Supplementary Online Appendix to Strategic Behavior with Tight, Loose, and Polarized Norms

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A Theoretical Appendix

A.1 Proofs

Proof of proposition 1 Expected payoff is

$$E[X - x_i + \gamma (x_i + x_j) - \frac{\eta_i}{2} (x_i - x_j)^2 - \frac{\delta_i}{2} (x_i - x_i^a)^2]$$

which can be rewritten as

$$X - x_i + \gamma(x_i + E[x_j]) - \frac{\eta_i}{2} \int_0^{\overline{x}} (x_i - x_j)^2 f(x_j) dx_j - \frac{\delta_i}{2} (x_i - x_i^a)^2 . \tag{3}$$

The derivative of (3) with respect to x_i gives

$$-(1-\gamma) - \eta_i(x_i - \mu) - \delta_i (x_i - x_i^a) . \tag{4}$$

Evaluated at $x_i = 0$, (4) becomes $-(1-\gamma) + \eta_i\mu + \delta_i x_i^a$. When $\eta_i < \frac{1-\gamma-\delta_i x_i^a}{\mu}$ we therefore have $x_i^* = 0$. Evaluated at $x_i = \overline{x}$, (4) becomes $-(1-\gamma) - \eta_i(\overline{x} - \mu_x) - \delta_i (\overline{x} - x_i^a) < 0$. Finally, as highlighted in the proposition, in any interior solution (4) is equal to 0, so that $x_i^* = \frac{\eta_i\mu + \delta_i x_i^a - (1-\gamma)}{\eta_i + \delta_i}$. ∎

Proof of proposition 2 Expected payoff is:

$$\begin{aligned} &X - x_i + \gamma (x_i + E[x_j]) - \alpha_i F(x_i) [x_i - E(x_j \mid x_j < x_i)] \\ &-\beta_i(1 - F(x_i))[E(x_j \mid x_j > x_i) - x_i] - \frac{\delta_i}{2} (x_i - x_i^a)^2 \end{aligned}$$

which can be rewritten as

$$\begin{aligned} &X - x_i + \gamma (x_i + E[x_j]) - \alpha_i \int_0^{x_i} (x_i - x_j) f(x_j) dx_j \\ &-\beta_i \int_{x_i}^{\overline{x}} (x_j - x_i) f(x_j) dx_j - \frac{\delta_i}{2} (x_i - x_i^a)^2 . \end{aligned} \tag{5}$$

The derivative of (5) with respect to x_i gives

$$-(1-\gamma) - \alpha_i F(x_i) + \beta_i(1 - F(x_i)) - \delta_i (x_i - x_i^a) . \tag{6}$$

Evaluated at $x_i = 0$, (6) becomes $\beta_i - (1-\gamma) + \delta_i x_i^a$. When $\beta_i < 1 - \gamma - \delta_i x_i^a$ we therefore have $x_i^* = 0$. Evaluated at $x_i = \overline{x}$, (6) becomes $-\alpha_i - (1-\gamma) - \delta_i (\overline{x} - x_i^a) < 0$. Finally, as highlighted in the proposition, in any interior solution (6) is equal to 0, and hence

$$\delta_i x_i^* + F\left(x_i^*\right)\left(\alpha_i + \beta_i\right) = \beta_i - (1-\gamma) + \delta_i x_i^a. \tag{7}$$

■

Proof of corollary 1 Part (i) Suppose that, for some $\widehat{x} \in (0, \overline{x})$, the following holds: $F_1(x) > F_0(x)$ for $\in (0, \widehat{x})$ and $F_1(x) < F_0(x)$ for $x \in (\widehat{x}, \overline{x})$. Consider $x_{i0}^* \in (0, \widehat{x})$. We have

$$\begin{aligned} -(1-\gamma) - \alpha_i F_1\left(x_{i0}^*\right) + \beta_i(1 - F_1\left(x_{i0}^*\right)) - \delta_i\left(x_i - x_i^a\right) &< \\ -(1-\gamma) - \alpha_i F_0\left(x_{i0}^*\right) + \beta_i(1 - F_0\left(x_{i0}^*\right)) - \delta_i\left(x_i - x_i^a\right) &= 0 \end{aligned}$$

Since $-(1-\gamma) - \alpha_i F(x) + \beta_i(1 - F(x)) - \delta_i(x - x_i^a)$ is decreasing in x, this implies that $x_{i1}^* < x_{i0}^*$. The proof of part (ii) is analogous and is therefore omitted. ■

Proof of corollary 2. From (7) we see that, restricting attention to interior solutions, we have

$$\begin{aligned} \frac{dx_i^*}{d\alpha_i} &= -\frac{F(x_i^*)}{\delta_i + (\alpha_i + \beta_i) f(x_i^*)} < 0 \\ \frac{dx_i^*}{d\beta_i} &= \frac{1 - F(x_i^*)}{\delta_i + (\alpha_i + \beta_i) f(x_i^*)} > 0 \\ \frac{dx_i^*}{dx_i^a} &= \frac{\delta_i}{\delta_i + (\alpha_i + \beta_i) f(x_i^*)} > 0 \end{aligned}$$

■

Proof of corollary 3 Consider first the difference in α necessary to induce a change in x_i^* from x' to x''. Fix the other parameters to be equl to β, δ and x^a and denote as α_k' the value of α required for x' to be optimal under f_k. We have

$$F_k\left(x'\right) = \frac{\varkappa}{\alpha_k' + \beta}$$

where $\varkappa \equiv \beta - (1-\gamma) + \delta x^a - \delta x'$, and, analogously,

$$F_k\left(x''\right) = \frac{\varkappa}{\alpha_k'' + \beta}.$$

Recall that $F_1(x') > F_0(x')$ while $F_1(x'') < F_0(x'')$. As a result,

$$\begin{aligned} \frac{\varkappa}{\alpha_0' + \beta} &< \frac{\varkappa}{\alpha_1' + \beta} \text{ i.e. } \alpha_1' < \alpha_0' \\ \text{and similarly } \frac{\varkappa}{\alpha_0'' + \beta} &> \frac{\varkappa}{\alpha_1'' + \beta} \text{ i.e. } \alpha_1'' > \alpha_0'' \end{aligned}$$

which implies that $\alpha_0' - \alpha_0'' > \alpha_1' - \alpha_1''$. Consider now the difference in β necessary to induce a change in x_i^* from x' to x''. We have

$$F_k\left(x'\right) = \frac{\beta_k' + \varrho(x')}{\alpha + \beta_k'}$$

where $\varrho(x) \equiv -(1-\gamma) + \delta x^a - \delta x$, and, analogously,

$$F_k\left(x''\right) = \frac{\beta_k'' + \varrho}{\alpha + \beta_k''}.$$

Recalling that $F_1\left(x'\right) > F_0\left(x'\right)$ while $F_1\left(x''\right) < F_0\left(x''\right)$,

$$\begin{array}{rcll} \dfrac{\beta_0' + \varrho(x')}{\alpha + \beta_0'} & < & \dfrac{\beta_1' + \varrho(x')}{\alpha + \beta_1'} & \text{i.e. } \beta_0'\left(\alpha - \varrho(x')\right) < \beta_1'\left(\alpha - \varrho(x')\right) \\ \text{and similarly } \dfrac{\beta_0'' + \varrho(x'')}{\alpha + \beta_0''} & > & \dfrac{\beta_1'' + \varrho(x'')}{\alpha + \beta_1''} & \text{i.e. } \beta_0''\left(\alpha - \varrho(x'')\right) > \beta_1''\left(\alpha - \varrho(x'')\right). \end{array}$$

where $\alpha - \varrho > 0$. To see this note that, from (7),

$$\alpha_i > \beta_i(1 - F(x_i^*)) - (1-\gamma) + \delta x^a - \delta x_i^* > \varrho(x_i^*).$$

This implies that $\beta_0'' - \beta_0' > \beta_1'' - \beta_1'$. Finally, the result with respect to x_i^a is derived analogously to α and β and is therefore omitted.■

