

Social Preferences and Strategic Uncertainty: an Experiment on Markets and Contracts

Appendix B: Additional Experimental Evidence

NOT FOR PUBLICATION

1 Identifying preferences and beliefs

There are four relevant subsets of parameters studied in the literature, which we now describe. Neither of these specifications consider reciprocal motives (i.e., they always assume $\theta_i = 0$), and, in this sense, they define purely “distributional” preferences.

$$\text{Egoistic Preferences (EP): } \alpha_i = \beta_i = 0. \quad (1)$$

$$\text{Inequality Averse Preferences (IAP): } 0 \leq \beta_i < 1, \alpha_i \geq \beta_i. \quad (2)$$

$$\text{Status Seeking Preferences (SSP): } \alpha_i \in [0, 1), \beta_i \in (-1, 0], |\alpha_i| \geq |\beta_i| \quad (3)$$

$$\text{Efficiency Seeking Preferences (ESP): } \alpha_i \in (-\frac{1}{2}, 0], \beta_i \in [0, \frac{1}{2}), |\beta_i| \geq |\alpha_i| \quad (4)$$

Inequality Averse Preferences (2) were first proposed by Fehr and Schmidt (1999, F&S). They assume that an increase in the difference in payoffs is always disliked, independently on relative positions. Status Seeking Preferences (SP, Rey-Biel, 2008) assume that an increase in the other player’s monetary payoff is always disliked, independently of relative positions. Efficiency Seeking Preferences (ESP, Engelmann Dirk and Martin Strobel, 2004) assume that a payoff reduction is acceptable only if it is accompanied by an increase (at least of the same amount) in the other player’s payoff. Even though C&R follow F&S in only considering IAP, with a slight abuse of terminology we jointly call “C&R distributional preferences” the four types of preferences (1)-(4).

As Figure 2 (in the main text) shows, we do not constrain our distributional parameters (α_i, β_i) to lie in any particular subspace of $\mathbb{R}^2$. Therefore, our estimated pairs $(\hat{\alpha}_i, \hat{\beta}_i)$ can potentially cover all the $\mathbb{R}^2$ space. In this respect, our estimates display significant heterogeneity. In many cases, the constraints on absolute values are violated (in particular, in the case of IAP). This is the reason why we shall identify each distributional preference type to the corresponding quadrant in Figure 2a).

In Table B1 we assign each subject to the quadrant (Q_1 to Q_4) of the $\mathbb{R}^2$ space in which her estimated parameters are most likely to fall considering the confidence intervals of Figure

2b). We also group in an additional EP category those subjects whose estimated α_i and β_i are jointly not significantly different from zero (at the 10% confidence level). Subjects with IAP preferences are a subset of those included in the first quadrant ($\alpha_i > 0, \beta_i > 0$; 31.9% of all the subjects), the pool in Q_2 ($\alpha_i > 0, \beta_i < 0$; 20.8%) includes agents with SSP preferences, while those with ESP preferences fall in Q_4 ($\alpha_i < 0, \beta_i > 0$, 20.8%). For 19.4% of the subjects we cannot reject the null hypothesis of EP.

	EP $\alpha=\beta=0$	Q_1 $\alpha,\beta>0$	Q_2 $\alpha>0,\beta<0$	Q_3 $\alpha,\beta<0$	Q_4 $\alpha<0,\beta>0$
Agents	10 20.8%	15 31.3%	10 20.8%	4 8.33%	9 18.8%
Principals	4 16.7%	8 33.3%	5 20.8%	1 4.2%	6 25%
Total	14 19.4%	23 31.9%	15 20.8%	5 6.9%	15 20.8%

Table B1. Preference types of agents and principals

In this respect, the (slight) predominance of ESP subjects, contrasts with Fisman, Kariv and Markovits' (2007) evidence, when they find a majority of subjects having estimated parameters that indicate a preference for increasing total payoffs rather than reducing differences in payoffs.

