Incentives and Prosocial Discomfort: A Laboratory Experiment

APPENDIX

A Design and methods

A.1 Participants

The Institutional Review Board of the Johns Hopkins School of Medicine approved this study, and all subjects provided informed consent. Participants were recruited using the Johns Hopkins online announcement system, which sends daily messages to the Johns Hopkins Community, including all levels of students, staff, and faculty. Table A.1 shows the demographics of the recruited subject pool. All participants were right-handed, and the electrical stimulation was applied to the left (non-dominant) arm throughout the study. Those with self-reported neurological or psychiatric disorders were excluded from participation. Participants who self-reported pregnancy or suspected pregnancy were excluded as well.

Thirty-three individuals participated in the experiment. Of these, two were excluded because they reported that more than two different levels of shock yielded the same level of discomfort. The final analysis included n = 31 participants in total (14 males, mean age = 24.1 y, SD = 4.1 y).

A.2 Procedure

This experimental procedure was built in MATLAB 2014a27 using Psychophysics Toolbox Version 328.

A.2.1 Calibration Phase

Participants first underwent a calibration procedure to set electric stimulation levels to their unique pain tolerances. This allowed us to administer shocks of matched subjective value to each participant, which provided a direct comparison of the shock units between participants. Electrodes (EL508, BIOPAC Systems, Inc., Goleta, CA) were affixed to the participants' non-dominant forearm before calibration. Participants experienced distinct levels of an attenuated 10mA signal in 5 bursts (BIOPAC MP150, STMISOC, BIOPAC Systems, Inc., Goleta, CA). Stimulations began at a signal strength of 35dB below the 10mA signal. Every successive stimulation was increased by one dB level in attenuation. To compensate for the increase in signal amplitude, the frequency associated with the shock bursts was also increased to maintain the power of the signal being transmitted to the participant. The participant was asked to rank the sensation on a scale of 1 to 7, with 1 meaning they could feel the sensation and 7 meaning they would not want to experience that sensation again. Once the subject rated a stimulation above a 5, the calibration procedure ended, and the preceding stimulation was used as the maximum stimulation value. If participants made it to the end of the calibration without rating a sensation a 5 or above, they were dismissed from the study.

Participants went through this calibration process twice to establish consistency. Only the second calibration was used to determine participants' maximum stimulation threshold for the experiment.

A.2.2 Association Phase

During the association phase, each participant was presented with their personally calibrated shock levels. 10 units of shock (U) represented the level a participant first started to feel the stimulus and 100U represented their maximum stimulus threshold. Stimulations between those values were linearly interpolated from the minimum and maximum shock levels. For example, if 10U were equivalent to 29dB attenuation and 100U were equivalent to 20db attenuation, 60U would be a 24dB attenuated signal. Participants were exposed to levels that ranged from 20U to 100U in increments of 20U. Each level was experienced 5 times in succession, and participants were asked to recall the distinct sensation of each stimulus level. Shock levels were presented in random order without replacement, such that five successive stimulations of a single level could be followed by any remaining level. Ther purpose of this phase was to ensure that participants developed salient associations between units of shock and their feelings.

A.2.3 Choice Phase

Before performing the choice phase, participants were asked to choose a charity to which their donations would be given. A full list of the selectable charities can be found in Table S2. Participants performed two choice conditions: unpaid phase and paid phase. The unpaid condition simulated completely altruistic giving, where participants made decisions to accept or reject an offered compensation to the charity of their choice in exchange for incurring uncomfortable electric shock. During the paid Choice condition, participants made decisions to accept or reject prospective incentives for themselves and charity in exchange for uncomfortable electric shock. Participants had between 3 and 5 seconds to make choices and were encouraged to consider each offer independently, since one of the offers shown would be randomly selected to be realized at the end of the experiment. Participants would receive the shock of that randomly selected trial and the stated compensation to themselves and the donation to their charity of choice. If a participant did not make a choice in the time window allotted for a particular offer, that offer was removed from the pool of outcome scenarios.

The unpaid and paid conditions included the same levels of charitable donations and shock, except the paid condition additionally included incentives offered directly to the participant. The order of the unpaid and paid conditions was randomly assigned across participants, allowing us to study the influence of the order of presentation of the conditions (n = 14, experienced the unpaid condition first; n = 17, experienced the paid condition first).

The choices presented were uniformly distributed across shock level, donation, and participant incentive compensation. The shock levels offered were in increments of 20 U from 20 to 100 U. Donations to charity ranged from $0 to 20$ in increments of 4. In the paid condition, participants were offered compensation ranging from 0 to 10 in 2 increments.

