012; Goodwin et al., 2014; Leach, Ellemers, & Barreto, 2007). Indeed, people view moral traits as more central to personal identity (whether a person is “the same” over time) than even a person’s memories (Strohinger & Nichols, 2014). Together with the (hypothesized) greater moral signaling power of time-donations, these previous findings led us to hypothesize that time-donations would increase interpersonal approach, which we operationalize both in terms of personal attraction (Study 3A) and hiring decisions (Study 3B). Overall, we predict:

**H4:** The extent of one’s time-donations predicts (a) personal attractiveness and (b) hiring decisions to a greater degree than the extent of money-donations.

Studies 4 and 5 turned to examining potential moderators and boundary conditions. A first potential moderator is the social situation. Moral behavior varies according to who will be observing that behavior and how one relates to the observers (e.g., Griskevicius et al., 2010). In many competitive situations (such as a business meeting), there is little interpersonal need to signal morality, and indeed doing so may be counterproductive. Conversely, in other situations (such as a date), it may be crucial to signal one’s moral character for attracting a long-term partner. If third-parties perceive time-donations as more diagnostic of moral character than money-donations, then situations that create a need to signal moral character should provoke more time-donations. Study 4 tests:

**H5:** People should be more inclined to donate time (vs. money) when the social context creates a motive to signal morality.

A second potential moderator is framing. Time and money are fungible resources—we work to convert time into money and outsource labor to convert money into time. Thus, these effects might be malleable. Reframing a money-donation as a time-donation (pledging one's income during a time-period) should increase perceived emotional investment, and thereby judgments of moral character and praiseworthiness. Therefore, Study 5 tests:

**H6:** Reframing money-donations as time-donations makes donors appear more emotionally invested and higher in donor character, and donations more praiseworthy.

## 2. Study 1

Study 1 examined whether and why people morally favor time-donations over money-donations, for similar degrees of objective personal sacrifice (H1). If time-donation signals greater *emotional* investment to a cause, this could lead time-donors to be seen as stronger in moral character even if their objective *resource* investment is equivalent to the money-donors.

Here we also began to examine the issue of perceived benefits. Singer (1972) points out that, on reflection, it is usually more efficient to hire professionals rather than to bring in non-expert volunteers. But people may not appreciate this when evaluating donors. Thus, Study 1 measured beliefs about the benefits of the donations, to test whether perceived benefit might instead drive a preference for time-donations. Thus, Study 1 aimed to equate the objective *costs* while making no effort to equate the *benefits* of the time- and money-donations, measuring participants' own conclusions in the context of an ecologically realistic pair of decision donations.

### 2.1. Method

We recruited 200 Americans (57% female,  $M_{\text{age}} = 36.4$ ) from Amazon Mechanical Turk. The sample size was selected *a priori* and achieves 90% power for effects of  $d > 0.23$ . Participants were excluded ( $N = 30$ ) if they incorrectly answered >25% of the attention check questions.

Participants read about two pairs of donors. In each pair, one had volunteered for one week in a developing country, while the other donated one week's salary to a comparable charity that hires local workers to do the same task. For example:

Megan and Kate both work in Columbus, OH and earn about \$70,000 per year.

Megan volunteered for one week with Build a Dream, a charity that transports people to Nepal to build houses for villagers.

Kate donated \$1350 to Care Builders, a charity that hires local carpenters to build houses for villagers in Nepal.

Since Megan and Kate's income is \$70,000, one's week salary is \$1346. Thus, Kate's money donation is equivalent in hours of labor to Megan's time donation. Moreover, the volunteer charity always transported people to the location themselves ("...a charity that transports people to Nepal...") to sidestep the issue of transportation costs, which would increase the objective cost to the donor. See the Appendix B in the Supplementary Materials for the full text of all items.

For each vignette, participants made four judgments on scales from -5 (time-donation) to 5 (money-donation): Praiseworthiness ("Which of these two acts do you think was more morally praiseworthy?"), emotional investment ("Who do you think cares more about people in [Nepal]?"), moral reputation ("Who do you think has stronger moral character"), and benefit ("Which of these two acts do you think resulted

in greater benefit to people in [Nepal]?"). The questions were on separate pages, with the vignette repeated on each page.

The order of the donation types was counterbalanced, the left/right orientation of the scale adjusted to match, and items presented in a random order; the charity and donor names were counterbalanced. For analyses, except as stated, scales were re-coded with negative numbers corresponding to the time-donation and positive numbers to the money-donation. All data are available through the Open Science Framework: <https://bit.ly/2NzZqHT>.

### 2.2. Results and discussion

Participants viewed the time-donor as more praiseworthy than the money-donor [ $M = -0.84$ ,  $SD = 2.11$ ;  $t(186) = -5.47$ ,  $p < .001$ ,  $d = -0.40$  versus 0], supporting H1b.

This effect was expected to be rooted in the perception that time-donors are more emotionally invested (H1a). Indeed, time-donors were seen as caring more about the people they were helping [ $M = -0.59$ ,  $SD = 1.89$ ;  $t(186) = -4.29$ ,  $p < .001$ ,  $d = -0.31$ ]. Moreover, judgments of praise were strongly predicted by judgments of emotional investment [ $b = 0.76$ ,  $SE = 0.06$ ,  $p < .001$ ].

Why does perceived emotional investment have such a large effect on praiseworthiness? According to our account, emotional investment impacts perceived moral character, which itself drives judgments of praiseworthiness. Indeed, perceived emotional investment strongly predicted character judgments [ $b = 0.63$ ,  $SE = 0.05$ ,  $p < .001$ ], which strongly predicted praise [ $b = 0.84$ ,  $SE = 0.06$ ,  $p < .001$ ]. However, since all variables were measured at the same time it is of course difficult to definitively tease apart the causal ordering of these variables.

An alternative hypothesis is that, although we equated the sacrifice or *input* of the time- and money-donations, we made no effort to equate the effectiveness or *output*. Although effective altruists argue that money-donations are usually more efficient (Singer, 1972), participants may not agree and may even think time-donations are more efficient (e.g., because they cut out intermediaries).

However, money-donations were in fact thought to produce greater benefits [ $M = 0.30$ ,  $SD = 2.07$ ;  $t(186) = 1.97$ ,  $p = .051$ ,  $d = 0.14$ ]. Thus, people found time-donations *more* praiseworthy even though they believed they were *less* effective. Simultaneously entering perceived benefit, emotional investment, and character judgments into a regression, all three variables predict praise: The strongest predictor was character [ $b = 0.50$ ,  $SE = 0.08$ ,  $p < .001$ ], then emotional investment [ $b = 0.38$ ,  $SE = 0.08$ ,  $p < .001$ ], then perceived benefit [ $b = 0.15$ ,  $SE = 0.05$ ,  $p = .005$ ]. Thus, participants did place some weight on the perceived benefit of the donations, which tended to favor the money-donations. But this effect was overwhelmed by the massive effects of emotional investment and moral character.

One possible concern is that asking questions about emotional investment and perceived benefit created demand characteristics, such that participants felt experimenter demand to use these judgments in judging praise. However, Study S1 in the Supplementary Materials (Appendix A) found a similarly dramatic effect on praiseworthiness without asking about emotional investment or moral character at all. Thus, participants view time-donations as more praiseworthy than money-donations even when they are not primed to think about these other factors.

