Costless and Costly Prosociality: Correspondence among Personality Traits, Economic Preferences, and Real World Prosociality

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Abstract

Prosociality can either be costly (e.g., donating to charity) or costless (e.g. posthumous organ donation). Whereas links between personality and costly prosociality and have been explored, links with costless prosociality and personality are at present unknown. We address this in two studies. Study 1 (N = 200) confirms the distinction between costless and costly prosociality based on willingness to engage with health and non-health prosociality. Study 2, using data from 4 samples (student and community; N = 733) shows that across incentivized and hypothetical economic games to assess costless (generosity game; GG) and costly (dictator game; DG) prosociality, that organ donor behavior was linked to greater allocations in the GG and charity/volunteering behavior in the DG. Costless and costly prosocialities are associated with different personality traits (e.g., costly with politeness and compassion, and costless with intellect). Implications for cooperative phenotypes and recruiting organ donors are discussed.

Key words. Altruism, Costly, Personality, Organ Donation. Dictator Game

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Perceived cost is a key determinant of helping (Stewart-Williams, 2007) with helping generally decreasing with increasing costs (Bode, Miller, O'Gorman, & Codling, 2015). Studies using economic games or examining real world prosociality have typically focused on costly giving such as dictator game allocations, volunteering, and charitable donations (Bekkers & Wiepking, 2010; Böckler, Tusche & Singer, 2016). In all of these instances, the individual must bear a considerable cost in terms of time, money, or effort in order to assist or benefit another person. However, while the vast majority of research into prosociality has focused on costly helping, there are prosocial acts that can be considered extremely low cost and thus relatively *costless* and in some case *zero-cost*, such as posthumous organ donation (Moorlock, Ives, & Draper, 2014). Thus, just considering costly helping, in isolation, does not provide a complete coverage of the prosocial domain. In the present studies, therefore, we examine the distinction between costless and costly prosociality. We firstly explore the factor structure of peoples' willingness to engage in *general* costless and costly prosociality, and then examine the correspondence that costless and costly prosocial preferences in lab-based economic games have with real-world prosocial behavior and personality traits.

Prosociality and Cost

Some prosocial behaviors are costly because they consume resources that become depleted by giving, whereas other prosocial acts are very *low-cost*/*relatively costless*, in that the giver has sufficient resources to expend without detriment (Zahavi & Zahavi, 1997), other prosocial acts may be *zero-cost* as the giver longer needs the resource (Moorlock, Ives, & Draper, 2014; Shepherd, O'Carroll, & Ferguson, 2014).

Examples of real-world costly prosocial acts include charitable giving (which involves sacrificing money) and volunteering (which involves sacrificing time) for the benefit

of others (Böckler et al., 2016). In the lab, costly prosocial preferences can be assessed using the dictator game (DG) (Forsythe, Horowitz, Savin, & Sefton, 1994), where one player (the dictator) decides how to split a fixed amount of money — usually with an anonymous recipient — who must accept this unconditionally (Forsythe, et al., 1994). Given the constant-sum nature of the game, the dictator has to bear a cost to be prosocial to the recipient.

A classic example of costless real world prosociality is posthumous organ donation (Moorlock et al., 2014; Shepherd et al., 2014). Religious or spiritual concerns aside, this act is ultimately costless because the donor bears no cost at the time of deciding to donate, and, once deceased, is no longer in need of their organs. Within behavioral economics, costless prosocial preferences can be explored using the generosity game (GG) (Güth, Levati, & Ploner, 2012; Güth, 2010; Zhao, Ferguson, & Smillie, 2016a). Here, one player (the proposer) has a fixed amount of money (e.g., $5) to keep, and must decide how much of a given range of money (e.g., $0 to $10) another player should receive (see Güth et al., 2012). Because the proposer's own windfall is fixed, the cost of allocating to the recipient is zero — the proposer will leave with $5 regardless of what they allocate to the recipient. Research shows that most proposers choose to maximize the recipient's payoff, while a substantial portion prefer an equal share to the recipient (Güth et al., 2012; Güth, 2010).

Aims of the Current Paper

The main aim of this paper is to demonstrate that costless and costly prosociality are distinct factors of prosociality. This adds to the existing research that has focused solely on the factor structure of costly prosociality (Böckler, Tusche & Singer, 2014; Hubard; Harbaugh, Srivastava, Degras & Mayr, 2016; Peysakhovich, Nowak & Rand, 2014). We address this aim by: (1) exploring the factor structure of peoples' willingness to engage in a variety of costless and costly prosociality (Study 1), (2) exploring the correspondence

between costless and costly real-world and lab-based prosociality (Study 2), and (3) examining how these prosocialities are linked with personality (Study 2).

Study 1: Costless vs. Costly Prosociality in the context of Health vs. Non-Health Behaviors

To study the (zero) costless-costly prosociality distinction we explore the factor structure for costless and costly health and non-health based prosociality. Bekkers (2006) argues that health and non-health based prosociality are distinct and should be assessed separately. Thus, we identify costless and costly aspects of both health and non-health prosociality. For example, *costless non-health prosociality* can be seen in behaviors such as 'donating unwanted clothes to charity, signing a petition' whereas instances of *costly non-health prosociality* include 'donating money to charity'. *Costly health prosociality* is seen in behaviors like blood donation (Lyle et al., 2009), whereas *costless health prosociality* is seen in posthumous organ donation (Shepherd et al., 2014). Thus, we cross costless vs. costly with health vs. non-health prosociality to examine whether the costless-costly distinction is identifiable.

Method

Participants. Two hundred participants (mean age= 24.6, SD = 3.4; 50% male), recruited across a UK university campus took part and the sample size is sufficient given the number of items to produce a stable factor structure (Ferguson & Cox, 1993)

Measures. As part of a larger study on motivations and prosociality, participants indicated the extent to which they would be willing (from 1 = not at all to 5 = very likely) to perform each of 12 behaviors selected to assess archetypal costly and costless prosociality for both health and non-health prosocial acts (see Table 2 and Supplementary Files Text S1 and

supplementary Tables S1, S2 and, S3 for the rationale for the behaviors included and excluded).

Analysis. We specified a series of confirmatory factor models (CFAs) in M*plus* 7, using weighted least square with mean and variance adjustment (WLSMV) to account for the ordinal nature of these data. We specified (i) a one factor prosociality model (Model 1); (ii) a two factor model with correlated costly and costless factors (Model 2); (iii) a two factor model with correlated health and non-health factors (Model 3); (iv) a four factor model with orthogonal costly, costless, health and non-health factors (Model 4); and (v) a four factor model with the costly and costless factors correlated and the health and non-health factors correlated and all other associations orthogonal (Model 5) (see Supplementary Text S1, and Table S2 for items and their factor targets).

Results & Discussion

Fit statistics for the CFA models are presented in Table 1. While Model 5 is the best fit to these data, the pattern of factor loadings suggested a different modified model such that blood donation represented a high cost prosociality factor and that low cost prosociality is represented by two factors: (1) 'communal and civic duty' (e.g., signing a petition, voting, registered organ donor and, giving away a car parking ticket and (2) 'generic non-health costless' prosociality (e.g., giving unwanted clothes or toys to charity or someone a free concert ticket) (see Supplementary Text S2 and Table S4 for more detail and the rationale for the revised model). This modified model was specified and is referred to as Model 6 in Table 2. This model is both a good fit to these data with an interpretable structure (Table 2).

Table 1. *CFA Model Fit Statistics*

Models	***χ^2 (df)***	***CFI***	***TLI***	***RMSEA***
Model 1: One factor	311.06 (54)***	.59	.49	.15***
Model 2: Two factors (costly vs costless)	255.85 (53)***	.72	.65	.13***
Model 3: Two factors (health vs non-health)	226.70 (53)***	.72	.65	.13***
Model 4: Four factors (health vs non-health, costly vs costless) – all orthogonal	106.14 (42)***	.90	.84	.09***
Model 5: Four factors (health vs non-health, costly vs costless) - health vs non-health, costly vs costless – oblique	66.41 (40)***	.96	.93	.06
Modified Modelling				
Model 6: Four-factor – Costless (genetic or communal/civic) and Costly (health or non-health)	74.97(48)**	.96	.94	.05

Note. ** p < .01, *** p < 001. CFI = Comparative Ft Index, TLI – Tucker-Lewis Index, RMSEA = Root Mean Square Error of Approximation

In Model 6, there are two types of costless prosociality, one focused on communal and civic duty (Factor 4) that includes organ donation, the other being a generic non-health costless prosociality (Factor 1). Similarly, costly prosociality is split into health (Factor 3), focusing on blood donation, versus general non-health behaviors (Factor 2). We conducted a sensitivity analysis that showed that this factor structure was not influenced by our strict item exclusion criteria concerning living organ donation (Supplementary Text S3, Table S5).