A.2.4 Outcome Phase

After the participants made all the required choices, the computer randomly selected one offer from both the unpaid and paid conditions. The offers were displayed on the screen along with the participants' response. Then, if the subject accepted the chosen offer, the shock would be administered and the money dispensed. If the subject rejected the offer, nothing was administered or dispensed.

A.2.5 Compensation

Participants were compensated with any incentives awarded by from outcome phase in addition to a $15 show-up fee. The money to be donated to the charity of choice was recorded and dispensed to each charity at the end of the collection.

A.3 Data and code availability

The datasets generated during and analyzed during the current study are available in the Open Science Framework repository, https://osf.io/kreb8/. The code used to collect and analyze data during the current study are available in the Open Science Framework repository https://osf.io/kreb8/.

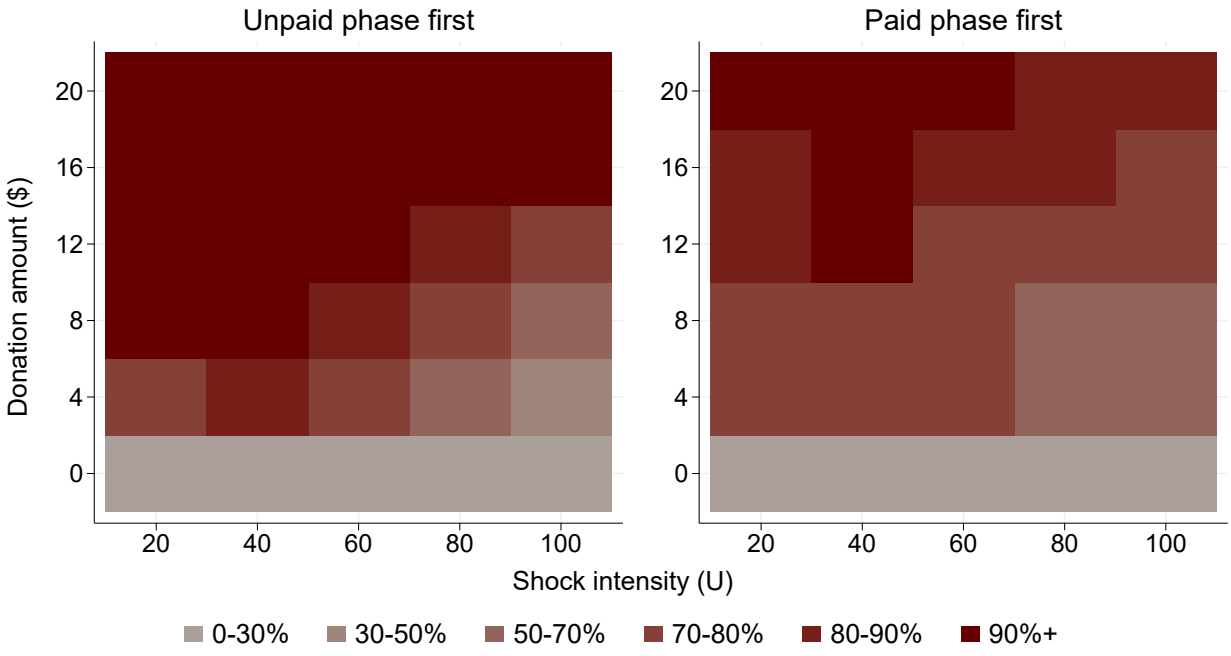
Table A.1

Characteristics	**# of Participants**
Included	31
Excluded	2
Male	14
Female	17
White	14
Asian	14
White - Middle Eastern	1
White - Hispanic/Latino	1
Black or African American	1
Paid phase first	17
Unpaid phase first	14

Table A.2: Eligible charities

American Association for the Advancement of Science
American Civil Liberties Union and Foundation
Climate Works Foundation
Direct Relief
Feeding America
Goodwill Industries International
Humane Society of the United States
Nature Conservancy
Patient Access Network Foundation
Public Broadcasting Service
Step Up for Students
St. Jude Children's Research Hospital
Task Force for Global Health
Teach for America
United Way
World Wildlife Fund
Wounded Warrior Project