2 Q_1 . Is it inequality aversion or strategic uncertainty aversion?

We construct a measure of relative inequality associated to each contract $\bar{k}$ in C_t , relative to the other available options in C_t :

$$\sigma_{\bar{k}} = \frac{\left(b_1^{\bar{k}} - b_2^{\bar{k}}\right) - \min_k [b_1^k - b_2^k]}{\max_k [b_1^k - b_2^k] - \min_k [b_1^k - b_2^k]}, k = 1, \dots, 4. \quad (5)$$

By (5), $\sigma_{\bar{k}} \in [0, 1]$, i.e. we normalize the inequality induced by each contract relative to the choice set C_t . We thus define $\omega_t = \frac{\sum_{k \in wing} \sigma_k}{\sum_{k \in sting} \sigma_k}$ as a “relative inequality index” associated with the choice of a *wing* vs a *sting* contract in C_t . We then estimate the following logit function:

$$\Pr(k_{it} \in sting | \alpha_i, \beta_i, \omega_t) = \frac{\exp(\psi_0 + \psi_1 \alpha_i + \psi_2 \beta_i + \psi_3 \omega_t)}{1 + \exp(\psi_0 + \psi_1 \alpha_i + \psi_2 \beta_i + \psi_3 \omega_t)},$$

where k_{it} identifies the contract choice of individual i at round t . For players 2 (principals), we use observations from P_2 (P_3).¹ We do so to frame the contract choice problem over the same choice sets, C_t , since in P_3 3 agents' choice sets are determined by principals' decisions. In Table B2 we report the partial maximum likelihood estimates of ψ_0 to ψ_3 with bootstrap standard errors.

¹Player 1 goes for *wing* in P_2 only 7 times out of 288, so that the predicted probability is basically one.

	Phase 2, <i>player 2</i>			Phase 3, <i>Principals</i>		
	<i>Coeff.</i>	<i>Std.err.</i>	<i>p-val</i>	<i>Coeff.</i>	<i>Std.err.</i>	<i>p-val</i>
<i>Constant</i> $\rightarrow \psi_0$	-0.060	0.101	0.551	0.493	0.091	0.000
$\alpha_i \rightarrow \psi_1$	-0.864	0.327	0.008	0.329	0.223	0.142
$\beta_i \rightarrow \psi_2$	0.700	0.258	0.007	0.311	0.228	0.173
$\omega_t \rightarrow \psi_3$	21.248	3.038	0.000	11.979	0.910	0.000
Obs.	288			192		

Table B2. *Sting vs. wing* choice in the “mixed” rounds, logit regression

Notice that:

1. Estimated ψ_3 are always positive and significant: the more unequal is the *wing* choice, the more likely is the choice of a *sting* contract. On average, a 1% increase of the relative inequality index ω_t yields an increase of 29% in the probability of choosing *sting* for player 2, and of 14% for the principals. These results are maintained (both in sign and magnitude) if we use a fixed-effects logit model.
2. For principals, distributional parameters are not significant to explain the choice of contract type, while for player 2 in P_2 , both α and β are significant, with opposite sign.

3 Q2. Does the social preference model work?

We now look at how principals’ and agents’ estimated preferences explain their contract decision, with respect to the two natural dimensions for the problem at stake: *a*) the total cost of the contract ($b_1 + b_2$) and, *b*) its induced inequality ($b_1 - b_2$). By analogy with $\sigma_{\bar{k}}$, we define, for each choice set C_t , the following two variables:

$$\tau_{\bar{k}} = \frac{(b_1^{\bar{k}} + b_2^{\bar{k}}) - \min_k [b_1^k + b_2^k]}{\max_k [b_1^k + b_2^k] - \min_k [b_1^k + b_2^k]}, \bar{k} = 1, \dots, 4, \text{ and} \quad (6)$$

$$\rho_{\bar{k}} = \frac{1 + \sigma_{\bar{k}}}{1 + \tau_{\bar{k}}}. \quad (7)$$

We interpret τ , as a measure of *relative efficiency* (or relative cost, from the principal’s viewpoint). Consequently, $\rho_{\bar{k}}$ proxies the trade-off agents (principals) face between inequality and efficiency (total costs).