Table 2. *CFA factor loadings and Latent factor inter-correlations for Model 6*

Behaviors	Factors			
	1	2	3	4
Donate your unwanted clothes to charity	**.913**	. 000	. 000	. 000
Give someone a concert ticket for free that you can no longer use	**.554**	. 000	. 000	. 000
Donate any unwanted toys to charity	**.690**	. 000	. 000	. 000
Donating 20% of your salary to charity	. 000	**.617**	. 000	. 000
Donate money to help those you think have unfairly lost their jobs	. 000	**.780**	. 000	.000
Volunteer your time regularly to help out at a local charity shop	. 000	**.377**	. 000	.000
Donate blood once	.000	.000	**.806**	. 000
Donate blood regularly	. 000	. 000	**.831**	. 000
Give someone your car parking ticket, for free, when there is still time left on it	. 000	. 000	. 000	**.604**
Register as an organ donor to donate organs after your death	.000	. 000	. 000	**.553**
Sign a petition	. 000	.000	. 000	**.658**
Vote in a general election	. 000	.000	. 000	**.672**
Correlations across latent factors				
Factor 1: *Costless Non-Health Prosociality*	1			
Factor 2: *Costly Non-Health Prosociality*	**.381**	1		
Factor 3: *Costly Health Prosociality: Blood Donation*	**.278**	**.**116	1	
Factor 4: *Costless Communal and Civic Duty*	**.521**	-.063	**.415**	1

Note*. Coefficients in bold indicate significant loadings and significant inter-correlations.*

Study 2: Correspondence Between Real World and Lab-Based Prosociality

Study 1 demonstrates a clear distinction between costless and costly prosociality. Here we move beyond self-reports and examine the correspondence between an archetypal costless behavior – posthumous organ donation – and allocations in the generosity game (GG: a costless behavioural preference). We also examine the correspondence between archetypal costly behaviours – donating to charity and volunteering – and allocations in the dictator game (DG: a costly behavioral preference). We choose to explore organ donation as an example of costless prosociality as it is endorsed by a large number within the population, whereas numbers of people giving unwanted clothes to charity, for example, is not clearly measured or known (US Department of Health and Human Services, 2016). Furthermore, organ donation reflects aspects of non-health costless prosociality (see Table 2 above) and thus has generalizability beyond the health domain.

Our predictions are based on *self-perception* theory from psychology (Bem, 1972; Baumeister, 1998) and *self-image* models from economics (Benabou & Tirole, 2006: see also Tonin & Vlassopoulos, 2013). These suggest that people's prosocial behaviors reflect, to an extent, their underlying values and people act in a manner consistent with these (see also Yamagishi, Horita, Takagishi, Shinda, Tanida & Cook, 2009). Thus, we predict that those who identify as an organ donor will allocate more to a partner in the GG (but not the DG) as this will be consistent with them being a generous person who gives when there are no real costs. On the other hand, those who engage in donating to charity and volunteering will allocate more to a partner when it comes to costly giving in the DG (but not the GG) as again this is more consistent with their self-image as a person who gives when it is costly.

Links with Personality

There is a growing literature showing how personality traits predict giving in the real-world and prosocial preferences within economic games (Zhao & Smillie, 2015). Based on this literature we offer a number of predictions about how costless and costly prosociality will differ with respect to the aspects of the Five-Factor Model of personality. This consists of five broad trait domains (i.e., neuroticism, agreeableness, conscientiousness, extraversion, openness/intellect), each of which subsumes two narrower traits (known as *aspects*) which reflect distinct but correlated tendencies (DeYoung, Quilty, & Peterson, 2007; DeYoung, 2013). The five factor domains and their aspects are detailed in Table 3. Examining the trait predictors of costly versus costless prosociality at this finer-grained level of personality may shed light on some of the psychological mechanisms underpinning each different form of prosociality.

Table 3. *Aspects of the Big Five model of personality, from the Big Five Aspect Scales (BFAS; DeYoung, Quilty, & Peterson, 2007*).

	Description	Example item	α
Neuroticism			
Withdrawal	Tendency to experience anxious and depressive traits	Seldom feel blue	.88
Volatility	Tendency to be irritated, angry, and emotionally labile	Get angry easily	.90
Agreeableness			
Politeness	Tendency to respect others and adhere to social norms	Hate to seem pushy	.78
Compassion	Tendency to be emotionally concerned about others' wellbeing	Sympathize with others' feelings	.90
Conscientiousness			
Industriousness	Tendency to be focused on goal pursuit and carry out plans	Finish what I start	.87
Orderliness	Tendency to be rule-abiding and organised	Follow a schedule	.81
Extraversion			
Enthusiasm	Tendency to be gregarious and to experience positive emotions	Warm up quickly to others	.88
Assertiveness	Tendency to be bold and dominant	Take charge	.91
Openness/Intellect			
Openness	Tendency for engagement with perceptual and aesthetic domains	Enjoy the beauty of nature	.82
Intellect	Tendency for intellectual curiosity and engagement	Like to solve complex problems	.88

Note. Cronbach's α are calculated from the combined samples of the current study (N = 733).

For example, previous research indicates that allocations in the standard DG (costly helping) are predicted by politeness (Zhao, Ferguson & Smillie, 2016b). However, both politeness and compassion (the tendency to be emotionally concerned for others) aspects of agreeableness are linked to DG allocations when these are framed within real world contexts of need and equity (Zhao, Ferguson, & Smillie, 2016c). In accordance with this, we expect that indices of costly prosociality should be linked to both politeness and compassion (Zhao, Ferguson & Smillie, 2016 b, c). Conscientiousness has also been linked to costly effortful real-world prosociality in terms of predicting the frequency of repeat blood donation (Ferguson, 2004). Thus, we expect that the industriousness aspect of conscientiousness, as this specifically reflects effort in pursuit of a goal, should be positively linked to costly prosociality. On the other hand, as costless prosociality reflects no real cost to the individual it may be driven more by norm adherence (i.e., to "do good") and linked, therefore, more to politeness than compassion. However, at present there are no data on which to make specific predictions regarding costless prosociality and as such this is a more exploratory aspect of the current paper, and should, therefore, add new and novel findings to the literature.

Method

Samples. We tested our predictions across 4 samples drawn from both predominantly Australian student (Samples 1 and 3, hereafter referred to as "students") and US community (Samples 2 and 4, hereafter referred to as "MTurk") populations. Australian students were recruited from online advertisements and flyers posted around the University of Melbourne, Australia, and completed the study for monetary payment or course credit. US community members (US residents) were recruited from the online marketplace, Amazon Mechanical Turk (MTurk) and completed the study online for monetary payment. The final overall N was 733. The mean age of the samples ranged from 19.63 (Sample 3) to 34.8 (Sample 4) years. Table 4 presents further details of each sample. This greatly exceeds our minimum target

sample size of at least 175 participants, which provides 80% power to identify an effect sizes of r = .21 (Faul, Erdfelder, Buchner, & Lang, 2009), which is in line with previous findings for the role of agreeableness in dictator games (Zhao et al., 2016). The greater sample size allows us to control for sample differences and to explore the role of sex and different game structures (e.g., incentivization).

Table 4. *Summary of Samples in Study 2*

	Sample 1	**Sample 2**	**Sample 3**	**Sample 4**
Final *N*	70	304	103	256
Number (%) removed after comprehension and/or attention checks	33 (32%); four comprehension checks of games and one of two attention checks embedded within personality measures	26 (7.9%); two attention checks embedded within personality measures	19 (15.6%); two attention checks embedded within personality measures	10 (3.8%); two attention checks embedded within personality measures
Participants	University students and community members in Australia	US Amazon MTurk workers (with fewer than 50 Human Intelligence Tasks)	First-year psychology students at an Australian university	US Amazon MTurk workers
Age	18–33 years (M_{age} = 22.34, SD = 3.76)	18–65 years (M_{age} = 30.90, SD = 9.89)	18–47 years (M_{age} = 19.63, SD = 3.71)	19–67 years (M_{age} = 34.76, SD = 11.00)
% female	65.7%	54.9%	75.7%	42.6%
% organ donor	25.7%	66.8%	29.1%	53.5%
Administration of study	Online Qualtrics survey	Online Qualtrics survey	Online Qualtrics survey	Online Qualtrics survey

	Sample 1	**Sample 2**	**Sample 3**	**Sample 4**
Median study time	64 minutes	30 minutes	43 minutes	42 minutes
Show-up fee	AUD15.00	USD2.00	Course credit	USD8.00
Game format	Full description of dictator and generosity game	Decomposed: dictator and generosity games embedded within a series of different decomposed economic allocation decisions	Decomposed: dictator and generosity games embedded within a series of different decomposed economic allocation decisions	Decomposed: dictator and generosity games embedded within a series of different decomposed economic allocation decisions
Incentivisation	Incentivized: participants played a number of economic games in which they were matched with another player, and one of these games was selected for payment at the rate of 1 point = AUD1.00	Hypothetical: participants asked to imagine that they were playing with a stranger that they would not knowingly meet	Hypothetical: participants asked to imagine that they were playing with a stranger that they would not knowingly meet	Incentivized: participants played a number of economic games in which they were matched with another player, and one of these games was selected for payment at the rate of 1 point = USD0.10

	Sample 1	**Sample 2**	**Sample 3**	**Sample 4**
Economic games in study	Dictator game, ultimatum game (proposer), ultimatum game (responder), and generosity game. Participants were randomly assigned to one of four different orders of these games based on a Latin Squares design. The order of the games was not associated with responses in the dictator and generosity games.	Real-world dictator game, dictator game, and generosity game (the latter two were randomized). Experimental condition for the real-world dictator game was not associated with responses in the later dictator and generosity games.	Giving/taking framed dictator game, social mindfulness task, dictator game, and generosity game (the latter two were randomized). Giving/taking framing of the earlier dictator game was not associated with responses in the later dictator and generosity games.	Giving/taking framed dictator game, dictator game, followed by generosity game. Giving/taking framing of the earlier dictator game was not associated with responses in the later dictator and generosity games.