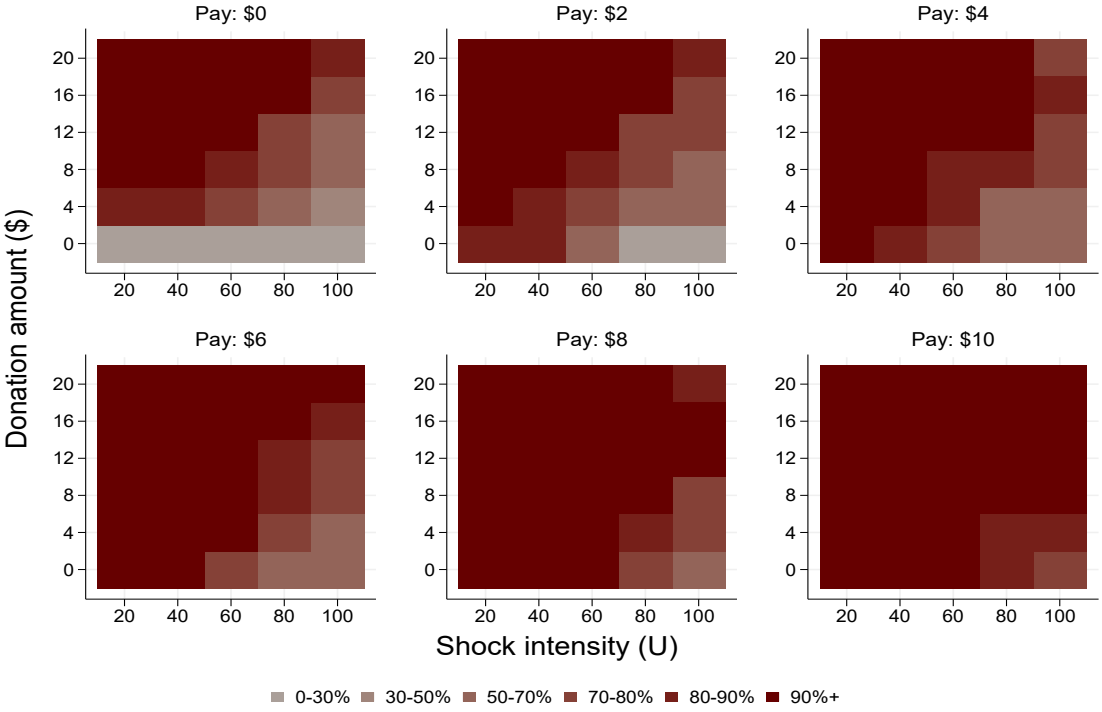
Figure A.1: Acceptance rates: Unpaid phase



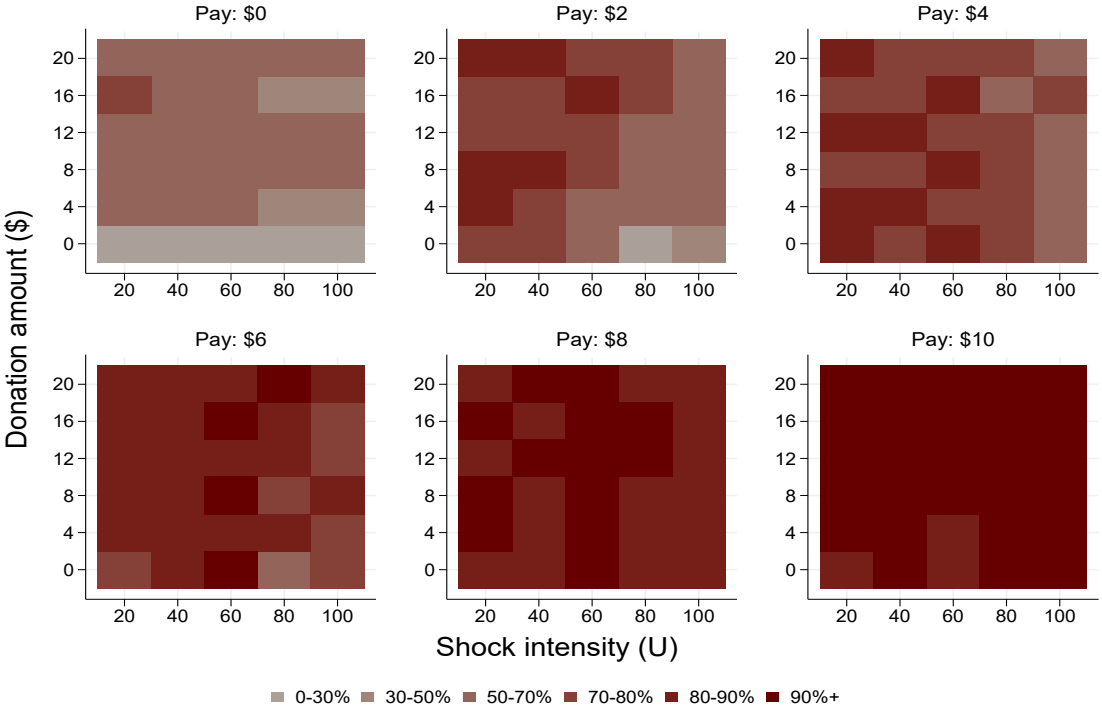
Notes: The heat plots show the shock acceptance rates for each amount of charitable donation and units of the electric stimulation, in the Unpaid phase. The graph on the left refers to subjects who experienced the unpaid phase first, and the right graph those who went through the paid phase first.