We study principals’ contract decisions by regressing $\rho_{\bar{k}}$ and $\tau_{\bar{k}}$ against their own distributional parameters, α_i and β_i . Given that, in both regressions, the dependent variable is bounded both above and below (with round dependent upper and lower bounds), we use a double censored tobit model:

$$y_{it} = \psi_1 \alpha_i + \psi_2 \beta_i + \psi_3 V_{it} + \psi_4' \mathbf{D}_t + v_{it}, \quad (8)$$

where the dependent variable y_{it} refers, alternatively, to the corresponding $\rho_{\bar{k}}$ and $\tau_{\bar{k}}$ induced by the contract choice $\bar{k}$ made by individual i at round t , V_{it} is the randomly generated value for the principal, and $\mathbf{D}_t$ is a full set of round dummy variables. Tables B3-4 reports the partial maximum likelihood estimates of the parameters for principals and agents, respectively, with bootstrap standard errors. We estimate the parameters separating the rounds in which the contract menu includes both *sting* and *wing* contracts (“mixed” rounds) from the others (“non mixed”).

	Mixed			Non mixed		
Dep.var.: $\tau_{\bar{k}}$	<i>Coeff.</i>	<i>Std.err.</i>	<i>p-value</i>	<i>Coeff.</i>	<i>Std.err.</i>	<i>p-value</i>
$\alpha_i \rightarrow \psi_1$	0.119	0.090	0.188	0.294	0.163	0.071
$\beta_i \rightarrow \psi_2$	0.206	0.093	0.027	0.276	0.131	0.035
$V_{it} \rightarrow \psi_3$	0.002	0.001	0.228	-0.004	0.002	0.022
Left censored	16 (8.6%)			30 (7.8%)		
Uncensored	76 (39.6%)			90 (23.4%)		
Right censored	100 (52.1%)			264 (68.8%)		
Dep.var.: $\rho_{\bar{k}}$	<i>Coeff.</i>	<i>Std.err.</i>	<i>p-value</i>	<i>Coeff.</i>	<i>Std.err.</i>	<i>p-value</i>
$\alpha_i \rightarrow \psi_1$	-0.061	0.046	0.185	-0.191	0.092	0.038
$\beta_i \rightarrow \psi_2$	-0.084	0.046	0.067	-0.203	0.080	0.011
$V_{it} \rightarrow \psi_3$	-0.001	0.0005	0.022	0.003	0.001	0.001
Left censored	85 (44.3%)			218 (56.8%)		
Uncensored	68 (35.4%)			138 (35.9%)		
Right censored	39 (20.3%)			28 (7.3%)		

Table B3. Relative cost choice and inequality-total costs trade-off for principals

As Table B3 shows, principals opt for the most expensive contract available more than 50% of the cases (the latter corresponds to the right-censored observations), and more that 2/3 of the cases in the non-mixed rounds. By contrast, less than 10% go for the cheapest one. We explain this evidence by the effect of competition among principals, and consequently the fear of having their offered contract not chosen by any agent. Also notice also that, in the mixed rounds, principals’ distributional parameters are only marginally significant in explaining the choice of $\rho_{\bar{k}}$ and $\tau_{\bar{k}}$. This is further indirect evidence of the predominance of the search for robustness we already observed in the *wing/sting* choice. By contrast, in the non-mixed rounds, we see that both principals’ distributional parameters significantly explain their preferred $\rho_{\bar{k}}$. They do so in the natural direction: the highest the (inequality-averse) distributional concerns, the lowest the relative inequality, and the highest the relative cost for the principal.