## 3. Study 2

Study 2 had three primary goals. First, it aimed to further solidify the case that time-donations are viewed as more reputation-enhancing and praiseworthy than money-donations (H1). The vignettes used in Study 1 attempt to control for costs by using the protagonist's wage rate to convert between time and money. However, these costs are controlled on a weekly rather than hourly basis—introducing the possible confound that volunteers might work different numbers of hours from a



standard work week—and volunteering abroad can both increase personal sacrifice (e.g., the risks of international travel) and decrease sacrifice (e.g., the pleasure of visiting somewhere new). Moreover, the participant herself may trade off time and money differently from the protagonist in the vignette, creating a potential mismatch. Study 2 addressed these issues by examining local volunteering, matching the costs on an hourly basis, and calibrating the donations to participants' individual time–money trade-offs. This allowed us to measure perceived costs and test the prediction that time-donations are perceived as costlier even when their objective costs are equated (H2).

A related issue is that Study 1 did not attempt to control the benefits, instead assuming that the benefits are *in fact* greater for money-donations (as argued by Singer, 1972) and then *measuring* whether participants nonetheless found the benefits greater for time-donations. Although Study 1 (and Study S1 in the Supplementary Materials) found that people do agree that benefits are (somewhat) greater for money-donations for an ecologically realistic situation, Study 2 equated these benefits objectively to see whether this leads people to view the time-donations as more beneficial as a halo effect.

Second, Study 2 aimed to test the role of individual differences in their general “time = self” lay theory in producing the intuition that time-donors are more emotionally invested (H3). We did so by including a self-report scale that quantifies the relative diagnosticity of how time and money are used in revealing preferences. This allows us both to examine whether the “time = self” lay theory exists in general and whether its magnitude influences the magnitude of our effects.

Third, Study 2 tested a possible boundary condition—the importance of the cause. Few would disagree that fighting poverty and disease is socially important, and emotional investment in such causes seems intuitively praiseworthy. But it is unclear whether these intuitions would hold as strongly for causes that are viewed as less important. Thus, Study 2 tested this possible boundary condition by comparing donations to matched charities—one benefitting an important cause (saving endangered species) and one benefitting a less important cause (saving common animals such as rats and pigeons).

### 3.1. Method

We recruited 301 Americans (54% female,  $M_{\text{age}} = 37.8$ ) from Amazon Mechanical Turk. Participants were excluded ( $N = 71$ ) if participants either (i) failed a series of attention check questions using the same criteria as Study 1 ( $N = 9$ ), (ii) failed either of two attention checks embedded in the two individual difference scales ( $N = 44$ ); or (iii) failed a manipulation check (see below;  $N = 18$ ). Study 2 was pre-registered at <https://aspredicted.org/nu7bc.pdf>.

First, participants' individual time–money trade-offs were estimated using a task similar to those used in loss aversion studies (e.g., Gächter, Johnson, & Herrmann, 2010). Participants were asked to “Suppose you were offered the opportunity to do some freelance work that was estimated to take 50 hours. Which of the following offers is the *smallest* payment you would accept in exchange for this work?” with options listed in order from largest to smallest from \$2500 to \$250. The median response was \$1000—roughly in keeping with participants' median household income (\$60,000–\$70,000).

For the main task, participants read about a pair of time- and money-donations as in Study 1. Measures were taken to equate the personal sacrifice across the donations, with the volunteering taking place locally and for the same number of hours the donor would have spent at work. The vignettes were also designed to equate the benefits as much as possible, with the time-donor being a qualified professional (to avoid the criticism of volunteering that donors are often not competent) and defraying costs rather than replacing labor (to avoid the criticism of volunteering that it displaces local workers). Half of the participants were randomly assigned to read about a cause relatively high in importance:

Megan and Kate both live in Honolulu, HI and earn about [\$X] per year working in the field of veterinary medicine, working 40 hours per week. Both make charitable contributions to Animal Trust, a local charity that focuses on rehabilitating endangered species of tropical birds and marine mammals that are injured.

Megan took one week off from work to volunteer for Animal Trust for 40 hours. Her donation of time was used to fabricate supplies that were used to save the lives of 10 endangered animals such as parrots and dolphins.

Kate donated [\$Y] to Animal Trust. Her donation of money was used to purchase supplies that were used to save the lives of 10 endangered animals such as parrots and dolphins.

For the other half of participants, the cause was relatively low in importance (“...a local charity that focuses on rehabilitating common animal species such as rodents that are injured...” and “...to save the lives of 10 common animals such as rats and pigeons”). The order of the time and money donations was random (and therefore the scale orientations were adjusted to match), as in Study 1.

The salary \$X and donation amount \$Y were calculated using each participant's individualized trade-off. The donation \$Y was calculated as 20% less than the amount specified in the time–money trade-off task, since the number of hours donated (40) was 20% lower than the number of hours used in the trade-off task (50). This was done to diminish demand characteristics while equating the time and money value to the participant. The salary \$X was calculated as 50 times greater than the donation, to equate the value of the time and money value to the protagonist since the hours donated was one work-week and there are approximately 50 work-weeks in a year. Thus, the time and money donation are objectively equivalent to both the participant *and* the protagonist.

The main dependent measures were *praiseworthiness* (“Which of these two acts do you think was more praiseworthy?”) from –5 (“Megan's volunteering”) to 5 (“Kate's donation”); *emotional investment* (a composite of three items, e.g. “Who do you think feels a stronger personal connection with animals?”;  $\alpha = 0.88$ ) from –5 (“Megan”) to 5 (“Kate”) (a fourth emotional investment item was inadvertently omitted from some conditions, so we exclude this item from the measure to facilitate comparability); *moral character* (a composite of eight items, “Based on the situation above, who do you think is better characterized by each of the following traits?” including “trustworthy,” “fair,” “kind,” “prudent,” “dishonest” (R), “unjust” (R), “mean” (R), and “irresponsible” (R) from –5 (“Megan”) to 5 (“Kate”), based on character traits studied by Dahlsgaard, Peterson, & Seligman, 2005 and used by Johnson & Ahn, 2021 to measure character;  $\alpha = 0.77$ ); and *benefit* (“Which of these two acts do you think resulted in greater benefit to animals”) and *cost* (“Which of these two acts do you think required a greater sacrifice?”) from –5 (“Megan's donation”) to 5 (“Kate's volunteering”). Each set of questions (praiseworthiness, emotional investment, moral character, and benefit/cost) were presented on their own page with the vignette text repeated at the top of the page.

In addition to attention check questions similar to those used in Study 1, participants also completed a manipulation check for the importance manipulation, indicating “In your opinion, which is the more important cause?” and selecting from “Helping endangered species such as parrots and dolphins” or “Helping common animal species such as pigeons and rats.” Any participant who selected the latter option was excluded from analysis ( $N = 18$ ).

After the main task and check questions, participants completed two individual difference scales in a random order. The key measure was a novel scale, quantifying individual differences in the strength of the “time = self” versus “money = self” lay theories. This scale was composed of two sets of opposite statements, such as “Our time is a deeper reflection of the self than our money” vs. “Our money is a deeper reflection of the self than our time” (R); complete items are listed in Appendix B. Scale reliability was acceptable ( $\alpha = 0.66$ ).

As an exploratory measure, participants also completed the Oxford Utilitarianism Scale (Kahane et al., 2018), which measures individual tendencies toward impartial beneficence (treating all people as of equal moral worth; e.g., “From a moral perspective, people should care about the well-being of all human beings on the planet equally; they should not favor the well-being of people who are especially close to them either physically or emotionally”;  $\alpha = 0.73$ ) and toward instrumental sacrifice (being willing to sacrifice others for the greater good; e.g., “It is permissible to torture an innocent person if this would be necessary to provide information to prevent a bomb going off that would kill hundreds of people”;  $\alpha = 0.77$ ). As is typical in other research (e.g., Johnson & Ahn, 2021; Kahane et al., 2018), these two components of utilitarianism were only weakly correlated ( $r = 0.25$ ). Given the historical links between utilitarian or consequentialist moral philosophy (e.g., Singer, 1972) and effective altruism, one might expect more utilitarian participants to more strongly favor time-donors.