Figure A.2: Acceptance rates: Paid phase

(a) Unpaid phase first

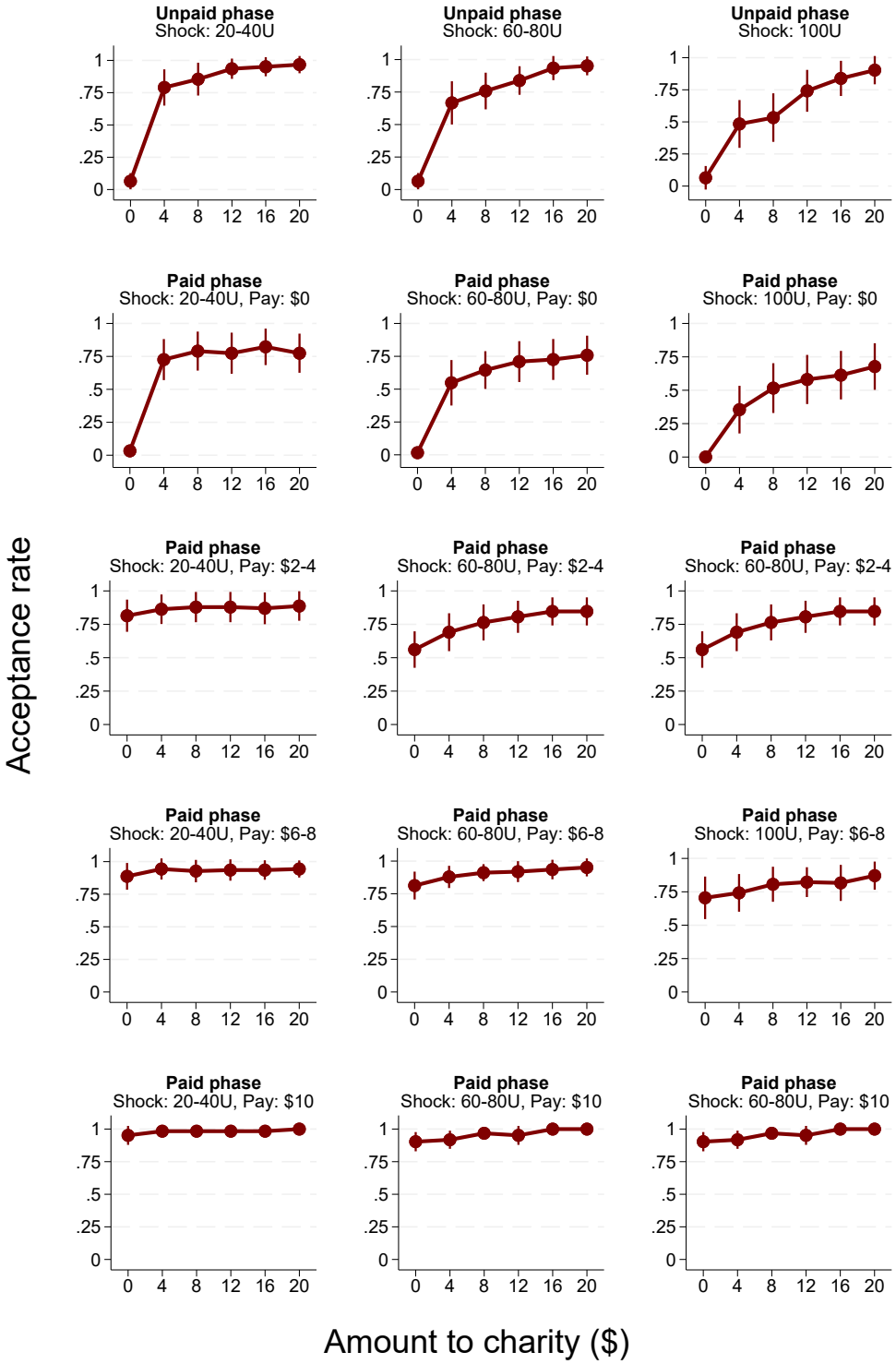


(b) Paid phase first



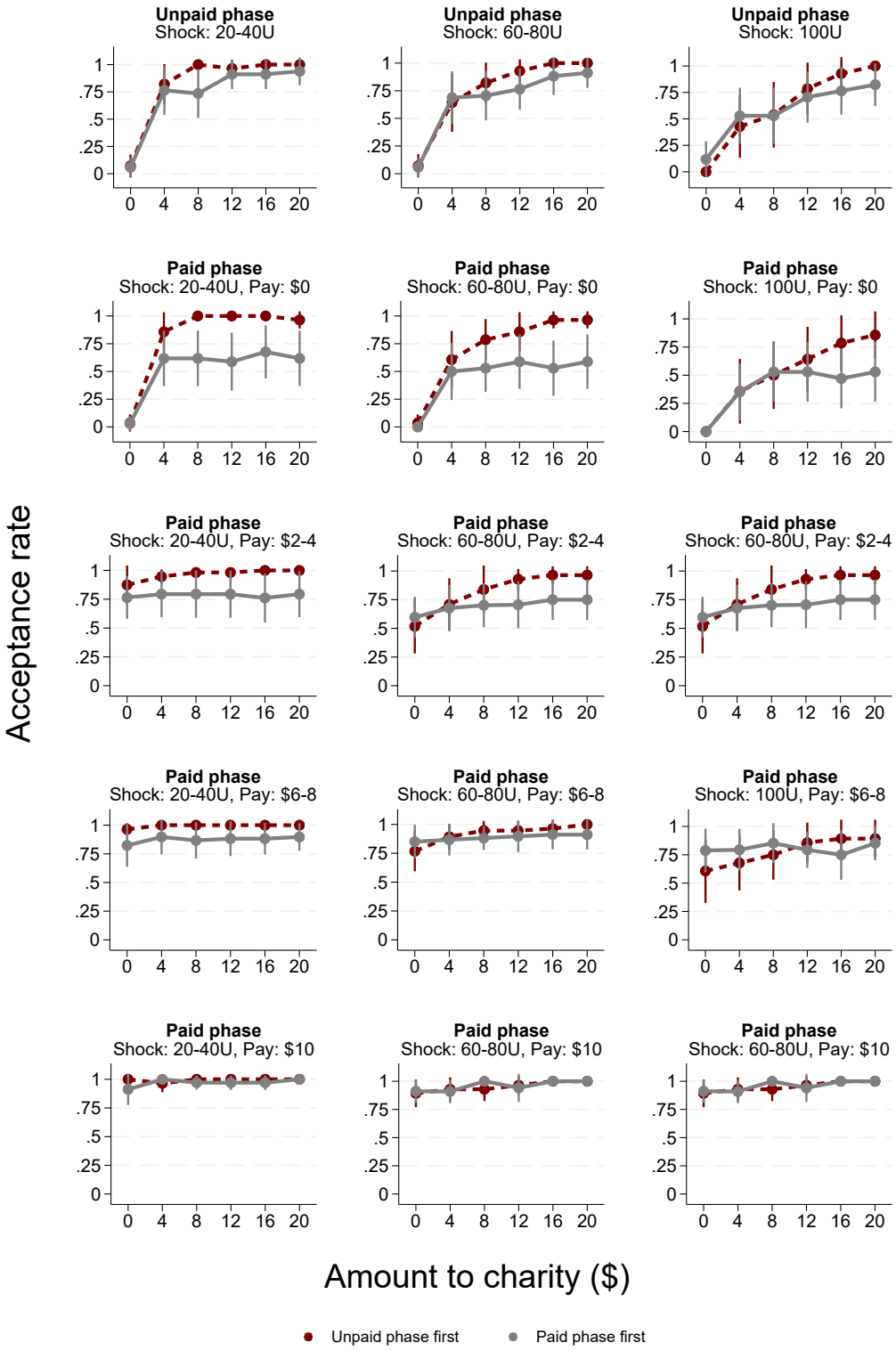
Notes: The heat plots show the shock acceptance rates for each amount of charitable donation, units of the electric stimulation, and monetary compensation to the subjects in the Paid phase. The graphs on the top refer to subjects who experienced the Unpaid phase first, and the bottom graphs those who went through the Paid phase first.

Figure A.3: Acceptance rates by experimental condition



Notes: Each panel reports the share of participants who accepted the electric stimulation for each monetary value of the donation, a given level of the shock, the phase of the experiment (Unpaid or Paid) and, for the Paid phase, different levels of the monetary reward offered. We grouped, as indicated in the title of each panel, different electric intensity levels and amounts of private payments together for ease of representation and greater precision of the estimates. The vertical lines report the 95% confidence intervals of the estimates, with standard errors clustered at the subject level.

Figure A.4: Acceptance rates by experimental condition, and phase ordering



Notes: As in Figure A.3, each panel reports the share of participants who accepted the electric stimulation for each monetary value of the donation, level of the shock, the phase of the experiment (Unpaid or Paid) and, for the Paid phase, different levels of the monetary reward offered. Here, we compute the acceptance rate separately by wehter a subject experienced the Unpaid phase or the Paid phase first.