A.2 The disutility of deviating from x_i^a takes the absolute value form

Suppose that the disutility from selecting a contribution that differs from x_i^a is given by

$$\begin{array}{c} -\vartheta_i(x_i - x_i^a) \text{ if } x_i > x_i^a \\ -\rho_i(x_i^a - x_i) \text{ if } x_i < x_i^a \end{array}$$

for some $\vartheta_i \geq 0$ and $\rho_i \geq 0$. If $x_i > x_i^a$, individual expected utility is

$$X - x_i + \gamma\left(x_i + x_j\right) - \alpha_i \int_0^{x_i} \left(x_i - x_j\right) f(x_j) dx_j - \beta_i \int_{x_i}^{\overline{x}} \left(x_j - x_i\right) f(x_j) dx_j - \vartheta_i(x_i - x_i^a)$$

while if $x_i < x_i^a$ it is

$$X - x_i + \gamma\left(x_i + x_j\right) - \alpha_i \int_0^{x_i} \left(x_i - x_j\right) f(x_j) dx_j - \beta_i \int_{x_i}^{\overline{x}} \left(x_j - x_i\right) f(x_j) dx_j - \rho_i(x_i^a - x_i)$$

The optimal contribution x_i^* satisfies

$$\begin{array}{ll} F\left(x_i^*\right) = \frac{\beta_i - (1-\gamma) - \vartheta_i}{\alpha_i + \beta_i} & \text{if } \frac{\beta_i - (1-\gamma) - \vartheta_i}{\alpha_i + \beta_i} > F\left(x_i^a\right) \\ F\left(x_i^*\right) = \frac{\beta_i - (1-\gamma) + \rho_i}{\alpha_i + \beta_i} & \text{if } \frac{\beta_i - (1-\gamma) + \rho_i}{\alpha_i + \beta_i} < F\left(x_i^a\right) \\ x_i^* = x_i^a & \text{if } \frac{\beta_i - (1-\gamma) + \rho_i}{\alpha_i + \beta_i} > F\left(x_i^a\right) > \frac{\beta_i - (1-\gamma) - \vartheta_i}{\alpha_i + \beta_i} \end{array}$$

Consider two distributions f_0 and f_1 with the same mean and suppose that f_0 is single-crossing stochastic dominant over f_1 so that, for some $\widehat{x} \in (0, \overline{x})$ the following holds: $F_1\left(x\right) > F_0\left(x\right)$ for $x < \widehat{x}$ and $F_1\left(x\right) < F_0\left(x\right)$ for $x > \widehat{x}$.

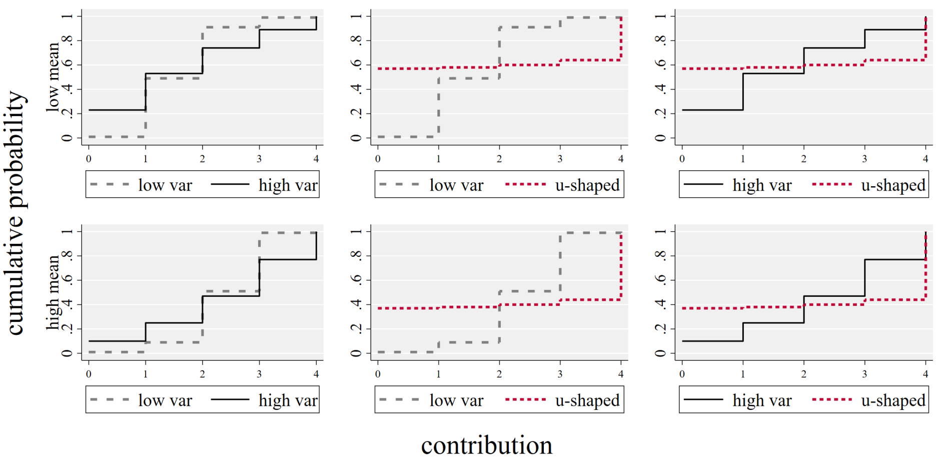
Clearly enough, the results outlined in corollaries 1 and 2 continue to hold. Consider now corollary 3. It is straightforward to check that $\alpha_0' - \alpha_0'' > \alpha_1' - \alpha_1''$ and $\beta_0'' - \beta_0' > \beta_1'' - \beta_1'$ as in the proof of corollary 3. This implies that the the parameter shift in α_i or in β_i needed to generate a change in optimal contribution from x' to x'' is larger under f_0 compared to f_1. However, the prediction with respect to x_i^a is less clear-cut. Suppose for instance that $\frac{\beta_i-(1-\gamma)-\vartheta_i}{\alpha_i+\beta_i} = x'$ and $\frac{\beta_i-(1-\gamma)+\rho_i}{\alpha_i+\beta_i} = x''$. A change in x_i^a from $\widetilde{x}' = F^{-1}(x')$ to $\widetilde{x}'' = F^{-1}(x'')$ would result in the optimal contribution moving from x' to x''. Since $F_1^{-1}(x') < F_0^{-1}(x')$ and $F_1^{-1}(x'') > F_0^{-1}(x'')$, $\widetilde{x}'' - \widetilde{x}'$ is larger under f_1 compared to f_0. We conclude that, if the disutility of deviating from x_i^a takes the absolute value form, corollary 3 does not necessarily hold for x_i^a (but it does for α_i and β_i).

B Additional analysis

B.1 Single crossing property of shown distributions

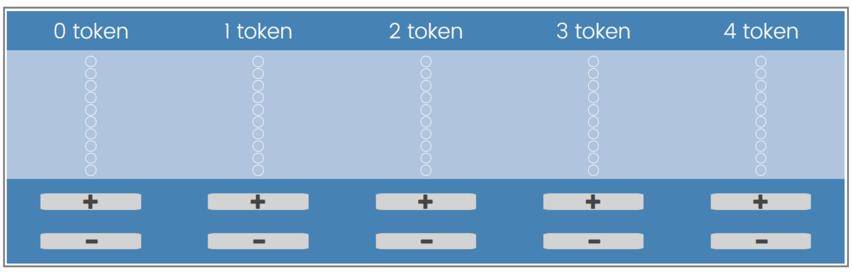
Figure B.1 plots the cumulative distributions of all six treatments. As can be seen below, the single-crossing condition discussed in Section 2 holds for all pairwise comparisons of descriptive norms sharing the same mean.

Figure B.1: Cumulative distributions of descriptive norm treatments



B.2 Belief elicitation screen

Figure B.2: Belief elicitation screen

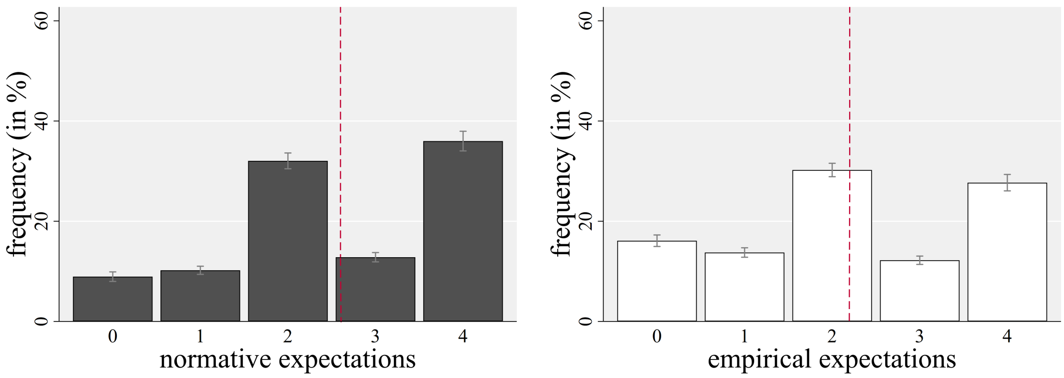


Note. Participants are asked to allocate a total of 10 points across all available options, according to how likely they think each option is.

B.3 Empirical and normative expectations

Empirical (EE) and normative (NE) expectations in Part I — i.e. expectations about what most people do and what most people think one should do — are very similar to contributions, beliefs and PVs (see Figure B.3). Not surprisingly, when asked about what most other people actually contribute (EEs) participants answer in the same way as when asked about their co-player's likely contribution. NEs are shifted slightly to the right, indicating that people think others contribute less than they say one should. In addition, to eliciting the distribution of expectations and beliefs, we measured the participants' confidence in their replies. Participantsappear to be more certain about what others say one should contribute than actual contributions. Although the difference is small, our confidence measure is significantly higher for NEs than EEs about the other player (Wilcoxon signed-rank test, $p = 0.01$).