Materials

Economic Games

Dictator Game. In the DG, participants indicated their preferred choice out of 11 different payoff combinations that varied in one monetary unit (MU) increments (1 MU = 1 AUD in Sample 1, 1 MU = 0.10 USD in Sample 4, and 1 MU = 1 hypothetical dollar in Samples 2 and 3). For example, in Sample 1 the 11 different payoff combinations ranged from $0 for oneself and $10 for one's partner (scored 10) to $10 for oneself and $0 for one's partner (scored 0), varying in $1 increments. While stake sizes vary, the evidence shows that this has no systematic effect on behavioral responses (Raihani, Mace & Lamba, 2013).

Generosity Game. In the GGs (Güth et al., 2012; Güth, 2010), participants were again asked to indicate their preferred selection out of 11 different payoff combinations. These involved the same MUs and conversion rates as those in the DG. This time, their own payoff was always fixed at 5 MUs and the choices ranged from 0 MU (scored 0) to 10 MUs (scored 10) for their partner, varying in 1 MU increments. Although this game was based on the original paradigms of the same name developed by Güth et al. (2012) and Güth (2010), there is one crucial difference. Participants directly selected their partner's payoffs (e.g., 0–10 MUs) rather than the total size of the combined payoffs, which was implemented to allow comparability with the format of the dictator game responses (see Supplementary Text S4 for full instructions for the DG and GG).

Incentivized and Hypothetical Versions: As there is some evidence that incentivized economic games magnify trait effects in prosocial behavior (Zhao, Ferguson, & Smillie, 2016a) we administered the games both as hypothetical scenarios with imagined partners (Samples 2 and 3) and incentivized games with real partners and stakes (Samples 1 and 4). In the incentivised games, participants were informed that their decisions would be matched to another participant and that their earnings from one of the games would be

selected for payment at the end of the session. Game payoffs were represented by points that corresponded with real dollar amounts that were paid at the end of the study using participants' anonymous response identification codes (see Table 1 for details). Participants playing hypothetical versions of these games were asked to imagine that they were playing the games with an anonymous partner who was described as another participant that they would not knowingly meet.

Expressed Real-World Prosociality

To measure costless real-world prosociality, we asked all participants: "Are you an organ donor?" (Yes/ No). This was adapted from questions used to assess blood donor behavior (Ferguson et al., 2012).

To measure costly real-world prosociality, we asked and summed responses to two questions: (1) How often have you donated to charity in the past year? And (2) How often have you been involved in any form of volunteer work in the past year? Both were responded to using a 5-point Likert scale (1 = 0 times, 2 = 1-2 times, 3 = 3-5 times, 4 = 6-10 times, and 5 = more than 10 times; inter-item correlation = .34). These were also adapted from previous work concerning general charity/volunteer identity (Ferguson et al., 2012).

Personality measure: Big Five Aspect Scales (BFAS; DeYoung et al., 2007)

Participants completed the 100-item BFAS, a widely-used and well-validated measure of the five broad domains of personality and each of their two lower-level aspects. These were each measured with 10 items per aspect, to which participants responded using a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). Table 1 provides the alpha coefficients, indicating that the scales were all reliable. Data on the HEXACO model were also collected but not analyzed here as our hypotheses derive directly from previous work on the BFAS.

Procedure

All participants completed the DG and GG as part of a larger set of economic games (see Table 4; the order and number of games completed did not affect performance on either the DGs and GGs), and also indicated whether or not they were an organ donor, as well as the extent to which they had donated to charity and volunteered.

Statistical Analysis

DG and GG responses were not skewed, but response options were left and right censored. Therefore, we applied OLS as well as Tobit models to account for the left and right censoring. We explored for consensus across analytic strategies to ensure findings were not sensitive to the nature of the DG and GG distributions. As these games show consistent sex effects (Andreoni & Vesterlund, 2001), sex was also included in all models. We initially conducted our analyses aggregating these data across all 4 samples, and sample (student vs. M*Turk*) and incentivization (incentivized vs. hypothetical) dummies, as well as their interaction, were included to control for sample differences. To control for any consistent prosocial preference across DG and GG allocations, DG allocations were included as a covariate in the GG model and vice versa.

Results & Discussion

Table 4 indicates the percentage of participants who expressed being an organ donor, with 66.8% and 53.5% in the US MTurk samples and 25.7% and 29.1% in Australian student samples. At present, 54% of the US population have registered as an organ donor (US Department of Health and Human Services, 2016) with a corresponding percentage of 22% in Australia who have registered their intent to donate (Department of Human Services, 2017). Thus, the figures reported in the samples are generally consistent with their nationally representative figures.

Tables 5a and b shows the regression models for the aggregated data for the generosity and dictator games respectively. Organ donors vs. non-donors, allocated more to their partner in the GG (means: 7.0 MUs to the partner vs. 6.2 MUs to the partner: Tobit regression B = 1.45, (95%CI = 0.76, 2.12) t = 4.17, p = .000; Table 3a), but organ donor status was unrelated to DG allocations (means: 4.0 MUs to the partner vs. 3.8 MUs to the partner; Tobit regression B = -0.06, (95%CI = -0.40, 0.28) t = -0.36, p = .722; Table 3b). Conversely, expressed levels of charity/volunteer prosociality were significantly associated with DG allocations (Tobit regression B = 0.11, (95%CI = 0.03, 0.19) t = 2.82, p = .005; Table 3b), but showed no significant association with GG allocations (Tobit regression B = 0.09, (95%CI = -0.07, 0.25) t = 1.09, p = .277; Table 3a). While this pattern is generally seen across all 4 sample there are a few variations that are discussed in Supplementary Text S5 and Tables S6 and S7).

Table 5a. *Regression Models Predicting Generosity Game Allocations*

	ρ	OLS	95%CI	Tobit	95%CI
Organ Donation (0= no, 1 = yes)	.15***	0.85***	0.44, 1.26	1.45***	0.76, 2.12
Charity/Volunteer	.03	0.05	-0.04, 0.15	0.09	-0.07, 0.25
Sex (1 = male, 2= female,)	-.19***	-0.93***	-1.33, -0.52	-1.58***	-2.26, -0.91
Incentives (Incentivized = 1, = hypothetical = 2)	-.16***	-1.69***	-2.55, -0.84	-2.79***	-4.23, -1.34
Sample (0= Student, 1 = M*Turk*)	.06	-2.00*	-3.56, -0.44	-1.42*	-2.69, -0.125
Dictator Game	-.11**	-0.02	-0.13, 0.09	0.09	-0.28, 0.08
Generosity Game					
Incentives*Sample		1.21*	0.27, 2.14	1.97*	0.39, 3.55
					95%CI
R^2		.08***		.02	0.76, 2.12
N		728		728	

Note. * p < .05, ** p < .01, *** p < .001; ρ = Spearman's Rho

Table 5b. *Regression Models Predicting Dictator Game Allocations*

	ρ	OLS	95%CI	Tobit	95%CI
Organ Donation (0= no, 1 = yes)	.05	-0.06	-0.34, 0.22	-0.06	-0.40, 0.27
Charity/Volunteer	.13**	0.10**	0.03, 0.16	0.11**	0.03, 0.19
Sex (1 = male, 2= female,)	.14**	0.33*	0.06, 0.61	0.41*	0.07, 0.74
Incentives (Incentivized = 1, = hypothetical = 2)	.40***	2.32***	1.76, 2.88	2.69***	2.01, 3.38
Sample (0= Student, 1 = M*Turk*)	.05	1.94**	0.88, 2.99	1.04**	0.43, 1.65
Dictator Game					
Generosity Game	-.11**	-0.01	-0.06, 0.04	-0.01	-0.07, 0.04
Incentives*Sample		-1.02**	-1.65, -0.38	-1.13**	-1.91, -0.36
R^2		.19***		.05	
N	729-732	728		728	

Note., * p < .05, ** p < .01, *** p < .001; ρ = Spearman's Rho

Structure of Costless and Costly Prosociality. To replicate the findings from Study 1 we explore if indices for costly and costless prosociality (both preferences and expressed real world prosociality) load on distinct components. We ran a CFA where, to reflect their distributions, we specified the DG allocations as censored on lower values and the GG allocations on higher values, the remaining variables were specified as categorical and we used a WLSMV estimator. We also specified a complex survey design and clustered within samples. The CFA fits were excellent (χ^2 = 4.45 (df = 4), *p* = .35; CFI = .99, TLI = .98, RMSEA = .01). The analysis confirm a costly and costless two-factor structure.

Table 6. *CFA for Costless and Costly Prosociality*

Prosociality Measures	Costly Helping	Costless Helping
Charity	**.99**	.00
Volunteering	**.39**	.00
Dictator Game	**.16**	.00
Generosity Game	.00	**.76**
Organ Donation	.00	**.26**
Eigenvalues		
% variance		
	Latent Correlations	
	1	
	.26	1

Note*. Coefficients in bold indicate the significant associations and loadings*

Relations with Personality. We summed the two factors for costly and costless prosociality and regressed (OLS) these onto the 10 aspects of personality, controlling for sex, incentivisation (incentivized game vs. hypothetical scenario), sample type (student vs. M*Turk*), and the incentivisation by sample interaction (Table 7). These results show that costly prosociality is positively associated with the politeness (β = .13; p = .009) and compassion (β = .18 p = .001) aspects of agreeableness, and the assertiveness aspect of extraversion (β = .15 p = .010). Conversely, costless helping was positively associated with the politeness (β = .14 p = .004) aspect of agreeableness and the intellect aspect of openness/intellect (β = .25 p = .009, and negatively associated with the industriousness aspect of conscientiousness (β = -.15 p = .017). Both costly and costless prosociality are, therefore, related to good manners and following social norms. However, costly and costless

prosociality can be differentiated in that the former involves empathy, compassion, and social boldness, whereas the latter involves greater intellectual engagement and reduced behavioral effort.