### 3.2. Results

Overall, the results mirror those of Study 1. Despite carefully equating the objective costs and benefits of the time and money donations, participants continued to believe that the time-donations were more praiseworthy and more diagnostic of emotional investment and moral character. Participants’ subjective beliefs about costs and benefits also favored the time-donations (unlike Study 1, where participants believed the money donations were more beneficial), suggesting a halo effect. All of these effects were associated with higher belief in the “time = self” lay theory. The effects did not differ between the high- and low-importance conditions.

Praise judgments significantly favored the time-donors [ $M = -1.42$ ,  $SD = 1.97$ ;  $t(229) = -10.96$ ,  $p < .001$  vs. 0,  $d = -0.72$ ], and this effect was similar for the high-importance and low-importance donations [ $t(228) = 0.02$ ,  $p = .99$ ,  $d < 0.01$ ]. Corresponding to this, the time-donors were also seen as more emotionally invested [ $M = -1.63$ ,  $SD = 1.58$ ;  $t(229) = -15.60$ ,  $p < .001$ ,  $d = -1.03$ ] and as superior in moral character [ $M = -0.42$ ,  $SD = 0.67$ ;  $t(229) = -9.58$ ,  $p < .001$ ,  $d = -0.63$ ], with these effects also not differing between the high-importance and low-importance conditions [ $ts < 1$ ,  $ps > 0.40$ ,  $ds < 0.11$ ].

In addition, despite taking extensive measures to equate the objective costs and benefits, participants’ subjective judgments reflected a belief that the time-donation required greater personal cost [ $M = -2.52$ ,  $SD = 1.99$ ;  $t(229) = -19.26$ ,  $p < .001$ ,  $d = 1.27$ ] and resulted in greater benefit [ $M = -0.98$ ,  $SD = 1.89$ ;  $t(229) = -7.84$ ,  $p < .001$ ,  $d = -0.52$ ], with these effects not differing across the high- and low-importance conditions [ $ts < 0.30$ ,  $ps > 0.76$ ,  $ds < 0.04$ ].

Table 1 presents the correlations among the main dependent measures and individual difference moderators (“time = self” lay theory and utilitarianism). All dependent measures (praise, emotional investment, moral character, costs, and benefits) were significantly correlated with one another, often with substantial effect sizes. However, these effects were moderated by belief in the “time = self” theory. People who endorsed this theory more strongly were more prone to favor the time-donors on each of the other measures [ $ps < 0.01$ ]. Of note, the mean

score on this scale was significantly positive [ $M = 2.04$ ,  $SD = 1.24$ ;  $t(229) = 24.97$ ,  $p < .001$ ,  $d = 1.65$  vs. the midpoint of 0], indicating that participants were more prone to the belief the “time = self” than that “money = self,” since the scale was composed of matched, opposing pairs of statements. In addition, more utilitarian participants were somewhat more disposed to favor time-donors, with this effect reaching significance for emotional investment but at most marginally for the other dependent measures. This is the opposite direction one might expect, given the historical link between utilitarian philosophy and effective altruism (Singer, 1972).

### 3.3. Discussion

Overall, the results echo the main conclusions of Study 1. As in Study 1, time-donors were deemed more praiseworthy, emotionally invested, and higher in moral character, despite using somewhat different measures of all three of these constructs. In Study 1, we attempted to roughly equate the objective personal costs of the time- and money-donations, whereas we made no effort to equate the benefits in order to test whether people share Singer (1972) view that money-donations are typically more effective. In Study 2, we took much greater pains to equate both the costs and the benefits, finding that time-donations were still seen as more praiseworthy. Even so, the benefits are probably still greater in the money-donation condition, because the money-donor (a veterinarian) produced benefits both through her work and her monetary donation. Despite this, participants reported higher subjective beliefs in both the costs and benefits of the time-donations. This supports H1–H2.

We measured beliefs in the “time = self” lay theory to test whether lay theories moderate the effect of time- vs. money-donations. They do. Beliefs on average were significantly above the scale midpoint, indicating that time is more associated with the self than is money. Moreover, participants higher on these beliefs showed a stronger preference for time- over money-donors. These findings support H3.

Finally, Study 2 allowed us to examine the role of utilitarianism versus deontology—two comprehensive ethical belief systems—in moderating the effects. According to utilitarianism (one form of consequentialist moral philosophy), the goal of morality is to maximize the ‘utility’ experienced across all individuals. In contrast, deontology focuses on norm- and rule-following, with particular emphasis on avoiding rule-violations. Singer (1972) utilitarian argument for money-donations suggests that when benefits are not equated, utilitarians should be more predisposed to money-donations. When the benefits are equated, utilitarians should still be less prone to believe that time-donations are more praiseworthy than money-donations, believing them to be equally praiseworthy. In fact, we find no evidence for this—if anything for the opposite. This is consistent with the more recent argument that utilitarianism and deontology are less psychologically fundamental than person-centered approaches, perhaps reflecting cultural constructs more than deep-seated psychology (e.g., Bartels & Pizarro, 2011; Johnson & Ahn, 2021; Uhlmann et al., 2015).

Although Study 2 more carefully equated objective costs and benefits compared to Study 1, one might still object that there may be subtle

**Table 1**  
Correlations among measures in Study 2.

	Praise	Emotional Investment	Moral Character	Subjective Costs	Subjective Benefits	“Time = Self” Theory
Emotional Investment	0.35 ***	—				
Moral Character	0.35 ***	0.57 ***	—			
Subjective Costs	0.41 ***	0.55 ***	0.41 ***	—		
Subjective Benefits	0.45 ***	0.42 ***	0.40 ***	0.33 ***	—	
“Time = Self” Theory	-0.20 **	-0.34 ***	-0.19 **	-0.31 ***	0.19 **	—
Utilitarianism	-0.12 °	-0.23 ***	-0.10	-0.11	-0.09	0.12 °

Note. Entries are first-order Pearson correlations among measures. “Time = self” is coded such that higher numbers indicate stronger belief in “time = self” and utilitarianism is coded such that higher numbers indicate higher endorsement of utilitarianism.

° < 0.10 \* < 0.05 \*\* < 0.01 \*\*\* < 0.001.

differences between the time- and money-donation that could still be driving the results. First, perhaps participants believed that the opportunity cost of the two donations differed. Although both donors worked the same total number of hours and earned the same take-home pay, perhaps participants believed that the time-donor would need to work additional hours to cover the time taken off, or believed that the time-donor had a strict number of vacation days that she could take off, so that volunteering cost her a significant fraction of her annual leisure. Second, perhaps it was not clear to some participants that the two donations entailed the same total amount of effort. Given that prior research finds that people use effort as a proxy for quality (Kruger, Wirtz, Van Boven, & Altermatt, 2004) and duration to evaluate services (Yeung and Soman, 2004), differences in perceived effort could affect evaluations of charitable acts or donors.

Study S2 in the Supplementary Materials addressed both of these possibilities by transparently equating the opportunity costs and effort between the time- and money-donations. The vignette in that study described both donors as sometimes working extra weekend shifts at work, with the money-donor working an extra shift and donating the proceeds and the time-donor volunteering for one shift. The results were statistically robust (albeit with smaller effect sizes) for character, emotional investment, and even perceived costs, but not for praise or perceived benefits. One possible reason for the smaller effect sizes was the highly transparent equation of opportunity costs. Another possibility, however, is that the framing of the vignette created the perception that the money-donation was a time-donation—working an extra shift in order to donate the proceeds. Study 5 will further investigate the possibility that reframing money in terms of time is a boundary condition.

#### 4. Study 3

Moral character is central to how we interact with others (e.g., Goodwin et al., 2014). Study 3 therefore tests the extent to which time-donations versus money-donations influences perceived moral character (H1) in interpersonal contexts (dating in Study 3A and employment in Study 3B) and the extent to which these moral signals translate into interpersonal approach, as measured by interest in dating and employment (H4).