Table A.3: Regression estimates - 1.1

Outcome:	Accepted electric stimulation					
Phase:	Unpaid			Paid		
Payment to subject:				$0		
Stimulation intensity:	20-40U	60-80U	100U	20-40U	60-80U	100U
	(1)	(2)	(3)	(4)	(5)	(6)
Charity contribution	0.036***	0.035***	0.032***	0.022***	0.022***	0.021***
	(0.004)	(0.004)	(0.006)	(0.004)	(0.004)	(0.005)
Unpaid phase first	0.081	0.016	-0.132	0.139**	0.054	-0.072
	(0.082)	(0.095)	(0.126)	(0.064)	(0.086)	(0.095)
Charity contribution	0.001	0.006	0.017**	0.014***	0.019***	0.019**
X Unpaid phase first	(0.005)	(0.005)	(0.007)	(0.005)	(0.005)	(0.008)
Constant	0.361***	0.313***	0.263**	0.309***	0.235***	0.188***
	(0.071)	(0.073)	(0.097)	(0.052)	(0.051)	(0.054)
Observations	370	369	185	371	372	186
R-squared	0.347	0.334	0.311	0.263	0.259	0.204

Notes: The table reports linear regression estimates from the following model: $D_i = \beta_0 + \beta_1 Charity\ contribution_i + \beta_2 I(Unpaid\ phase\ first)_i + \beta_3 Charity\ contribution_i * I(Unpaid\ phase\ first)_i + \epsilon_i$, where D_i is a 0-1 indicator of the choice of whether a subject i (i=1,...,30) accepted (1) a given level of electric stimulation or not(0), in each of the j=1,...6 decisions, one for each proposed donation; $Charity\ contribution_i$ indicates the dollar amount of the charitable donation to make if subject i accepted the electric stimulation; $Unpaid\ phase\ first_i$ is equal to one if subject i experienced the Unpaid phase first, and zero otherwise; and $Charity\ contribution_i * I(Unpaid\ phase\ first)_i$ is the product between the two regressors. Each column reports regression estimates by phase (Paid or Unpaid), shock level, and, in the Paid phase, the amount of private monetary reward offered. We grouped, as indicated in each column, different electric intensity levels and amounts of private payments together for ease of representation and greater precision of the estimates (these are the seame groupings as those in Figures A.3 and A.4. In this table, the estimates refer to the Unpaid phase, and to the Paid phase limited to the case of $0 private payment. Standard errors are clustered ad the participant level. *** significant at the 1% level, ** at the 5% level, * at the 10% level.

Table A.4: Regression estimates - 1.2

Outcome:	Accepted electric stimulation								
Phase:	Paid								
Payment to subject:	$2-4			$6-8			$10		
Stimulation intensity:	20-40U	60-80U	100U	20-40U	60-80U	100U	20-40U	60-80U	100U
	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Charity contribution	0.000	0.007**	0.009**	0.002	0.003**	0.001	0.003	0.005**	0.002
	(0.001)	(0.003)	(0.004)	(0.002)	(0.001)	(0.004)	(0.002)	(0.002)	(0.004)
Unpaid phase first	0.128	-0.026	-0.043	0.130	-0.033	-0.172	0.041	-0.018	-0.131
	(0.103)	(0.135)	(0.157)	(0.081)	(0.089)	(0.146)	(0.040)	(0.067)	(0.107)
Charity contribution	0.005	0.015**	0.013	-0.001	0.007*	0.015*	-0.002	0.001	0.008
X Unpaid phase first	(0.003)	(0.006)	(0.008)	(0.002)	(0.004)	(0.008)	(0.002)	(0.004)	(0.006)
Constant	0.780***	0.626***	0.482***	0.851***	0.855***	0.796***	0.945***	0.914***	0.944***
	(0.089)	(0.086)	(0.101)	(0.080)	(0.061)	(0.079)	(0.037)	(0.042)	(0.053)
Observations	743	741	370	744	743	369	372	371	186
R-squared	0.075	0.083	0.061	0.056	0.029	0.033	0.017	0.030	0.044

Notes: The table reports linear regression estimates from the following model: $D_i = \beta_0 + \beta_1 Charity\ contribution_i + \beta_2 I(Unpaid\ phase\ first)_i + \beta_3 Charity\ contribution_i * I(Unpaid\ phase\ first)_i + \epsilon_i$, where D_i is a 0-1 indicator of the choice of whether a subject i (i=1,...,30) accepted (1) a given level of electric stimulation or not(0), in each of the j=1,...6 decisions, one for each proposed donation; $Charity\ contribution_i$ indicates the dollar amount of the charitable donation to make if subject i accepted the electric stimulation; $Unpaid\ phase\ first_i$ is equal to one if subject i experienced the Unpaid phase first, and zero otherwise; and $Charity\ contribution_i * I(Unpaid\ phase\ first)_i$ is the product between the two regressors. Each column reports regression estimates by phase (Paid or Unpaid), shock level, and, in the Paid phase, the amount of private monetary reward offered. We grouped, as indicated in each column, different electric intensity levels and amounts of private payments together for ease of representation and greater precision of the estimates (these are the seame groupings as those in Figures A.3 and A.4. In this table, the estimates refer to the Paid phase, for the cases of $2-4 $6-8 and $10 private payments. Standard errors are clustered ad the participant level. *** significant at the 1% level, ** at the 5% level, * at the 10% level.