Table 7. *Ordinary Least Squares Regression for Costless and Costly Prosociality*

		Costly			Costless	
Predictor	**β**	**B**	**95%CI**	**β**	**B**	**95%CI**
N-Withdrawal	-.10	-0.37	-0.83, 0.09	-.06	-0.22	-0.67, 0.24
N-Volatility	.02	0.09	-0.31, 0.49	-.01	-0.05	-0.45, 0.35
A-Compassion	.18**	0.85**	0.37, 1.33	-.01	-0.06	-0.53, 0.42
A-Politeness	.13***	0.68***	0.17, 1.19	.14**	0.74**	0.24, 1.24
C-Industriousness	-.05	-0.23	-0.74, 0.28	-.15*	-0.61*	-1.12, -0.11
C-Orderliness	.03	0.16	-0.25, 0.57	-.04	-0.17	-0.57, 0.23
E-Enthusiasm	-.08	-0.34	-0.76, 0.08	.01	0.05	-0.36, 0.46
E-Assertiveness	.15**	0.58**	0.14, 1.02	-.08	-0.30	-0.73, 0.13
O-Intellect	-.01	-0.01	-0.45, 0.44	.25***	1.07***	0.63, 1.51
O-Openness	.01	0.04	-0.36, 0.45	-.08	-0.39	-0.78, 0.01
Gender (1 = male, 2= female,)	.13***	0.76***	0.31, 1.21	-.14***	-0.83***	-1.28, -0.38
Incentives (Incentivized = 1, = hypothetical = 2)	.24***	1.45***	0.58, 2.31	-.32***	-1.87***	-2.72, -1.03
Sample (0 = Student, 1 = M*Turk*)	.05	0.38	-1.25, 2.01	-.30*	-2.00*	-3.61, -0.40
Incentives* Sample	-0.04	-0.14	-1.13, 0.85	.40**	1.47**	0.50, 2.44
N		728			729	
R^2		.17			.12	

Note. * p < .05, ** p < .01, *** p < .001. N = Neuroticism, A = Agreeableness, C = Conscientiousness, E = Extraversion, O = Openness/Intellect. B coefficients are unstandardized and β standardized.

Effects of Sex, Incentives and Sample. The analysis also revealed a number of interesting effects for sex, incentivization, and sample type (i.e., women showed greater costly prosociality than men, while this was reversed for costless prosociality; incentivization increased costless prosociality but reduced costly prosociality). As these were not the focus of this study they are detailed in the supplementary materials (Supplementary Text S6, Figure S1) for the interested reader.

General Discussion

Taken together, the present studies yielded a clear, important, and novel, finding: Costly prosociality can be distinguished from costless prosociality in both lab-based economic games and real-world prosocial behaviors, and these two forms of prosociality show diverging relations with personality characteristics. Thus, considering only costly prosociality, in isolation, does not provide a complete analysis of the prosocial domain.

Distinguishing Costly and Costless Prosociality

While Böckler, Tusche and Singer (2014) report a multidimensional structure for prosociality, based on both self-report and behavioral data, there is growing evidence, based on behavioral (Brocklebank, Lewis & Bates, 2011; Peysakhovich, Nowak & Rand, 2014; Yamagishi, Mifune, Li, Shinda, Hashimoto, Horita, Miura, Inukai, Tanida, Kiyonari, Takagishi & Simunovic, 2013) as well as a mixture of self-report and behavioral data (Hubard; Harbaugh, Srivastava, Degras & Mayr, 2016), supporting the existence of a general prosocial/cooperative phenotype. Indeed, Wilhelm, Kaltwasser and Hilderbrandt (2017) raise a number of conceptual and statistical concerns with the Böckler, Tusche and Singer (2014) analyses and identified a single factor underlying prosociality in their re-analysis (however see Böckler, Tusche & Singer, 2018 for a reply).

However, all of this this evidence is based on tasks that are costly. The costless vs. costly dichotomy demonstrated here has not been modelled with respect to the prosocial

phenotype and our results suggest that there may be at least two distinct prosocial phenotypes — costly and costless. This requires further study with a wider array of preferences and real-world prosociality.

To support this further we see that the costly prosociality is associated with personality traits reflecting politeness and compassion, the two aspects of Big Five agreeableness. Previous research examining the DG shows that when this is decontextualized – as used here –politeness, rather than compassion is the main predictor (Zhao et al., 2016b). However, compassion becomes a predictor of DG allocations when these are contextualized in terms of norms of need and equity (Zhao et al., 2016c). It is not surprising, therefore, that the costly prosociality component that contains both decontextualized and contextualized prosociality is associated with both compassion and politeness. Thus, costly prosociality may be motivated both by adherence to social norms as well as by emotional concern for others.

Interestingly costless prosociality is distinguished by its association with intellect. With respect to organ donor registration, for example, there is some evidence that this is linked to knowledge, education, and thoughtfulness (Sperling & Gurman, 2012; Saleem et al., 2009). As such, this may, in part, account for the association of the intellect aspect of openness with costless prosociality. Thus, while it might still be normative to help, helping here may be more considered and thought through. This suggests that costless helping may be more dependent than costly helping on processes connected with cognitive engagement, such reasoning and reflection, than compassion and empathy. Indeed, this may also reflect a utilitarian principle in which utility is maximised for all with as little wastage as possible.

In contrast to our predictions, costly prosociality was not associated with increased effort (as indexed by the industriousness aspect of conscientiousness), but rather costless prosociality was linked to *reduced* industriousness. While this is an unpredicted finding and warrants further attention, in this context it appears that it is the absence of expenditure of

energy, effort and resources which underlie costless prosociality. Finally, we show that the assertiveness aspect of extraversion was positively associated with costly helping. It has previously been shown that other measures of assertiveness positively predict costly punishment (negative reciprocity) with respect to rejection of unfair offers in the ultimatum game (Yamagishi, Horita, Mifune, Hashimoto, Li, Shinadad, M., Miura, Inukai., Takagishi., & Simunovic, 2012; Kaltwasser, Hilderbrandt, Whilhelm, & Sommer, 2016), which has been interpreted in terms of status protection. However, in the context of costly prosociality without punishment, as studied here, this may specifically reflect the social, leadership, and agentic elements of volunteer behavior.

Applications

Lab-Field Correspondence There is a growing literature on the capacity of lab based prosocial preferences to predict real-world behaviors (Ostrom, 2006). In this paper economic preferences corresponded well with instances of real-world prosociality with a theoretically meaningful distinction based on costliness. One implication of our results is to identify correspondence between prosocial preferences in economic games and real-world prosociality. Here we focused on costly versus costless prosociality. Ferguson and colleagues (Ferguson et al., 2012) focused on warm-glow preference with respect to blood donation, and Fehr and Leibbrandt (2011) on social cooperation, as indexed by PGG allocations, and variation in use of fishing techniques there were more or less likely to preserve stocks. In all these cases the correspondence was good. When the correspondence is less clear the associations are generally lower (Voors, Turley, Kontoleon, Bulte, & List, 2012). Thus, a clear matching of the motivations of real-world prosociality and lab-based preferences is needed.

Interventions for Organ Donation. The present findings offer potential implications for encouraging organ donation: Internationally, there is a major shortage of donor organs to

meet the demand for transplantation. By way of example, in August 2016 there were 120,000 people in the US and over 7,000 people on the UK waiting list for a solid organ transplant. Advances in transplant surgery and immunosuppression mean that outcomes following a solid organ transplant are excellent. We know from the GG results that the organ donors actually are *hyper* generous, endowing their partners with more wealth than themselves. Thus organ donors who start from a position of relative advantage and are motivated, not just to redress that initial inequality, but over-compensate. This initial inequality may trigger an 'advantageous inequality aversion' (Fehr & Schmidt, 1999) whereby they are motivated by guilt to reduce it, resulting in a 'dis-advantageous inequality aversion' whereby the partner is now better off. This pattern reflects exactly what is observed in an organ donation context. Initially the donor is healthy and the recipient unhealthy (advantageous inequality aversion from the perspective of the donor) and after donation the recipient is healthy and the donor deceased (dis-advantageous inequality aversion from the perspective of the donor). Applied to the donor domain, this equates to motivating the healthy organ donors to help another whose health is poor. Thus, the following appeal, "Being fit and healthy to give organs after your death means you have the ability to help those less healthy than you have a better life", is worthy of rigorous evaluation.

Conclusion. Costliness is a major determinant of prosocial behavior, yet previous research has largely focused on costly prosociality both in the lab (e.g., giving to an anonymous partner in dictator games) and self-reported real-world behaviors (e.g., charitable giving and volunteering). In the current study, we identified distinct components of costly and costless prosociality (across self-reports and economic games) that were driven by different personality traits, and are likely to reflect different motivations. This distinction highlights the multifaceted nature of prosociality and has important implications for how different types of prosocial behaviors can be promoted in the real-world.

Data Access: The data can be obtained from either the 1st author on request or from uploaded files as supplementary associated with this paper on OSF web-pages.

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Supplementary Files

Supplementary Files

Supplementary Text S1: Item Selection for Costless and Costly Helping Behaviors in Study 1

Study 1 was part of a larger study that explored a wide variety of 21 helping behaviors, in which 12 key indicators of costless and costly helping were embedded. These 12 behaviors are detailed in Table S1 below, which also details how they relate to the two dimensions of costly-costlessness and health-non-health prosociality.