In addition to testing a downstream consequence of signaling, Study 3 also aimed to show that these signaling effects occur for real donations, reflective of the range of typical people's charity. Thus, we recruited a sample of participants to report their actual donations of money and time, asking a separate sample of participants to then rate the first group in terms of character and attraction.

##### 4.1. Method

###### 4.1.1. Pretest

We recruited 100 Americans (72% female,  $M_{\text{age}} = 35.1$ ) from Mechanical Turk. Participants were asked whether they donated money to charity in a typical year, and if so, how much money they typically donated; and whether they volunteered in a typical month, and if so, how many hours they typically volunteered. Money-donations and time-donations were elicited in a counterbalanced order. About 62% of participants donated money in a typical year, and about 44% volunteered in a typical month. Participants were also asked to describe their hobbies.

###### 4.1.2. Participants

We recruited 200 Americans (62% female,  $M_{\text{age}} = 35.6$ ) from Mechanical Turk for Study 3A and another 200 Americans (50% female,  $M_{\text{age}} = 38.2$ ) for Study 3B. Participants were excluded using the same criterion as Study 1 ( $N = 10$  and 13, respectively). Study 3B was pre-registered at <https://aspredicted.org/52jz4.pdf>.

###### 4.1.3. Study 3A materials

We used the pretest responses to construct 100 dating profiles for

Study 3A, with both a male and female version of each. For example, one profile read:

**Name:** [Vincent/Jade]  
**Hobbies:** Drawing, Boating  
**Income:** \$42,000  
**Annual contributions to charity:** \$200  
**Monthly volunteering:** 5 hours

The manipulation was the charity contribution and volunteering amount, which were each yoked to the data of one pretest participant. Thus, the variability in these contributions reflects the real range of charitable activities among the participant population.

The names, hobbies, and income were assigned randomly to profiles. Names were selected from a list of most common male and female names and were randomly assigned to the 100 profiles. Each profile included 2 hobbies, one indoor-oriented and one outdoor-oriented, which were constructed from the pretest data and then randomly assigned to profiles. Income was randomly selected for each profile from between \$40,000 and \$50,000 range (around the median individual income for the United States). This was done so that the money-donations were comparable across profiles as a proportion of total income. It was important to specify income so that participants could not use charitable contributions as a signal of wealth.

###### 4.1.4. Study 3A procedure

Participants were instructed that they would be viewing and evaluating profiles of potential dates, and were told that these profiles were based on real data from other Mechanical Turk workers. Participants were then asked to indicate their gender and preference for viewing profiles of men or women. Most participants (92%) indicated opposite-gender preferences. Participants were then asked to rate several traits in importance for choosing dates on 0–10 scales. Kindness ( $M = 8.67$ ) and sense of humor ( $M = 8.41$ ) were rated highest, followed by morality ( $M = 8.02$ ), intelligence ( $M = 8.02$ ), and shared interests ( $M = 7.90$ ). These traits were all considered more important than physical attractiveness ( $M = 7.10$ ), financial well-being ( $M = 6.40$ ), or professional success ( $M = 5.96$ ). Thus, these results confirm our impression that moral character is a key criterion when selecting potential dates.

Participants were then shown 10 profiles, randomly chosen out of the 100 profiles, with names corresponding to participants' gender preference. For each profile, participants made two attitude judgments—morality (“To what extent do you think this person is caring?”) and enjoyment (“To what extent do you think this person is fun?”)—and rated their dating interest (“How interested would you be in meeting this person for a date?”). These judgments were all made on 0–10 scales.

###### 4.1.5. Study 3B materials

The materials for Study 3B were based on those from Study 3A. For example, the Study 3B version of the example above read:

**Name:** Vincent  
**Education:** New Mexico State University  
**GPA:** 3.4  
**Hobbies:** Drawing, Boating  
**Monthly contributions to charity:** \$20  
**Monthly volunteering:** 5 hours

Thus, five changes were made from the versions used in Study 3A. First, either the male or female version of each profile used in Study 3A was randomly selected. Second, each applicant was assigned an educational background; 20 public universities were selected from U.S. universities ranked 100–150 in the Times Higher Education ranking, and each randomly assigned to 5 of the profiles. Third, each applicant's GPA was randomly assigned between 3.2 and 3.5. These educational traits were selected to be relevant to employability, but restricted within a

relatively narrow range so as not to swamp the variance due to other variables. Fourth, unlike Study 3A, income was not provided. Finally, applicants' monetary donations were translated from annual donations (provided in Study 3A) to monthly donations in Study 3B. The amounts used in Study 3A were divided by between 8 and 12 (with the exception of a \$5/year profile in Study 3A, changed to \$1/month in Study 3B), to roughly equate the amounts donated across studies while keeping the dollar amounts round.

4.1.6. Study 3B procedure

Participants were instructed that they would act in the role of a hiring manager, "tasked with selecting job applicants to interview and hire" and that they would be "asked to rate each candidate on a series of traits to the best of your availability given the available information." Participants then rated the importance of several traits in a potential employee on 0–10 scales, as in Study 3A. Participants rated conscientiousness highest ( $M = 8.94$ ; "how careful, hard-working, and conscientious the employee is"), with morality following close after ( $M = 8.71$ ; "how ethical and moral the employee is"). These traits were more important than agreeability ( $M = 7.54$ ; "how friendly and agreeable the employee is"), emotional stability ( $M = 7.46$ ; "how relaxed and emotionally stable the employee is"), openness ( $M = 7.01$ ; "how open and creative the employee is"), or extraversion ( $M = 5.18$ ; "how outgoing and extraverted the employee is"). Thus, morality appears to be an especially important trait in lay theories of employability, nearly on par with conscientiousness.

Participants were then shown 10 profiles (randomly selected out of the 100). Participants completed two sets of ratings for each profile. First, they rated 12 traits. Ten of these traits were roughly based on the Big 5 short form scale (Rammstedt & John, 2007), measuring extraversion ("outgoing", "reserved";  $r = -0.76$ ), conscientiousness ("thorough", "lazy";  $r = -0.64$ ), agreeableness ("friendly", "disagreeable";  $r = -0.51$ ), openness ("artistic", "unimaginative";  $r = -0.64$ ), and stability/neuroticism ("relaxed", "nervous";  $r = -0.24$ ), with the latter trait in each pair reverse-coded. Two of the traits were measures of morality, based on Goodwin et al. (2014), which were selected to be traits that load high on morality but low on warmth to more cleanly separate these two constructs ("fair", "honest";  $r = 0.80$ ). These 12 traits were rated in a separate random order for each item. Finally, participants rated the employability of each applicant ("Relative to other potential candidates, how seriously do you think this candidate should be considered for the position?"). All measures were taken on scales anchored at -5 ("Far below average"), 0 ("Average"), and 5 ("Far above average").

4.2. Results

Compared to the magnitude of money-donations, the magnitude of time-donations had a larger effect on dating (Study 3A) and hiring (Study 3B) interest as well as on moral character (both studies).

4.2.1. Study 3A

Analyses were conducted at the level of items ( $N = 100$ ), averaging across participants ( $Mdn = 10$  per version [male/female] of each item). Judgments of morality [ $r(98) = 0.68, p < .001$ ] and dating interest [ $r(98) = 0.43, p < .001$ ] were moderately to highly correlated between the male and female versions of each item, so we averaged these versions for analysis. However, results are similar when looking at the male or female profiles separately. Since money-donations and time-donations were both skewed, we transformed both variables by taking the square-root, before centering each variable at its mean and scaling by its standard deviation. Results are similar on the untransformed variables.