Figure B.3: EEs and NEs in Part I

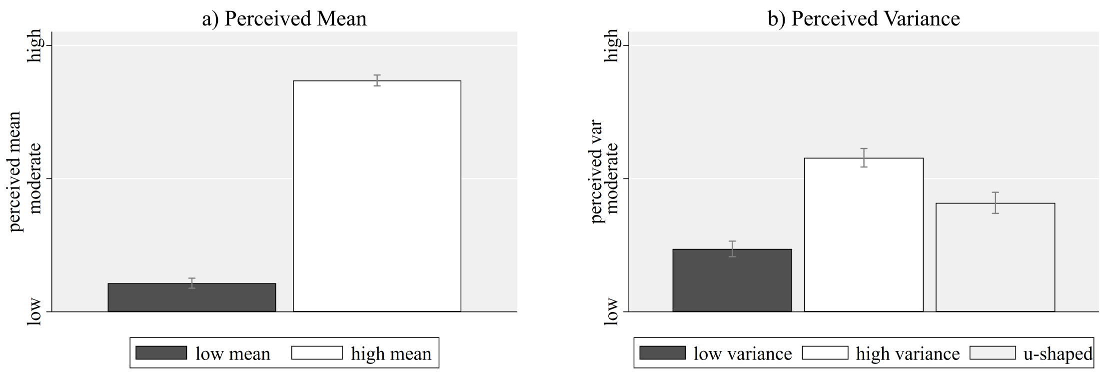


Note. The dashed lines represent averages. Whiskers show 95% confidence intervals.

B.4 Manipulation checks

In the ex-post survey we ask participants about their perceptions of the shown distribution. As Figure B.4a shows, participants in high-mean conditions also have a significantly higher perception of the mean (Wilcoxon-Mann-Whitney test, $p < 0.001$). In terms of the variance (Figure B.4b), participants perceive the low-variance condition as significantly less varying than the high-variance and the u-shaped conditions, and the u-shaped as less varying than the high-variance condition (Wilcoxon-Mann-Whitney tests, for all $p < 0.001$). In addition, we ask participants about their difficulty in interpreting the distribution and how common they think this distribution is in the general population. On a scale from 1 (very easy) to 7 (very difficult) the average difficulty rating is 2.1, indicating that participants do not seem to have trouble interpreting the information. Moreover, there is no difference in the difficulty rating between high and low-mean conditions or u-shaped and low-variance conditions. Only the high-variance condition is described as significantly harder to understand than both the u-shaped (Wilcoxon-Mann-Whitney tests, $p = 0.03$) or the low-variance condition (Wilcoxon-Mann-Whitney tests, $p = 0.08$). However, the difference is very small (0.2 on a scale from 1 to 7). The average rating of how common the shown distributions are perceived to be is 5.0 on a scale from 1 (very rare) to 7 (very common). Again, there are no differences between high and low-mean conditions or u-shaped and high/low-variance conditions. Only the high-variance condition is perceived as slightly less common than the low-variance condition (Wilcoxon-Mann-Whitney tests, $p = 0.009$). Again, the difference is extremely small (0.2).

Figure B.4: Manipulation checks



Note. Whiskers show 95% confidence intervals.

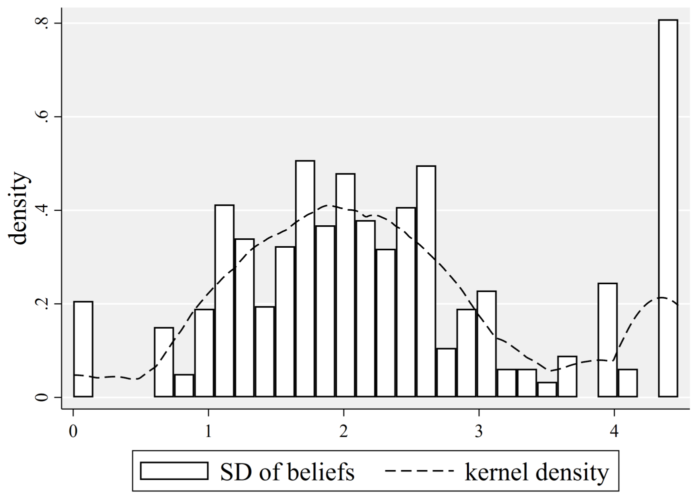
B.5 Distribution of beliefs in Part I

Figure 5 in the main text shows the aggregate distribution of beliefs about the co-player's contribution in Part I, with most people believing that the other will either contribute 2 or 4 tokens. This aggregate distribution hides a substantial heterogeneity between participants in the distribution of beliefs. Figure B.5 shows that the standard deviation of initial beliefs varies substantially between participants (min=0, max=4.5).

The individual distributions of beliefs can roughly be categorized into 6 types:

1. Low-variance: participants who put more than 80% of points on one single option

Figure B.5: Variation in standard deviations of beliefs in Part I



2. High-variance: participants who believe outcomes are equally likely (10 - 30% per option)

3. Linear: participants who have either non-decreasing or non-increasing beliefs

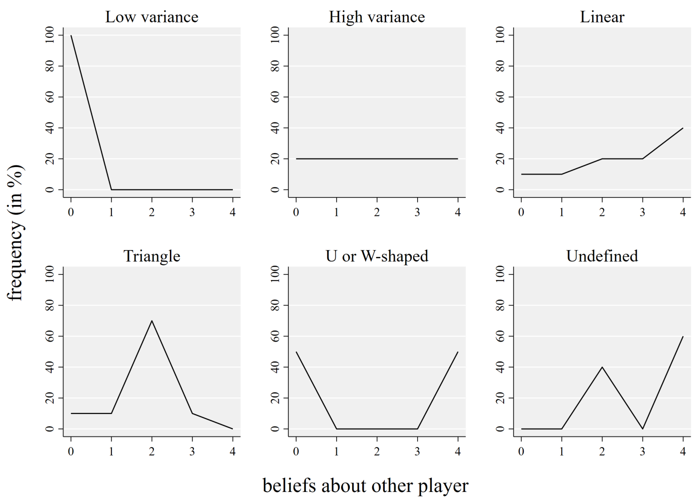
4. Triangle: participants with a single modal belief below 80% that is 1,2, or 3 tokens

5. U- or w-shaped: participants with either two modes (at 0,4) or three modes (at 0,2,4)

6. Others: not defined by the previous categories

Figure B.6 provides examples for each type. Using these rules we can classify 92% of participants. The most common types are triangles (41%), followed by low-variance (21%), u-/w-shaped (15%), linear (10%), and high-variance types (5%).

Figure B.6: Examples of individual distributions of beliefs in Part I

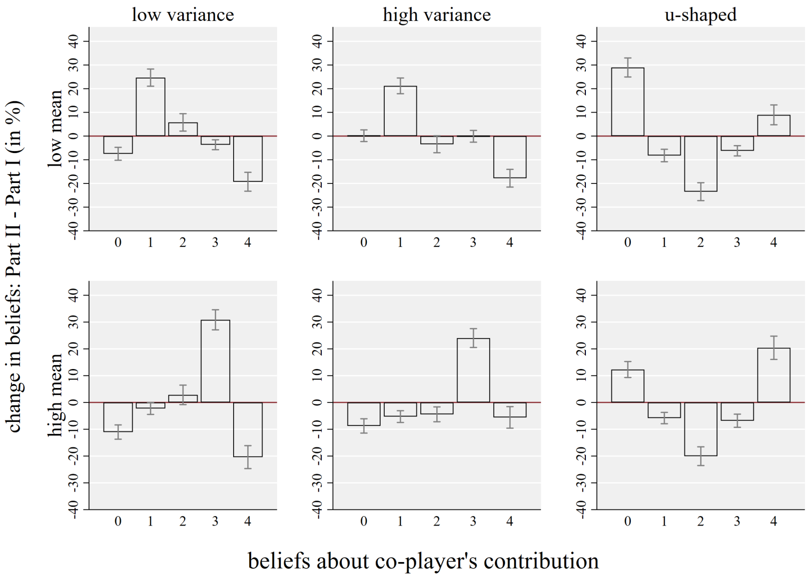


B.6 Changes between Part I and II

Figure B.7 shows changes in beliefs about their co-player's contribution between Part I and Part II. As we can see, participants change their beliefs in line with the shown distributions. For instance, for the u-shaped conditions, the beliefs that the other player contributed 0 or 4 tokens increase substantially between Part I and II of the experiment, while intermediate values (1-3) decrease. The opposite is true for the low and high-variance conditions, where in line with the observed distribution, the beliefs that the other contributes 0 or 4 tokens decrease in favor of intermediate values. Intuitively, the additional information in Part II also explains that participants state a significantly higher confidence in their beliefs as compared to Part I (Wilcoxon signed-rank test, $p < 0.001$).