Defining Altruistic Helping/Prosociality

We define altruistic helping/prosociality as behaviors performed by one individual to benefit another unknown individual, group or society (Ma, Tunney, & Ferguson, 2017; Nowak, 2006). We focus on unknown recipients as this is central to the archetypal definition of altruistic helping that does not include effects of kin-selection and inclusive fitness (whereby the helper shows a preferential pattern of helping towards those related to them; Nowak, 2006). The extent to which helper and recipient are genetically related, as well as socially related, will influence how costs are calculated and as such introduces an additional dimension (genetic relatedness) to the analyses. We felt as an initial step in the investigation of costly and costless helping we would restrict our analyses to helping strangers. Our definition of helping does not include cost directly, as we suggest that, in fact, there can be altruistic helping toward a stranger where cost is not involved.

Items to Assesses Costless Prosociality.

Specifically we define *costless* prosociality when the giver has sufficient resources to expend without detriment (Zahavi & Zahavi, 1997), and *zero-cost* prosociality when the giver no longer needs the resources and can, therefore, give it at zero-cost (Moorlock, Ives, & Draper, 2014; Shepherd, O'Carroll, & Ferguson, 2014). Thus, gifting unwanted or unneeded goods is seen to define zero-cost/costless prosocial acts (Moorlock, Ives, & Draper, 2014; Shepherd, O'Carroll, & Ferguson, 2014). Thus, behaviors that focused on costless helping were constructed such that each item indicated that the resources gifted were no longer 'wanted', 'needed' or 'useful' (e.g. 'Donate your unwanted clothes to charity', 'register as an organ donor to donate organs after your death') or incurred no direct cost to immediate resources of the individual but may help large groups of people (e.g., voting). These behaviors were also designed to be a *generic class of costless behaviors* (e.g., 'Donate your unwanted clothes to charity') that most people will have done or are likely to do, as we feel that this adds to the generalizability of the findings. As registering as an organ donor after death has been highlighted as an archetypal costless health behaviour, it was used as our primary index of zero-cost/costless health based prosociality (Moorlock, Ives, & Draper, 2014; Shepherd, O'Carroll, & Ferguson, 2014).

Items to Assess Costly Prosociality Helping.

The costly prosociality items were specified such that the cost to the helper was made clear in terms of money, effort, and time. These again were *generic archetypal behaviors* such a volunteering, donating money from a person's salary (e.g., Donating 20% of your salary to charity), contributing to compensate injustices ('Donate money to help those you think have unfairly lost their jobs'). Blood donation was chosen as the classic example of a costly prosocial health behavior (Lyle et al, 2009) and acts that involved donating time, effort

and resources that can be depleted as classic examples of costly non-health prosociality (see Tables S1 & S2).

Defining Prosocial Health and Non-Health Behaviors.

The prosocial health behaviors were defined as those that had a direct benefit to another person's health (e.g., blood donation). The non-health behaviors were general daily acts that had no health implications for any party involved.

Table S1. *Key Costly-Costless and Health-Non-health Prosocial Behaviors*

	Cost	Focus
Donating 20% of your salary to charity	Costly	Non-Health
Donate money to help those you think have unfairly lost their jobs	Costly	Non-Health
Volunteer your time regularly to help out at a local charity shop	Costly	Non-Health
Donate blood once	Costly	Health
Donate blood regularly	Costly	Health
Register as an organ donor to donate organs after your death	Costless	Health
Give someone your car parking ticket, for free, when there is still time left on it	Costless	Non-Health
Sign a petition	Costless	Non-Health
Vote in a general election	Costless	Non-Health
Donate your unwanted clothes to charity	Costless	Non-Health
Give someone a concert ticket for free that you can no longer use	Costless	Non-Health
Donate any unwanted toys to charity	Costless	Non-Health

To ensure that these 12 target costly and costless prosocial behaviors conformed to our specification we ran a small pilot study where we asked 15 participants (mean age = 31.73; SD = 13.45) to rate the 12 behaviors in Table S1 that are used in Study 1 in terms of cost with respect to time, money, effort, and emotional impact. Time, money, and effort are standardly used in the literature to index cost. We also included emotional impact to index

psychological cost. We thus created two aggregate scores of cost one based in time, money and effort (*traditional cost index*) and one to include all 4 (*augmented cost index*).

Participants used the following scales to make the ratings:

Time = How much of your time would you need to spend to do each behaviour (where: 0 = **no time at all**, is essentially something that can be **done very quickly**, 1 = **very little** time, 2 **a small** amount of time, 3 = **some time**, 4 = **a lot** of time, 5 = **very** time consuming, 6 = **extremely** time consuming)

Money = How much money would it cost you to do each of behaviour (where: 0 = **no money** at all it is essentially a free act, 1 = a **very small** amount of money, 2 a **small** amount of money, 3 = **some** money, 4 a **lot** of money, 5 = **expensive**, 6 = **very expensive**)

Effort = How much effort (physical and mental effort) would you need to spend to do each behaviour (where: 0 = **no work at all**, is essentially something that can be **done easily**, 1 = **a very small** amount of effort, 2 **a small** amount of effort, 3 = **some effort**, 4 = **a lot** of effort, 5 = **very** hard work, 6 = **extremely** hard work)

Emotional = How emotionally hard would you find it to do each behaviour (where: 0 = **not find it at all emotionally hard**, is essentially something that would **not affect me emotionally**, 1 = **a very weak** emotional effect, 2 **a weak** emotional effect, 3 = **some** emotional effect, 4 = **a strong** emotional effect, 5 = **very strong** emotional effect, 6 = **extremely strong** emotional effect)

We interpret scores in the range zero to 1 to indicate *zero-cost* and in the range 1 to 2 to indicate small to minimal cost that is essentially *costless*, ratings in the range 2 to 4 to indicate *costly* and the range 5 to 6 *extremely costly*.

We ordered the behaviors in term of these aggregate scores by mean and mode (Table S2). We used the mode to index the normative response. ‘Give someone your car parking ticket, for free, when there is still time left on it’ was rated as costless and ‘Donating 20% of your salary to charity’, ‘Donating blood regularly’ and ‘Volunteer your time regularly to help out at a local charity shop’ as the most *costly*. ‘Registering as an organ donor’ to ‘giving unwanted clothes or any unwanted toys to charity’ are essentially *costless*. We also see in Table S2 that our interpretation of the factors from Study 1, as *costless* and *costly* behaviors, is validated in these ratings.

Table S2*: Ratings of Costly for Prosocial Behavior used in Study 1and their link to the factor structure in Study 1*

	Augmented costs ∑(4 costs)/4	**Traditional Costs** ∑(3 cost)/3	**Interpretation in Terms of Cost**	Cost	**Factor in Study 1**
Donating 20% of your salary to charity	2.73, 1.50	2.80, 2.00	**a small** amount of time, money, effort, **weak emotional effect**	Costly	*Costly Non-Health Prosociality*
Donate blood regularly	2.58. 2.50	2.82, 2.33	**a small** amount of time, money, effort, **weak emotional effect**	Costly	*Costly Health Prosociality: Blood Donation*
Volunteer your time regularly to help out at a local charity shop	2.45. 1.50	2,80, 3.00	**a small** amount of time, money, effort, **weak emotional effect**	Costly	*Costly Non-Health Prosociality*
Donate money to help those you think have unfairly lost their jobs	1.95, 2.75	2.00, 2.00	**a small** amount of time, money, effort, **weak emotional effect**	Costly	*Costly Non-Health Prosociality*
Register as an organ donor to donate organs after your death	1.73, 1.50	1.44. 1.33	**very little** time, money effort, **very weak emotional effect**	Costless	*Costless Health and Non-Health Prosociality*
Vote in a general election	1.48, 1.00	1.49, 1.33	**very little** time, money effort, very **weak emotional effect**	Costless	*Costless Health and Non-Health Prosociality*
Give someone a concert ticket for free that you can no longer use	1.43, 0.50	1.27, 0.67	**very little** time, money effort, very **weak emotional effect**	Costless	*Costless Non-Health Prosociality*
Donate blood once	1.33, 0.75	1.35, 1.33	**very little** time, money effort, very **weak emotional effect**	Costless	*Costly Health Prosociality: Blood Donation*
Donate your unwanted clothes to charity	1.31, 0.50	1.44. 0.67	**very little** time, money effort, very **weak emotional effect**	Costless	*Costless Non-Health Prosociality*
Donate any unwanted toys to charity	1.20, 0.50	1.28, .67	**very little** time, money effort, very **weak emotional effect**	Costless	*Costless Non-Health Prosociality*
Sign a petition	1.01, 0.50	0.80. 0.67	**No** time, money, effort or emotional effect	Zero-Cost	*Costless Health and Non-Health Prosociality*
Give someone your car parking ticket, for free, when there is still time left on it	0.58. 0.50	0.55, 0.00	**No** time, money, effort or emotional effect	Zero-Cost	*Costless Non-Health Prosociality*

Note. Columns 2 and 3 first figure = mean, second = mode

Excluded Prosocial Behaviors

There were nine behaviors assessed that were not specifically designed as key indicators of costless and costly prosocial behaviors in that they did not indicate unwanted or unneeded resources. We also excluded prosocial behaviors that focus on kin-selection. These were included for the purposes of other specific analyses we aim to conduct and to act as potential distractor items from the key twelve indicators. These nine behaviors and the prosocial constructs they are designed to assess and the rationale for their exclusion are provided in Table S3.