To test the impact on morality and attractiveness of money-donations and time-donations, we entered both variables as predictors in a multiple regression. Although both variables were predictive, time-donations [ $b = 0.67, SE = 0.07, p < .001$ ] were more predictive of perceived morality than money-donations [ $b = 0.41, SE = 0.07, p < .001$ ]. That is, whereas a 1 SD increase in money-donations led to a 0.41-point increase in perceived morality, a 1 SD increase in time-donations led to a 0.67-point increase. Similarly, time-donations were more predictive of perceived fun [ $b = 0.29, SE = 0.08, p < .001$ ] than money-donations [ $b = 0.05, SE = 0.08, p = .51$ ], although these effects were smaller than for morality. Finally, for dating interest, the effect of time-donations [ $b = 0.47, SE = 0.08, p < .001$ ] was nearly three times the magnitude of the effect of money-donations [ $b = 0.17, SE = 0.08, p = .040$ ].

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4.2.2. Study 3B

As for Study 3A, analyses were conducted at the level of items ( $N = 100$ ), averaging across participants. Once again, we used multiple regression, with time-donations and money-donations as predictors. These variables were again square-root-transformed before centering and scaling by its standard deviation, but the results are similar on the untransformed variables.

For predicting morality, time-donations [ $b = 0.22, SE = 0.03, p < .001$ ] were again more predictive than money-donations [ $b = 0.10, SE = 0.03, p = .002$ ], with more than double the effect size. Consequently, time-donations were also more predictive of hiring intentions [ $b = 0.33, SE = 0.04, p < .001$ ] than were money-donations [ $b = 0.16, SE = 0.04, p < .001$ ]. Indeed, as shown in Table 2, there was no interpersonal judgment for which time-donations were not more predictive than money-donations, except openness for which neither variable was predictive. The relatively small coefficients on stability may be due to the poor reliability of the stability measure ( $r = 0.24$ ).

We also fit a multiple regression model fitting employability from the six interpersonal judgments. The most predictive judgment was morality [ $b = 0.50, SE = 0.13, p < .001$ ], followed by conscientiousness [ $b = 0.41, SE = 0.11, p < .001$ ], extraversion [ $b = 0.23, SE = 0.07, p < .001$ ], and openness [ $b = 0.16, SE = 0.05, p = .005$ ]. Agreeableness [ $b = 0.07, SE = 0.15, p = .63$ ] and stability [ $b = -0.09, SE = 0.12, p = .47$ ] were not significant. These results are consistent both with the findings in Table 1 (large effects of time-donations on morality and conscientiousness) and participants' self-reports that conscientiousness and morality were the most important factors in hiring. The finding that moral traits are seen as especially crucial to employability is interesting in light of the finding that perceived morality explains employment discrimination against formerly incarcerated individuals (Mikkelsen & Schweitzer, 2019), and work suggesting that moral traits are especially likely to be essentialized (De Freitas et al., 2017; Strohinger & Nichols, 2014).

4.3. Discussion

Study 3 contributes to our investigation in two primary ways. First, it replicates the finding that time-donations have an especially large effect on perceived moral character, relative to money-donations. Within the ordinary range of time- and money-donations (as measured among our

**Table 2**  
Multiple regressions predicting interpersonal judgments from time- and money-donations.

Dependent Variable	Predictor	
	Time Donations	Money Donations
Extraversion	0.33 (0.06) ***	0.09 (0.06)
Conscientiousness	0.26 (0.04) ***	0.08 (0.04) *
Openness	0.05 (0.07)	0.09 (0.07)
Agreeableness	0.26 (0.03) ***	0.09 (0.03) **
Stability	0.08 (0.04) *	0.05 (0.04)
Morality	0.22 (0.03) ***	0.10 (0.03) **
Employability	0.33 (0.04) ***	0.16 (0.04) ***

Note. Each row corresponds to a separate regression, with the columns giving the coefficients for the two predictors (square-root transformed and then scaled by 1 SD).

°  $p < .05$  \*  $p < .05$  \*\*  $p < .01$  \*\*\*  $p < .001$ .



participant population), a 1 SD increase in time-donations has a 63% and 120% larger impact (in terms of  $b$  coefficients in Study 3A and 3B, respectively) on morality compared to a 1 SD increase in money-donations. This goes beyond Studies 1 and 2, which pitted time- and money-donations directly against one another, by allowing us to document the independent effect of each kind of donation on perceived morality. Second, it documents a downstream consequence of perceived moral character—interpersonal approach in both dating (Study 3A) and employment (Study 3B) contexts. This helps to support the idea that morality-signaling guides interpersonal approach (H4).

Nonetheless, it remains possible that donors themselves are oblivious of these signals. Studies 1–3 show that these signals are *received* by third-parties, but they have not examined how these signals are *sent*. Study 4 thus examines behavior of *donors* rather than third-party observers.

## 5. Study 4

If time-donations versus money-donations differ in the signals they send to third-parties, then participants should be sensitive to social context in deciding between donation types (H5). Study 4 thus manipulated signaling motive, using a manipulation based on Maeng and Aggarwal (2018). Some participants imagined a social context in which they would have an affiliation goal and therefore a motive to signal their moral character. Other participants imagined a context in which they had a dominance goal and therefore a motive to signal power and status. If donors are aware of the signals sent by their donations to third-parties, then the affiliation motive should nudge donors relatively more toward time-donations over money-donations.

### 5.1. Method

We recruited 499 Americans (62% female,  $M_{\text{age}} = 37.6$ ) from Mechanical Turk. Participants were excluded ( $N = 43$ ) using criteria explained below.

First, participants' signaling *motive* was manipulated between-subjects. Participants first read a scenario designed to manipulate their signaling motive, based on Maeng and Aggarwal (2018, Study 3). In the dominance goal condition, participants were told to imagine they would be going on an important business trip tomorrow to finalize a negotiation. In the affiliation goal condition, participants were instead told they would be going on an important date. See Appendix B for the full text of these vignettes. To measure (first-person) signaling motives, participants were then asked "how important is it that you are perceived in the following ways tomorrow?" with separate ratings of moral character ("moral"), power ("powerful"), and status ("sophisticated") on 0–10 scales.

Next, participants' own (first-person) signaling *behavior* was measured. Participants were told that while preparing for tomorrow's negotiation or date, they saw a news broadcast about an earthquake in Nepal. Participant were told that they are considering making a money-donation or a time-donation to help the victims, which might potentially come up in conversation with the participant's negotiation partner or date. Participants then rated which donation they were likelier to make on a scale from –5 to 5. The order of mentioning the time- and money-donations was counterbalanced, and the scale orientation adjusted to match. Responses were recoded so that negative numbers correspond to a time-donation preference for consistency with other studies.

Finally, participants' (third-person) signaling *perceptions* were measured. Participants were told about two other people who made either time-donations or money-donations. Participants rated the donors' moral character ("Who do you think is more moral?"), power ("Who do you think is more powerful?"), and status ("Who do you think is more sophisticated?") on –5 to 5 scales. The order and scale orientation were counterbalanced to match the order of the participants' own choice.

At the end of the study, in addition to attention check questions

similar to those used in previous studies, an additional check question was asked about tomorrow's activity (e.g., business meeting, date, etc.). Participants were excluded if they either answered the latter question incorrectly or answered more than 25% of the former questions incorrectly.

## 5.2. Results

Overall, participants favored the time-donations more when their goal was affiliation rather than dominance. This effect was mediated by moral signaling motives and was particularly strong among participants high in the belief in the morality-signaling power of time-donations, demonstrating alignment among first-person motives, third-person judgments, and behavior.

