Electronic Supplementary Material (ESM) to "On the performance of rule-based contribution schemes under endowment heterogeneity"

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MOTIVATION AND RESULTS

In a robustness check and additional to the treatments reported in the paper, we consider an increase in marginal benefits (for low-type agents) which – under the equal-payoff rule – would benefit both players. This treatment *E-MPCR-eqpay* adds an additional dimension of heterogeneity: agents are both unequally endowed and differ with respect to their benefits from the public good. In contrast to the treatment *E-eqpay*, low-type players ($e_L = 10$) have a MPCR of 0.8 while benefits for high-type players ($e_H = 30$) remain at 0.4. The motivation for this treatment two-fold. Firstly, in this setting, equalizing payoffs[1] would require nearly identical contributions from both types of players which may facilitate coordination in contrast to the homogeneous MPCR setting where redistribution of efficiency gains is addressed by requiring higher contributions from rich agents. Secondly, some public goods may disproportionally benefit low-income subjects (e.g., public transport, public health insurance) such that public good provision may serve a redistributive purpose.

In order to compare *E-MPCR-eqpay* to the treatments in the paper we report all relevant tables and figures in the paper including *E-MPCR-eqpay* (added by "ESM") as well as the instructions of this treatment.

As depicted in Figure 1ESM, the payoff to high-type agents is relatively flat for changes in the minimum requirement when assuming no voluntary contributions, while low-type agents substantially benefit from increases in the binding group minimum level. For any given binding minimum, Q^{min}, both types can generate larger payoffs in *E-MPCR-eqpay* than in *E-eqpay*. However, we observe players on average to agree upon $Q^{min} = 27.3$ which is even below the proposals with homogeneous MPCRs in *E-eqpay* (35.7) (see Table 3ESM). In particular, high-type players make smaller suggestions, even though these differences and also

[1] Full payoff equalization is possible for $0 \leq -10 + 0.45Q^{min} \leq 10$ leading to $22.2 \leq Q^{min} \leq 44.4$. Noting that Q^{min} is constrained to multiples of 4, we obtain $q_L^{min} = 0$ and $q_H^{min} = Q^{min}/2$ for $Q^{min} \leq 20$, $q_L^{min} = 10$ and $q_H^{min} = (Q^{min} - 20)/2$ for $Q^{min} \geq 44$, while $q_L^{min} = -10 + 0.45Q^{min}$ and $q_H^{min} = 10 + 0.05Q^{min}$ for $20 < Q^{min} < 44$.

those in contribution behavior are not significant. This result can be rationalized by our theory if (some) high-type agents under effort based allocation feel to deserve a higher payoff than low-type agents ($\Delta_i > 0$) and thereby desire to keep some advantageous inequality ($Q^{min} < 22$).

Comparing *E-eqpay* and *E-MPCR-eqpay* therefore shows that an increase in marginal benefits does not necessarily enhance coordination, even though the distribution scheme is designed such that both players benefit. This additional treatment thereby further indicates that heterogeneities among players may obscure the performance of specific rule-based mechanisms, potentially because players have different views on what constitutes a fair distribution.

APPENDIX TO THE ELECTRONIC SUPPLEMENTARY MATERIAL (ESM)

Table 1ESM: Experimental design

Treatment	Stages	No. of subjects (ind. obs.)
R-VCM	contribution stage	48 (12)
E-VCM	real effort task, contribution stage	48 (12)
R-eqcont	minimum and contribution stage	48 (12)
E-eqcont	real effort task, minimum and contribution stage	48 (12)
R-eqpay	minimum and contribution stage	48 (12)
E-eqpay	real effort task, minimum and contribution stage	48 (12)
E-MPCR-eqpay	real effort task, minimum and contribution stage	48 (12)

Table 2ESM: Summary statistics for contributions and payoffs

Treatment	q_{all}	q_L	q_H	π_{all}	π_L	π_H
			Periods 1-5			
R-VCM	9.5	5.0	13.9	25.7	20.1	31.3
E-VCM	5.7	4.0	7.4	23.4	15.1	31.8
R-eqcont	8.8	6.7	10.9	25.3	17.4	33.2
E-eqcont	7.2	6.1	8.2	24.3	15.3	33.3
R-eqpay	7.4	2.7	12.1	24.4	19.1	29.8
E-eqpay	9.6	5.1	14.1	25.7	20.3	31.2
E-MPCR-eqpay	7.0	5.5	8.6	29.9	27.1	32.6
			Periods 6-10			
R-VCM	5.8	3.2	8.3	23.4	16.0	30.9
E-VCM	2.9	2.3	3.6	21.8	12.4	31.1
R-eqcont	7.6	6.4	8.7	24.5	15.7	33.4
E-eqcont	6.6	5.7	7.5	23.9	14.8	33.1
R-eqpay	6.5	3.1	10.0	23.9	17.4	30.5
E-eqpay	9.5	5.0	14.1	25.7	20.3	31.2
E-MPCR-eqpay	7.1	5.2	9.0	29.9	27.5	32.3

Note: q = average contributions: per group (q_{all}), for low-types (q_L) and for high-types (q_H), π = average payoffs: per group (π_{all}), for low-types (π_L) and for high-types (π_H)

Table 3ESM: Summary statistics for minimum proposals and voluntary contributions

Treatment	$Q_{min_p,L}$	$Q_{min_p,H}$	min (Q_{min_p})	min ($Q_{min_p,L}$)	min ($Q_{min_p,H}$)	$q_{min,L}$	$q_{min.H}$	$q_{delta,a}$	$q_{delta,L}$	$q_{delta,H}$
					Periods 1-5					
R-eqcont	57.1	46.6	26.3	46.1	31.7	5.5	7.7	2.2	1.2	3.3
E-eqcont	43.1	36.1	18.3	30.3	25.5	4.4	4.7	2.6	1.8	3.5
R-eqpay	54.4	41.0	23.8	44.7	27.1	1.5	10.5	1.4	1.3	1.6
E-eqpay	66.0	51.9	31.1	55.5	39.5	2.8	12.8	1.8	2.3	1.3
E-MPCR-eqpay	55.7	43.4	22.1	45.1	27.3	3.7	7.4	1.5	1.8	1.2
					Periods 6-10					
R-eqcont	59.8	44.8	26.0	49.2	31.9	5.7	7.3	1.1	0.7	1.4
E-eqcont	44.6	39.1	20.9	30.4	31.1	4.9	5.6	1.3	0.8	1.9
R-eqpay	58.1	34.8	24.4	48.7	25.3	2.4	9.8	0.4	0.7	0.2
E-eqpay	61.7	52.1	35.7	50.1	41.3	3.9	13.9	0.6	1.1	0.1
E-MPCR-eqpay	63.2	44.6	27.3	56.9	28.7	4.8	8.9	0.2	0.4	0.1

Note: Q_{min_p} = average minimum contribution proposals from low-type $\left(Q_{min_p,L}\right)$ and from high-type ($Q_{min_p,H}$), min(Q_{min_p}) = minimum of the minimum contribution proposals from low-type $\left(\min(Q_{min_p,L})\right)$ and from high-type $\left(\min(Q_{min_p,H})\right)$, q_{min} = average binding minimum contribution level: for low-type $\left(q_{\min,L}\right)$ and for high-type ($q_{\min,H}$), $q_{\text{delta}} = q_i - q_{min}$: for low-type $\left(q_{\text{delta},L}\right)$ and for high-type ($q_{\text{delta},H}$) and averaged over all players ($q_{delta,a}$)

Table 4ESM: Tests between treatments (MW-U Test)

	Treatment	*R-VCM*	*E-VCM*	*R-eqcont*	*E-eqcont*	*R-eqpay*	*E-eqpay*
q_i all	*E-VCM*	<					
	R-eqcont	>					
	E-eqcont		>**	<			
	R-eqpay	<		<			
	E-eqpay		>*		>	>	
	E-MPCR-eqpay		>		>		<
	Treatment	*R-VCM*	*E-VCM*	*R-eqcont*	*E-eqcont*	*R-eqpay*	*E-eqpay*
q_L	*E-VCM*	<					
	R-eqcont	>***					
	E-eqcont		>***	<			
	R-eqpay	<		<**			
	E-eqpay		>		<	>	
	E-MPCR-eqpay		>*		<		<
	Treatment	*R-VCM*	*E-VCM*	*R-eqcont*	*E-eqcont*	*R-eqpay*	*E-eqpay*
q_H	*E-VCM*	<**					
	R-eqcont	>					
	E-eqcont		>*	<			
	R-eqpay	<		<			
	E-eqpay		>**		>	>	
	E-MPCR-eqpay		>*		>		<
	Treatment	*R-VCM*	*E-VCM*	*R-eqcont*	*E-eqcont*	*R-eqpay*	*E-eqpay*
π_i all	*E-VCM*	<					
	R-eqcont	>					
	E-eqcont		>**	<			
	R-eqpay	<		<			
	E-eqpay		>*		>	>	
	E-MPCR-eqpay		>**		>		>
	Treatment	*R-VCM*	*E-VCM*	*R-eqcont*	*E-eqcont*	*R-eqpay*	*E-eqpay*
π_L	*E-VCM*	<**					
	R-eqcont	>					
	E-eqcont		>*	<			
	R-eqpay	<		>			
	E-eqpay		>**		>	>	
	E-MPCR-eqpay		>***		>*		>
	Treatment	*R-VCM*	*E-VCM*	*R-eqcont*	*E-eqcont*	*R-eqpay*	*E-eqpay*
π_H	*E-VCM*	>					
	R-eqcont	>***					
	E-eqcont		>***	<			
	R-eqpay	<		<***			
	E-eqpay		>		<***	>*	
	E-MPCR-eqpay		>		<		>*

Note: According to a MW-U test, the null hypothesis states that the median of two independent groups is equal. In our case, average contributions respectively payoffs per group in the last 5 periods serve as one observation. We compare rows with columns. *p<0.1, **p<0.05 and ***p<0.01. All tests are two-sided. Example: average contributions q_i of all players in *E-eqcont* are higher than in *E-VCM*, this difference is significant at the 5%-level

Table 5ESM: Tests between treatments (MW-U test): Minimum of minimum contribution proposals

	Treatment	*E-eqcont*	*R-eqpay*	*E-eqpay*	*E-MPCR-eqpay*
min (Q_{min_p})	*R-eqcont*	>	>		
	E-eqcont			<	<
	R-eqpay			<	
	E-eqpay				>
	Treatment	*E-eqcont*	*R-eqpay*	*E-eqpay*	*E-MPCR-eqpay*
min ($Q_{min_{p},L}$)	*R-eqcont*	>**	<		
	E-eqcont			<*	<**
	R-eqpay			<	
	E-eqpay				<
	Treatment	*E-eqcont*	*R-eqpay*	*E-eqpay*	*E-MPCR-eqpay*
min ($Q_{min_{p},H}$)	*R-eqcont*	>	>		
	E-eqcont			<	<
	R-eqpay			<	
	E-eqpay				>

Note: According to a MW-U test, the null hypothesis states that the median of two independent groups is equal. In our case, the average of the minimum of the minimum contribution proposal per group over the last 5 periods serve as one observation. We compare rows with columns. *p<0.1, **p<0.05. All. tests are two-sided. Example: average min ($Q_{min_{p},L}$) of low-type players in *R-eqcont* are higher than in *E-eqcont*, this difference is significant at the 5%-level

Table 6ESM: FGLS Random-effects regression of individual contributions and payoffs

VARIABLES	(1) q_i Periods 6-10	(2) q_i Periods 6-10	(3) q_i Periods 6-10	(4) π_i Periods 6-10	(5) π_i Periods 6-10	(6) π_i Periods 6-10
eqcont	1.815	2.535*	3.310***	0.891	0.260	-0.488
	(1.875)	(1.447)	(0.984)	(1.206)	(1.697)	(2.146)
eqpay	0.757	-1.700	-0.252	0.441	2.852	1.463
	(2.463)	(1.949)	(1.301)	(1.491)	(2.214)	(2.727)
MPCReqpay	4.102**	3.875***	3.046**	7.688***	13.82***	14.59***
	(1.846)	(1.421)	(1.274)	(2.275)	(4.014)	(4.054)
eff	-2.817	-2.761	-1.025	-2.026*	-1.790	-3.409*
	(1.761)	(1.728)	(0.954)	(1.213)	(1.104)	(2.048)
effXeqcont	1.729	1.403	-0.152	2.166	1.453	2.953
	(2.341)	(2.308)	(1.343)	(1.628)	(1.486)	(2.717)
effXeqpay	5.790*	5.723*	2.866	3.969*	3.638*	6.379
	(3.478)	(3.477)	(1.800)	(2.148)	(2.102)	(3.946)
high		3.391***	5.118***		16.57***	14.96***
		(1.128)	(1.628)		(1.043)	(1.597)
highXeqcont		-1.367	-2.914		1.455	2.948
		(1.474)	(2.221)		(1.392)	(2.136)
highXeqpay		4.846**	2.000		-4.727**	-1.996
		(1.900)	(2.561)		(1.940)	(2.569)
highXMPCReqpay		0.795	2.559		-11.55***	-13.19***
		(1.494)	(1.679)		(3.696)	(3.743)
highXeff			-3.500*			3.264
			(2.111)			(2.001)
highXeffXeqcont			3.165			-3.052
			(2.786)			(2.713)
highXeffXeqpay			5.715			-5.486
			(3.833)			(3.765)
male	-0.473	-0.879	-0.862	2.115**	1.135**	1.121**
	(0.877)	(0.776)	(0.778)	(1.028)	(0.575)	(0.567)
exp	-0.00345	-0.0551	-0.0523	0.0982	0.0182	0.0156
	(0.0621)	(0.0575)	(0.0569)	(0.0770)	(0.0416)	(0.0410)
eco	-0.177	0.0732	0.217	-0.217	0.664	0.532
	(1.107)	(0.965)	(0.971)	(1.138)	(0.710)	(0.711)
Constant	6.118***	4.917***	3.977***	21.75***	14.24***	15.12***
	(1.808)	(1.414)	(1.135)	(1.282)	(1.408)	(1.770)
Observations	1,670	1,670	1,670	1,670	1,670	1,670
R-sq	0.05	0.15	0.15	0.07	0.56	0.56

Note: We consider individual level random effects, i.e. one observation for one individual corresponds to the panel variable and the period sets the time variable: 334 individual observations x 5 periods = 1,670 total observations. Robust standard errors in parentheses, adjusted for group clusters, *** p<0.01, ** p<0.05, * p<0.1

Definition of variables

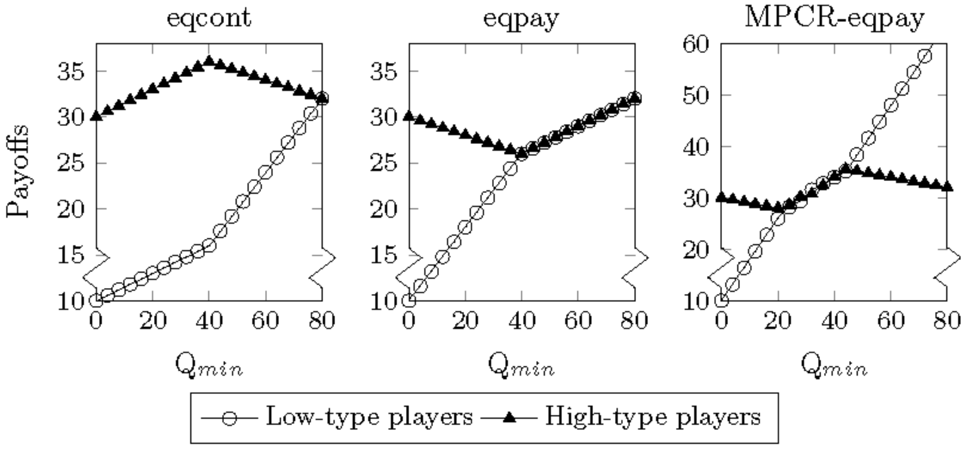
q_i	Individual contribution of subject i to the public good
payoff	Subject i's payoff
eqcont	= 1 if subject i played treatment *R-eqcont*/*E-eqcont*, 0 else
eqpay	= 1 if subject i played treatment *R-eqpay*/*E-eqpay*, 0 else
MPCReqpay	= 1 if subject i played treatment *E-MPCR-eqpay*, 0 else
eff	= 1 if endowment was allocated based on real effort task, 0 else
effX*burden sharing rule*	= 1 under effort allocation and played *burden sharing rule*, 0 else
high	= 1 if subject i is a high-type player, 0 else
highX*burden sharing rule*	= 1 if subject i is a high-type player <u>and</u> played *burden sharing rule*, 0 else
highXeff	= 1 if subject i is a high-type player <u>and</u> effort allocation of endowments
highXeff*burden sharing rule*	= 1 if subject i is a high-type player <u>and</u> effort allocation of endowments <u>and</u> subject i played *burden sharing rule*, 0 else
male	= 1 if subject i is male, 0 if female
exp	number of experiments subject i has taken part in MaXLab
eco	= 1 if subject i is economics student, 0 else

Estimation strategy:

We report results from using a random-effects Feasible Generalized Least Square estimator (RE FGLS) for determining differences in individual contributions and payoffs. 2 individuals had to be removed from the econometric analysis due to missing sociodemographic information. Moreover, the discussion of the regression results throughout the paper is based on standard errors computed at individual levels. This approach explicitly considers individual heterogeneity across participants. For robustness check, we further applied pooled FGLS regressions without explicitly modeling of the individual heterogeneity but allowing the error terms of observations from one single individual to be correlated over time. We specified the model in a way that error correlation declines as the time differences between observations increase. That is, the decision behavior of the current period may be influenced by some effects from past periods (that do not enter the regression as explanatory variables) but this effect lowers if time lags increase. In the FGLS random effect model, error correlation can only be captured by clustering observations on the individual level without accounting for declining error correlation over time. We apply a AR(2) approach which adequately fits to the error correlation observed after running a standard OLS regression.

For estimating contribution decisions, we further run a panel Tobit model. This estimator controls for the fact that the dependent variable (individual contributions to the public good) may be left-censored with a known lower limit of 0 (28.71% of all contribution decisions). We do not specify an upper limit since endowments vary across individuals. Specification tests suggest the Tobit model not to be sensitive to the number of quadrature points used in the estimation process. Similar to the regression on payoffs, results for contribution behavior in the pooled model are similar to the random effects model. We therefore do not include these results in the paper but provide the tables upon request.

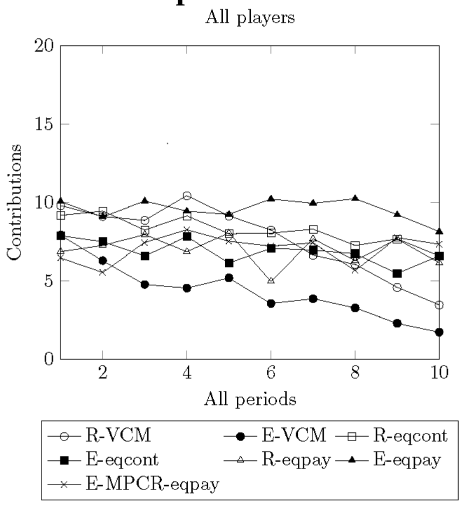
Figure 1ESM: Payoffs for the respective burden sharing schemes (without voluntary contributions)

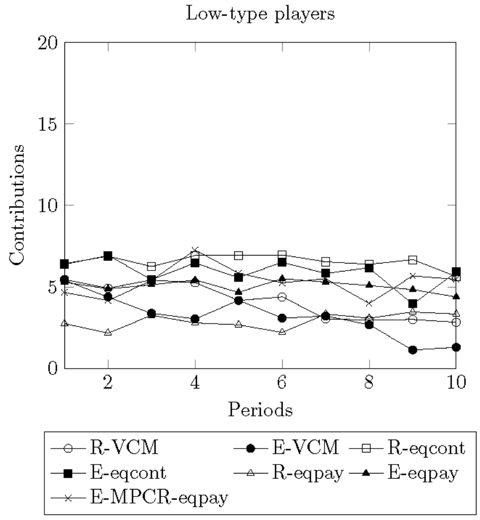


	eqcont	*eqpay*	*MPCR-eqpay*
Proposal Q_L^{min}	80	80	80
Proposal Q_H^{min}	40	(i) 80 if $Q_L^{min} \geq 68$ (ii) 0 else	(i) 44 if $Q_L^{min} \geq 40$ (ii) 0 else
q_L	10	(i) 10/(ii) 0	(i) 10/(ii) 0
q_H	10	(i) 30/(ii) 0	(i) 12/(ii) 0
π_L	16	(i) 32/(ii) 10	(i) 35.2/(ii) 10
π_H	36	(i) 32/(ii) 30	(i) 35.6/(ii) 30

Note: in *eqpay* and *MPCR-eqpay*, (i) is the payoff-dominant equilibrium

Figure 2ESM: Mean contributions over periods





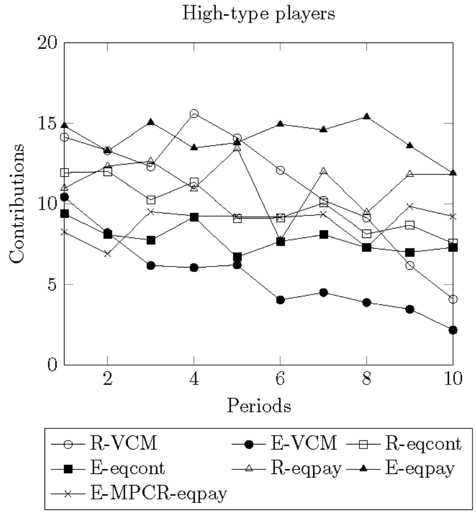
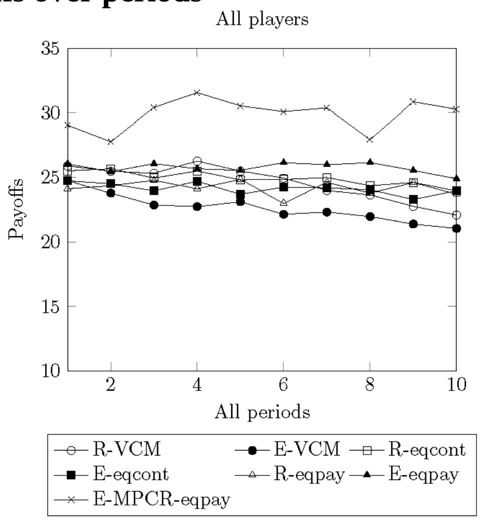
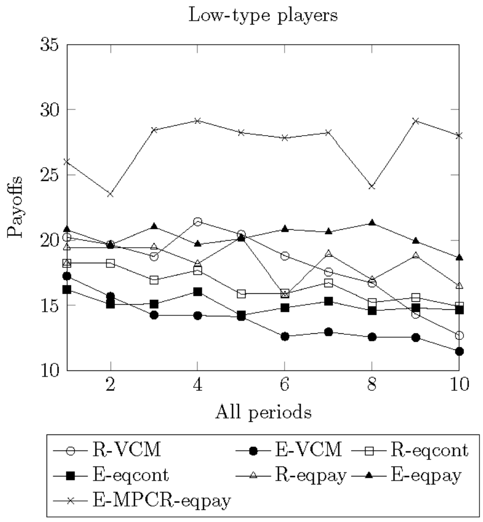
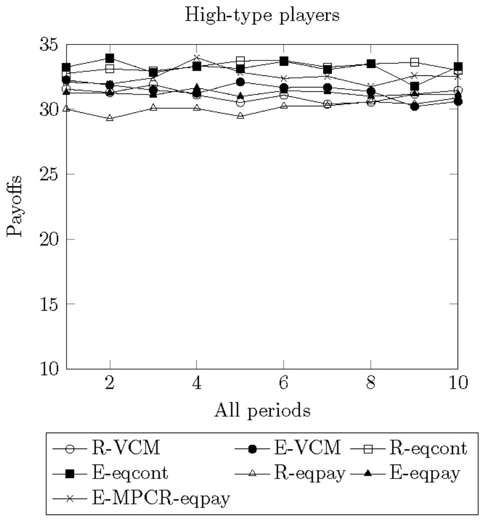


Figure 3ESM: Mean payoffs over periods







Instructions (for treatment E-MPCR-eqpay)

Welcome to the Magdeburg Experimental Laboratory MaXLab!

Please read these instructions carefully and should you have any questions please signal us by opening the door or a show of hands. Please do not talk to other participants. Please do not use any electronic devises like smartphones.

In the laboratory experiment you are taking part in, you can win money depending on your decisions and the decisions of your fellow players. Your payoff from the experiment will be calculated in LabDollars (LD). The conversion rate between € and LD is **1:2**, i.e. 1 LD are 0.50 €. All your decisions made in the experiment will remain **anonymous**. Only the experimenter will know your identity, but your data will be treated confidentially.

The experiment consists of an **earning stage** (stage 1) and a **game** (stage 2). In order to become familiar with the game, please read the following instructions. Thereafter you will get additional information on the earning stage via screen.

Rules of the game

Now you will learn more about the rules of the game you will be participating in. Altogether **4 players** take part in the game, so besides you there are 3 more players. The group of 4 players has an initial endowment of 80 points. Two players have an initial endowment of 10 points each ("low-type") and two players have an initial endowment of 30 points each ("high-type").

Whether you are a low- or a high-type agent will be depend on your effort in the earning stage before the game that is described in the following starts

Your task in the game, and also your fellow players' task, is to decide how many points you would like to contribute to a **joint project**. Your **contribution, q,** can be set between 0 and 10 points (only integer numbers) if you are a low-type agent or between 0 and 30 points (only integer numbers) if you are a high-type agent.

Your individual and also your fellow players' **payoff** will be calculated as follows:

Your payoff = (E – your contribution to the project) + b·(sum of all contributions of all players to the project)

The factor b is $b = 0.8$ for low-types and $b = 0.4$ for high-types.

Assuming you to be a low-type: Your payoff (in LD) will be calculated as follows:

Payoff = (**10** – your contribution to the project) + **0.8**·(sum of all contributions of all players to the project)

That is, if for example all other players have contributed altogether 70 points to the project and your contribution is 10, then your payment will be:

Payoff = (10 – 10) + 0.8·(70 + 10) = 64

If, however, all other players have contributed a total amount of 70 points and you do not contribute anything, your payoff will be:

Payoff = (10 – 0) + 0.8•(70 + 0) = 66

If you are a high-type, then your payoff (in LD) will be calculated as follows:

Payoff = (**30** – your contribution to the project) + **0.4**·(sum of all contributions of all players to the project)

The information, whether you are a low-or a high-type will be displayed on your screen.

There are **two stages** in this game. In **stage 1** you decide on the **minimum contribution,** $Q_{min,}$ that should be contributed to the joint project by the group as a whole. Simultaneously, all other players make their suggestions on a group minimum contribution level, Q_{min}. The minimum of the suggested levels, min(Q_{min}), is then decisive for contributions in the second stage. In **stage 2** you decide on your contribution, q, to the joint project, thereby keeping in mind that for each player an individual minimum contribution level, q_{min}, will be calculated from min(Q_{min}). The implementation of these individual minimum contributions, q_{min}, yields to **equal** payoffs or at least to a harmonization of payoffs. Please note that the harmonization of payoffs is subject to the constraint that Q_{min} will be achieved.

An example: If the minimum group contribution level is Q_{min} = 24 low-type players are bound to an individual minimum contribution of q_{min} = 1 and high-type agents face q_{min} =11. Assuming these contribution levels, the payoff for a high-type subject would be 26.2 LD and for a low-type subject would amount 25.8 LD. If, however, Q_{min}= 64, minimum contribution for high-types is $q_{min} = 22$ and for low-types $q_{min} = 10$. The payoff for a high-type subject would be 27.2 LD and for a low-type subject would amount 44.8 LD.

The game consists of **10 separate rounds** in each of which you will play the same two-stage game remaining the same type. The three other players you will interact with will be the same in every round. In every round you decide how many points, q you would like to contribute to the joint project. In each round you will receive information on individual contributions (q_1 to q_4), payoffs ($Payoff_1$ to $Payoff_4$) and minimum contribution proposals (Q_{min1} to Q_{min4}) for all your group members and average levels (D).

If the experiment is complete you will receive the **payoff of one of the rounds** in € (according to the conversion rate stated above). The round to be paid out will be determined **randomly**. This means you should behave in **each** round as if it were the round relevant for payoff. In the beginning, **two trial rounds** will be played which are **not relevant for payoff**.

Control questions

If you have read the instructions and do not have any questions, please answer the following control questions:

Please assume that calculating individual minimum contribution levels, q_{min}, leads to 1 for each of the two low-type players and to 11 for the two high-type players respectively. Please indicate the range of your possible contribution levels to the joint project if you are a low-type.

More than _____ and less than or equal _____

Please assume that your contribution as a high-type to the joint project is 20 points. The contributions of the three other group members are 0, 10 and 30. What is your payoff?

My payoff is _______

Please assume that your contribution as a low-type to the joint project is 0 points. The contributions of the three other group members are 0, 10 and 30. What is your payoff?

My payoff is _______

Please assume that all three players have contributed their entire endowment to the project. Which of the following contribution levels results in **your** highest payoff if you are a high-type (please check the according box)?

O 0 points O 5 points O 10 points O 30 points

Please assume that all three players have contributed entire endowment to the project. Which of the following contribution levels results in the highest payoff **for the group** if you are a high-type (please check the according box)?

O 0 points O 5 points O 10 points O 30 points

If you have answered all questions, please signal us. We will then check your answers. The game begins when all participants in the experiment have successfully completed the test.

Good luck in the experiment! The MaXLab-Team

Instructions

Welcome to the Magdeburg Experimental Laboratory MaXLab!

Please read these instructions carefully and should you have any questions please signal us by opening the door or a show of hands. Please do not talk to other participants. Please do not use any electronic devises like smartphones.

In the laboratory experiment you are taking part in, you can win money depending on your decisions and the decisions of your fellow players. Your payoff from the experiment will be calculated in LabDollars (LD). The conversion rate between € and LD is **1:2**, i.e. 1 LD are 0.50 €. All your decisions made in the experiment will remain **anonymous**. Only the experimenter will know your identity, but your data will be treated confidentially.

[Additional paragraph for effort based allocation of endowments:

The experiment consists of an **earning stage** (stage 1) and a **game** (stage 2). In order to become familiar with the game, please read the following instructions. Thereafter you will get additional information on the earning stage via screen.]

Rules of the game

Now you will learn more about the rules of the game you will be participating in. Altogether **4 players** take part in the game, so besides you there are 3 more players. The group of 4 players has an initial endowment of 80 points. Two players have an initial endowment of 10 points each ("low-type") and two players have an initial endowment of 30 points each ("high-type").

[Additional paragraph for random allocation of endowments:

There will be a **random draw** whether you are a low- or a high-type.]

[Additional paragraph for effort-based allocation of endowments:

Whether you are a low- or a high-type agent will be depend on your effort in the earning stage before the game that is described in the following starts]

Your task in the game, and also your fellow players' task, is to decide how many points you would like to contribute to a **joint project**. Your **contribution, q,** can be set between 0 and 10 points (only integer numbers) if you are a low-type agent or between 0 and 30 points (only integer numbers) if you are a high-type agent.

Your individual and also your fellow players' **payoff** will be calculated as follows:

Your payoff = (E − your contribution to the project) + 0.4·(sum of all contributions of all players to the project)

Assuming you to be a low-type: Your payoff (in LD) will be calculated as follows:

Payoff = (**10** – your contribution to the project) + 0.4·(sum of all contributions of all players to the project)

That is, if for example all other players have contributed altogether 70 points to the project and your contribution is 10, then your payment will be:

Payoff = (10 – 10) + 0.4·(70 + 10) = 32

If, however, all other players have contributed a total amount of 70 points and you do not contribute anything, your payoff will be:

Payoff = (10 – 0) + 0.4·(70 + 0) = 38

If you are a high-type, then your payoff (in LD) will be calculated as follows:

Payoff = (**30** – your contribution to the project) + 0.4·(sum of all contributions of all players to the project)

[Additional paragraph in

eqcont:

There are **two stages** in this game. In **stage 1** you choose a **minimum contribution,** $Q_{min} \geq 0$, that should be contributed to the joint by the group as a whole. Simultaneously, all other players make their suggestions on a minimum contribution level, Q_{min}. The minimum of the suggested levels, $\min(Q_{min})$, is then decisive for contributions in the second stage. In **stage 2** you decide on your contribution, q, to the joint project, thereby keeping in mind that for each player an individual minimum contribution level, q_{min}, will be calculated from $\min(Q_{min})$ such that each player has to contribute at least a quarter of the minimum contribution level of the group, i.e. $q \geq 0.25 \cdot \min(Q_{min})$. Please keep in mind that low-types cannot contribute more than 10 LD such that high-types may contribute more to achieve the minimum group contribution level.

eqpay:

There are **two stages** in this game. In **stage 1** you decide on the **minimum contribution,** Q_{min}, that should be contributed to the joint project by the group as a whole. Simultaneously, all other players make their suggestions on a group minimum contribution level, Q_{min}. The minimum of the suggested levels, $\min(Q_{min})$, is then decisive for contributions in the second stage. In **stage 2** you decide on your contribution, q, to the joint project, thereby keeping in mind that for each player an individual minimum contribution level, q_{min}, will be calculated from $\min(Q_{min})$. The implementation of these individual minimum contributions, q_{min}, yields to **equal** payoffs or at least to a harmonization of payoffs. Please note that the harmonization of payoffs is subject to the constraint that Q_{min} will be achieved.

An example: If the minimum group contribution level is $Q_{min} = 64$ low-type players are bound to an individual minimum contribution of $q_{min} = 6$ and high-type agents face $q_{min} = 26$. Assuming these contribution levels, the payoff for each player would be 29.6 LD. If, however, $Q_{min}= 20$, minimum contribution for high-types is $q_{min} = 10$ and for low-types $q_{min} = 0$. The payoff for a high-type subject would be 28 LD and for a low-type subject would amount 18 LD.

]

The game consists of **10 separate rounds** in each of which you will play the same two-stage game remaining the same type. The three other players you will interact with will be the same in every round. In every round you decide how many points, q you would like to contribute to the joint project. In each round you will receive information on individual contributions (q_1 to q_4), payoffs ($Payoff_1$ to $Payoff_4$) and [in **eqcont** and **eqpay**: minimum contribution proposals (Q_{min1} to Q_{min4})] for all your group members and average levels (D).

If the experiment is complete you will receive the **payoff of one of the rounds** in € (according to the conversion rate stated above). The round to be paid out will be determined **randomly**. This means you should behave in **each** round as if it were the round relevant for payoff. In the beginning, **two trial rounds** will be played which are **not relevant for payoff**.

Control questions

If you have read the instructions and do not have any questions, please answer the following control questions:

[Additional question in

eqcont

Please assume that the four players suggested 4, 16, 52 and 72 as **minimum contribution levels** for the group as a whole to the joint project. Please indicate the range of your possible contribution levels to the joint project.

More than _____ and less than or equal _____

Is it possible that the minimum contribution rule forces players to contribute more than their own minimum contribution suggestions?

O yes   O no

eqpay

Please assume that calculating individual minimum contribution levels, q_{min}, leads to 2 for each of the two low-type players and to 22 for the two high-type players respectively. Please indicate the range of your possible contribution levels to the joint project if you are a low-type.

More than _____ and less than or equal _____

]

Please assume that your contribution as a high-type to the joint project is 20 points. The contributions of the three other group members are 0, 10 and 30. What is your payoff?

My payoff is _______

Please assume that your contribution as a low-type to the joint project is 0 points. The contributions of the three other group members are 0, 10 and 30. What is your payoff?

My payoff is _______

Please assume that all three players have contributed their entire endowment to the project. Which of the following contribution levels results in **your** highest payoff if you are a high-type (please check the according box)?

O 0 points   O 5 points   O 10 points   O 30 points

Please assume that all three players have contributed entire endowment to the project. Which of the following contribution levels results in the highest payoff **for the group** if you are a high-type (please check the according box)?

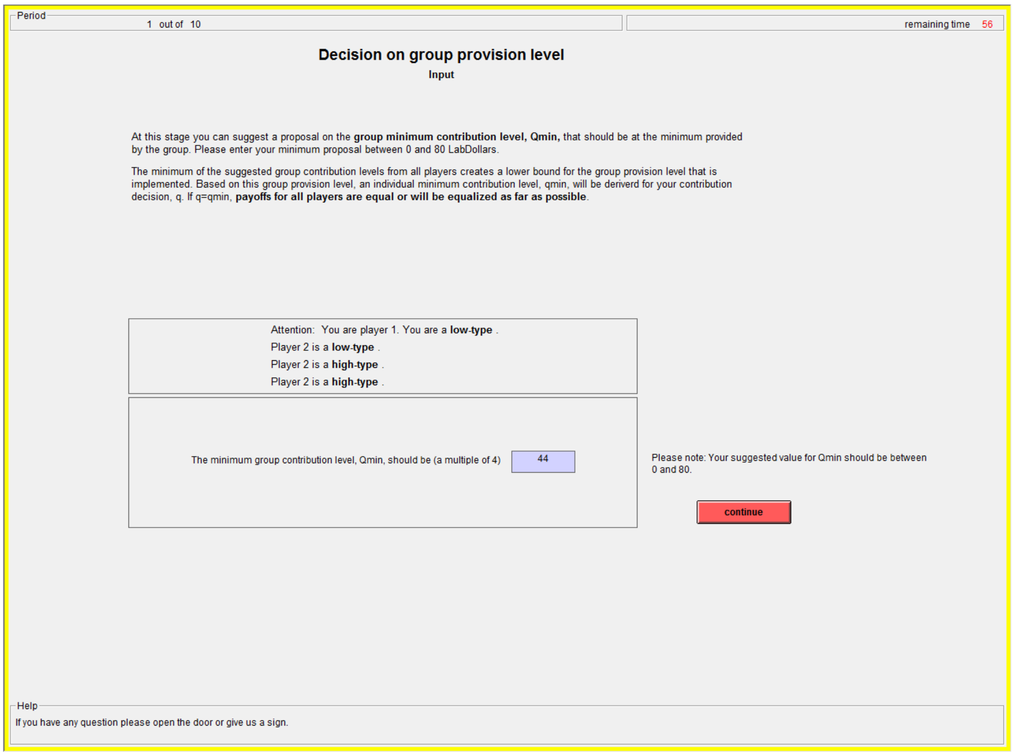
O 0 points   O 5 points   O 10 points   O 30 points

If you have answered all questions, please signal us. We will then check your answers. The game begins when all participants in the experiment have successfully completed the test.

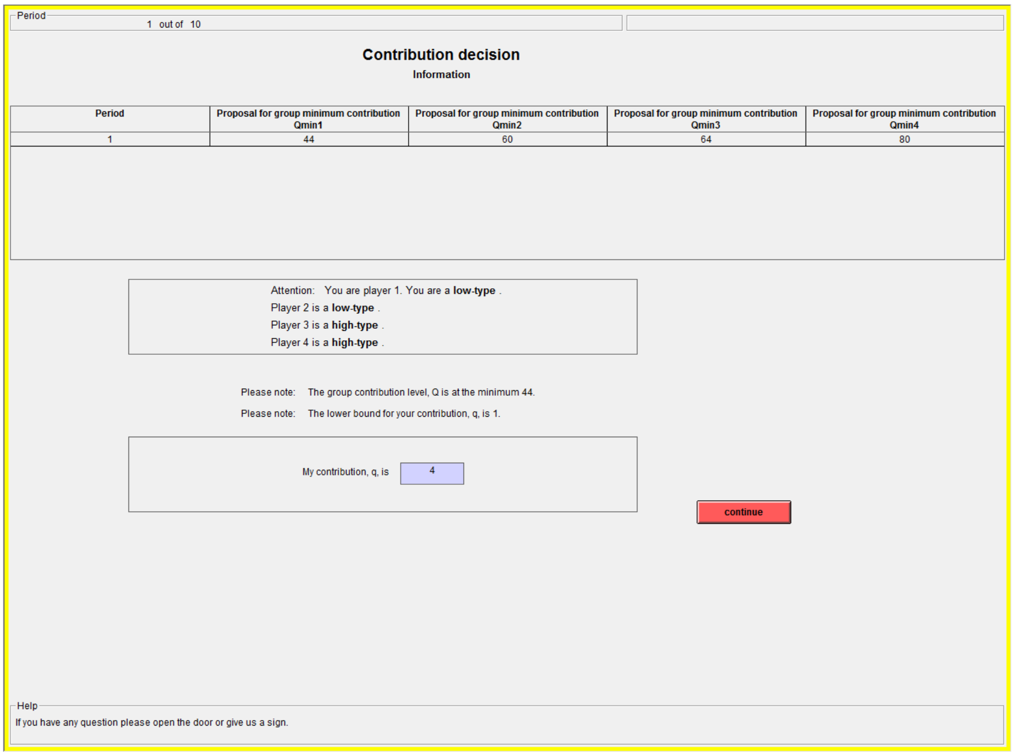
Good luck in the experiment! The MaXLab-Team

Screenshots for *eqpay* treatments

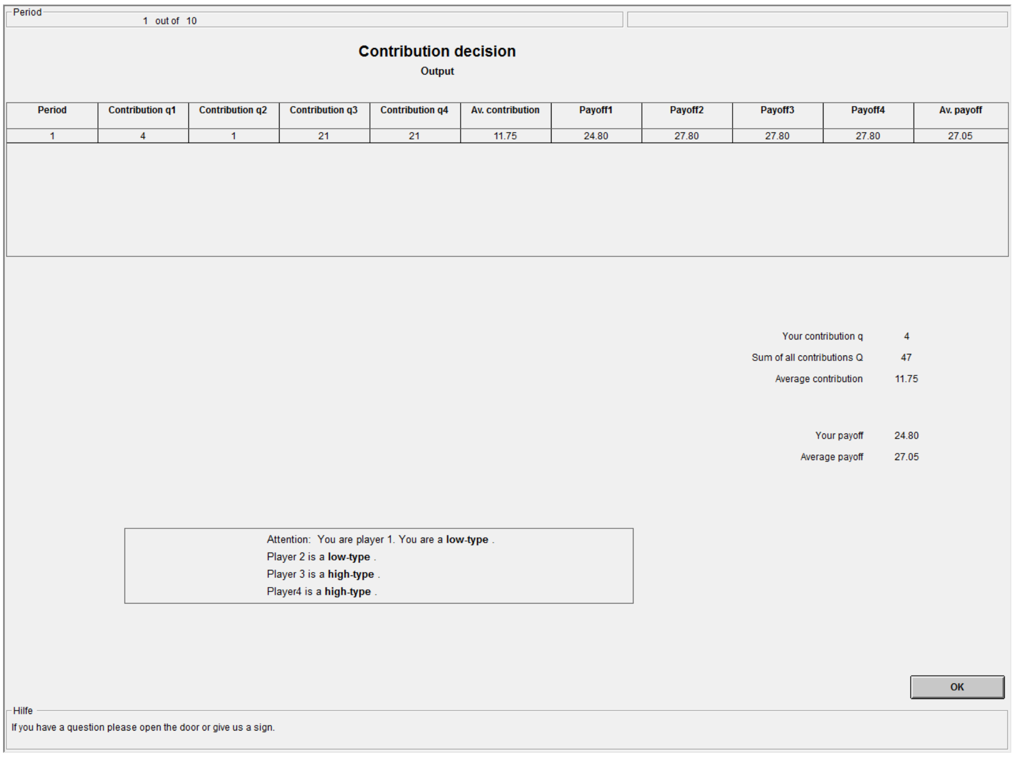
Decision on group provision level



Decision on individual contributions



Payoffs


Period
1 out of 10
Contribution decision
Output
Period | Contribution q1 | Contribution q2 | Contribution q3 | Contribution q4 | Av. contribution | Payoff1 | Payoff2 | Payoff3 | Payoff4 | Av. payoff
1 | 4 | 1 | 21 | 21 | 11.75 | 24.80 | 27.80 | 27.80 | 27.80 | 27.05
Your contribution q 4
Sum of all contributions Q 47
Average contribution 11.75
Your payoff 24.80
Average payoff 27.05
Attention: You are player 1. You are a low-type .
Player 2 is a low-type .
Player 3 is a high-type .
Player4 is a high-type .
OK
Hilfe
If you have a question please open the door or give us a sign.