Our data allows us to analyze in more detail how different types of individuals — based on their Part I behavior — respond to the shown distribution in Part II. Figure B.8 shows the change in contributions between Part I and Part II depending on the unconditional contribution level in Part I. Even though individuals with a middle contribution in Part I change slightly less, there is no significant difference in changes across the contribution levels in Part I. When

Figure B.7: Changes in beliefs about the co-player's distribution between parts

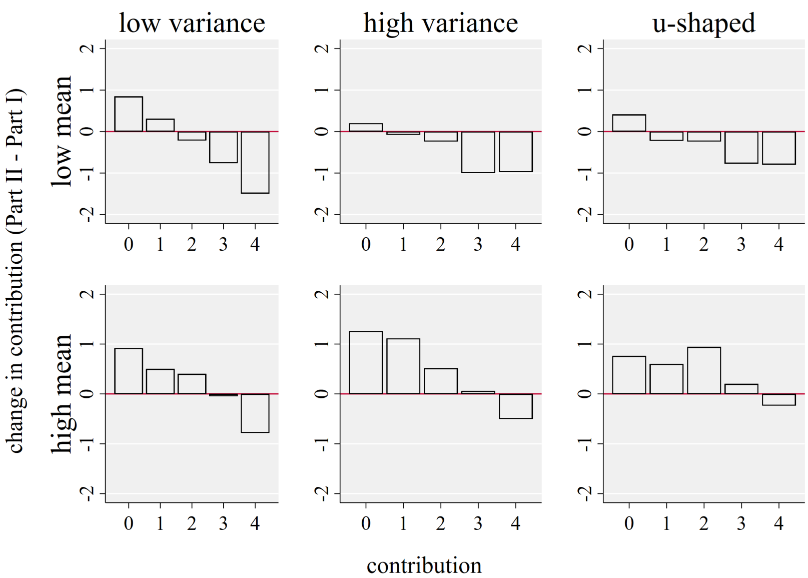


Note. Whiskers show 95% confidence intervals.

zooming in on the u-shaped conditions, we find that individuals who contributed 0 tokens in Part I are significantly less likely to contribute fully and significantly more likely to contribute 0 in Part II compared to those with a middle contribution (2) in Part I (tobit regression, $p < 0.001$). Conversely, participants who contributed 4 tokens in Part I are significantly more likely to contribute fully and significantly less likely to contribute 0 in Part II compared to those with a middle contribution (tobit regression, $p < 0.001$ and $p = 0.02$ respectively).

Finally, Figure B.8 shows some heterogeneity in how individuals change their behavior be-

Figure B.8: Changes in behavior between parts by initial contribution level



tween Part I and II across treatments. For low-mean treatments there is a stronger adjustment of high contribution levels, while the opposite holds true for low contribution levels. We also find that individuals change their contributions more in low-mean treatments (Wilcoxon-Mann-Whitney test, $p = 0.03$). Finally, changes are more pronounced in the low-variance (Wilcoxon-Mann-Whitney test, $p = 0.04$) and the u-shaped (Wilcoxon-Mann-Whitney test, $p = 0.08$) compared to the high-variance treatment.

B.7 Effect of variance and shape of the distribution

A more indirect test of whether the variation in contribution increases with the observed variance is by splitting our sample in Part II in a high and a low contribution group (contributions above/ below the median) and comparing their reactions to different environments. If a higher observed variation increases the overall variance in contributions, we would expect this to translate into lower contributions for the *low contribution sub-sample* and higher contributions for the *high contribution sub-sample*, resulting in an overall wider spread of contributions.

Before discussing our analysis, we note that the distributions of personal traits – sucker aversion, free riding aversion and personal values – in the high (resp., low) contributors sub-samples are statistically indistinguishable across treatments (pairwise Kolmogorov-Smirnov tests). This is also true when we exclude the medium contribution level of 2 from the two subgroups and

Table B.1: Tobit models. Effect of variance in observed distribution on contributions in Part II for different sub-samples

	(1) High contributions (≥2)	(2) Low contributions (≤2)
Variance (baseline = low)		
High variance	0.32***	-0.13
	(0.09)	(0.09)
U-shaped	1.20***	-0.79***
	(0.10)	(0.10)
High mean	0.36***	0.35***
	(0.07)	(0.08)
Constant	0.62	0.22
	(0.43)	(0.43)
Baseline controls	Yes	Yes
Demographic controls	Yes	Yes
N observations	906	602
Pseudo R^2	0.20	0.14

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
Note. Data is censored at 0 and 4. The dependent variable is *contributions in Part II*. *High mean* is a binary variable with 0 = low and 1 = high mean. *Variance* is a categorical variable with 0 = low variance, 1 = high variance and 2 = u-shaped. Baseline controls include average individual beliefs, SD of individual beliefs, and PVs in Part I and can take values between 0 and 4. Demographic controls include age, gender, education, acceptance of risk, trust, sucker aversion, free-riding aversion and GPS measures for negative and positive reciprocity. High and low contribution sub-samples are generated by dividing participants in a group with contributions in Part II above and below the median (=2). Regressions control for order effects.

reassures us about subgroups cross-treatment comparability.[15]

Table B.1 shows the results of two tobit models, where we regress contributions in Part II on treatment conditions for each sub-sample. We can see that in fact in the high contribution sub-sample, high-variance significantly increases contributions compared to low-variance, and u-shaped considerably increases contributions compared to high-variance. For the low contribution sub-sample, by contrast, we see the exact opposite pattern. In this case, a higher variance is associated with lower contributions. We thus confirm that both the u-shaped and the high-variance conditions increase the overall variation of contributions.

As an additional robustness check, we consider the participants' perception of how common is the distribution from which their co-player's contribution is drawn. This allows to control for the possibility that some distributions may be considered more "natural" than others which in principle may act as a confounding effect. In the questionnaire we asked participants how

Table B.2: Tobit models. Effect of variance in observed distribution on contributions in Part II for different sub-samples - controlling for perception of distribution

	(1) High contributions (≥2)	(2) Low contributions (≤2)
Variance (baseline = low)		
High variance	0.33***	-0.13
	(0.09)	(0.09)
U-shaped	1.20***	-0.78***
	(0.10)	(0.10)
Distribution perceived as common	0.06	0.06
	(0.08)	(0.09)
High mean	0.35***	0.35***
	(0.07)	(0.08)
Constant	0.60	0.21
	(0.43)	(0.43)
Baseline controls	Yes	Yes
Demographic controls	Yes	Yes
N observations	906	602
Pseudo R^2	0.20	0.14

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
Note. Data is censored at 0 and 4. The dependent variable is *contributions in Part II. High mean* is a binary variable with 0 = low and 1 = high mean. *Variance* is a categorical variable with 0 = low variance, 1 = high variance and 2 = u-shaped. *Distribution perceived as common* is a binary variable that takes the value of 1 if participants state they rather think the observed distribution is common and 0 otherwise. Baseline controls include average individual beliefs, SD of individual beliefs, and PVs in Part I and can take values between 0 and 4. High and low contribution sub-samples are generated by dividing participants in a group with contributions in Part II above and below the median (=2). Regressions control for order effects.