### 5.2.1. Judgments

Looking first at participants' third-party judgments, participants once again believed that time-donations much more strongly signaled moral character than money-donations [ $M = -1.34$ ,  $SD = 2.17$ ;  $t(455) = -13.14$ ,  $p < .001$ ,  $d = -0.62$ ]. This yet again replicates the moral preference for time-donations over money-donations found in Studies 1 and 2. However, money-donations were seen as somewhat more strongly signaling power [ $M = 0.41$ ,  $SD = 2.64$ ;  $t(455) = 3.29$ ,  $p = .001$ ,  $d = 0.15$ ] and status [ $M = 0.50$ ,  $SD = 2.28$ ;  $t(455) = 4.69$ ,  $p < .001$ ,  $d = 0.22$ ]. This may be due to the inference that high-power or high-status individuals would have greater scarcity of time relative to money (see Shaddy & Shah, 2018), and therefore be likelier to choose money-donations. We note, however, that the signaling value of time vs. money donations is much smaller for power and status ( $d$ s = 0.15 and 0.22) than for morality ( $d = -0.62$ ).

### 5.2.2. Motives

Turning next to the first-person task, the experimental manipulation effectively shifted participants' signaling motives. Participants in the affiliation (rather than dominance) condition were higher in moral signaling motives [ $M$ s = 8.52 vs. 6.86;  $t(454) = 8.69$ ,  $p < .001$ ,  $d = 0.81$ ] but lower in power signaling [ $M$ s = 4.56 vs. 8.92;  $t(454) = -25.23$ ,  $p < .001$ ,  $d = -2.36$ ] and status signaling [ $M$ s = 6.48 vs. 7.83;  $t(454) = -7.42$ ,  $p < .001$ ,  $d = -0.69$ ] motives. Given that these three motives are confounded in our experimental design—and perhaps in any experimental design manipulating signaling motives through social context—we rely on regression models to tease apart these pathways.

### 5.2.3. Donation behavior

Before turning to more sophisticated modeling, we can look at the raw effects on behavior. Indeed, participants favored time-donations to a greater degree in the affiliation signaling condition [ $M = 0.55$ ,  $SD = 3.53$ ] than in the dominance signaling condition [ $M = 1.59$ ,  $SD = 3.42$ ;  $t(454) = 3.21$ ,  $p = .001$ ,  $d = 0.30$ ]. Given the greater actual prevalence of money-donations over time-donations in real-world behavior (see Study 3), it is not surprising that participants in both conditions favored the money-donation overall; what is more impressive is that this tendency was nearly three times greater in magnitude in the dominance than in the affiliation condition.

To quantify the part of this effect due to morality signaling motive (versus power and status signaling) and to examine the interaction between first-person signaling motives and third-person signaling judgments, we fit a moderation mediation model (PROCESS Model 14; Hayes, 2013). This model used social context condition (dummy-coded; affiliation goal = 1) as the independent variable (X), first-person signaling motives as the mediator (M), donation preference as the dependent variable (Y; coded here so that *positive* numbers reflect time-donation preference), and third-person morality signaling perception as the moderator (W) of the relationship between signaling motives and donation behavior. To adjust for the measured differences in status and power signaling motives across conditions, we include these motives as

covariates. However, the results are nearly identical if these covariates are omitted from the model. The results are shown in Fig. 1.

As Fig. 1 shows, there was evidence for moderated mediation over-and-above any confounding effects of status or power signaling. Social context condition (affiliation versus dominance goal) was significantly associated with the motive to signal moral character [ $b = 1.65$ ,  $SE = 0.29$ ,  $p < .001$ ]. First-person moral signaling motives did not significantly predict first-person donation decisions when other variables are held constant at their means [ $b = 0.13$ ,  $SE = 0.08$ ,  $p = .10$ ], but crucially first-person signaling motives interacted [ $b = 0.05$ ,  $SE = 0.03$ ,  $p = .070$ ] with third-person signaling perceptions, which themselves had a significant effect on first-person donation decisions [ $b = 0.38$ ,  $SE = 0.07$ ,  $p < .001$ ]. This moderation led to a significant indirect effect of social context condition on donation decisions via morality signaling for participants who were high (+1 SD) on third-person morality signaling perception [ $b = 0.41$ , 95% CI: 0.06 to 0.83] but not among those who were low [ $b = 0.02$ , 95% CI: -0.35 to 0.38].

### 5.3. Discussion

Study 4 showed that donation choices of time versus money are sensitive to social context (H5). With an affiliation goal, participants were likelier to favor time-donations over money-donations, particularly among participants high in the belief that time-donations send powerful signals of morality. This provides further support for the moral signaling power of time-donations, using a between-subjects design. Moreover, this shows another downstream consequence of signaling beliefs for behavior: Beliefs in third-party signaling manifest in first-person donation choices.

This study does have limitations—the social context manipulation affected not just moral character signaling motives, but also status and power signaling motives. Anticipating this problem, we measured these other motives and included them as covariates in the statistical analysis. However, it is always possible in such settings that unobserved confounds exist, reflecting other importance differences between conditions. What we *can* say is that (i) the manipulation did successfully manipulate moral signaling motives; (ii) that individual differences in moral signaling motives combined with individual differences in moral signaling perceptions to jointly influence behavior—a finding at odds with the idea that the results are due to unobserved confounds; and (iii) that these effects occurred over-and-above any effects of status or power signaling motives.

Study 4 also illustrates a broader point about social signaling—it depends crucially on an interaction between first-person motives and third-person social perception. Even if people are motivated to signal a trait, this will not manifest in behavior if they do not know how third-parties interpret the meaning of their actions. Conversely, even someone who fully understands how others judge their actions will not take signaling actions if they do not have the associated signaling goals. Thus, social context and beliefs about how social perceivers will view one's actions are both necessary to shift behaviors such as donations. Social signaling depends on shared systems of meanings between observers and doers, as reflected in the socially shared “time = self” lay theory.

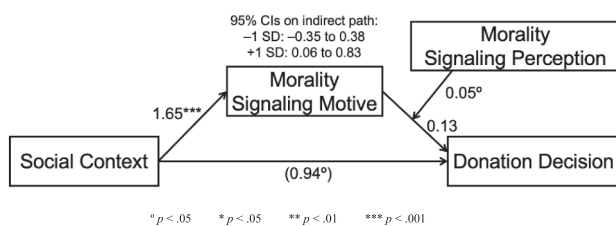


Fig. 1. Moderated mediation model predicting donations from social context, motives, and perceptions. Note. Model fit using PROCESS Model 14 with status and power signaling motives as covariates.

At first blush, the results of Studies 3 and 4 may seem to be in conflict, as both studies compared social versus work situations and arrived at seemingly different results: Study 3 found that time-donations are seen as diagnostic of moral character in both settings, and thus that people used time-donations as a cue for both dating and hiring decisions, whereas Study 4 found that time-donations have different signaling properties in different contexts. However, the conflict is only apparent. In all conditions of these studies, time-donations signaled warmth- and morality-oriented traits to a greater degree than money-donations. The crucial difference is that in the specifically competitive work-related task in Study 4, the *donor's* goal is not to signal such traits, but instead to signal dominance, favoring the money-donation as a consequence. In a hiring task (Study 3B), it is far from clear that one wants to hire maximally dominant people, but instead one is likelier to assess traits such as morality given that most jobs require trust and cooperation among co-workers, as indicated by the participants themselves in Study 3B.

## 6. Study 5

Logically equivalent statements can yield different moral intuitions and behaviors in many contexts (Sinnott-Armstrong, 2008). For example, when a situation is framed as a loss rather than a gain, people behave more unethically (Kern & Chugh, 2009); when options are framed as actions rather than omissions, behave less unethically and react more negatively to negative outcomes from other's choices (Ritov & Baron, 1992; Teper & Inzlicht, 2011); and when behaviors are described abstractly rather than concretely, the behaviors are thought to be more biologically based and less intentional, and thus the actors less morally responsible (Kim et al., 2016, 2017; Nichols & Knobe, 2007). Study 5 examines whether intuitions about time versus money donations can be shifted through reframing.