Table A.5: Regression estimates - 2.1

Outcome:	Accepted electric stimulation					
Phase:	Unpaid			Paid		
Payment to subject:				$0		
Stimulation intensity:	20-40U	60-80U	100U	20-40U	60-80U	100U
	(1)	(2)	(3)	(4)	(5)	(6)
Charity: $4	0.706***	0.629***	0.412***	0.587***	0.500***	0.353***
	(0.106)	(0.109)	(0.125)	(0.131)	(0.121)	(0.121)
Charity: $8	0.676***	0.647***	0.412***	0.587***	0.529***	0.529***
	(0.105)	(0.103)	(0.125)	(0.131)	(0.100)	(0.127)
Charity: $12	0.853***	0.706***	0.588***	0.558***	0.588***	0.529***
	(0.071)	(0.086)	(0.125)	(0.136)	(0.115)	(0.127)
Charity: $16	0.853***	0.824***	0.647***	0.646***	0.529***	0.471***
	(0.083)	(0.085)	(0.122)	(0.120)	(0.117)	(0.127)
Charity: $20	0.881***	0.853***	0.706***	0.587***	0.588***	0.529***
	(0.070)	(0.071)	(0.116)	(0.131)	(0.115)	(0.127)
Unpaid phase first	0.013	0.013	-0.118	0.005	0.036	-0.000
	(0.063)	(0.063)	(0.082)	(0.047)	(0.036)	(.)
Charity: $4	0.044	-0.057	0.017	0.234	0.071	0.004
X Unpaid phase first	(0.146)	(0.175)	(0.187)	(0.156)	(0.167)	(0.181)
Charity: $8	0.252**	0.103	0.127	0.377***	0.221	-0.029
X Unpaid phase first	(0.115)	(0.135)	(0.191)	(0.136)	(0.132)	(0.189)
Charity: $12	0.040	0.151	0.197	0.406***	0.233	0.113
X Unpaid phase first	(0.091)	(0.107)	(0.170)	(0.140)	(0.143)	(0.185)
Charity: $16	0.076	0.105	0.282*	0.318**	0.399***	0.315*
X Unpaid phase first	(0.096)	(0.098)	(0.141)	(0.125)	(0.127)	(0.171)
Charity: $20	0.048	0.076	0.294**	0.341**	0.340**	0.328**
X Unpaid phase first	(0.085)	(0.086)	(0.116)	(0.140)	(0.125)	(0.160)
Constant	0.059	0.059	0.118	0.030	0.000	0.000
	(0.040)	(0.040)	(0.082)	(0.030)	(.)	(.)
Observations	370	369	185	371	372	186
R-squared	0.572	0.450	0.344	0.450	0.347	0.246

Notes: The table reports linear regression estimates from the following model: from the following model: $D_i = \beta_0 + \beta_1 I(Unpaid\ phase\ first)_i + \sum_{k=1}^{5} \gamma_k I(Charity : \$4k)_i + \sum_{k=1}^{5} \gamma_k I(Charity : \$4k)_i * I(Unpaid\ phase\ first)_i) + \epsilon_i$, where D_i is a 0-1 indicator of the choice of whether a subject i (i=1,...,30) accepted (1) a given level of electric stimulation or not (0); $I(Charity = \$4k)$ is a 0-1 indicator for whether the dollar amount of the charitable donation to make if subject i accepted the electric stimulation in a given phase is $\$4k$ (k=1,...,5); and $I(UnPaid\ phase\ first)$ is a binary indicator for whether subject i experienced the Unpaid phase first. Each column reports regression estimates by phase (Paid or Unpaid), shock level, and, in the Paid phase, the amount of private monetary reward offered. We grouped, as indicated in each column, different electric intensity levels and amounts of private payments together for ease of representation and greater precision of the estimates (these are the seame groupings as those in Figures A.3 and A.4. In this table, the estimates refer to the Unpaid phase, and to the Paid phase limited to the case of $0 private payment. Standard errors are clustered ad the participant level. *** significant at the 1% level, ** at the 5% level, * at the 10% level.