[15] We also compare average personal traits across treatments within each subgroup. (i) There are no significant cross-treatment differences in average free riding aversion; (ii) There is no significant difference in average sucker aversion among low contributors. Among high contributors average sucker aversion is higher in the high-variance than in the u-shaped treatment (p=0.09). If anything, this should reduce the high subgroup's contributions in the u-shaped compared to the high-variance treatment, which goes against what we are looking for; (iii) There are no significant difference in average personal values among low contributors. Among high contributors personal values are higher in the low-variance treatment than in the u-shaped (p=0.06). Again, this goes against the result we are looking for, since it should reduce the high subgroup's contributions in the u-shaped compared to the low-variance treatment.

common they thought the shown distribution was on a scale from 1 to 7. We can then split participants into two groups — those who think it is rather common (5–7) and those who think it is rather uncommon (1–4). Table B.2 shows that controlling for this variable does not affect the result on the importance of variance. What is more, whether participants perceive the distribution as common or not has no significant effect on contribution decisions.

Finally, our results also hold when we use average individual beliefs and the standard deviation of individual beliefs in Part II as regressors instead of the mean and variance of the observed distribution. This allows us to control for possible confounding effects arising from misperceptions of the observed distribution. Table B.3 shows that our results continue to apply.[16] In the high contribution sub-sample, a higher standard deviation in individual beliefs has a positive effect on contributions, while it has a negative effect in the low contribution sub-sample.

Table B.3: Tobit models. Effect of variance in beliefs on contributions in Part II for different sub-samples

	(1) High contributions ($\geq$2)	(2) Low contributions ($\leq$2)
Average individual belief in Part II	0.64***	0.36***
	(0.06)	(0.07)
SD of individual beliefs in Part II	0.09*	-0.10*
	(0.05)	(0.05)
Constant	0.45	-1.09**
	(0.46)	(0.47)
Baseline controls	Yes	Yes
Demographic controls	Yes	Yes
N observations	906	602
Pseudo R^2	0.16	0.08

* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors in parentheses.
Note. Data is censored at 0 and 4. The dependent variable is *contributions in Part II.* Baseline controls include average individual beliefs, SD of individual beliefs, and PVs in Part I and can take values between 0 and 4. Demographic controls include age, gender, education, acceptance of risk, trust, sucker aversion, free-riding aversion and GPS measures for negative and positive reciprocity. High and low contribution sub-samples are generated by dividing participants in a group with contributions in Part II above and below the median (=2). Regressions control for order effects

B.8 Personal traits and demographics

In the experiment, we measure personal values twice, in Part I before participants receive any information about co-player behavior and in Part II after they see the distributions. In the main text, we use personal values in Part I as a regressor as they cannot be affected by the treatments and thus represent a cleaner representation of what participants think is the "right thing to do". Table B.4 shows that our results hold also after controlling for the change in personal values between parts and their interaction with treatment indicators. Note that changes in personal values are very minor. On average participants change their personal values by -0.1 (with

[16] A hybrid approach where we control for individual average beliefs but insert high-variance and u-shaped dummies instead of the standard deviation of beliefs delivers an equivalent result.

personal values taking values between 0 and 4). Although this is statistically different from zero (Wilcoxon signed-rank test, $p < 0.001$), the median change is 0, with 69% of participants not changing their reported personal values between parts.

Table B.4: Tobit models. Effect of personal traits on contributions in Part II (controlling for change in PVs)

	(1)	(2)
High mean	0.63***	0.66***
	(0.11)	(0.11)
Variance (baseline = low)		
High variance	-0.41	-0.53
	(0.50)	(0.50)
U-shaped	-0.86	-0.94*
	(0.54)	(0.53)
Sucker aversion	-0.13**	-0.12**
	(0.05)	(0.05)
Sucker aversion x high variance	-0.06	-0.02
	(0.08)	(0.07)
Sucker aversion x u-shaped	-0.24***	-0.22***
	(0.08)	(0.08)
Free-riding aversion	0.13***	0.14***
	(0.05)	(0.05)
Free-riding aversion x high variance	0.05	0.04
	(0.07)	(0.07)
Free-riding aversion x u-shaped	0.28***	0.28***
	(0.07)	(0.07)
Personal values in part I	0.75***	0.71***
	(0.10)	(0.10)
PVs x high variance	0.23*	0.26**
	(0.13)	(0.13)
PVs x u-shaped	0.41***	0.44***
	(0.14)	(0.14)
Change in personal values	0.56***	0.51***
	(0.11)	(0.11)
Change in PVs x high variance	0.22	0.24
	(0.17)	(0.16)
Change in PVs x u-shaped	0.27*	0.31**
	(0.14)	(0.14)
Constant	0.23	-1.55**
	(0.37)	(0.66)
Demographic controls	No	Yes
N observations	1203	1188
Pseudo R^2	0.14	0.15

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
Note. Results of two tobit regressions (data is censored at 0 and 4). The dependent variable is *contributions in Part II*. *High mean* is a binary variable with 0 = low and 1 = high mean. *Variance* is a categorical variable with 0 = low variance, 1 = high variance and 2 = u-shaped. *Personal values* are measured in Part I and can take values between 0 and 4. *Sucker* and *free-riding aversion* are measured on a Likert scale from 1 to 7. *Change in personal values* is the difference between PVs in Part II and I and takes values between -4 and 4. Demographic controls include age, gender, education, acceptance of risk, trust, and GPS measures for negative and positive reciprocity. All regressions control for order effects.

Finally, we find that some demographic variables correlate with personal traits. In Table B.5 we regress personal values in column (1), sucker aversion in column (2), and free-riding aversion in column (3) on demographic characteristics. We find that women and younger participants have both a higher sucker and a higher free-riding aversion. Personal values on the other hand are slightly lower for female participants.

Table B.5: Tobit models. Correlates of personal values, sucker and free-riding aversion

	Personal values	Sucker aversion	Free-riding aversion
	(1)	(2)	(3)
Female	-0.14**	0.59***	1.15***
	(0.07)	(0.15)	(0.19)
Age	-0.00	-0.03***	-0.02***
	(0.00)	(0.00)	(0.01)
Education (baseline=no formal degree)			
Secondary school	-0.08	-0.63	-0.62
	(0.23)	(0.54)	(0.67)
University/ college	-0.04	-0.71	-1.13*
	(0.23)	(0.53)	(0.66)
Prefer not to say	-0.68	-0.45	-1.67
	(0.41)	(0.93)	(1.18)
Constant	3.02***	6.52***	5.13***
	(0.24)	(0.56)	(0.69)
N observations	1188	1188	1188
Pseudo R^2	0.002	0.015	0.011

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.
Note. Results of three tobit regressions. The dependent variable in column (1) is *personal values* in Part I and is censored at 0 and 4. The dependent variables in column (2) and (3) are *sucker* and *free-riding aversion* and are measured on a Likert scale from 1 to 7.

B.9 Contributions in Part I

As mentioned in the discussion section, unconditional contributions in Part I are an alternative measure for an individual's cooperative tendencies. Unsurprisingly, they are highly correlated with personal values. As a robustness check we can perform the same analysis as in Table 2 but using contributions in Part I instead of personal values as a measure for an individual's unconditional cooperative tendencies. As Table B.6 shows our main results are qualitatively unchanged. Both free-riding and sucker aversion matter more in the u-shaped than in the low-variance condition and just like personal values, contributions in Part I are more predictive of Part II behavior in the high-variance and the u-shaped than in the low-variance condition.

Table B.6: Tobit models. Effect of personal traits on contributions in Part II - using contributions in Part I as a measure for unconditional cooperative tendencies

	(1)	(2)
High mean	0.95***	0.96***
	(0.10)	(0.10)
Variance (baseline = low)		
High variance	-0.70	-0.71*
	(0.43)	(0.43)
U-shaped	-1.05**	-1.19***
	(0.46)	(0.45)
Sucker aversion	-0.14***	-0.13**
	(0.05)	(0.05)
Sucker aversion x high variance	0.01	0.04
	(0.07)	(0.07)
Sucker aversion x u-shaped	-0.18**	-0.17**
	(0.08)	(0.07)
Free-riding aversion	0.14***	0.14***
	(0.04)	(0.05)
Free-riding aversion x high variance	-0.00	-0.02
	(0.06)	(0.06)
Free-riding aversion x u-shaped	0.23***	0.23***
	(0.07)	(0.07)
Contributions in part I	0.61***	0.58***
	(0.07)	(0.07)
Contributions x high variance	0.34***	0.34***
	(0.10)	(0.10)
Contributions x u-shaped	0.61***	0.65***
	(0.11)	(0.11)
Constant	0.49	-0.77
	(0.32)	(0.60)
Demographic controls	No	Yes
N observations	1203	1188
Pseudo R^2	0.17	0.18

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses.