<i>Player 1</i>	Mixed			Non mixed		
	<i>Coeff.</i>	<i>Std.err.</i>	<i>p-value</i>	<i>Coeff.</i>	<i>Std.err.</i>	<i>p-value</i>
$\alpha_i \rightarrow \psi_1$	-0.030	0.014	0.040	0.070	0.083	0.399
$\beta_i \rightarrow \psi_2$	-0.041	0.012	0.001	-0.381	0.085	0.000
Left censored	101 (35.1%)			313 (54.3%)		
Uncensored	139 (48.3%)			209 (36.3%)		
Right censored	48 (16.7%)			54 (9.4%)		
<i>Player 2</i>	<i>Coeff.</i>	<i>Std.err.</i>	<i>p-value</i>	<i>Coeff.</i>	<i>Std.err.</i>	<i>p-value</i>
$\alpha_i \rightarrow \psi_1$	-0.031	0.018	0.091	-0.185	0.097	0.056
$\beta_i \rightarrow \psi_2$	-0.043	0.017	0.009	-0.181	0.065	0.006
Left censored	168 (81.1%)			467 (81.1%)		
Uncensored	109 (37.8%)			97 (16.8%)		
Right censored	11 (3.8%)			12 (2.1%)		

Table B4. Inequality-inefficiency trade-off for players in P_2 . Dep.var.: $\rho_{\bar{k}}$

As for the agents, we use a regression similar to (8) - where we drop V_{it} , which plays no role here- to study their choice about the inequality/inefficiency trade-off ($\rho_{\bar{k}}$) in P_2 . Estimation results, conditional on player positions, are shown in Table B4. Here we generally find -as intuition would suggest- a (negative and significant) relation between distributional concerns and relative inequality.

Moving to stage 2, Table B5 reports the relative frequencies of positive effort decisions in P_2 , conditional on subjects' behavior in Stage 1.

<i>wing</i> contracts				<i>sting</i> contracts		
<i>i</i> is player 1				<i>i</i> is player 1		
	$\phi_j = -1$ (51)	$\phi_j = 0$ (288)	<i>Total</i> (339)	$\phi_j = -1$ (101)	$\phi_j = 0$ (424)	<i>Total</i> (525)
No Dictator	0.48	0.54	0.52	0.91	0.93	0.93
Dictator	0.11	0.55	0.49	0.91	0.92	0.92
Total	0.34	0.54	0.51	0.91	0.92	0.92
<i>i</i> is player 2				<i>i</i> is player 2		
	$\phi_j = -1$ (34)	$\phi_j = 0$ (305)	<i>Total</i> (339)	$\phi_j = -1$ (86)	$\phi_j = 0$ (439)	<i>Total</i> (525)
No Dictator	0.17	0.42	0.39	0.50	0.55	0.55
Dictator	0.31	0.48	0.47	0.65	0.70	0.69
Total	0.24	0.46	0.43	0.59	0.62	0.62

Table B5. Relative frequencies of positive effort decisions in P_2

Notice that player 1 misbehaves ($\phi_1 = -1$) in about 14% ($= (34 + 86) / (339 + 525)$) of the times. This frequency is higher in *sting* (16% *vs* 10%). On the other hand, player 2

misbehaves ($\phi_2 = -1$) in 15% (=51/339) of the times in *wing* and in 19% (101/525) in *sting*. Actions following misbehavior are heterogeneous, with instances of reciprocity only in *wing*.²

We now compare effort levels across phases. As Table 4 in the main text shows, average effort rates in P_3 are similar to those observed in P_2 (see also Table 3 in the main text): in *sting* player 1 puts effort in 91% of the cases, where the same frequency drops to 64% for player 2. By contrast, in *wing*, both players put effort about 43% of the times. The only noticeable difference between P_2 and P_3 refers to player 1 in *wing*, with 51% of effort decisions in P_2 , *vs* 44% in P_3 .

4 Robustness check

4.1 Robustness check 1: contract choices

We test whether P_1 choices are different across treatments for a given round. Remember that, in any given round t , the choice set C_t is the same for all treatments. In Table B6 we show the p -values of the Pearson tests for the null hypothesis that, for a given choice set C_t , the distribution of the chosen contracts is independent of the treatment, with statistically significant differences highlighted in boldface. As Table B6 shows, there are very few rounds (3 in the comparison between TR_1 and TR_2 ; 2 between TR_1 and TR_3 ; 1 between TR_2 and TR_3) where the choices within rounds are significantly different in any pairwise comparison between treatments.