Table S3. *Rationale for Excluding Prosocial Behaviors*

Prosocial Concepts	Items	Rationale for Exclusion
Food Poverty	• *'donate food to a food bank'* • *'asking that, food left over after a meal out, is donated by the restaurant to a homeless hostel'*	The first behavior is ambiguous with respect to the costly-costless distinction as it can reflect either giving away unwanted food [costless] or buying food for a food bank appeal [costly]. The second behavior is also ambiguous with respect to who is actually making the donation—the customer or the restaurant.
Whole Body Donation	• *'donate your body to medical science after your death'*	This item ambiguous with respect to whether or not it was a health or non-health behavior. Unlike organ and blood donation where there is a direct effect on another's health from donation, here the whole body donation is likely to be used as a cadaver for medical student training.
Observable Physical Prosocial Activity:	• *'do a sponsored run to raise money for charity'*	This item was written with different analysis in mind and is ambiguous with respect to cost, which will reflect levels of fitness and distance ran. For a very fit, well trained individual, this is virtually costless, but for a novice very costly.
Community Prosociality:	• *'become a member of a neighbourhood watch scheme'*	Again the exact cost and amount of time involved is unclear.
Emotional Suport	• *'comfort a grieving friend'*	This type of prosocial behavior focuses on helping someone known to the helper, whereas the helping in the main paper focuses on helping strangers, as such, the link to relationships is outside the type of act we have focused on. Again, cost is ambiguous, as cost depends on the nature of the relationship of the helper to the friend (close friend, acquaintance) and the nature of friends' bereavement (close relative, sudden etc.).
Prosocial Concepts	***Items***	**Rationale for Exclusion**
Genetic Relatedness and Kin vs Non-Kin Prosociality:	• *'becoming a living kidney donor by donating a kidney to a relative' (to assess kin selection,*	These behaviours were designed to assess the influence of genetic relatedness in terms of *kin-selection* (i.e., *inclusive fitness*: whereby the helper shows a preferential pattern of helping behaviour toward those related to them, such that the related receiver of help benefits at some personal cost to the helper; Nowak, 2006) versus benefiting a genetically related non-kin individual at a cost to the self; Batson, 1991).

	• *'becoming a living kidney donor by donating a kidney to a stranger'.* • *'registering as a bone marrow donor'*	These three items were designed primarily to explore kin-selection and genetic relatedness. Blood donation is costly and involves *no genetic match*, whereas while all three of these are also costly, they additionally involve a *genetic match*, and explicit and implicit *kinship links*. Indeed, screening information to be registered as a marrow donor includes reference to genetic relatedness (see https://www.nhsbt.nhs.uk/british-bone-marrow-registry/how-can-i-help/). Posthumous organ donation is, by contrast, *zero-cost* and while it includes *genetic matching*, this is not made salient at registration in a way that it is for living organ donation (e.g., https://www.nhs.uk/conditions/kidney-transplant/#kidney-donations and https://www.odt.nhs.uk/living-donation/altruistic-kidney-donation/) and bone marrow donation (e.g., http://www.nbta-uk.org.uk/wp-content/uploads/2014/05/25384-Your-Questions-Answered-A5-Booklet.pdf and https://www.organdonation.nhs.uk/). So as not to confound costly health helping with kinship and genetic matching, we focused on blood donation as the purest aspect of costly health based helping to a stranger (Lyle et al., 2009), however, the costly versus costless status of living kidney donation is less clear. For example, donating a kidney to a relative may be perceived as costly due to stronger emotional ties and feelings of guilt (Gill & Lowes, 2008l Show, 2010). This will not be the case for kidney donation to a stranger. Thus, for simplicity and similarity across constructs we included blood donation as the marker for costly health-based helping and posthumous organ donor as zero-cost health-based helping. As bone marrow and living kidney donations go to a stranger we include a sensitivity analyses (see Supplementary Text 3 and Table S5) to ensure that excluding these two items did not affect our main results. It did not.

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Supplementary Text S2: *Adaptation of CFA Model 5*

Model 5 from the analysis reported in the main paper was the best fit to these data. The factor loadings for this model are shown in Table S4.

As can be seen in Table S4 all the health behaviors load significantly on the health factor and non-health behaviors on the non-health factor. However, for the factor representing high cost helping, the behaviors assessing high cost health helping (blood donation) did not load significantly on that factor. Similarly, the behaviors referring to donating 'unwanted clothes' or 'toys' to charity and, 'giving someone a free concert ticket', did not significantly load on the low cost factor. This suggests that the blood donation may represent a high cost health factor of its own. Also, low cost helping may be represented two factors. One representing signing a petition, voting, being in the organ donor register and, giving away a car parking ticket. These behaviors loaded together and organ donation has a higher loading on this costless helping factor than the health factor. This combination of behaviors represents low cost helping around communal and civic duty. A second costless factor may be represented by giving unwanted clothes or toys to charity and giving someone a free concert ticket, as these behaviors do not load on the costless helping factor.

Table S4. *CFA factor loadings and Latent factor inter-correlations for Model 5*

Behaviors	Factors			
	C	CL	H	NH
Donate blood once	**-.**160	.000	**.773**	.000
Donate blood regularly	**-.**010	.000	**.858**	.000
Donating 20% of your salary to charity	**.549**	.000	.000	**.251**
Donate money to help those you think have unfairly lost their jobs	**.697**	**.**000	.000	**.375**
Volunteer your time regularly to help out at a local charity shop	**.338**	**.**000	.000	**.157**
Register as an organ donor to donate organs after your death	.000	**.608**	**.308**	.000
Sign a petition	.000	**.441**	.000	**.431**
Vote in a general election	.000	**. 685**	.000	**.337**
Donate your unwanted clothes to charity	.000	. 124	.000	**.818**
Give someone a concert ticket for free that you can no longer use	.000	-.029	.000	**.558**
Donate any unwanted toys to charity	.000	-.050	.000	**.722**
Give someone your car parking ticket, for free, when there is still time left on it	.000	**.405**	.000	**.403**
Correlations across latent factors				
Factor 1: *Costly*	1			
Factor 2: *Costless*	**-.432**	1		
Factor 3: *Health*	.000	.000	1	
Factor 4: *Non- Health*	.000	.000	**.381**	1

Note*. C = Costly; CL = Costless; H = Health; NH = Non-health. Coefficients in bold indicate significant loadings and significant inter-correlations. Coefficients at .000 were fixed to equal .000.*

Supplementary Text S3: *Sensitivity Analysis for Study 1*

We decided to adopt a strict item exclusion criteria around item assessing behaviors linked to living kidney donation to a stranger and bone marrow donation. Therefore, we conducted a sensitivity analysis to check that the results we report in Study 1 in the main paper are not affected by our decisions to not include these two altruistic health helping items. We thus added an additional factor (Factor 5) to the final model specified in the main paper (Model 6), to reflect behaviors linked directly to genetically-related living donation of human tissue to a stranger. While this model was a reasonable fit to these data (CFI = .84, TLI = .88, RMSEA = .08) modification indices indicated that this would be improved by adding a cross loading such that 'becoming a bone marrow donor' also loaded on Factor 4 (Costless Community and Civic Duty Focused Prosociality) along with posthumous organ donation (CFI = .93, TLI = .91, RMSEA = .06). This indicates that becoming a bone marrow donor, while linked to living donation to a genetically related stranger, is also likely to be perceived as costless, at the point of the decision to join the register, much like posthumous organ donation. Living kidney donation to a stranger, however, does not cross-load and remains as a costly prosocial health behaviour. Furthermore, it also indicates that our main analyses and conclusions are not a consequence of our strict decision to leave these items out.

Table S5. *CFA factor loadings and Latent factor inter-correlations for adapted Model 6*

Behaviors	Factors				
	1	2	3	4	5
Donate your unwanted clothes to charity	**.928**	.000	.000	.000	.000
Give someone a concert ticket for free that you can no longer use	**.553**	.000	.000	.000	.000
Donate any unwanted toys to charity	**.677**	.000	.000	.000	.000
Donating 20% of your salary to charity	.000	**.615**	.000	.000	.000
Donate money to help those you think have unfairly lost their jobs	.000	**.738**	.000	.000	.000
Volunteer your time regularly to help out at a local charity shop	.000	**.435**	.000	.000	.000
Donate blood once	.000	.000	**.744**	.000	.000
Donate blood regularly	.000	.000	**.899**	.000	.000
Give someone your car parking ticket, for free, when there is still time left on it	.000	.000	.000	**.589**	.000
Register as an organ donor to donate organs after your death	.000	.000	.000	**.600**	.000
Sign a petition	.000	.000	.000	**.625**	.000
Vote in a general election	.000	.000	.000	**.663**	.000
Become a living kidney donor, by donating a kidney to a stranger	.000	.000	.000	.000	**.830**
Register as a bone marrow donor	.000	.000	.000	**.460**	**.568**
Correlations across latent factors					
Factor 1: *Costless Non-Health Prosociality*	1				
Factor 2: *Costly Non-Health Prosociality*	**.380**	1			
Factor 3: *Costly Health Prosociality: Blood Donation*	**.273**	**.**121	1		
Factor 4: *Costless Communal and Civic Duty*	**.511**	-.099	**.435**	1	
Factor 5: *Genetically linked Altruistic Health Donation*	-.110	**.520**	**.378**	-.013	1