Note. Results of two tobit regressions (data is censored at 0 and 4). The dependent variable is *contributions in Part II*. *High mean* is a binary variable with 0 = low and 1 = high mean. *Variance* is a categorical variable with 0 = low variance, 1 = high variance and 2 = u-shaped. *Sucker* and *free-riding aversion* are measured on a Likert scale from 1 to 7. *Contributions in Part I* are used as an alternative measure for an individual's basic cooperative proclivities and take values between 0 and 4. Demographic controls include age, gender, education, acceptance of risk, trust, and GPS measures for negative and positive reciprocity. All regressions control for order effects.

C Quadratic scoring rule

The quadratic scoring rule (QSR) is used to elicit participants' beliefs about uncertain events in an incentive compatible way. As a consequence participants should reveal their beliefs truthfully. The key idea of the QSR is that participants are rewarded for the correct assessment, but penalized for every wrong assessment by the squared distance between their guess and the true event, using the following equation (Murphy and Winkler, 1970):

$$Q_j(p) = \alpha + 2\beta p_j - \beta \sum_{i=1}^{n} (p_i)^2, \tag{8}$$

where p_i is the probability an individual assigns to event i and p_j is the probability an individual assigns to the true event. Artinger et al. (2010) develop and test a salient and intuitive way to communicate information about payoffs to participants using a decomposed version of the equation above:

$$Q_j(p) = (\alpha + \beta) - \beta(1 - p_j)^2 - \beta \sum_{i \neq j} (p_i)^2. \tag{9}$$

The first two terms represent the earnings from the correct option. Participants are penalized for not assigning a probability of 1 to the correct event $(-\beta(1 - p_j)^2)$. In the experiment we set $\alpha = \beta = \$0.5$. This implies that if an individual assigns full probability to the correct event they earn \$1, if they assign a zero probability to the correct event they earn \$0.5 from the first terms in (9). The last term in the equation above represents the penalty for assigning a positive probability to events that do not occur. If individuals assign zero probability to untrue events, this penalty is zero. If they assign all probabilities to wrong events, the penalty is \$0.50. This means that the maximum amount individuals can earn in the elicitation task is \$1, while the minimum is \$0.

Artinger et al. (2010) show that if payoffs are split up in this way, this significantly facilitates participants' understanding of the QSR and the implications for payoffs. Figure C.1 shows how the QSR is presented to participants.

Figure C.1: Representation of QSR

Points put on the correct option	**Earnings from the correct option**	**Points put on a wrong option**	**Costs from a wrong option**
10	100¢	10	50¢
9	99.5¢	9	40.5¢
8	98¢	8	32¢
7	95.5¢	7	24.5¢
6	92¢	6	18¢
5	87.5¢	5	12.5¢
4	82¢	4	8¢
3	75.5¢	3	4.5¢
2	68¢	2	2¢
1	59.5¢	1	0.5¢
0	50¢	0	0¢

D Instructions

Welcome

Thank you very much for participating in this study! This study consists of two parts and a questionnaire. Upon completion you will receive \$1.70 for your participation plus an additional bonus of up to \$2.36 that depends both on your decisions and the decisions of other participants. **In both parts you will face a situation in which you will be matched with one other, real participant**. On the next page we will describe this situation to you in more detail.

Instructions (1/2)

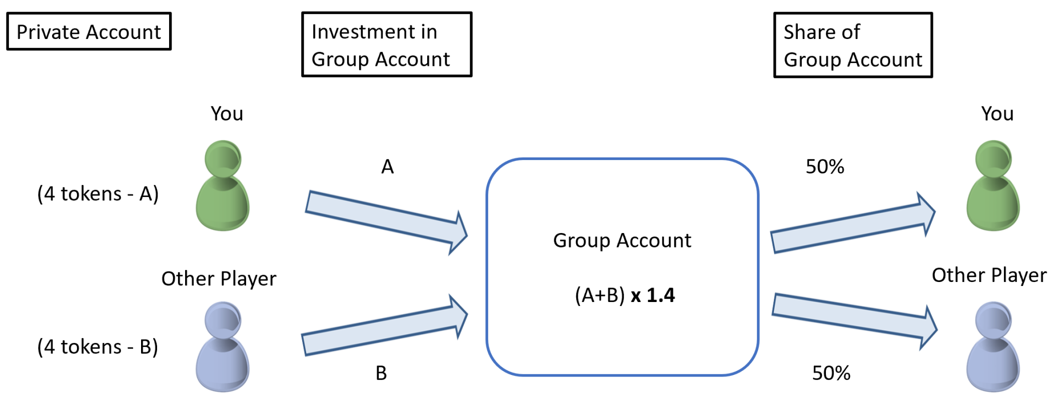
In this study, you will be anonymously paired with another participant. You will each start with **4 token** in your personal **private accounts**. In addition to the private accounts, there is a **group account**. You have to decide how many of your token you want to invest in the group account (either 0, 1, 2, 3 or 4 token). The amount leftover will remain in your private account. The other player has to make the same decision.

Your income from the private account

The amount in the private account is yours to keep. The other player doesn't earn anything from the token you keep in your private account. For example, if you keep 2 token in your private account, this will be your income from this account.

Your income from the group account

The amount invested in the group account will be multiplied by 1.4. That is, each token invested in the group account will yield 1.4 token for the group. The total amount in the group account will be split equally between you and your partner regardless of your individual investments. That is, each player receives half (50%) of the total amount in the group account.



If, for example, the sum of all investments in the group account by you and the other player is 6 token (A+B), then the group account yields 6 x 1.4 = 8.4 token. Both you and the other player would then receive 0.5 x 8.4 = 4.2 token from this account.

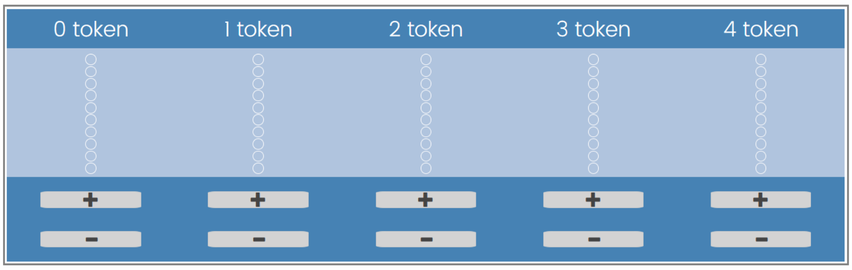
Your total income

Please note that for logistic reasons you are not interacting with other participants in real time. Once we collected all responses, we will match you with another person to calculate your and

the other's total income.[17] The latter consists of **all the token you kept in your private account plus half of the token** that you and that other participant invested **in the group account**.
Your total income will then determine your bonus payment, with each token being worth \$0.10. Whatever income you earned in token will be converted at this rate into actual money at the end of the experiment and paid out as a bonus.

Instructions (2/2)

In addition to making an investment decision in this situation, we will ask you to state **your beliefs about other participants**. You will be paid for these tasks according to how accurate your beliefs are.
A brief explanation follows: let us assume, we ask you to make a guess about how many token the participant you have been matched with invested in the group account. In this case, you would have to indicate **how likely you think it is that the other participant invested 0, 1, 2, 3 or 4 token**. To make your choices you will see a screen like the one below.



To make your decision you have to allocate a total of 10 points across options by clicking on the plus and minus buttons. The points you allocate need to add up to 10 and **the more likely you think one option is, the more points you would allocate to it**. The points you allocate to each option will naturally reflect your beliefs about the other participant's behavior.
The amount of money you can earn depends on how you allocated your points and what is actually true. If you put all points on the correct option, you will earn \$1 if you put all points on a wrong option you will earn \$0. In general, the more points you allocate to a correct option, the higher your earnings and the more points you allocate to a wrong option the lower your earnings. **The way your earnings are determined ensures that your best strategy is to carefully and honestly answer these questions.** If you want to have a closer look at how your earnings will be calculated click **here**.
Let's for example assume that you think it is equally likely that the other participant invested 2 or 4 token and you put 5 points on each option. If the other participant really invested either 2 or 4 token, you would in each case earn \$0.75. If they invested 0, 1 or 3 token you would earn \$0.