If the moral preference for time-donations over money-donations is a mistake—as effective altruists such as Singer (1972) argue—then it would be useful to consider ways to reframe money-donations to compete more effectively against time-donations in the moral marketplace. Study 5 capitalizes on the fact that time can often be converted into money and vice versa. Specifically, we tested whether reframing money-donations as time-donations would make money-donations appear more praiseworthy (H6) and, conversely, whether framing time-donations as money-donations would make time-donations appear less praiseworthy.

### 6.1. Method

We recruited 200 Americans (57% female,  $M_{age} = 40.7$ ) from Mechanical Turk. Participants were excluded ( $N = 25$ ) using the same criterion as Studies 1 and 3. Study 5 was pre-registered at <https://aspredicted.org/4r6cq.pdf>.

Participants read four vignettes concerning donations to different charitable causes (see Appendix B), in which one person donated time and the other person donated money. Each vignette appeared in one of four conditions in a 2x2 design, where the time-donation was framed either in terms of time or money and the money-donation was framed either in terms of money or time. In the baseline condition (time-framing/money-framing), the time-donation was framed in terms of time and the money-donation in terms of money. The baseline version of one of the vignettes read:

Megan and Kate both work in Columbus, OH and earn \$20 per hour. They both made contributions to a charity called Build a Dream, which helps build houses for the homeless.

Megan pledged to donate 10 hours of her time to volunteer with Build a Dream.

Kate pledged to donate \$200 of her income to Build a Dream.

A second condition (time-framing/time-framing) was identical to the baseline condition, except that the money-donation was re-described in terms of its time value:

Kate pledged to donate 10 hours' worth of her income to Build a Dream. This amounted to a cash donation of \$200.

Conversely, a third condition (money-framing/money-framing) was identical to the baseline condition, except that the time-donation was re-described in terms of its money value:

Megan pledged to donate \$200 worth of her time to Build a Dream. This amounted to volunteering for 10 hours.

Finally, a fourth condition (money-framing/time-framing) described the time-donation in terms of money and the money-donation in terms of time, using the wordings above. Participants read one vignette in each of the four conditions, assigned to condition using a Latin square. Vignettes were completed in a random order.

For each item, participants rated praiseworthiness ("Whose act do you think was more praiseworthy?"), emotional investment ("Who do you think cares more about helping the homeless"), and character ("Who do you think has stronger moral character") on scales from -5 ("Megan") to 5 ("Kate"). These judgments were all made on the same screen.

### 6.2. Results

We once again see an overall preference for time-donors, but this was attenuated depending on how the donations were framed. The means are plotted in Fig. 2.

In the baseline condition (i.e., time-donations framed in terms of time and money-donations framed in terms of money), participants viewed the time-donations as more praiseworthy [ $M = -1.31, SD = 1.90; t(174) = -9.13, p < .001, d = -0.69$  vs. 0], more diagnostic of emotional investment [ $M = -0.85, SD = 1.75; t(174) = -6.45, p < .001, d = 0.49$ ], and more revealing of good moral character [ $M = -0.90, SD = 1.65; t(174) = 7.23, p < .001, d = 0.55$ ] compared to money-donations, replicating the results of our previous studies.

Can framing money-donations in terms of time help to make them more appealing relative to time donations? Yes: As shown in Fig. 2, although participants continued to favor the time-donations, these tendencies were weaker when money-donations were framed in terms of time (time-frame/time-frame condition) compared to the baseline condition, with these effects manifesting significantly in praise [ $M = -0.86, SD = 2.06; t(174) = 3.38, p < .001, d = 0.23$  vs. baseline] and character [ $M = -0.56, SD = 1.77; t(174) = 2.64, p = .009, d = 0.20$ ], but only directionally for emotional investment [ $M = -0.66, SD = 1.77; t(174) =$

$1.43, p = .15$ ]. This supports H6.

We can also ask, conversely, whether framing time-donations in terms of money makes time-donations less appealing relative to money-donations. It did not: The money-frame/money-frame condition did not differ from the baseline condition on praise [ $M = -1.19, SD = 1.89; t(174) = 1.12, p = .26, d = 0.07$  vs. baseline], emotional investment [ $M = -0.94, SD = 1.76; t(174) = -0.80, p = .42, d = -0.05$ ], or character [ $M = -0.86, SD = 1.69; t(174) = 0.52, p = .61, d = -0.02$ ]. Since re-framing the time-donation in terms of money made no significant difference, it is unsurprising that when both donations are reframed (the money-frame/time-frame condition), the results look very similar to when only the money-donation is reframed (the time-frame/time-frame condition), as shown in Fig. 2.

### 6.3. Discussion

There are two key findings here. First, reframing money-donations in terms of time is an effective way to increase the perceived praiseworthiness of the money-donations (H6), although they are still not seen as equally as praiseworthy as time-donations. Second, reframing time-donations in terms of money does *not* make time-donations seem less praiseworthy. One possibility is that any framing that highlights that time resources were expended is sufficient to cue the perception of emotional investment. That is, for money-donations, the time-framing is necessary because the time expenditure is otherwise not salient. But for time-donations, the time expenditure is salient whether or not the money-frame is used or not.

We also report a replication study in the Supplementary Materials (Study S3), which uses somewhat different methods to reach broadly similar conclusions about the efficacy of framing money-donations in terms of time.

## 7. General discussion

Americans donate 8 billion hours of time to charity each year (Grimm & Dietz, 2018), equivalent to over \$200 billion at the median American wage. For comparison, the cost of saving a human life by donating to the most effective charities is between \$1000 and \$5000 (GiveWell, 2019) and the cost of eradicating malaria is estimated at \$90–120 billion (Renwick, 2016). Americans' charitable impulse, if channeled effectively, could save millions of lives and transform the poorest regions of the world. Why is it that our charitable efforts fare so poorly relative to these remarkable possibilities?

There are probably many reasons for the underwhelming performance of charity. People's willingness to donate to prosocial causes is famously biased by affective influences, such as the ease of imagining an individual relative to a statistic (Small et al., 2007). People often deny that one charitable cause can be objectively worthier than another (Berman et al., 2018). And even among donations to the same cause, the donation's reputational impact tends to be guided by the amount of sacrifice rather than social good (Johnson, 2020), producing little social incentive for effective giving.

The current results add yet another wrinkle: Third parties consider donations of time to be more praiseworthy than donations of money. This occurs even when the amount of sacrifice is equated and even though most people believe that *money-donations* are more effective at helping the recipients (Study 1) when the benefits are not objectively equated. This effect was hypothesized based on reputational accounts of moral judgment, on which praise and blame are assigned to reflect a person's perceived moral character (Goodwin et al., 2014; Uhlmann et al., 2015). We predicted—and found—that time-donations signal greater emotional investment, which in turn signals moral character (Levine et al., 2018) (Study 1). We considered two complementary mechanisms for this effect, finding evidence for both—people believe that time-donations are more costly, even when their objective costs are equated, and this bias is linked to a "time = self" lay theory (Study 2).

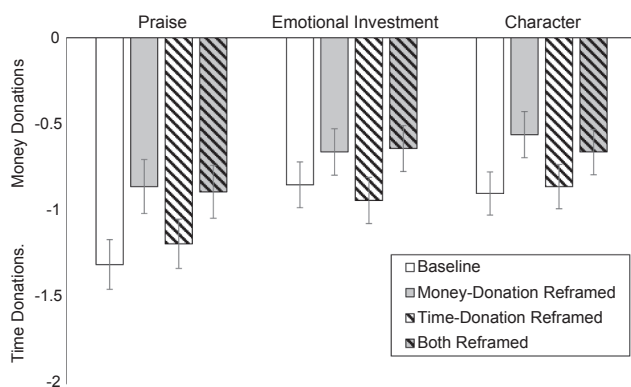


Fig. 2. Results of Study 5. Note. Possible scores on the vertical axis range from -5 (time-donation) to +5 (money-donation).