Note*. Coefficients in bold indicate significant loadings and significant inter-correlations.*

Supplementary Text S4: *Instructions for Economic Games*

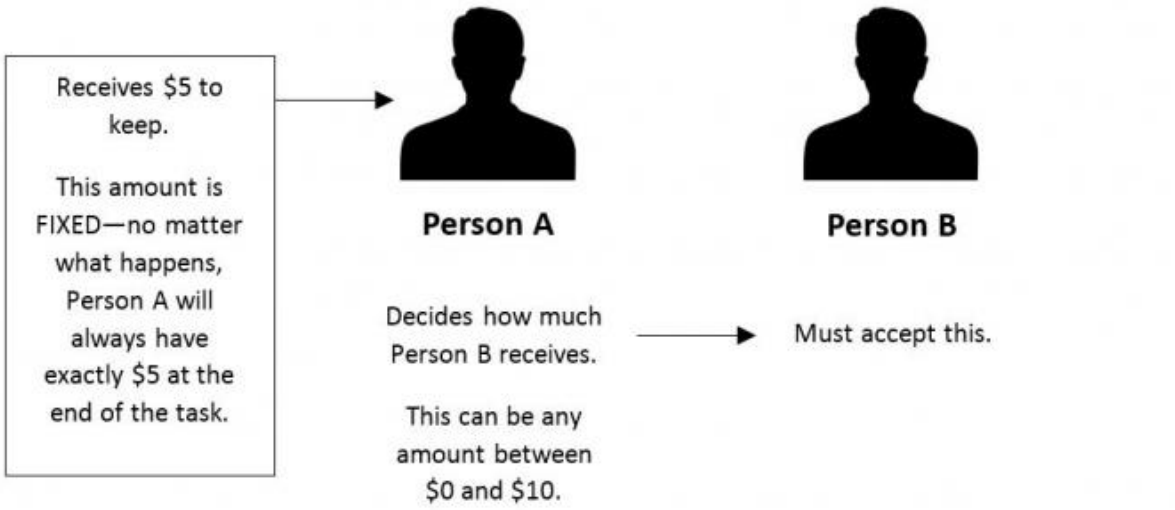
Full description (narrative) generosity game

Please read the following task carefully and make sure that you understand the task before proceeding.

In the following task, there are two roles, Person A and Person B:

- Person A and Person B begin the task with $0 each.
- Person A then receives a fixed amount of $5 to keep. This amount cannot increase or decrease no matter what happens.
- Person A must then decide how much Person B can receive from this task. This can be any amount between $0 and $10.

The diagram below illustrates this task.



You have received a fixed amount of $5 to keep. How much should your partner (Person B) receive from this task, between $0 and $10?

- ○ $0 for my partner
- ○ $1 for my partner
- ○ $2 for my partner
- ○ $3 for my partner
- ○ $4 for my partner
- ○ $5 for my partner
- ○ $6 for my partner
- ○ $7 for my partner
- ○ $8 for my partner
- ○ $9 for my partner
- ○ $10 for my partner

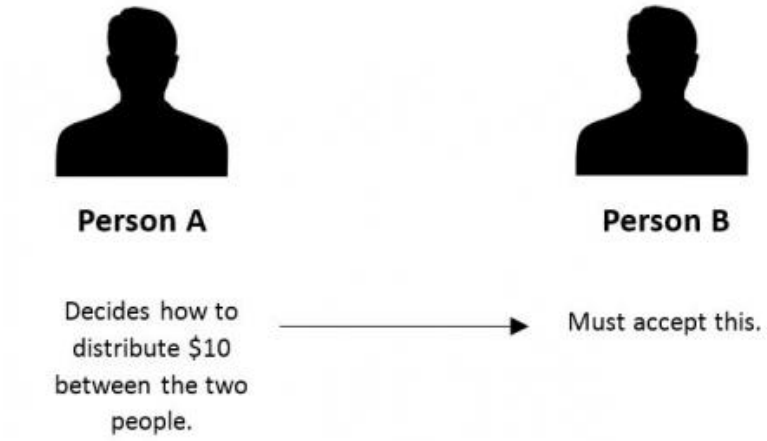
Full description (narrative) dictator game

Please read the following task carefully and make sure that you understand the task before proceeding.

In the following task, there are two roles, Person A and Person B:

- Person A and Person B begin the task with $0 each.
- Person A then receives $10 to distribute between the two people, and decides accordingly.
- Person A's distribution goes ahead and Person B must accept this.

The diagram below illustrates this task.



How do you decide to distribute $10 between the two of you?

- $0 for myself (and $10 for my partner)
- $1 for myself (and $9 for my partner)
- $2 for myself (and $8 for my partner)
- $3 for myself (and $7 for my partner)
- $4 for myself (and $6 for my partner)
- $5 for myself (and $5 for my partner)
- $6 for myself (and $4 for my partner)
- $7 for myself (and $3 for my partner)
- $8 for myself (and $2 for my partner)
- $9 for myself (and $1 for my partner)
- $10 for myself (and $0 for my partner)

Decomposed generosity game

You will be matched to a new participant. Your partner has no say in the following task.

Which of the following do you choose?

- 5 points for myself and 0 points for my partner
- 5 points for myself and 1 point for my partner
- 5 points for myself and 2 points for my partner
- 5 points for myself and 3 points for my partner
- 5 points for myself and 4 points for my partner
- 5 points for myself and 5 points for my partner
- 5 points for myself and 6 points for my partner
- 5 points for myself and 7 points for my partner
- 5 points for myself and 8 points for my partner
- 5 points for myself and 9 points for my partner
- 5 points for myself and 10 points for my partner

Decomposed dictator game

You will be matched to a new participant. Your partner has no say in the following task.

Which of the following do you choose?

- 10 points for myself and 0 points for my partner
- 9 points for myself and 1 point for my partner
- 8 points for myself and 2 points for my partner
- 7 points for myself and 3 points for my partner
- 6 points for myself and 4 points for my partner
- 5 points for myself and 5 points for my partner
- 4 points for myself and 6 points for my partner
- 3 points for myself and 7 points for my partner
- 2 points for myself and 8 points for my partner
- 1 point for myself and 9 points for my partner
- 0 points for myself and 10 points for my partner

Supplementary Text S5: *Analyses Across Samples*

Organ Donor Behavior: Results Across the 4 Samples

Across all 4 samples (Table S6) organ donor behavior is consistently positively associated with GG allocations, such that those who express being an organ donor give more on the GG, with this marginal only in sample 4 ($p < .10$). Thus, the picture for each sample is consistent with the aggregated analyses in the main paper. With respect to DG allocations the non-significant association reported in the main text, with no association in samples 2, 3 and, 4 which is consistent with the aggregate analysis in the main paper, however, inconsistently there is a positive association in sample 1. However, sample 1 had the *smallest* N of 70, with such small sample sizes can come the possibility that a significant effect does not represent a true significant association (Button, Ioannidis, Mokrysz, Nosek, Flint, Robinson & Munarfo, 2013).

Table S6. *Associations between GG and DG Allocations and Organ Donor Behavior*

	Dictator Game		Generosity Game	
	Tobit	OLS	Tobit	OLS
Sample 1 (N = 70)	B (95%CI)	B (95%CI)	B (95%CI)	B (95%CI)
Organ Donor	5.62*	1.55*	7.85**	2.54**
	(0.91, 10.32)	(0.38, 2.73)	(2.36, 13.35)	(0.83, 4.25)
Sex	3.45	0.81	3.04	1.15
	(-0.65, 7.56)	(-0.28, 1.89)	(-1.10, 7.18)	(-0.42, 2.73)
R^2	.04	.11	.04	.13
Sample 2 (N=301)				
Organ Donor	-0.31	-0.29^	1.41***	0.93**
	(-0.64, 0.02)	(-0.61, 0.02)	(0.51, 2.30)	(0.34, 1.53)
Sex	0.15	0.14	-1.46**	-0.94**
	(-0.16, 0.46)	(-0.15, 0.44)	(-2.32, -0.60)	(-1.51, -0.38)
R^2	.004	.01	.01	.06
Sample 3 (N=102)				
Organ Donor	0.41	0.38	1.17*	0.95*
	(-0.29, 1.10)	(-0.27, 1.03)	(0.06, 2.29)	(0.04, 1.87)
Sex	0.24	0.22	-1.04	-0.82
	(-0.48, 0.97)	(-0.46, 0.90)	(-2.22, 0.12)	(-1.78, 0.14)
R^2	.005	0.21	.01	.06
Sample 4 (N=256)				
Organ Donor	-0.26	-0.16	1.19^^	0.56
	(-1.07, 0.55)	(-0.72, 0.39)	(-0.21, 2.59)	(-0.15, 1.27)
Sex	1.08**	0.75*	-2.64***	-1.30**
	(0.26, 1.90)	(0.18, 1.31)	(-4.07, -1.22)	(-0.202, -0.59)
R^2	.006	.03	.01	.05

Note ^^ p < .10, ^p < .07, * p =< .05, ** p < .01, *** p < .001:. Sex: 1 = male, 2 = female; Organ: 0 = non-organ donor, 1 = organ donor.

Charity/Volunteer Behavior: Results Across the 4 Samples

Across the 4 samples (Table S7) there were no associations between charity/volunteer identity and GG allocations, which is consistent with the results reported in the aggregate analyses in the main paper. The positive association with the DG reported in the aggregate data was less consistent and observed in samples 2 and 4, which are the studies with the larger Ns. The two samples (samples 1 and 3) with the smallest Ns show the non-significant associations, which may reflect a lack of power.