Table A.6: Regression estimates - 2.2

Outcome:	Accepted electric stimulation								
Phase:				Paid					
Payment to subject:		$2-4			$6-8			$10	
Stimulation intensity:	20-40U	60-80U	100U	20-40U	60-80U	100U	20-40U	60-80U	100U
	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Charity: $4	0.029	0.079	0.118**	0.074	0.017	0.006	0.088	-0.003	0.000
	(0.029)	(0.061)	(0.053)	(0.046)	(0.026)	(0.090)	(0.064)	(0.044)	(.)
Charity: $8	0.029	0.104	0.135	0.044*	0.032	0.065	0.059	0.088*	0.000
	(0.029)	(0.065)	(0.093)	(0.024)	(0.037)	(0.074)	(0.059)	(0.048)	(0.087)
Charity: $12	0.029	0.109	0.135	0.059*	0.046*	0.006	0.059	0.029	0.059
	(0.029)	(0.075)	(0.093)	(0.034)	(0.024)	(0.090)	(0.059)	(0.052)	(0.060)
Charity: $16	-0.004	0.153**	0.206**	0.059	0.061**	-0.038	0.059	0.088*	0.059
	(0.043)	(0.069)	(0.086)	(0.040)	(0.027)	(0.123)	(0.059)	(0.048)	(0.060)
Charity: $20	0.029	0.153**	0.206**	0.074**	0.061**	0.065	0.088	0.088*	0.000
	(0.029)	(0.069)	(0.097)	(0.035)	(0.027)	(0.077)	(0.064)	(0.048)	(0.087)
Unpaid phase first	0.110	-0.079	-0.048	0.141	-0.083	-0.181	0.088	-0.019	-0.155
	(0.115)	(0.137)	(0.158)	(0.090)	(0.105)	(0.158)	(0.064)	(0.074)	(0.130)
Charity: $4	0.042	0.112	0.025	-0.038	0.108*	0.065	-0.124	0.038	0.071
X Unpaid phase first	(0.062)	(0.098)	(0.082)	(0.052)	(0.057)	(0.114)	(0.073)	(0.056)	(0.128)
Charity: $8	0.078	0.217*	0.115	-0.008	0.147*	0.078	-0.059	-0.053	0.143
X Unpaid phase first	(0.082)	(0.120)	(0.138)	(0.034)	(0.080)	(0.122)	(0.059)	(0.079)	(0.131)
Charity: $12	0.078	0.302**	0.223	-0.023	0.132*	0.244	-0.059	0.042	0.084
X Unpaid phase first	(0.082)	(0.124)	(0.144)	(0.041)	(0.074)	(0.145)	(0.059)	(0.071)	(0.115)
Charity: $16	0.129	0.293**	0.223	-0.023	0.135	0.324*	-0.059	0.019	0.084
X Unpaid phase first	(0.088)	(0.122)	(0.153)	(0.047)	(0.083)	(0.183)	(0.059)	(0.074)	(0.115)
Charity: $20	0.096	0.293**	0.223	-0.038	0.171*	0.221	-0.088	0.019	0.214
X Unpaid phase first	(0.082)	(0.122)	(0.159)	(0.043)	(0.084)	(0.156)	(0.064)	(0.074)	(0.144)
Constant	0.765***	0.597***	0.441***	0.824***	0.851***	0.788***	0.912***	0.912***	0.941***
	(0.086)	(0.083)	(0.104)	(0.087)	(0.068)	(0.091)	(0.064)	(0.048)	(0.060)
Observations	743	741	370	744	743	369	372	371	186
R-squared	0.078	0.092	0.066	0.059	0.035	0.039	0.037	0.040	0.054

Notes: The table reports linear regression estimates from the following model: from the following model: $D_i = \beta_0 + \beta_1 I(Unpaid\ phase\ first)_i + \sum_{k=1}^{5} \gamma_k I(Charity : \$4k)_i + \sum_{k=1}^{5} \gamma_k I(Charity : \$4k)_i * I(Unpaid\ phase\ first)_i) + \epsilon_i$, where D_i is a 0-1 indicator of the choice of whether a subject i (i=1,...,30) accepted (1) a given level of electric stimulation or not (0); $I(Charity = \$4k)$ is a 0-1 indicator for whether the dollar amount of the charitable donation to make if subject i accepted the electric stimulation in a given phase is $\$4k$ (k=1,...,5); and $I(Unpaid\ phase\ first)$ is a binary indicator for whether subject i experienced the Unpaid phase first. Each column reports regression estimates by phase (Paid or Unpaid), shock level, and, in the Paid phase, the amount of private monetary reward offered. We grouped, as indicated in each column, different electric intensity levels and amounts of private payments together for ease of representation and greater precision of the estimates (these are the seame groupings as those in Figures A.3 and A.4. In this table, the estimates refer to the Paid phase, for the cases of $2-4 $6-8 and $10 private payments. Standard errors are clustered ad the participant level. *** significant at the 1% level, ** at the 5% level, * at the 10% level.