²As for *wing*, formal tests of mean equality conditional on player position reject the null at $\alpha = 5\%$ when player 1 is the Dictator and when player 2 is not the Dictator. As for *sting*, the same tests never reject the null.

<i>Round</i>	$H_0:TR_1=TR_2$	$H_0:TR_1=TR_3$	$H_0:TR_2=TR_3$
1	.0018	.3854	.1347
2	.0235	.1715	.0639
3	.3004	.1106	.1100
4	.5505	.4651	.4138
5	.3236	.8938	.8539
6	.3008	.4241	.6203
7	.5701	.5457	.5461
8	.5522	.6892	.5241
9	.3202	.8168	.7193
10	.1252	.8065	.4702
11	.4208	.0225	.0034
12	.1545	.6964	.2285
13	.5007	.2638	.2869
14	.3653	.3606	.4578
15	.5914	.1759	.1674
16	.1136	.2497	.9410
17	.3549	.0782	.4753
18	.2710	.1713	.2004
19	.3320	.9735	.7204
20	.2551	.6341	.4839
21	.0014	.0052	.9137
22	.1392	.6692	.0868
23	.4495	.4832	.9969
24	.3807	.2689	.2435

Table B6. Contract choices within rounds across treatments.

H_0 is that the contract choices in the two treatments under consideration are equal.

In each cell the p – *value* of the corresponding Pearson test.

Contract choices are basically constant across treatments also in P_2 and P_3 . In fact, using the same strategy adopted for P_1 , contract choices in Stage 1 of P_2 differ in only 3 rounds in the comparison between TR_1 and TR_2 , 1 between TR_1 and TR_3 and 2 between TR_2 and TR_3 . As for principals, choice distributions differ across treatments in 1 round between TR_1 and TR_2 and between TR_2 and TR_3 , and in 3 rounds between TR_1 and TR_3 .³

4.2 Robustness check 2: effort decisions and parameter estimations

In Table B7 we compare effort decisions (Panel A) and outcome distributions (Panel B) across treatments. As Table B7 shows, moving from TR_1 to TR_3 yields an overall decrease

³Estimation results are not reported here, but are available upon request.

in average effort levels, so that the relative frequency of (in)efficient outcomes gradually goes down (up).

Panel A												
Phase 2												
Non Dictator						Dictator						
Player 1			Player 2			Player 1			Player 2			
wing	sting	Tot	wing	sting	Tot	wing	sting	Tot	wing	sting	Tot	
TR_1	0.46	0.74	0.62	0.47	0.72	0.63	0.54	0.84	0.73	0.43	0.77	0.63
TR_2	0.44	0.85	0.66	0.42	0.50	0.47	0.46	0.93	0.76	0.43	0.60	0.52
TR_3	0.34	0.78	0.57	0.27	0.42	0.36	0.34	0.83	0.65	0.37	0.47	0.42
Phase 3												
Non Dictator						Dictator						
Player 1			Player 2			Player 1			Player 2			
wing	sting	Tot	wing	sting	Tot	wing	sting	Tot	wing	sting	Tot	
TR_1	0.47	0.76	0.66	0.42	0.75	0.61	0.46	0.81	0.66	0.40	0.77	0.64
TR_2	0.29	0.88	0.64	0.35	0.54	0.47	0.35	0.90	0.69	0.32	0.64	0.51
TR_3	0.25	0.82	0.59	0.32	0.48	0.42	0.18	0.84	0.58	0.20	0.51	0.38
Panel B												
Phase 2												
<i>wing</i>						<i>sting</i>						
	None	Pl. 1	Pl. 2	Both		None	Pl. 1	Pl. 2	Both			
TR_1	0.37	0.20	0.13	0.31	0.06	0.33	0.03	0.03	0.59			
TR_2	0.37	0.21	0.19	0.24	0.08	0.38	0.03	0.03	0.52			
TR_3	0.45	0.22	0.21	0.12	0.13	0.43	0.07	0.07	0.37			
Phase 3												
<i>wing</i>						<i>sting</i>						
	None	Pl. 1	Pl. 2	Both		None	Pl. 1	Pl. 2	Both			
TR_1	0.42	0.14	0.14	0.30	0.07	0.30	0.03	0.03	0.61			
TR_2	0.52	0.15	0.17	0.16	0.08	0.33	0.03	0.03	0.56			
TR_3	0.63	0.12	0.16	0.10	0.13	0.38	0.04	0.04	0.45			

Table B7. Panel A: relative frequencies of positive effort decisions
in Phase 2 and 3 of TR_1 to TR_3 .