These moral signals manifested in third-person dating interest (Study 3) and first-person donation choices (Study 4). As further evidence that these donations act as powerful signals, between-subjects manipulations of interpersonal goal (affiliation versus dominance) led to large shifts in donation behavior, with time-donations cued more by social contexts that encourage moral signaling (Study 4). Fortunately, however, since money-donations are at root donations of time (i.e., the time worked to earn the amount donated), reframing money-donations in terms of time moderates this preference for time-donations (Study 5).

### 7.1. Theoretical implications and directions

These results contribute to broader debates about moral psychology. Altruistic actions elude traditional evolutionary accounts when we help strangers we are not related to (Hamilton, 1964) nor expect to interact with again (Trivers, 1971). Reputational accounts (Miller, 2007; Nowak & Sigmund, 2005) fill this Darwinian gap by pointing out that prosocial acts can be selfishly beneficial if they send a strong signal of cooperativeness or trustworthiness to others, incentivizing third-parties to enter into mutually beneficial relationships. Such signaling need not be conscious; rather, genuinely felt prosocial motives may serve the ultimate, adaptive function of signaling our underlying morality to third-parties. The current results support reputation-signaling accounts of morality. That is, judgments of prosocial actions are not merely or even primarily answering the question “Is this a good action?” but “Is this a good person who did this action?”

Reputational accounts are theoretically distinct from “warm glow” theories of prosociality, which emphasize that altruism is often motivated by a desire to feel good about oneself or signal positive traits to oneself—an emotionally positive but not materially beneficial goal. Indeed, such motives do partly drive preferences for time- over money-donations: Donors consider their own time-donations to be more expressive of self-identity than their money-donations (Reed et al., 2007). Our results show, however, that this “warm glow” is not the only output of time-donations—they also broadly signal one’s moral reputation to third-parties. Rather than undermining the idea that “warm glow” self-signaling impacts time-donation choices, our results suggest that this motive coexists with a third-party signaling motive.

In our view, character-based or virtue ethics accounts of moral judgment are a promising “third way” to the more popular utilitarian and deontological perspectives in both normative ethics and moral psychology (Hursthouse, 1999; Uhlmann et al., 2015). The basic cognitive claim of such accounts is that moral judgments are *explanatory inferences* about what a behavior implies about a person’s deep-seated traits. Thus, these accounts build natural bridges to existing work on person perception (e.g., Anderson, 1965; Asch, 1946; Johnson & Ahn, 2021; Johnson, Kim, & Keil, 2016), theory of mind (e.g., Gopnik & Wellman, 1992; Johnson & Rips, 2015; Waytz, Gray, Epley, & Wegner, 2010), and explanatory reasoning (e.g., Johnson, Rajeev-Kumar, & Keil, 2016; Johnson et al., 2019; Khemlani, Sussman, & Oppenheimer, 2011; Lombrozo, 2016). In addition to their theoretical virtues, character-based accounts provide natural explanations of phenomena such as signaling effects in moral behavior (e.g., Griskevicius et al., 2010), “altruistic” punishment by third-parties (e.g., Jordan, Hoffman, Bloom, & Rand, 2016), the tendency to blame people for their mental states (Cusimano & Goodwin, 2019; Inbar et al., 2012), and the surprisingly poor relationship between measurements that ought to be inter-related according to consequentialist theories (Bartels & Pizarro, 2011; Kahane, Everett, Earp, Farias, & Savulescu, 2015, 2018).

Despite its promise, more work is needed to provide a theoretical exposition of a character-based approach to moral psychology at the same level of detail as consequentialist and deontological theories (notwithstanding the excellent foundation laid by Uhlmann et al., 2015). The role of emotion, studied here, is one aspect considered in normative approaches to virtue ethics that should be carefully incorporated into character-based accounts; systematic theoretical and

empirical work taking normative philosophy (e.g., Hursthouse, 1999) as its starting point could further elaborate this approach. Given the centrality of reputation to branding, advertising, and other key business issues (e.g., Dawar & Parker, 2014), we believe that person-centered moral psychology has broad organizational relevance. For example, this approach may be useful for understanding how firms can best manage public relations crises, how firms can maximize the moral cachet of their products for consumers to flaunt to others, and how firms can morally position themselves.

The current results also contribute to the literature on individual differences in moral psychology. Utilitarian responses in moral dilemmas are surprisingly unrelated to standard measures of utilitarian moral theories (e.g., Bartels & Pizarro, 2011; Kahane et al., 2015, 2018), and we once again find a poor relationship between explicitly held utilitarian beliefs and judgments logically consistent with utilitarianism (favoring money- over time-donations; Singer, 1972). Future work could examine the relationship between other individual differences in moral thought, such as attention to different moral foundations (Graham, Haidt, & Nosek, 2009) or the extent to which morality is believed to be objective (Goodwin & Darley, 2008; Johnson, Rodrigues, & Tuckett, 2020).

### 7.2. Practical implications and directions

Our theoretical framework suggests several lines of future inquiry to further understand charitable giving. First, given that cost-based thinking is at the root of the preference for time-donations, one might expect that the relative scarcity of time versus money would influence both first-person donation choices (see Shah, Shafir, & Mullainathan, 2015) as well as third-person inferences about emotional investment and moral reputation. Second, the *source* of a resource may impact the moral reputation of its donor. For example, a person who received a windfall such as an inheritance might experience minimal reputational gain from donating it because that resource is perceived as relatively decoupled from the self due to the low time-investment required to obtain it. In contrast, if a person earns the same amount of money and then donates it, this may be perceived as a greater sacrifice because the donor’s time—not just their money—is at the root of the donation.

To the extent that social signaling is in play in donor behavior (as suggested by Study 4 as well as a large literature in economics, e.g. Glazer & Konrad, 1996; Harbaugh, 1998), this suggests that a further dimension of social context would also impact donor behavior—whether the donation is made in public or in private. For example, Griskevicius et al. (2010) find that people are likelier to purchase green products in public rather than private settings. On the other hand, it is possible that social norms become internalized over time. Indeed, this is one possible explanation for why warm-glowing giving exists—we “feel good” as a proximal mechanism for “looking good.” In a different domain, Rand et al. (2014) find evidence for a similar mechanism in the context of cooperative dilemmas. Because cooperation usually pays (since most real-world social encounters are repeated over time and reputation matters), most people are intuitive cooperators. Thus, deliberation—which pushes behavior more toward the optimum for a given situation—leads people to be more selfish in social situations that are not to be repeated. This suggests that the differences between public and private contexts may be relatively modest if people internalize the norm that time-donations signal moral character to a greater degree than money-donations.

These results also contribute directly to practical knowledge. On the one hand, they help to explain the proliferation of relatively ineffective charities that take donations in the form of time rather than money—the charity market is not optimizing for effectiveness, but for donor reputation. Yet, these results also provide clues for how to resolve this market failure. If money-donations are more effective, then the key to increasing the relative share of money versus time donations is to develop ways to signal the donors’ emotional investment in the causes. Study 5 showed



that one such technique is reframing money-donations in terms of time—for example, pledging a day’s income to a charity rather than donating \$100. Impartiality in our distribution of charitable dollars may be critical for maximizing social good, but so is providing opportunities for donors to flaunt their moral character.

### CRedit authorship contribution statement

**Samuel G.B. Johnson:** Conceptualization, Methodology, Formal analysis, Investigation, Supervision. **Seo Young Park:** Conceptualization, Methodology, Investigation.

### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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### Appendix A. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.obhdp.2021.05.004>.

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