[17]Note that this is a common setup for studies on Prolific and thus familiar to participants. The Prolific guidelines allow up to 21 days to pay participants.

What if you had instead put all your eggs in one basket and allocated 10 points on the other participant investing 2 token? If the other participant indeed invested 2 token, you earn the maximum bonus of $1. But if any of the other options is the correct one, you would earn nothing in this task. It is thus up to you to balance the strength of your personal beliefs with the risk of them being wrong.

In total, we will ask you to state your belief on **five** different questions throughout this study. In the end, a lottery will decide **one of them to be chosen for payment**. The amount you earned in the chosen question will then be added to your bonus payment.

If participants click to get more information about payoffs, they see the following pop-up:

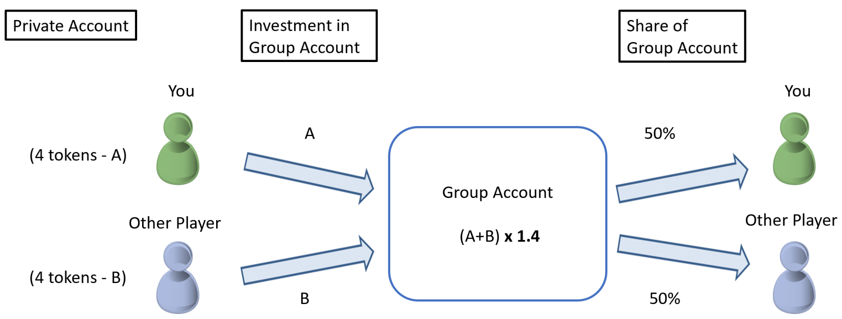
Your earnings are calculated on the basis of the table below. The more points you put on the correct option the higher your earnings. For each wrong option to which you allocate points your earnings will be reduced. The reduction is larger the more points you allocated to that option.

Points put on the correct option	**Earnings from the correct option**	**Points put on a wrong option**	**Costs from a wrong option**
10	100¢	10	50¢
9	99.5¢	9	40.5¢
8	98¢	8	32¢
7	95.5¢	7	24.5¢
6	92¢	6	18¢
5	87.5¢	5	12.5¢
4	82¢	4	8¢
3	75.5¢	3	4.5¢
2	68¢	2	2¢
1	59.5¢	1	0.5¢
0	50¢	0	0¢

Part 1

We are now going to ask you a number of questions that relate to the situation that you previously read (see image below). It is important that you answer these questions truthfully and as accurately as possible.[18]

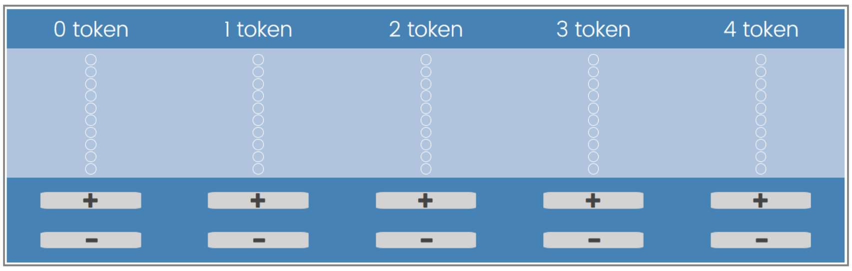
[18]Either normative questions or ABC questions are asked first. The three normative questions appear in randomized order.



1) We asked other participants what they believe is the **most appropriate amount to invest** in the **group account**. What do you believe was the most common answer?

Appropriate here means what you personally consider to be "correct" or "moral". You can allocate up to 10 points to an option by clicking on the plus and minus buttons below to indicate your guess. The more likely you think one option is, the more points you would allocate to it. Your guesses need to add up to 10.

Most people believe it is appropriate to invest...

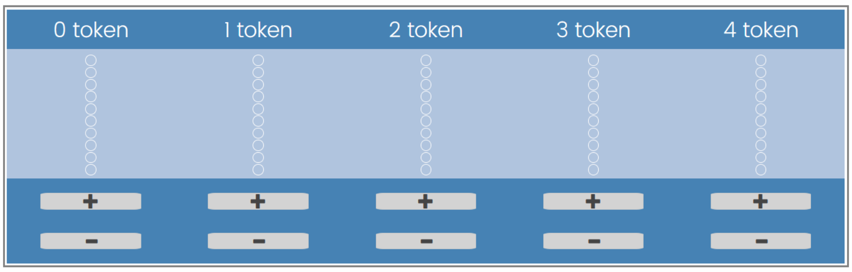


How confident are you in your response above? (0 not very confident, 100 very confident)

2) We asked other participants to make an investment decision in this situation. How many token do you believe most people **actually invested** in the group account?

You can allocate up to 10 points to an option by clicking on the plus and minus buttons below to indicate your guess. The more likely you think one option is, the more points you would allocate to it. Your guesses need to add up to 10.

Most people actually invested...



How confident are you in your response above? (0 not very confident, 100 very confident)

3) According to your own opinion and independent of the opinion of others, what is the **most appropriate amount to invest** in the **group account**?

Appropriate here means what you personally consider to be "correct" or "moral".

- 0 token
- 1 token
- 2 token
- 3 token
- 4 token

For the next section of Part 1, you will be matched with one other participant. You will only interact once with this person and you will never learn each other's identity.
Your and the other participant's bonus payment for Part 1 will depend on your decisions and the decisions of this participant.

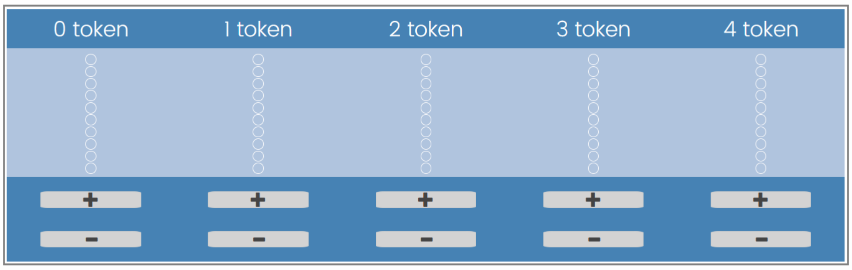
1) How many token do you want to **invest** in the **group account**?

- 0 token
- 1 token
- 2 token
- 3 token
- 4 token

2) How many token do you believe the participant you are matched with **invested** in the **group account**?

You can allocate up to 10 points to an option by clicking on the plus and minus buttons below to indicate your guess. The more likely you think one option is, the more points you would allocate to it. Your guesses need to add up to 10.

The participant you are matched with invested...



How confident are you in your response above? (0 not very confident, 100 very confident)

3) We are also interested in how many token you want to invest in the group account if you could know the other's choice beforehand. This means **you can condition** your investment on your group member's choice.

For one of you, the **unconditional choice** that you took before will count as the investment decision. For the other, the **conditional choice** (according to the table below) will count as the investment decision. Should the conditional choice be selected for you and the other participant invested x token in their unconditional choice, your decision for that scenario will determine your investment and thus matter for your bonus.

To determine your conditional choice, please tell us what you **want to invest** in the **group account** if:

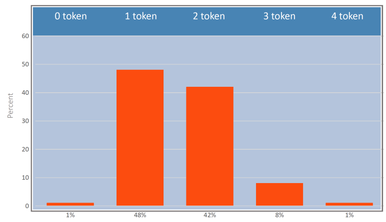
- The other player invests 0 token: ______ token
- The other player invests 1 token: ______ token
- The other player invests 2 token: ______ token
- The other player invests 3 token: ______ token
- The other player invests 4 token : ______ token

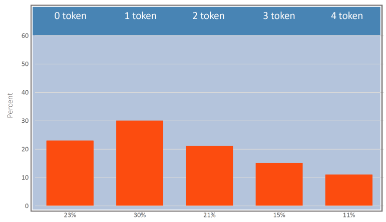
Part 2

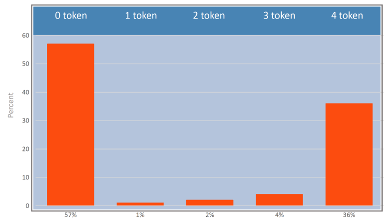
In a previous study we asked over 600 participants to **make an investment decision** in the same situation. The possible choices were to invest 0, 1, 2, 3 or 4 token in the **group account**. From their answers we constructed different subgroups. The graph below shows the percentage of people choosing each option in one randomly selected subgroup.