Panel B: outcome distribution across treatments

As for P_2 , player 1 reduces her aggregate effort rate by 15% from TR_1 to TR_2 only in *wing* when she is the Dictator (from 0.54 to 0.46, see Panel A). Player 2, instead, reduces her effort rates more in *sting*: -22% (from 0.77 to 0.60) when she is the Dictator and - 31% (from 0.72 to 0.5) when she is not. Given that, moving from TR_1 to TR_2 , player 1's average effort

does not fall significantly, we have a moderate reduction of the cases in which both players put effort (see Panel B): from 30.7% to 24.1% in *wing* (-21%), and from 59.1% to 51.8% in *sting* (-12%). It is in TR_3 where we detect a substantial reduction in the effort rates with respect to TR_1 also for player 1, whose average effort rates are now 26% (37%) lower than in TR_1 in *wing* when she is (not) the Dictator, respectively. In consequence, the all-effort equilibrium is played much less frequently in TR_3 , being the outcome of a mere 11.7% of the *wing* cases (-61% wrt TR_1 and -50% wrt TR_2) and 37% of the *sting* cases (-37% wrt TR_1 and -29% wrt TR_2).

In P_3 player 1's effort rates are constant across treatments in *sting*, while, in *wing*, player 1 reduces her effort rate by 24% (38%) in TR_2 and by 61% (47%) in TR_3 when she is (not) the Dictator, respectively. Just like in P_2 , also in P_3 player 2 is the one who reduces average effort the most. In fact, player 2 provides less effort both in *wing* and in *sting*: effort rates drop from about 0.75 in TR_1 to about 0.50 in TR_3 in *sting*, and from 0.40 (0.42) in TR_1 to 0.20 (0.32) in TR_3 in *wing* when she is (not) the Dictator, respectively.

To further investigate on treatment effects in aggregate effort rates, we run the following regression:

$$\delta_{ilt}^k = \gamma_0 + TR_l \gamma_1 + wing_{lt}^k \gamma_2 + (TR_j \times wing_{lt}^k) \gamma_3 + \varepsilon_i + u_{it} \quad (9)$$

where i identifies the individual; $l = 1, 2, 3$ the treatment, $t = 1, \dots, 24$ the round; k the selected contract; δ_{ilt}^k is equal one if individual i puts efforts in round t of treatment l under contract k ; $wing_{lt}^k$ equals one only if the played contract k is a *wing* one; and TR_l is a treatment dummy. We estimate (9) on P_2 and P_3 effort data, using OLS and clustered standard errors, separately for each possible combination of player position, Dictator assignment, and pairwise comparisons between treatments (that is, we run $2 \times 2 \times 3 = 12$ regressions for each phase).⁴ As for P_2 , the estimated γ_1 s are significantly different from zero only when comparing TR_1 and TR_3 for player 2. In all the other cases, γ_1 and γ_3 are not significantly different from zero. For P_3 , we detect significant differences between TR_1 and TR_3 for all player positions and Dictator roles (with player 1 reducing effort the most), while the differences between TR_1 and TR_2 are significant only in the case of player 1 in the role of a Dictator in *sting*.

We now proceed to check different explanations for the fact that, in TR_3 , agents put considerably less effort than in TR_1 , or TR_2 . One potential explanation could be that the situation experienced in TR_3 makes subjects more prone to reciprocate. In Table B8 panel A we first check whether misbehavior differs across treatments. Such a comparison can only be done for non Dictators since, in TR_3 , non Dictators' misbehavior is not defined. Panel A shows that misbehavior is more diffused in TR_2 and TR_3 , rather than in TR_1 . In Panel B we can observe that, in P_2 , there is no more punishment in TR_3 than in the other treatments. In fact, the ratio between effort rates in case of mis/well behavior is constant across treatments (about 0.7 with *wing* and 1 with *sting*). Only in the case of *sting* in P_3 , where the same ratios go from 0.91 (TR_1) to 0.79 (TR_3), there is some evidence of more reciprocity in TR_3 .

⁴ Estimation results are not reported here, but are available upon request.

than in TR_1 . In this sense, reciprocity alone cannot explain player 2's lower effort levels in P_2 of TR_3 , nor the Dictators' effort reduction in P_3 of TR_3 (see Table B7).

Panel A: incidence of misbehavior				
Phase 2				
	wing contracts		sting contracts	
	# cases	% of $\phi_j = -1$	# cases	% of $\phi_j = -1$
Treatment 1	339	14.7	525	16.6
Treatment 2	345	18.0	519	23.3
Treatment 3	359	18.1	505	24.4
Phase 3				
	wing contracts		sting contracts	
	# cases	% of $\phi_j = -1$	# cases	% of $\phi_j = -1$
Treatment 1	222	11.7	354	12.1
Treatment 2	227	21.1	349	20.3
Treatment 3	233	16.3	343	20.1

Panel B: effort rates (%)								
	Phase 2				Phase 3			
	<i>wing</i> contracts		<i>sting</i> contracts		<i>wing</i> contracts		<i>sting</i> contracts	
	$\phi_j = -1$	$\phi_j = 0$	$\phi_j = -1$	$\phi_j = 0$	$\phi_j = -1$	$\phi_j = 0$	$\phi_j = -1$	$\phi_j = 0$
Treatment 1	34.0	48.4	75.9	72.4	11.5	48.5	69.8	76.5
Treatment 2	30.6	45.6	71.1	64.3	16.7	35.8	52.1	75.9
Treatment 3	23.1	32.7	59.3	58.4	13.2	31.3	53.6	67.9

Table B8. Incidence of misbehavior and effort rates in P_2 and P_3 of TR_1 to TR_3 .

Finally, we investigate on the existence of treatment effects by estimating (a suitably modified version of) the structural model of Section 2 in the main text.

Since, in TR_2 and TR_3 , player position is constant, we cannot apply the same estimation strategy adopted in Section 2 for TR_1 , which exploits P_1 data to identify at the individual level both α and β . Therefore, our estimates here are obtained under the constraints that α and β are constant across individuals, and we combine observations from contract choices in P_1 , contract choices (of Stage 1) and effort decision (of Stage 2) in P_2 in a single step maximum likelihood estimation procedure. Furthermore, in TR_3 reciprocity can be estimated only for non Dictators. In other words, the estimates for TR_1 we present here cannot be directly compared with those presented in Section 2 of the main text, both because of the neglected heterogeneity in the social preference parameters (α, β) , and because of the different information set used. In addition, constraining the distributional parameters α and β to be constant across individuals remarkably reduces the number of parameters to be estimated (from $72 \times 2 + 3 + 3 = 150$ to $2 + 3 + 3 = 8$). Thus, we expect the estimates to be more precise. Given the experimental design of TR_2 and TR_3 these are the best estimates we can produce

of our structural model to investigate on treatment effects in our estimated parameters.

Distributional preferences	TR_1	TR_2	TR_3
α	0.0739** (0.0363)	-0.1249 (0.1863)	-0.1210* (0.0694)
β	0.6194** (0.0257)	0.6548** (0.0249)	0.6434** (0.0263)
Beliefs (λ_i^k)			
$D_i \rightarrow \psi_1$	0.2133** (0.0838)	0.5044** (0.1742)	0.8089** (0.4035)
$b_j^k \rightarrow \psi_2$	-0.0064** (0.0026)	-0.0215** (0.0105)	-0.0333** (0.0087)
$b_i^k - b_j^k \rightarrow \psi_3$	-0.0278** (0.0072)	-0.0152 (0.0121)	-0.0290** (0.0061)
Reciprocity (θ_i)	Treatment 1	Treatment 2	Treatment 3
θ_0	-0.1520** (0.0355)	-0.1925** (0.0389)	-0.2069** (0.0566)
$D_i \rightarrow \theta_1$	0.0562** (0.0218)	0.0718 (0.0463)	
$L_i \rightarrow \theta_2$	0.1664** (0.0402)	0.2110** (0.0559)	0.1863* (0.0979)
$\theta_0 + \theta_1$	-0.0957** (0.0435)	-0.1207** (0.0328)	
$\theta_0 + \theta_2$	0.014 (0.0174)	0.0185 (0.0618)	-0.0206 (0.0652)
$\theta_0 + \theta_1 + \theta_2$	0.0706** (0.0089)	0.0903** (0.0373)	

Table B9. Estimated parameters of belief function and reciprocity by treatment

Cluster adjusted standard errors in parenthesis. * $p - value < 0.1$, ** $p - value < 0.05$

Table B9 and formal tests show that:

1. keeping the player position constant affects the estimate of α , but not that of β . The null hypothesis of a constant β across treatments is not rejected, while α s in TR_2 and TR_3 are significantly lower than that of TR_1 . Since the estimate of α is mainly determined by player 2's behavior (and we already know from Section 4.1 that P_1 choices do not differ much across treatments), this is consistent with the evidence of Table B7, where we show that player 2 is the one who changes her effort the most between TR_1 and the other two treatments.
2. The estimated parameters for the difference $b_i^k - b_j^k$ (ψ_3) are always negative: player 1's beliefs are lower than player 2's. This evidence seems fairly robust, as statistical tests never reject the hypothesis that ψ_3 s are constant across treatments.
3. In all treatments, Dictators have higher beliefs than their teammates (i.e. $\hat{\psi}_1 > 0$). Point estimates increase going from TR_1 to TR_3 , although we cannot reject the hypothesis that ψ_1 is constant across treatments.

4. The effect of teammate's payoff on beliefs ($\partial\lambda_i^k/\partial b_j^k = (\psi_2 - \psi_3)\lambda_i^k$) is positive in TR_1 , while it is not statistically different from zero in TR_2 and TR_3 (that is, $H_0 : \psi_2 - \psi_3 = 0$ is not rejected for TR_2 and TR_3).
5. The estimated reciprocity parameters are constant across treatments.

To better appreciate the differences in beliefs across treatments, Table B10 reports the predicted beliefs $\lambda_i^k \left(D_i, b_i^k, b_i^k - b_j^k; \hat{\psi} \right)$ evaluated at the average values of b_i^k and $b_i^k - b_j^k$.

	Treatment 1		Treatment 2		Treatment 3	
	Non Dictator	Dictator	Non Dictator	Dictator	Non Dictator	Dictator
Player 1	0.3010** (0.0374)	0.3477** (0.0312)	0.1838** (0.0692)	0.2717** (0.0611)	0.0812** (0.0380)	0.1656** (0.0230)
Player 2	0.4972** (0.0572)	0.5503** (0.0632)	0.2046 (0.1454)	0.2988* (0.1559)	0.1150* (0.0617)	0.2258** (0.0474)

Table B10: predicted expectations $\lambda_i^k \left(\cdot; \hat{\psi} \right)$ at the average levels.

For player 1, $\left(\bar{b}_i^k = 75, \bar{b}_i^k - \bar{b}_j^k = 17 \right)$, for player 2 $\left(\bar{b}_i^k = 58, \bar{b}_i^k - \bar{b}_j^k = -17 \right)$

From Table B10 we learn that subjects' beliefs systematically decrease going from TR_1 to TR_3 , for both player positions and Dictator roles. This provides an explanation to the documented reduction in effort rates: subjects reduce their effort essentially because they expect their teammates to put less effort. Consistently with the descriptive statistics in Table B7, Player 2 is the one who decreases her expectations the most going from TR_1 to TR_2 , while in TR_3 both Player 1 and 2 reduce their expectations remarkably (by about 75% for the non Dictator and 55% for the Dictator).

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