References

Button, K. S., Ioannidis, J. P. A., Mokrysz, C., Nosek, B. A., Flint, J., Robinson, E. S.J., & Munarfo, M. R. (2013). Power failure: why small sample size undermines the reliability of neuroscience. *Nature Reviews Neuroscience, 14,* 365-376. Doi. 10.1038/nrn3475

Table S7. *Associations between GG and DG Allocations and Charity/Volunteer Behavior*

	Dictator Game		Generosity Game	
	Tobit	OLS	Tobit	OLS
Sample 1 (N = 69)	B (95%CI)	B (95%CI)	B (95%CI)	B (95%CI)
Charity/Volunteer	-0.49	-0.15	-0.13	-0.08
	(-1.44, 0.45)	(-0.42, 0.11)	(-1.14, 0.89)	(-0.48, 0.32)
Sex	2.53	0.62	1.68	0.72
	(-1.54, 6.61)	(-0.52, 1.76)	(-2.68, 6.03)	(-0.98, 2.42)
R^2	.010	.03	.002	.01
Sample 2 (N=301)				
Charity/Volunteer	0.10**	0.09**	0.06	0.04
	(0.03, 0.17)	(0.02, 0.16)	(-0.14, 0.26)	(-0.10, 0.17)
Sex	0.10	0.10	-1.43**	-0.92**
	(-0.21, 0.41)	(-0.19, 0.39)	(-2.30, -0.55)	(-1.49, -0.35)
R^2	.007	.02	.008	.03
Sample 3 (N=102)				
Charity/Volunteer	0.09	0.09	0.26^	.0.22^
	(-.08, 0.27)	(-0.08, 0.25)	(-0.01, 0.54)	(-0.01, 0.45)
Sex	0.31	0.29	-0.85	-0.66
	(-0.41, 1.03)	(-0.39, 0.96)	(-2.01, 0.30)	(-1.61, 0.29)
R^2	.005	.02	.012	.05
Sample 4 (N=256)				
Charity/Volunteer	0.22*	0.15*	0.20	0.11
	(0.02, 0.42)	(0.01, 0.29)	(-0.15, 0.55)	(-0.06, 0.29)
Sex	0.83^	0.57^	-2.79***	-1.40***
	(-0.008, 1.67)	(-0.004, 1.15)	(-4.26, -1.31)	(-2.14, -0.66)
R^2	.010	.04	.014	.05

Note . ^^ p < .10 ^p < .07, * p =< .05, ** p < .01, *** p < .001: Sex: 1 = male, 2 = female.

Supplementary Text S6: *Effects of Sex, Incentivization and their Interaction*

Effects of Sex, Incentives and Sample.

Tables 5a and 5b (main text) indicated a number of interesting effects for sex, incentivisation, and sample type.

Effect of Sex. Specifically, men give more in the GG (Means: MUs_{male} = 7.2 vs MUs_{female} = 6.2), and women in the DG (Means: MUs_{male} = 3.6 vs MUs_{female} = 4.20.

Men consistently allocated more than women in the (costless) GG while women allocated more than men in the (costly) DG. Although these results were unpredicted and were not the primary focus of this research, they replicated previous findings on gender and social preferences. Several studies have shown that women are more prosocial in simple DG, while men are more prosocial when the cost of giving is lowered or when giving or cooperating maximizes efficiency (Andreoni & Vesterlund, 2001; Croson & Gneezy, 2009; Eckel & Grossman, 1998; Kuhn & Villeval, 2015).

These differences may arise from evolutionary differences in reproductive strategies, specifically, the accumulation of economic resources and status for male, rather than female, reproductive success (Sidanius et al., 2000). Similarly, the literature on costly signaling in mate selection indicates that men may engage in acts of conspicuous consumption as a display of resources to increase prestige and status (Griskevicius et al., 2007). In the current study, this may expressed through costless allocations of money in the GG, which does not one's actual stakes at risk is through costless allocations in the generosity game

Effects of Incentives. Compared with hypothetical scenarios, incentivisation enhances GG allocations (Means: $MUs_{incentives}$ = 7.1 vs $MUs_{hypothetical}$ = 6.3) but reduces DG allocations (Means: $MUs_{incentives}$ = 3.0 vs $MUs_{hypothetical}$ = 4.6).

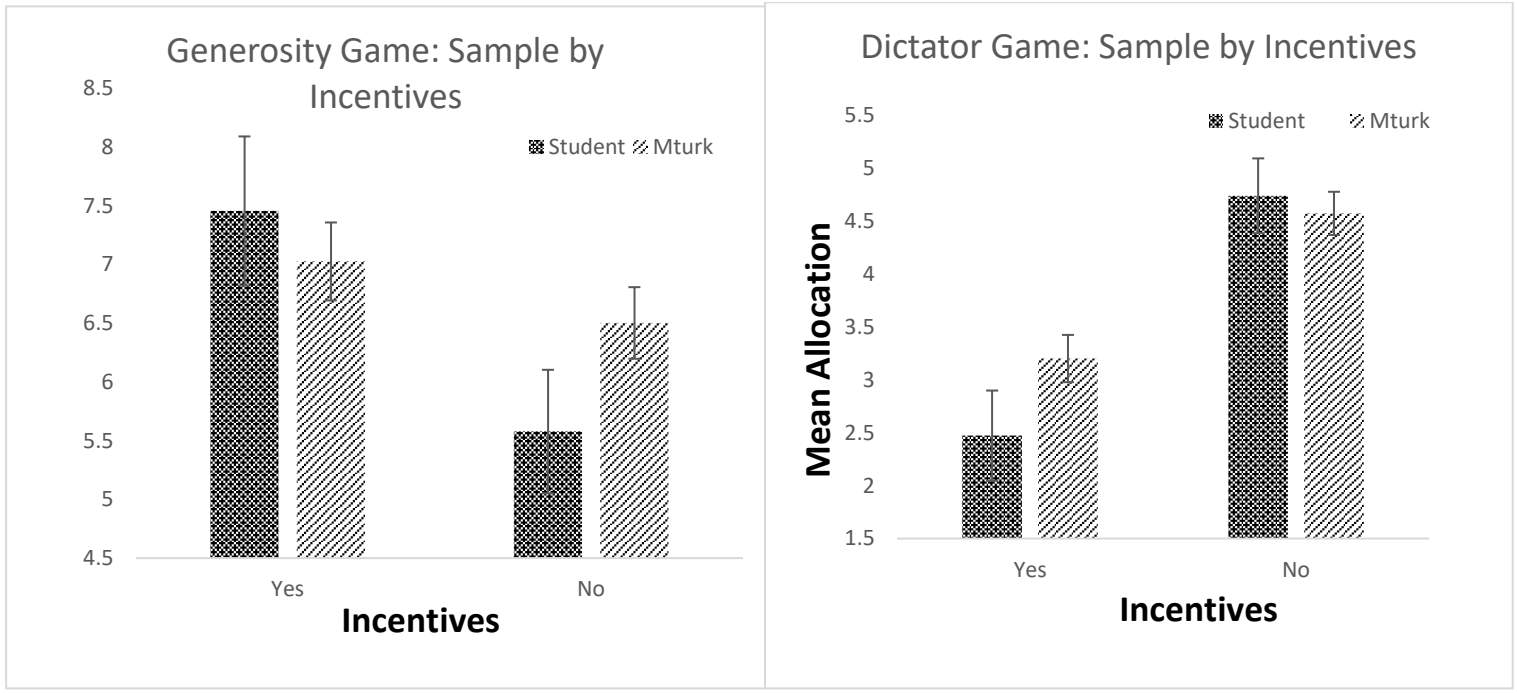
Some behavioral economists have challenged the external validity of decision making studies when tasks have no 'salient' material rewards. They argue that, without such incentives,

participants may not be adequately motivated to behave as they would in the field (Ariely & Norton, 2007; Hertwig & Ortmann, 2001). While psychologists have criticised this for being overly simplistic (e.g., Read, 2005), it is still a potentially pertinent critique for the lab. Indeed, effects of incentives are clearly seen in the present findings.

Without the trade-off between players' payoffs, it was predicted that players would allocate more to their partners in the GG than the DG (Güth, 2010) and this was indeed the case in incentivized games but not the hypothetical scenarios. Thus, it may be argued that incentives motivate players to play 'as if' in the real world (Hertwig & Ortmann, 2001). However, it should be acknowledged that in both incentivized games the players play with 'house money' (Clark, 2002). That is, the money is given to each player i.e. they did not have to earn it. When players have to earn money, giving is reduced (see Cherry, Frykblom & Shogren, 2002). This may explain why DG giving is reduced compared to the hypothetical scenario. Based on house-money effects it is a reasonable conjecture that in the DG game this may be an under-estimations of selfishness, with reduced giving when money is earned. In the GG the greater generosity observed with house money might be an over-estimate and again reduced if the money were earned initially. It would be interesting to examine whether the same predicted distinction would emerge if players earned the money first.

Incentives by sample. The interactions for incentives by sample (Figure S1) indicates that students give less in the GG than the community sample in the absence of incentives and less in the DG when it is incentivized. However, this is treated with caution as it was not a main focus of this study, or hypothesized. Also the student and community samples differ in many ways (occupation, ethnicity, age etc.), all of which may account for the differences. As such we report this for the interested reader.

Figure S1. *Interactions of Games (generosity or dictator) by Incentives and Samples*



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