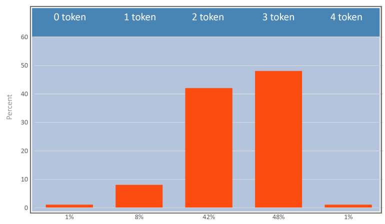
What previous participants invested in the group account:

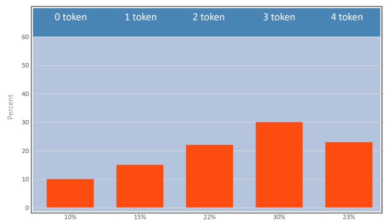
(Participants are randomly shown one of the following six pictures.)

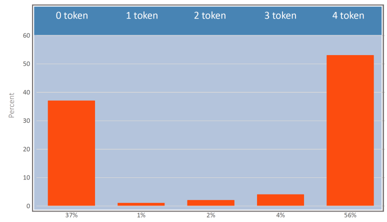












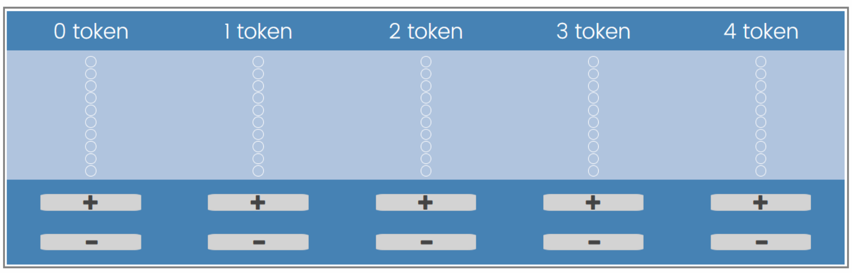
For Part 2 of the experiment you are matched with **one of the participants from the subgroup above**. You will only interact once with this person and you will never learn each other's identity.

Your and the other participant's **bonus payment for Part 2** will depend on your decisions and the decisions of this participant.[19]

1) We asked other participants from the previous study what they believe is the **most appropriate amount to invest** in the **group account**. What do you believe was the most common answer?

Appropriate here means what you personally consider to be "correct" or "moral". You can allocate up to 10 points to an option by clicking on the plus and minus buttons below to indicate your guess. The more likely you think one option is, the more points you would allocate to it. Your guesses need to add up to 10.

Most people believe it is appropriate to invest...



[19] We randomize whether participants are first asked about contributions and beliefs or about personal values and normative expectations.

How confident are you in your response above? (0 not very confident, 100 very confident)

2) Think again about the investment decision itself. According to your own opinion and independent of the opinion of others, what is the **most appropriate amount to invest** in the **group account**?

Appropriate here means what you personally consider to be "correct" or "moral".

- 0 token
- 1 token
- 2 token
- 3 token
- 4 token

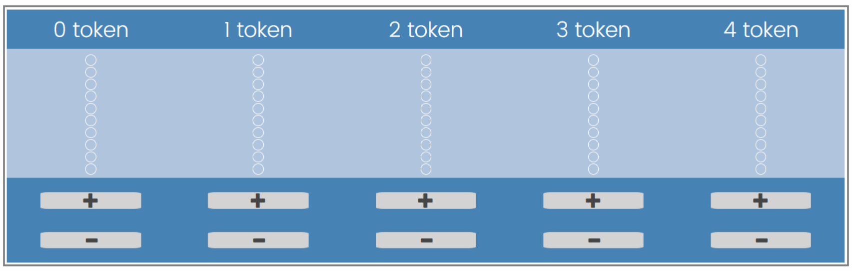
3) How many token do you want to **invest** in the **group account**?

- 0 token
- 1 token
- 2 token
- 3 token
- 4 token

4) How many token do you believe the participant you are matched with **invested** in the **group account**?

You can allocate up to 10 points to an option by clicking on the plus and minus buttons below to indicate your guess. The more likely you think one option is, the more points you would allocate to it. Your guesses need to add up to 10.

The participant you are matched with invested...

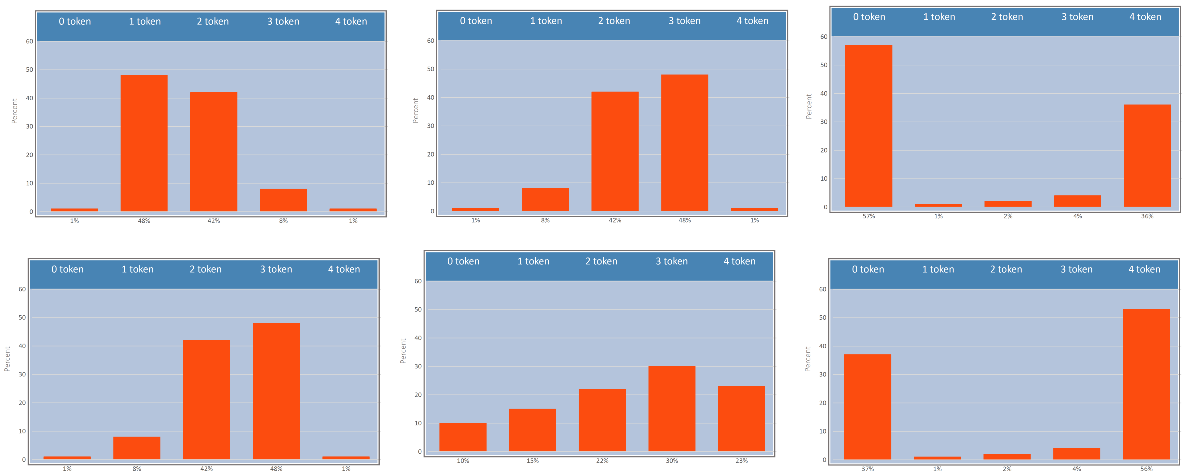


How confident are you in your response above? (0 not very confident, 100 very confident)

Questionnaire (1/2)

In this survey we showed you how many token a subgroup of other participants **invested** in the **group account**. Their answers are represented by the graph below.

What previous participants invested in the group account: *(Participants are randomly shown one of the following six pictures.)*



We will now ask you a few questions about the graph.

1) What are your thoughts on the behavior shown above?

---

2) Would you say the graph shows that overall

- people invest most of their token in the group account
- people invest half of their token in the group account
- people keep most of their token in their private account

3) Would you say the graph shows that overall

- there is a strong tendency for people to invest similar amounts in the group account
- there is a moderate tendency for people to invest similar amounts in the group account
- investments in the group account are very mixed

4) How common do you think the distribution of behavior shown above would be in other groups? (1 very rare, 7 very common)

5) How difficult was it for you to interpret the graph in Part 2, which is also shown above? (1 very easy, 7 very difficult)

6) How upset would you be if you invested everything in the group account and discovered that the participant you have been matched with invested nothing? (1 not at all upset, 7 very upset)

7) How ashamed would you be if you invested nothing in the group account and discovered that the participant you have been matched with invested everything? (1 not at all ashamed, 7 very ashamed)

Questionnaire (2/2)

1) Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?

- Need to be very careful
- Don't know
- Most people can be trusted

Taken from Haerpfer et al. (2022).

2) In how far do you agree with the following statement: "When someone does me a favour, I will return it." (1 don't agree at all, 7 completely agree) *Taken from Falk et al. (2023).*

3) In how far do you agree with the following statement: "If I am treated very unjustly, I will take revenge, even if there is a cost to do so." (1 don't agree at all, 7 completely agree) *Taken from Falk et al. (2023).*

4) Please tell me, in general, how willing or unwilling you are to take risks. (1 very unwilling to take risks, 11 very willing to take risks) *Taken from Dohmen et al. (2011).*

5) What is your age?

6) Which gender do you identify with?

- Female
- Male
- Non-binary
- Other
- Prefer not to say

7) What is the highest level of schooling you completed?

- No formal qualifications

- Secondary school
- University/ college degree
- Prefer not to say

Thanks a lot for participating in this survey! If you have any feedback for us you can write it here: