Voluntary Partnerships For Equally Sharing Contribution Costs

- Theoretical Aspects and Experimental Evidence -

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Abstract

Contributors to public goods with commitment power decide, before voluntarily contributing, whether and when to join the (sub)group whose partners equally share their contribution cost. According to our theoretical analysis stable cost sharing partnerships can solve the freeriding problem (partners fully contribute whereas possible outsiders freeride). Our data show that neither partners always contribute maximally nor that outsiders always freeride. Nevertheless, we confirm systematic partnership formation what considerably improves public good provision. In addition to offering a mechanism for enhancing voluntary cooperation, we use individual (joining) profiles to account

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for the usually considerable heterogeneity across individual participants as well their randomly formed player (and rematching) groups.

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1 Introduction

Voluntary provision of public goods is threatened by freeriding what explains the interest in institutional devices to avoid or at least weaken freeriding incentives. Commitments to contribute or to punish freeriders by at least a subgroup of contributors can help to solve cooperation problems. Still, the emergence of a subgroup willing to commit and its success in sustaining cooperation is not guaranteed, especially when not all commit themselves due to second order freeriding (e.g., Dannenberg et al., 2014, Kosfeld et al., 2009).

In this paper we investigate theoretically and experimentally voluntarily forming partnerships whose members equally share their total contribution cost. Forming such partnerships assumes self-commitment power what allows contributors to freely commit themselves according to following decision process: contributors first determine sequentially when they would or would not join the partnership; then all group members independently contribute, being aware whether there is a partnership and, if so, of how many belong to it and whether one is partner or outsider. Participants can freeride both, by not joining the partnership and by abstaining from voluntary contributions, even as partners. Still, partners are committed to share their total contribution cost equally what let partners earn the same. The theoretical analysis shows that opportunistic reasoning does not exclude joining the partnership: in case of a stable partnership (Selten and Güth, 1982) no partner would be better off by unilaterally opting out (internal stability) and no outsider would gain by unilaterally opting in (external stability). We exclude multiplicity of stable partnerships by imposing sequentiality in (not) joining according to a later determined random order where everyone is aware how many of those deciding earlier in the sequence have already joined.

Paradigmatic field examples of such cost sharing partnerships are trade unions, financed by their members to negotiate with employers about work conditions and wages. Successful collective negotiations in Continental Europe, often by national trade unions, yield improvements not only to union members but to all employees since employers try to discourage joining the union by providing freeriding incentives to employees.[1] Our mechanism resembles this type of collective wage bargaining, especially since sequentially forming the partnership is similar to continuous exit of old and entry of new union members. International treaties committing countries to provide some level of global public goods like environmental protection or global security are other important field applications: countries typically sequentially determine whether to enter or not international coalitions or alliances and members of the coalition share the burden of providing the public good (Barrett, 2003, Morgenstern et al., 2007). Instead of voluntary forming partnerships for sharing contribution costs in linear public good provision one can also consider burden sharing partnerships, e.g. the burden of price leadership on homogenous markets theoretically (see d'Aspremont et al., 1983, who like Selten and Güth, 1982 require such price leading cartels to be stable). Accepting the role of price-leader either individually or as voluntarily formed price-leading cartel allows outsiders to optimally adjust to the common price whereas the price leading cartel with at least one member serves the residual demand to guarantee its chosen price.[2]

Our contribution belongs to the stream of experimental literature on endogenous sub-group formation to which we add by proposing a mechanism with some novel interesting aspects. Most experimental investigations focus on the emergence of institutions which can enforce the compliance of their members up to socially optimal level (see Dannenberg and Gallier, 2020 for a review)[3] whereas we allow for free contribution choices inside and outside such coalitions. Our setting is then different from the other streams of literature on endogenous

[1]In the USA, unions have reacted to this social dilemma caused employers negotiating only closed-shop agreements which exclude non-unionized employees from enjoying union-negotiated improvements. In case of closed-shop collective wage negotiations usually all permanent employees become union members (see Booth, 1985 or Naylor and Cripps, 1993).

[2]One usually assumes that cartel members sell an equal share of the residual demand. For an equilibrium analysis of such market where either one seller or a seller cartel can assume the role of price-leader, see d'Aspremont et al. (1983), Güth et al. (1987).

[3]According to Dannenberg and Gallier (2020) definition, the stream of literature on endogenous group formation that we belong to is the one where cooperation benefits are *global* and the institutional setting is *exclusive*, what means that cooperation benefits not only partners and the institution applies only to the members who choose to join it.

group formation where subjects can sort into different groups of play or endogenously choose an institution that then applies to the whole play group, when implemented. Since unlike previous experimental investigations we introduce not only endogenous group formation, but also endogenous contributions determination inside and outside the coalition, our setting allows not only to test the successful emergence of cost sharing partnerships, but also their success in fostering contribution investigating how contributions of partners and outsiders depend on whether or not a partnership is formed, with how many partners and whether one is partner or not. Similar to our attempt, Dannenberg et al. (2014) allows endogenous contributions determination restricting partners' contributions by an endogenously determined minimum level. So in their setting exploitation within the coalition can be avoided only by committing to a large enought minimum level and the achievement of high contribution levels can be prevented by low contributors in the coalition (Dannenberg et al., 2014, Kurzban et al., 2001). Instead, our mechanism is not sensitive to low contributors in the coalition as it avoids freeriding incentives among partners guaranteeing their equal treatment. To pre-empt the results, our data show that partners contribute significantly more than outsiders and more so the larger the size m of the partnership. Still, on average, stable and larger partnerships let not all partners contribute maximally but inspire outsiders to contribute more than minimally. In view of this evidence, reducing freeriding incentives by voluntary committing the cost sharing is a very promising idea.

In addition to suggesting and experimentally testing a mechanism which may help to overcome or at least limit the freerider problem, we also want to offer a new categorization device in order to account for the usually considerable heterogeneity in experimental choice data in the public good setting. Indeed, another novel aspect of our setting, i.e., sequentially deciding whether or not joining partnership, avoids the strategic uncertainty of which stable partnerships are actually formed and provides an unambigous benchmark behavior that can be used to test the optimality of joining behavior and the existence of alternative behavioral patterns.[4] In the present paper we will mainly show how the participation profiles - when to join or not the cost sharing partnership - differ to a surprising extent to the unambiguous

[4]Sequentiality is relevant as it also captures the actual group formation in the field. McEvoy et al. (2010) also studies sequential coalition problem experimentally by letting the order of joining and not joining be endogenously determined.

theoretical benchmark, and profiles as "always joining" and "never joining" stick out. Moreover, it will also be indicated how our experimental setup offers ways to categorize randomly formed player groups and - in case of repeated random formation of player groups - their randomly formed rematching groups: doing so one not only accounts for the idiosyncratic differences across individual participants, but also across players and rematching groups of participants.

This paper develops as follows: Section 2 presents the game form and the theoretical predictions; Section 3 describes the experimental design and research questions; Section 4 informs about our results and Section 5 concludes. Appendix reports the English Translation of the Instructions.

2 Game form and theoretical predictions

Let $n(\geq 3)$ denote the group size, i.e., the number of contributors. When the partnership is formed with at least $m(\geq 2)$ partner(s), we refer by i to partners and, when $m < n$, by j to outsider(s). The payoff of an outsider j is

$$e - c_j + \alpha C \quad with \quad 0 < \alpha < 1 < n\alpha$$

Here $C = c_1 + \ldots + c_n$ as the total contribution, $e = 25$ is the individual endowment, and integer c_j with $5 \leq c_j \leq 20$ denotes j's contribution. For at least $m(\geq 2)$ partners i what matters, too, is:

$$C(m) = \sum_{i=1}^{m} c_i,$$

i.e., how much all partners contribute in total. All partners i earn the same, namely:

$$e - \tfrac{C(m)}{m} + \alpha C.$$

When deciding whether or not to join the partnership, contributors must anticipate that, in case of common and anticipated opportunism, outsiders j freeride:

$$c_j^*(m) = 5.$$

Instead for partners i the optimal contribution is m-dependent via:

$$c_i^*(m) = \begin{cases} 20 \quad if \quad m\alpha > 1 \\ \\ 5 \quad if \quad m\alpha < 1 \end{cases} .$$

The partnership is formed sequentially: one decides to join or not, aware how many of those preceding oneself in the sequence have joined. Subjects in the experiments have to choose for each possible position in the sequence: so each contributor $k = 1, \ldots, n$ has to make five binary choices $\delta_k(.) \in \{0, 1\}$ in case of $n = 3$ and nine binary choices in case of $n = 4$. Here $\delta_k \in \{0, 1\}$ means that:[5]

$$\delta_k = \begin{cases} 1 \quad k\, joins\, the\, partnership \\ \\ 0 \quad k\, does\, not\, join\, the\, partnership \end{cases} .$$

We refer to the list of these five, respectively nine, binary decisions δ_k of contributor k as $k's$ (partnership) profile. After eliciting the profile of all $n(\geq 3)$ contributors $k = 1, ..., n$ a sequence is randomly drawn in an unbiased way and determines according to all n profiles, whether there is a partnership or not, denoted by $m = \emptyset$ or $m \neq \emptyset$ respectively, the size $m = \sum_k \delta_k (\geqslant 2)$ of the partnership and who is a partner and, for $m < n$, who is outsider.

For $m\alpha < 1$ an opportunistic partner i would freeride, $c = 5$, whereas i but would maximally contribute, $c = 20$, when $m\alpha > 1$. Outsider(s) j would freeride. Thus one will opportunistically join the partnership when own joining increases m from $m\alpha < 1$ to $(m + 1)\alpha > 1$ what improves the equal payoffs of partners i and even more what outsiders earn. Partnerships of size m^* with $(m^* - 1)\alpha < 1 < \alpha m^*$ are externally (no outsider wants to opt in) and internally (no partner gains by unilaterally opting out) stable. Stable partnerships render each partner pivotal for avoiding freeriding incentives: if one partner opts out, the partners would not contribute maximally anymore.

To check the robustness of our main qualitative results the experimental design distinguishes two conditions:

$$m^* = m^*(\alpha) = \begin{cases} 3 \quad for\, \alpha = .4\, and\, n = 4 \\ \\ 2 \quad for\, \alpha = .6\, and\, n = 3 \end{cases} .$$

[5]When being last in the sequence and reacting to "0" having joined before, both decisions $\delta_k = \{0, 1\}$ would imply $m \leq 1$, i.e., $m = \emptyset$ (in Table 1 such cases are excluded by "X").

The first, $n = 3$ and $\alpha = .6$, condition seems cognitively less demanding although both conditions theoretically imply $m \neq \emptyset$ and $m^* = n - 1$, the coexistence of m^* partners and one outsider.[6] Table 1 presents the optimal δ^*-profiles predicting stable partnerships of size m^* when anticipating the different contribution incentives of outsiders and partners. The first in the sequence never joins, the second one only when the first one has not joined before, etc., in line with backward induction.

$n = 3$ & $\alpha = .6$				$n = 4$ & $\alpha = .4$				
how many have joined before you	your position in the sequence			how many have joined before you	your position in the sequence			
	3rd	2nd	1st		4th	3rd	2nd	1st
0	X	1	0	0	X	0	1	0
1	1	0		1	0	1	0	
2	0			2	1	0		
				3	0			

Table 1: The sequentially rational profiles $\delta^* \in \{0, 1\}$ with "X" excluding a choice when both, $\delta = 0$ and $\delta = 1$, imply $m = \emptyset$.

Universal $\delta_k = 0$ for all positions in the sequence by all n contributors is also an equilibrium outcome since its common expectation renders each choice $\delta_k \in \{0, 1\}$ ineffective. This equilibrium, however, fails to be perfect (Selten, 1975): in a slightly perturbed game all choices in Table 1 have small positive probabilities of being decisive so that optimally reacting as in Table 1 is the only optimal profile.

3 Experimental design and research questions

The experiment involves 12 rounds each composed by two stages. A round proceeds as follows: in the first stage the sequential choice elicitation of joining or not is implemented; participants make the 5 binary decisions to join or not in case of $n = 3$ and 9 such choices in case of $n = 4$ (see Table 1). Then a random sequence is drawn by the computer and determines whether or not a partnership is formed and in the case, its size and who is a partner or outsider. In the second stage, participants finally decide independently how much to contribute. After

[6] Our setup only guarantees the same efficiency $2 \times .6 = 1.2 = 3 \times .4$ for the stable group sizes across conditions. One may vary α with and without changing the stable group size m^*.

simultaneously contributing each group member is asked without this being incentivised for beliefs concerning others' contributions.

Each participant is endowed with 25 ECU (experimental currency unit) and can contribute any integer amount from 5 and 20 ECU.[7] Each token is converted in euro at the exchange rate, 1 ECU=0.50 euro. As partners share their total contribution costs equally, they earn the same irrespective how their individual contributions differ.

After each round participants periodically receive feedback information about their own payoff, whether $m = \emptyset$ or, in case of $m \neq \emptyset$, the size (m) of the partnership, whether they are partner or outsider, their own and the total contribution, and, if they are partners, the total contribution of all partners. After feedback information participants play another round till reaching the last one.

We collected data of 96 participants in 4 sessions employing the experimental methodology, described in Buso et al. (2021), i.e., via lab-like online sessions. The two conditions with different group size (n) and marginal propensity to contribute (α) are run between-subject. Participants played the 12 rounds being aware of not interacting with the same group members in two consecutive rounds. The re-matching group size (of which participants were unaware) was 6 for $n = 3$ & $\alpha = .6$ and 8 for $n = 4$ & $\alpha = .4$. At the end of the experiment, only one randomly selected round was paid (in addition to the show-up fee of 6 euro).

Participants were paid via Prolific (Palan and Schitter, 2018). Sessions lasted on average 90 minutes. The experiment was programmed in oTree (Chen et al., 2016) and carried out with student participants of Luiss Cesare Lab, recruited via Orsée (Greiner, 2015) among students of Economics, Law and Political Science. None participated in more than one session.

Our research focus is on two main issues:

- Will voluntary formed cost sharing partnerships actually discourage freeriding at least of their partners when stable, as theoretically predicted?

- Is joining behavior in line with the unambigous benchmark predictions or, alternatively, do behavioral regularities exist?

[7] This guarantees that participants earn a proper portfolio of what they keep for themselves and what they gain from public good provision.

4 Results

We begin with describing and analysing the chosen partnership profiles. The resulting contribution behaviour is discussed later.

4.1 Partnership formation

One can use the profiles [8] to explore the general *Willingness to Join* via an aggregate measure, the relative frequency of $\delta = 1$-choices, henceforth *share of ones*.[9] We further analyse how the 12 successive individual profiles vary across the 12 rounds, e.g. whether the share of ones declines or is rather constant. Since the actual partnership may depend on the random sequence drawn, we simulate all possible sequences of sequential partnership formation to assess how the actual and simulated partnerships differ.

Willingness to Join

The average *share of ones* and its dynamics are illustrated in Figure 1 and by Table 2. The left panel of Figure 1 shows the average *share of ones* for $n = 3$ & $\alpha = .6$ which is significantly greater than the one for $n = 4$ & $\alpha = .4$ (Mann-Whitney test, $z = 7.716$, $p < 0.001$). This difference widens across rounds for $n = 3$, e. g. the share of ones slightly increases (decreases) (see right panel of Figure 1).

[8] Individual profiles list of 5 binary decision $\delta_k \in \{0, 1\}$ to join or not of contributor k when n is 3, and of 9 binary decisions when n is 9.

[9] The *share of ones* is the average number of $\delta = 1$-choices divided by the number of all δ-choices, 5 in $n = 3$ and 9 in $n = 4$. We will later use this *Willingness to Join*, in all δ-regression analyses.

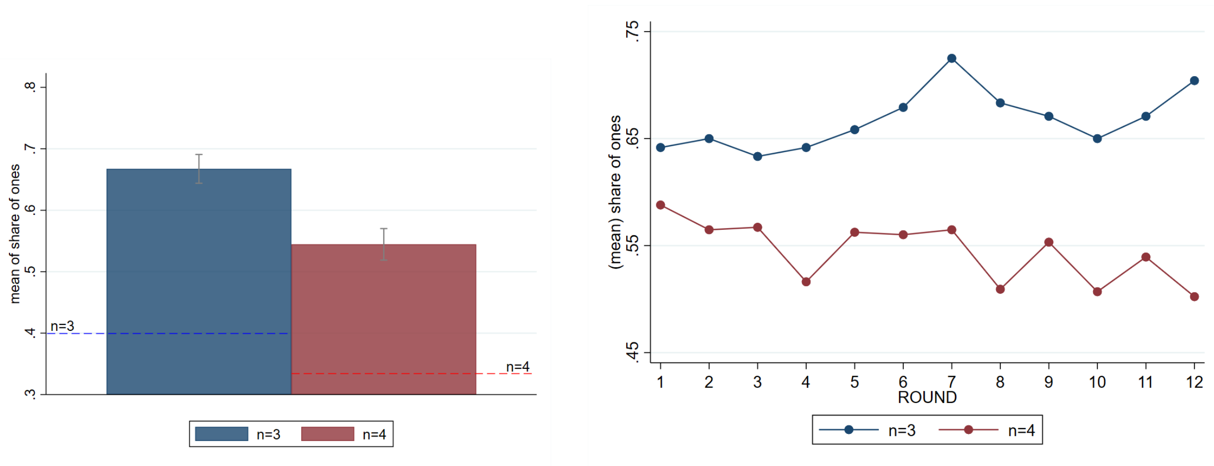

Figure 1: The left panel reports the *shares of ones* with confidence intervals at 95%; dashed lines represent the theoretical prediction for each condition; the dynamics across rounds are illustrated in the right panel.

The average *shares of ones* is always larger than theoretically predicted (left panel of Figure 1): 65% for $n = 3$ & $\alpha = .6$ (theoretically 40%) and 54% for $n = 4$ & $\alpha = .4$ (theoretically around 33%). Table 2 reveals a strong willingness to join even when not optimal. The impressive tendency to become a partner is, however, hardly in line with benchmark prediction, based on opportunism.

Table 2: *Share of Ones* per choice cell

$n = 3$ & $\alpha = .6$				$n = 4$ & $\alpha = .4$				
how many have joined before you	m*=2			how many have joined before you	m*=3			
	your position in the sequence				your position in the sequence			
	3rd	2nd	1st		4th	3rd	2nd	1st
0	X	0.44*	0.75	0	X	0.32	0.42*	0.62
1	0.70*	0.74		1	0.42	0.54*	0.59	
2	0.68			2	0.64*	0.66		
				3	0.65			

This Table displays the relative frequency of $\delta = 1$ for each choice cell in stage 1. The cells where $\delta = 1$ is optimal are identified by *.

For the dynamics of the shares of ones the regression results of Table 3 reveal the inertia of the individual *shares of ones*. This path dependence applies to both conditions: there is a positive and significant relationship between the *share of ones* in successive rounds in regressions (1) and (3); similarly, regressions (2) and (4) show a negative relationship between not being a member in $t-1$ and the *share of ones* in t and a significantly positive relationship between being a member in $t-1$ and the *share of ones* in t. Regressions (5) and (6) for the whole sample further confirm path dependence in joining behaviour with stronger effects for $n = 3$ & $\alpha = .6$ than for $n = 4$ & $\alpha = .4$.

Table 3

	Depvar: individual share of ones at round t					
	(1)	(2)	(3)	(4)	(5)	(6)
	$n=3$ & $\alpha=.6$	$n=3$ & $\alpha=.6$	$n=4$ & $\alpha=.4$	$n=4$ & $\alpha=.4$	$n=3$ & $\alpha=.6$ *and* $n=4$ & $\alpha=.4$	$n=3$ & $\alpha=.6$ *and* $n=4$ & $\alpha=.4$
No Partnership $t-1$ (baseline):						
- m=2 & member $t-1$		0.02		-0.01		
		(0.02)		(0.03)		
- m=2 & no member $t-1$		0.04		-0.05*		
		(0.03)		(0.03)		
- m=3 & member $t-1$		0.05**		0.01		
		(0.02)		(0.03)		
- m=3 & no member $t-1$				-0.01**		
				(0.04)		
- m=4				0.06**		
				(0.03)		
member $t-1$						0.04**
						(0.01)
Share of ones $t-1$	0.37***		0.45***		0.42***	
	(0.04)		(0.04)		(0.02)	
N=4					-0.10***	-0.16***
					(0.03)	(0.04)
Dummy Final Round	0.04	0.5	-0.04	-0.03	-0.0001	-0.004
	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)
Demographics	✓	✓	✓	✓	✓	✓
Round dummies	✓	✓	✓	✓	✓	✓
Session Number	✓	✓	✓	✓	✓	✓
Observations	528	528	528	528	1056	1056
Number of individuals	48	48	48	48	96	96
Number of groups	8	8	6	6	14	14

The model used is a multilevel one, with two nested levels: individual and matching group. Demographic controls include gender and age of the participant, field of study, geographic region, number of past experiment, self reported easiness of experiment.

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

As we find many possible profiles and even the same *share of ones* allows for multiple *profiles*, we present in Table 4 and Table 5 only the optimal profile and the profiles with a percentage share of at least 5% of all $48 \times 12 = 576$ profiles in each condition. In both conditions 5 different profiles emerge (in addition to the optimal one).

Profile 1, "always joining", seems to capture unconditional cooperation and can be rationalized by strong efficiency concerns. Instead Profile 2, "never joining", could be due to not wanting to voluntarily engage in collective action, even when profitable. Profile 4 for $n = 3$ & $\alpha = .6$ describes as "always joining", but not as the first in the sequence. Except for Profile 4 for $n = 3$ & $\alpha = .6$, all other profiles (Profile 3 and 5 for $n = 3$ & $\alpha = .6$ and Profile 3, 4, 5 for $n = 4$ & $\alpha = .4$) aim at the $m = n$ grand partnership when is still possible. There is also a tendency of not joining when $m = n$ is not anymore possible.

Table 6 summarizes the percentages of the five more frequent (and optimal) joining profiles. Altogether the five frequent profiles account for 68.9% of the $n = 3$ & $\alpha = .6$ and 46.75% of the $n = 4$ & $\alpha = .4$ profiles in the data set. Across conditions there are significant shares of "always joining" (24.8% and 14.5%, respectively) and "never joining" (8% and 13%, respectively) profiles which even increase in the last rounds (from 7 to 12) whereas optimal joining profiles are negligible (3% in $n = 3$ & $\alpha = .6$ and 0% in $n = 4$ & $\alpha = .4$). Table 6 also reports the percentage of subjects adopting the same profile at least 6 times: overall 49% of the subjects in $n = 3$ & $\alpha = .6$ and 30% in $n = 4$ & $\alpha = .4$ (see Table 14 in appendix for more details). This finding suggests inertia in the *share of ones* even at the individual level to Table 3.

The overall heterogeneity of individual and also the frequent profiles (in Table 4 and 5) calls for categorization to account for this heterogeneity not only across participants but possibly also across player groups. Due to random strangers rematching we demonstrate categorization of n-groups only for first round data and only for $n = 3$. Each $n = 3$-group with three participants can be categorized by its vector $w = (w_\emptyset, w_2, w_3)$, with $w_\emptyset + w_2 + w_3 = 1$, and represented in a two-dimensional probability simplex via simulating all possible $n! = 6$ sequences to join the cost sharing partnership, where each element of the vector w is $w_l = \frac{l-frequency}{n!}$ (see Figure 2). Due to 48 participants there are only 16 groups whose w-vectors are quite widely distributed. Actually there are two n=3-player groups in the first round which each realize the m=n-partnership with either probability 1 or 0, whereas two other n=3-player groups never form a partial partnership.[10]

[10] Note that one can extend this categorization to rematching groups, e.g. for $n = 3$ and rematching group size 6 by simulating all $\binom{6}{3} = 6 \cdot 5 \cdot 4 = 120$ possibilities to distinguish two $n = 3$-groups.

Table 4: Types of Joining Profiles when $n = 3$ and $\alpha = .6$

$n = 3$ & $\alpha = .6$							
Joining Profile 1				Joining Profile 2			
How many have joined before you	Your position in the random sequence			How many have joined before you	Your position in the random sequence		
	3rd	2nd	1st		3rd	2nd	1st
0	X	1	1	0	X	0	0
1	1	1		1	0	0	
2	1			2	0		
Joining Profile 3				Joining Profile 4			
How many have joined before you	Your position in the random sequence			How many have joined before you	Your position in the random sequence		
	3rd	2nd	1st		3rd	2nd	1st
0	X	0	1	0	X	0	0
1	1	1		1	1	1	
2	1			2	1		
Joining Profile 5				Optimal Profile according to theory			
How many have joined before you	Your position in the random sequence			How many have joined before you	Your position in the random sequence		
	3rd	2nd	1st		3rd	2nd	1st
0	X	0	1	0	X	1	0
1	0	1		1	1	0	
2	1			2	0		

This Table displays the joining profiles with at least 5% of the overall choices (576).

Table 5: Types of Joining Profiles when $n = 4$ & $\alpha = .4$

$n = 4$ and $\alpha = .4$									
Joining Profile 1					Joining Profile 2				
How many have joined before you	Your position in the random sequence				How many have joined before you	Your position in the random sequence			
	4th	3rd	2nd	1st		4th	3rd	2nd	1st
0	X	1	1	1	0	X	0	0	0
1	1	1	1		1	0	0	0	
2	1	1			2	0	0		
3	1				3	0			

Joining Profile 3					Joining Profile 4				
How many have joined before you	Your position in the random sequence				How many have joined before you	Your position in the random sequence			
	4th	3rd	2nd	1st		4th	3rd	2nd	1st
0	X	0	0	1	0	X	0	0	1
1	0	0	1		1	0	1	1	
2	1	1			2	1	1		
3	1				3	1			

Joining Profile 5					Optimal Profile according to theory				
How many have joined before you	Your position in the random sequence				How many have joined before you	Your position in the random sequence			
	4th	3rd	2nd	1st		4th	3rd	2nd	1st
0	X	0	1	1	0	X	0	1	0
1	0	1	1		1	0	1	0	
2	1	1			2	1	0		
3	1				3	0			

This Table displays the joining profiles with at least 5% of the overall choices (576).

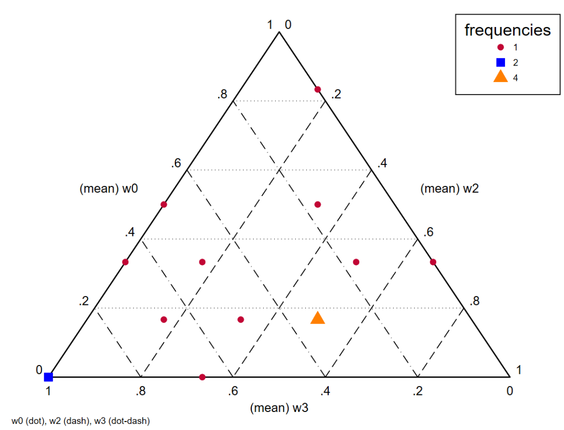

Figure 2: Categorization of n-groups (only for $n = 3$, based on simulating the mean probabilities of forming no partnership, $w_{\emptyset} = 0$, a stable one, w_2, or the grand $n = 3$ partnership when simulating all 6 possible sequences of sequentially joining the partnership in the first round).

Table 6: Frequency of Joining Profiles

type of choices	$n = 3$ & $\alpha = .6$			$n = 4$ & $\alpha = .4$		
	% choices		% subjects	% choices		% subjects
	All rounds	Rounds 7-12		All Rounds	Rounds 7-12	
According to theory	3	2	0	0	0	0
Profile 1 (always join)	24.8	32.3	25	14.5	17	14.5
Profile 2 (never join)	8	10	6	13	17	12.5
Profile 3	17.9	17	10	5	4.2	0
Profile 4	5.7	2.7	2	6.25	3.1	2.1
Profile 5	9.5	8.7	6	8	11.1	6.25
total	68.9	72.7	49	46.75	52.4	30

For each joining profile in Table 4 and Table 5, we report its percentage of choices and the percentage of subjects using it in at least 6 out of 12 rounds.

Comparison of Actual and Simulated m-frequencies

In spite of the significantly larger *Willingness to Join* for $n = 3$ & $\alpha = .6$, the relative partnership frequency does not differ significantly between the two conditions. This trend persists across time (74% for $n = 3$ & $\alpha = .6$ respectively 75% for $n = 4$ & $\alpha = .4$; t-test on actual frequencies, $t = 1.5308$, $p = 0.06$), as shown in Figure 3 and by Table 7. When, however, simulating all possible sequences this result is not anymore confirmed (see Table 7)[11] for the simulated partnership percentages:[12] there is a significantly higher number of partnerships in $n = 3$ & $\alpha = .6$ than in $n = 4$ & $\alpha = .4$ (78% for $n = 3$ & $\alpha = .6$ respectively 72% for $n = 4$ & $\alpha = .4$; t-test, $t = -25.1549$, $p < 0.001$).[13] Overall, partnership formation, $m \neq \emptyset$, dominates in both conditions and is stable across rounds (see the right panel in Figure 3).

[11] Considering simulated partnerships, we have 3456 observations for $n = 3$ & $\alpha = .6$ and 13824 observations for $n = 4$ & $\alpha = .4$. The 3456 data are derived from 576 choices which can be combined according to 6 possible sequences. The 13824 data are derived from 576 individual profile choices which can be applied to 24 possible sequences.

[12] The actual frequencies are included in the simulated ones as a subgroup.

[13] The t-test is run considering the averages at subject level. The result is confirmed also using the Mann-Whitney test.

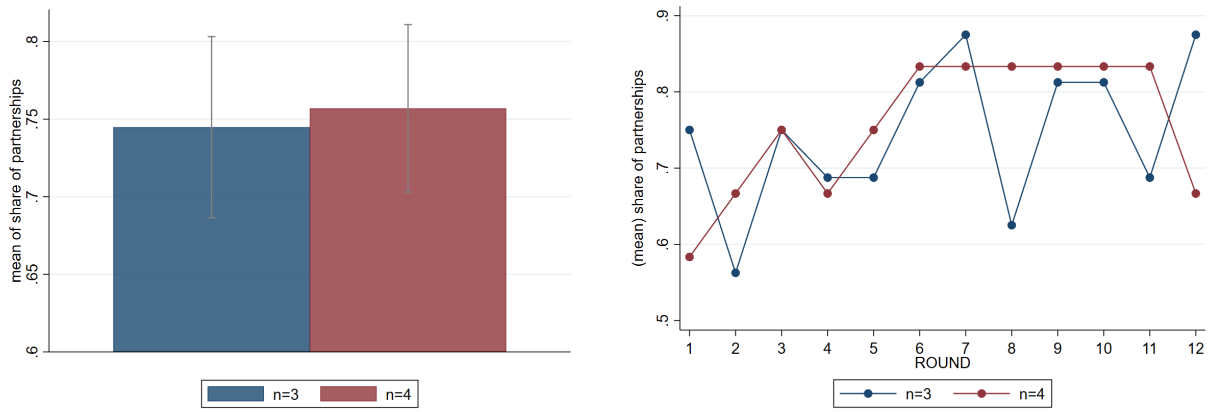

Figure 3: Shares of actually formed partnerships with confidence intervals at 95% for each *condition* in left panel and their dynamics across rounds in right panel.

Table 7: m-frequencies for actual and simulated data

	$n = 3$ & $\alpha = .6$			$n = 4$ & $\alpha = .4$			
	overall	m=2	m=3	overall	m=2	m=3	m=4
actual	0.74	0.30	0.44	0.75	0.33	0.25	0.17
simulated	0.78	0.34	0.44	0.72	0.26	0.33	0.13

This Table displays the proportion of actually formed and simulated partnerships, separately for partnership size (m) and condition.

Although unstable the grand partnership $m = n$ dominates in case of $n = 3$ & $\alpha = .6$ for both, actual and simulated, data. Instead, for $n = 4$ & $\alpha = .4$ smaller partnerships with $m < n$ dominate. Figure 4 illustrates the dynamics of stable and unstable partnerships. While the stable partnerships are more cyclic but on average rather constant across rounds, unstable partnerships change more erratically. The frequency of grand partnerships, $m = n$, increases across rounds for $n = 3$ & $\alpha = .6$, but decreases for $n = 4$ & $\alpha = .4$. Overall, the tendency to join is stronger for $n = 3$ & $\alpha = .6$ than for $n = 4$ & $\alpha = .4$ (see the illustration in Figure 5 via *share of ones* in $t = 1$). This latter finding can be accounted by the willigness to exploit the larger freeriding incentive in $n = 4$ than in $n = 3$ ($1 - .4 = .6 > 1 - .6 = .4.$), but also by inequity aversion. In this vein, Kosfelds et al. (2009) show that profitable partnerships are rejected when these benefit outsiders, and Dannenberg et al. (2014) observe a reduced contributions by partners to limit outsiders' benefits as their potential advantage increases. Inequity aversion can account then also for the tendency at individual level to join only if the grand partnership is possible.

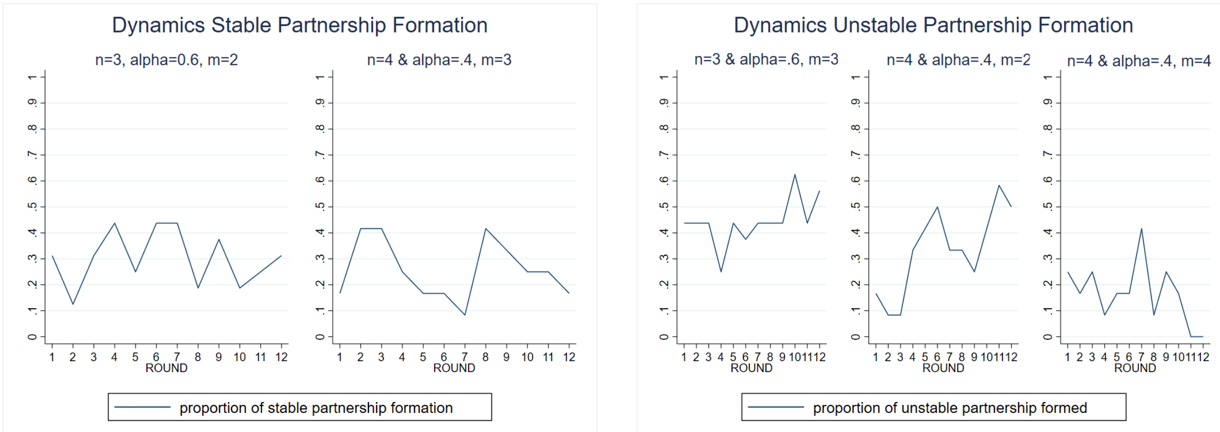

Figure 4: Proportions of stable partnerships in left and of unstable ones in right panel for both conditions.

Overall, our results strongly confirm the emergence of voluntary partnerships, $m \neq \emptyset$ clearly dominates although partnerships formed are not always stable; in particular, the unstable grand partnership dominates for $n = 3$. Individual joining behaviour is characterized by inertia, and evolves in an overall stable pattern. Although, individual joining behavior is hardly in line with the benchmark predictions, some interesting behavioral regularities emerge, e.g. the profiles of "always joining" and "never joining" and frequently forming the grand partnership, what can be explained by freering incentives and inequity aversion.

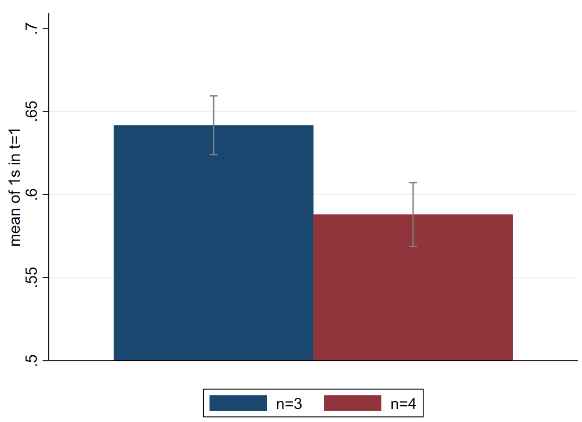

Figure 5: Tendency to join measured as share of ones in t=1.

4.2 Contribution behaviour

Figure 6 presents contribution behaviour after partnership formation by average contributions and their dynamics for both conditions. The left panel illustrates that the 95%-confidence intervals for $n = 3$ & $\alpha = .6$ triggers a significantly larger average contributions. According to the regressions in Table 8 heterogeneity in contributions in both conditions is partly accounted for *Willingness to Join* and being partner, both with positive and significant impact.

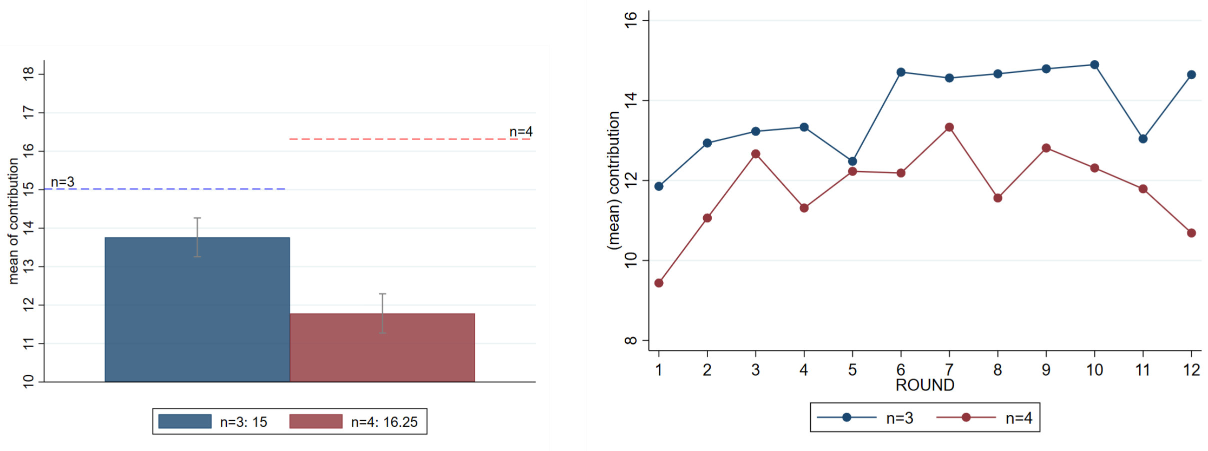

Figure 6: The contribution confidence intervals at 95% in left panel (dashed lines represent the theoretical predictions) and their dynamics across rounds in right panel.

Table 8

Depvar: Contribution at round t	(1) $n=3$ & $\alpha=.6$ *and* $n=4$ & $\alpha=.4$	(2) $n=3$ & $\alpha=.6$ *and* $n=4$ & $\alpha=.4$
Share of ones	7.33***	
	(0.66)	
Member		5.51***
		(0.28)
n=4	-1.28	-1.66**
	(0.79)	(0.74)
Final round	2.10***	1.91***
	(0.66)	(0.60)
Demographics	✓	✓
Round dummies	✓	✓
Session Number	✓	✓
Observations	1056	1056
Number of individuals	96	96

Dependent variable is the individual's contribution in a given round of play; the model used is a multilevel one, with two nested levels: individual and matching group. Demographic controls include gender and age of the participant, field of study, geographic region, number of past experiment, self reported easiness of experiment.

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

Overall establishing a partnership, i.e., $m \geq 2$, boosts aggregate contributions. Tables 9 and 10 report contribution shares of 55% for $n = 3$ & $\alpha = .6$ and 47% for $n = 4$ & $\alpha = .4$: partners who contribute on average 60% of their endowment when $n = 3$ & $\alpha = .6$ and 52% when $n = 4$ & $\alpha = .4$. These percentages seem large [14], compared to the meta-analysis for

[14] Recall that at most 80% (20 ECU) and at least 20% (5 ECU) of e=25 ECU can be contributed.

linear public good games (Zelmer, 2003). Contributions tend to be higher in $n = 3$ & $\alpha = .6$ than in condition $n = 4$ & $\alpha = .4$. (see also regression (2) in Table 8 and the overall averages in Table 9 and 10).

According to Tables 9 and 10 partners contributions always exceed those of outsiders: the average percentage of freeriding (contribution=5) is higher among outsiders than for partners. Without partnerships, i.e., $m = \emptyset$, freeriding is more frequent (42% when $n = 3$ & and $\alpha = .6$, 56% when $n = 4$ & $\alpha = .4$) than when a partnership exists (14% when $n = 3$ & $\alpha = .6$ and 27% when $n = 4$ & $\alpha = .4$). The opposite holds for fully contributing.

Table 9

	outsiders		partners		Overall	
	m				with p.ship	general
	$\emptyset$	2	2	3		
Mean	10.02	12.29	13.72	16.28	15.04	13.76
Std. Err.	0.48	0.89	0.53	0.32	0.28	0.26
n. of cases	147	58	116	255	429	576
# contr.=5	62 (42%)	17 (29%)	16 (14%)	26 (10%)	59 (14%)	121 (21%)
# contr.=20	29 (20%)	21 (36%)	39 (34%)	133 (52%)	193 (45%)	222 (39%)

Contribution Levels for $n = 3$ & $\alpha = .6$
.

Table 10

	outsiders			partners			Overall	
	m						with p.ship	general
	$\emptyset$	2	3	2	3	4		
Mean	8.1	7.80	6.54	14.85	15.98	15.13	12.97	11.78
Std. Err.	0.39	0.45	0.62	0.61	0.44	0.58	0.30	0.26
n. of cases	140	96	37	96	111	96	436	576
# contr.=5	79 (56%)	54 (56%)	30 (81%)	16 (17%)	3 (3%)	14 (15%)	117 (27%)	196 (34%)
# contr.=20	9 (6%)	5 (5%)	2 (5%)	45 (47%)	52 (47%)	44 (46%)	148 (34%)	157 (27%)

Contribution Levels for $n = 4$ & $\alpha = .4$
.

It is interesting to explore how individual contributions across the 12 successive periods depend on the profiles of participants chosen in the first round: one can use the *share of ones* as explanatory variable or whether a period t resulted in $m = \emptyset$, or in $m \geq 2$, whether one is partner or, in case of $m < n$, outsider. Table 11 separates both conditions when explains contribution choices by *Shares of ones* in round 1 in models (1) and (3) and in models (2) and (4) by the size m of the partnership and whether one is a partner or not.[15] Models (1) and (3) confirm that *Willingness to Join* significantly enhances contributions. Models (2) and (4) substantiate that partners contribute significantly more, irrespective of partnership size. Surprisingly, there are positive endgame effects.

[15]Viewing $m = \emptyset$ as the baseline, we use $m = 2$, $m = 3$ ($m = 4$ only for condition $n = 4$ & $\alpha = .4$) as dummy variables and the partner dummy with value 1, when i is a partner in period t.

Table 11

Depvar: Contribution at round t	(1)	(2)	(3)	(4)
	$n = 3$ & $\alpha = .6$	$n = 3$ & $\alpha = .6$	$n = 4$ & $\alpha = .4$	$n = 4$ & $\alpha = .4$
Share of ones in round 1	5.34***		9.53***	
	(0.93)		(0.86)	
No partnership (baseline):				
- non-partner & m=2		0.76		-0.20
		(0.66)		(0.60)
- partner & m=2		3.50***		5.41***
		(0.53)		(0.60)
- non-partner & m=3				-1.12
				(0.84)
- partner & m=3		5.42***		7.14***
		(0.49)		(0.57)
- partner & m=4				6.67***
				(0.59)
final round	2.46***	2.11***	2.07**	2.05**
	(0.88)	(0.81)	(0.99)	(0.87)
Demographics	✓	✓	✓	✓
Round dummies	✓	✓	✓	✓
Session dummies	✓	✓	✓	✓
Observations	576	576	576	576
Number of individuals	48	48	48	48

Dependent variable is the individual's contribution in a given round of play; the model used is a multilevel one, with two nested levels: individual and matching group. Demographic controls include gender and age of the participant, field of study, geographic region, number of past experiment, self reported easiness of experiment.

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

Figure 7 for $n = 3$ & $\alpha = .6$ and Figure 8 for $n = 4$ & $\alpha = .4$ present actual average and theoretical contributions (theoretical ones are indicated by horizontal lines, separately for partners and outsiders for all possible m).

Overall, participants react to the partnership in contributing at least qualitatively as predicted. However, outsiders contribute, on average, more than the minimum and partners less than maximally. Figure 8 shows a positive and sustained average contribution even for the partners of unstable $m = 2$ partnership: what suggest that being a partner *per se* helps to overcome minor freeriding incentives. Partners' beliefs can also account for their higher than outsiders, but not maximal contribution: Table 12 reveals that beliefs of partners about other partners' contributions have a positive and significant effect on their contributions. Additionally, when $m < n$ inequity aversion can account for partners shying away from maximal contribution. Although contribution behaviour is not optimal, average payoffs are close to their benchmark level, especially for $n = 3$ & $\alpha = .6$ (see Figure 9).

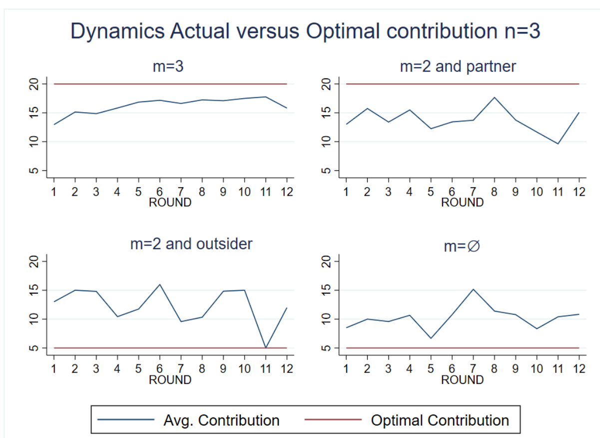

Figure 7: Average (and optimal) contribution dynamics depending on the partnership outcome for $n = 3$ & $\alpha = .6$.

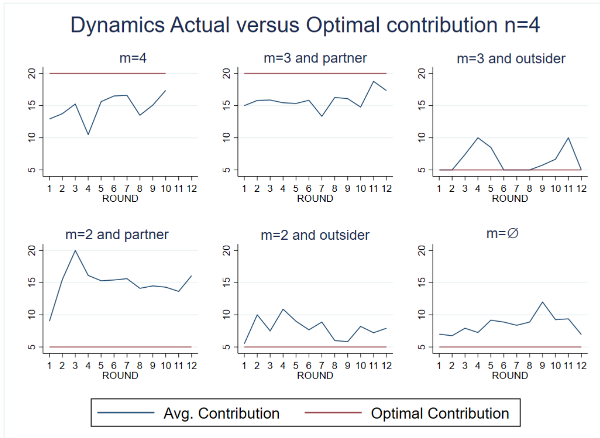

Figure 8: Average (and optimal) contribution dynamics depending on the partnership outcome for $n = 4$ & $\alpha = .4$.

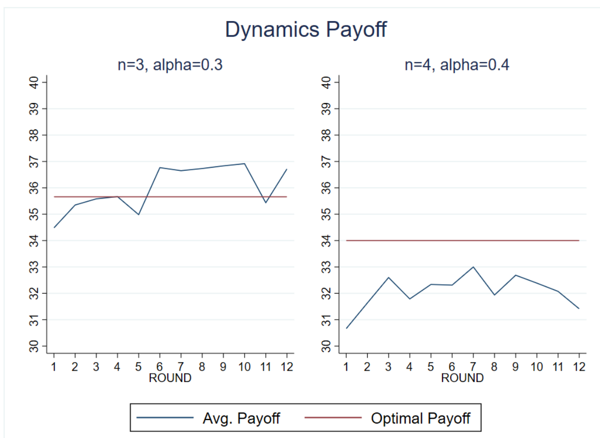

Figure 9: Average and predicted payoff for both conditions and their dynamics.

Table 12

	Depvar: Contribution at round t				
	(1)	(2)	(3)	(4)	(5)
	$n=3$ & $\alpha=.6$	$n=3$ & $\alpha=.6$	$n=4$ & $\alpha=.4$	$n=4$ & $\alpha=.4$	$n=4$ & $\alpha=.4$
	$m=2$	$m=3$	$m=2$	$m=3$	$m=4$
belief on partner(s)	0.67***	0.39***	0.94***	0.80***	0.82***
	(0.09)	(0.06)	(0.09)	(0.09)	(0.08)
belief on outsider(s)	0.16**		0.06	0.06	
	(0.08)		(0.09)	(0.07)	
final round	0.75	1.81**	1.23	0.84	
	(1.55)	(0.83)	(2.15)	(1.72)	
Demographics	✓	✓	✓	✓	✓
Round dummies	✓	✓	✓	✓	✓
Session number	✓	✓	✓	✓	✓
Observations	116	255	96	111	96

Dependent variable is the individual's contribution in a given round of play; the model used is a multilevel one, with two nested levels: individual and matching group. Belief partner(s) contribution is how much a partner believes other partner(s) to contribute; belief outsiders is how much an insider believes outsider(s) to contribute. Demographic controls include gender and age of the participant, field of study, geographic region, number of past experiment, self reported easiness of experiment.

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

5 Conclusions and directions for future research

We propose an institutional mechanism resembling in a stylized way some situations in the field like unions, cartels and international alliances. Before voluntary public good provision contributors can self-commit themselves to form a partnership whose members equally share their total contribution costs. Overall such cost-sharing partnerships emerge with about 75% probability and effectively help to enhance and sustain cooperation. In particular, we find that participants more willing to join a partnership tend to contribute more to the public good irrespective of partnership size, partners contribute significantly more than outsiders and, surprisingly, there are positive endgame effects.

Although individual joining behavior is not in line with benchmark predictions, the considerable heterogeneity of individual participation profiles confirms the need to account for heterogeneity by categorizing them, but also the randomly formed player groups, as shown by simulating all possible sequences and characterizing player groups via two-dimensional probability vectors (see Figure 2). Behavioral regularities like "always joining" and "never joining" profiles stick out, as well as the systematic willingness to form grand partnerships.

Voluntary partnership formation offers new ways to categorize participant types like unconditional cooperators and notorious, but not opportunistic, freeriders. So our categorization complements that of Fischbacher et al. (2001) distinguishing first mover (unconditional) and second mover (conditional) contributions, but maintain freeriding incentives, whereas our set up renders them endogenous and even avoidable. We are reluctant however to suggest a systematic categorization of contributor types based on our data alone. In a follow-up study we plan to focus on the smaller group size and complement the data of this study using a conditional elicitation of contribution behavior that will allow for a richer and hopefully more convincing categorization approach.[16]

[16]Since no contributor suffices for a partnership, all these contributors, in case of $n = 3$, have to determine $m = \emptyset$-contributions. If the own participation at least one "1" and one "0", furthermore, has to choose a $m = 2$-partner as well as an $m = 2$-outsider contribution. Only contributors with at least one "1" in their participation profile must determine also an $m = 3$-(partner) contribution.

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All authors contributed equally to conceiving and conducting the experiment, as well as to analysing the results and writing the paper.

Declaration of Competing Interest

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

Use of Human Subjects

The authors declare that all procedures were performed in compliance with relevant laws and institutional guidelines and that the appropriate institutional committee(s) have approved them. Informed consent was obtained all subjects in the experiment. The privacy rights have be observed by asking participants to accept the condition of being monitored (but not recorded) using a webcam.

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Appendix

Further descriptive statistics

Table 13: Relative frequency of Join per round

$n = 3$ & $\alpha = .6$														
Round	1	2	3	4	5	6	7	8	9	10	11	12	total	theory prediction
Frequency of Join	0.64	0.64	0.64	0.64	0.66	0.68	0.72	0.68	0.66	0.64	0.66	0.7	0.66	0.4
$n = 4$ & $\alpha = .4$														
Round	1	2	3	4	5	6	7	8	9	10	11	12	total	theory prediction
Frequency of Join	0.58	0.56	0.56	0.51	0.56	0.55	0.56	0.51	0.55	0.51	0.54	0.5	0.54	0.33

This table displays the proportion of *join* choices, $\delta = 1$ in each round where the optimal percentage would be 0.4 for $n = 3$ & $\alpha = .6$ and 0.33 for $n = 4$ & $\alpha = .4$.

Table 14

$n = 3$ & $\alpha = .6$												
	≥ 1	≥ 2	≥ 3	≥ 4	≥ 5	≥ 6	≥ 7	≥ 8	≥ 9	≥ 10	≥ 11	≥ 12
Profile 1	50	41	35	29	25	25	22.9	22	14.6	10.4	10.4	2.1
Profile 2	22.9	18.75	14.6	6.25	6.25	6.25	4.2	4.2	4.2	2.1	2.1	2.1
Profile 3	45.8	31.2	27.1	25	14.5	14.5	10.4	10.4	10.4	8.3	8.3	2.1
Profile 4	22.9	14.6	12.5	8.3	4.1	4.1	0	0	0	0		0
Profile 5	27.1	16.7	10.4	8.3	8.3	8.3	6.25	6.25	6.25	6.25	6.25	4.1
$n = 4$ & $\alpha = .4$												
	≥ 1	≥ 2	≥ 3	≥ 4	≥ 5	≥ 6	≥ 7	≥ 8	≥ 9	≥ 10	≥ 11	≥ 12
Profile 1	48	21	16.7	14.5	14.5	14.5	10.4	10.4	8.3	4.1	4.1	4.1
Profile 2	37.5	25	18.75	16.7	12.5	12.5	8.3	8.3	6.25	2.1	2.1	2.1
Profile 3	18.75	14.6	10.4	6.25	6.25	0	0	0	0	0	0	0
Profile 4	25	12.5	10.4	8.3	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Profile 5	20.1	16.7	14.6	8.3	6.25	6.25	6.25	6.25	4.1	2.1	2.1	0

This table shows for each profile in Tables 4 and 5 the percentage of subjects using it at least 1,2,3,4,5,6,7,8,9,10,11 12 rounds.

Table 14 shows that no profile is chosen always by more than 5% of the participants in either condition and that the most frequently constantly employed profiles with 4.1% of participants each differ across conditions (Profile 5 for $n = 3$ & $\alpha = .6$ and Profile 1 for $n = 4$ & $\alpha = .4$).

Instructions

These are the instruction for the treatment where $n = 4$ & $\alpha = .4$ [$n = 3$ & $\alpha = .6$]. English translation follows.

ISTRUZIONI

Descrizione generale dell'esperimento

Benvenuti a questo esperimento!

Nel corso di questo esperimento, completamente informatizzato, voi e gli altri partecipanti dovrete prendere alcune decisioni. Le vostre decisioni e quelle degli altri partecipanti determineranno il vostro guadagno per l'esperimento che verrà calcolato come spiegato di seguito.

In aggiunta al vostro guadagno per l'esperimento riceverete 6 euro per la vostra partecipazione e per la compilazione di un breve questionario alla fine dell'esperimento.

L'esperimento si compone di 12 round.

In ciascun round avrete l'opportunità di guadagnare gettoni sperimentali (ECU) che verranno convertiti alla fine dell'esperimento in euro al tasso di 1 ECU= 0,5 euro.

Alla fine dell'esperimento il computer selezionerà casualmente un solo round per il pagamento che verrà effettuato tramite Prolific. I dati dell'esperimento (le vostre decisioni) rimarranno anonimi nel senso che gli sperimentatori non saranno mai in grado di collegare il vostro nome alle vostre scelte.

All'inizio dell'esperimento il computer ti raggrupperà in modo casuale con altri 3[2] partecipanti tra quelli presenti in questa sessione dell'esperimento. Tu e gli altri soggetti selezionati formerete quindi un gruppo di 4[3] in ogni round.

Nota bene: Alla fine di ogni round la composizione del gruppo di cui fai parte verrà modificata in modo tale che almeno un membro del gruppo sia diverso rispetto al round precedente. In ogni caso non verrete mai a conoscere l'identità degli altri partecipanti al vostro gruppo né durante la sessione né in seguito.

In ogni round dell'esperimento dovrete prendere due tipi di decisione: la prima riguarda la decisione di partecipare o meno ad una "Iniziativa" relativa a un "Pro-

getto" comune a tutti i membri del vostro gruppo; la seconda riguarda quanto contribuire al "Progetto".

Dopo avere effettuato tali scelte dovrete rispondere in ogni round ad alcune domande la cui risposta non influenza in alcun modo i vostri guadagni.

Alla fine di ciascun round il computer vi comunicherà quale è il vostro guadagno in ECU per quel round. Alla fine dell'esperimento il computer selezionerà casualmente uno dei round per il pagamento e ve lo comunicherà, ricordandovi il guadagno che avete realizzato in tale round e che costituisce il vostro guadagno per l'esperimento. Prima del pagamento vi verrà chiesto di rispondere ad un breve questionario anonimo e non incentivato.

E' importante che leggiate con attenzione le istruzioni e capiate il modo in cui i vostri guadagni sono collegati alle vostre decisioni e a quelle degli altri. Per essere sicuri di ciò, all'inizio dell'esperimento, vi verranno proposte alcune domande di controllo per verificare se avete capito come il computer calcolerà i vostri guadagni.

Per qualsiasi dubbio rivolgetevi agli sperimentatori via chat o attraverso il microfono e qualcuno vi risponderà subito privatamente.

La decisione di aderire all' "Iniziativa" relativa al Progetto

In ogni round tu e gli altri membri del tuo gruppo dovrete scegliere uno dopo l'altro se volete partecipare o meno all'"Iniziativa" comune.

NB.: L'ordine in cui ciascuno di voi prenderà effettivamente tale decisione è stabilito casualmente dal computer.

Prima che il computer ti comunichi in che ordine prenderai effettivamente la tua decisione (cioè se sarai il primo, il secondo, il terzo o il quarto [primo, il secondo o il terzo] del tuo gruppo) dovrai dichiarare se intendi partecipare o non partecipare **per ogni possibile ordine che ti venga assegnato e sulla base di quanti membri del tuo gruppo hanno deciso di partecipare all' "Iniziativa" prima di te.**

Una volta dichiarate le tue scelte per ogni situazione possibile, il computer selezionerà l'ordine di decisione effettivo e eseguirà ciò che avevi dichiarato di volere fare nello scenario corrispondente a quello verificatosi.

Il computer ti informerà se si è realizzata o meno l'“Iniziativa” tra i partecipanti del tuo gruppo, quanti di voi partecipano ad essa e se tu ne fai parte o no.

Ricordate che la partecipazione all' “Iniziativa” è volontaria per ciascuno di voi. Di conseguenza, potrebbe avvenire che meno di due partecipanti al vostro gruppo vogliano partecipare all'”Iniziativa”, in tal caso l'“Iniziativa” non verrà intrapresa.

La decisione di quanto contribuire al “Progetto”

All'inizio di ogni round ciascuno di voi riceverà una dotazione di 25 ECU che dovrete decidere, indipendentemente e simultaneamente agli altri partecipanti, se e in che misura utilizzare per contribuire ad un “Progetto” comune. *NB: dovete scegliere un ammontare di contribuzione al “Progetto” compresa tra 5 e 20 ECU.*

Il vostro guadagno dal “Progetto” è calcolato in ogni round come segue:

(a) se avete deciso di partecipare all'”Iniziativa”, ed essa viene intrapresa, il vostro guadagno è dato da:

la vostra dotazione – [(la vostra contribuzione + la contribuzione degli altri partecipanti all'iniziativa) il numero dei partecipanti all'iniziativa)] + α (la vostra contribuzione + la contribuzione degli altri membri del gruppo).

Fate attenzione quindi che in questo caso la vostra contribuzione effettiva sarà diversa da quella dichiarata e pari alla media delle contribuzioni con cui tu e gli altri partecipanti all'iniziativa avete deciso in modo indipendente di contribuire al “Progetto”.

(b) se avete deciso di non partecipare all'Iniziativa, o essa non è stata intrapresa, il vostro guadagno è dato da:

la vostra dotazione – la vostra contribuzione + α (la vostra contribuzione + la contribuzione dei membri del vostro gruppo).

In tutti i round il valore di α sarà pari a 0,4[0,6].

Buon lavoro.

ENGLISH VERSION

INSTRUCTIONS General Description of the Experiment

Welcome to this experiment!

In this experiment, completely computerized, you and the other participants will make choices. Your choices and those of the other participants will determine your earnings for the experiment according the rules that will be explained in these instructions.

In addition to the earnings for the experiment, you will receive 6 euros for showing up and answering a short questionnaire at the end of the experiment.

The experiment consists of 12 rounds.

You have the opportunity to earn points (ECU) in each round that will be converted into Euro at an exchange rate of 1 point= € 0.5.

At the end of the experiment, one round is randomly selected for payment. The payment will be implemented using Prolific. The data of the experiment (your choices) are anonymous: the experimenter will not be able to connect your name to your choices.

At the beginning of the experiment you will be randomly matched by the computer with other 3[2] participants. You and the other selected participants will form a group of 4[3] in each round.

Note that after each round the composition of the group will change such that you will always interact with a group different from the group of the previous round for at least one participant. Note that you will not learn who the other members of your group are, neither during nor after today's session.

In each round you will make two types of choices. First, you will decide to join or not an "Initiative" related to a "Project" common to all the group members; the second choice will concern how much to contribute to the "Project".

After these choices, in each round you will be asked to answer few questions whose answers will not have any relevance for your earnings.

After each round you will learn the number of points (ECU) earned in that round. At the end of the experiment it will be shown on the screen which round has been drawn for payment and you will be recalled about the points earned in that round which will be your earnings for the experiment. Before the payment, you will be asked to answer few questions not relevant for the payment and that will preserve your anonymity. It is very important that you completely understand the instructions and the way your earnings are related to your decisions. In order to check your understanding, at the beginning of the experiment we will ask you to answer some questions about payoff calculation. If at any point during the experiment you have a question, please contact the experimenters using the chat or the microphone, and you will be answered privately.

The decision to join the "Initiative" related to the "Project"

In each round you and the other group members will choose sequentially whether to join or not the "Initiative".

Note that the position in the sequence for you and the other group members will be chosen randomly by the computer.

Before you are let aware of your actual position in the sequence (i.e., if you are the first, the second, the third or the fourth [the first, the second or the third], you will be asked whether you want to join or not the "Initiative" for every possible position in this sequence and **for every possible number of participants that have already joined the group before you.**

Once you have chosen whether to join or not in every possible scenario, the actual position in the sequence for each of you will be randomly drawn, and choices in the corresponding scenario will be implemented.

The computer will inform you about the existence of the "Initiative" in your group, how many group members are part of it, and if you are in.

Remember that participating to the "Initiative" is voluntary. Hence, it may happen that less than two members of your group choose to join; in this case, the "Initiative" will not exist.

The decision of how much to contribute to the "Project"

Each of you will be endowed with 25 points at the beginning of each round. You will choose simultaneously and independently whether and how much to contribute to a "Project" with your endowment: each of you have to choose an integer amount between and including 5 and 20 to devote to the "Project".

Your earnings from the “Project” in each round will be calculated as follows:

(a) If you chose to join the “Initiative” and this exists, your earnings are equal to:

Your Endowment– [(your contribution + the contribution of the other member(s) of the “Initiative”) / the member of the “Initiative” including you)] + α (your contribution + the contribution of the other group members).

Note that in this case your actual contribution may be different from the amount you stated and it will be equal to the average contribution of the members of the “Initiative”.

(b) If you chose to not join the “Initiative” or if this does not exist, your earnings are equal to:

Your Endowment– your contribution + α (your contribution + the contribution of the other group members).

In every round the value of alpha will be equal to 0.4[0.6].