Institution Bundling in Public Good Games with Heterogeneous Players

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Abstract

We investigate the formation of institutions in public good games in heterogeneous groups. If the players differ in their return from the public good, a conflict between maximizing contributions and equal payoffs for all players arises. Addressing this conflict we study the interaction of two distinct institutions. One fixes contributions at the potential maximum, the other eliminates inequity through redistribution. We vary the voting option players have: (1) both institutions can be adopted separately; (2) they are bundled and can only be adopted together. One might expect that the reduction of voting options is able to align conflicting interests, while the unrestricted voting options lead to coordination failure. This view is supported by our experimental data. Thus the bundling of multiple institutions allows even heterogeneous individuals to efficiently overcome the collective action problem inherent in public good games.

Keywords: endogenous institution formation, public good games, laboratory experiment, voting behavior

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1 Introduction

Institutions that govern all participating parties and demand identical commitment from all of them are frequently found to be particular effective in overcoming social dilemmas. Questions, however, arise if the returns from institutions are not evenly distributed among participating parties. If neither side payments nor renegotiation are possible, parties profiting less might be inclined to reject institutions or bills that favor another party disproportionally.[1] Thus redistribution might serve as a powerful tool to supplement existing institutions by increasing participation and contributions of heterogeneous players.

Nonetheless, even the tool of redistribution might not be enough to overcome social dilemmas effectively in the light of heterogeneity. Naturally the question arises how it is combined with the already existing institution. There are two possible ways: Profits from efficient institution formation can be redistributed separately or in combined fashion. If presented separately, one party might not want to share returns from an initiative equally, since it would give up a precious advantage. This in turn would seriously lower the possibility of success. However if both initiatives are bundled, it serves as the one and only possible solution to overcome the social dilemma at hand. The practice to bundle different bills is already extremely common in Congress of the United States.[2]

In short, if returns from certain initiatives are heterogeneous, redistribution might serve as an easy way to increase support for them. One might expect that it is necessary to link the decision on the base initiative with the decision on redistribution. Otherwise the lacking commitment to either institution might render the process of institution formation more difficult. This hypothesis is confirmed in this paper.

This paper analyzes how different voting options on two interrelated institutions affect voting behavior in the presence of heterogeneous agents in a linear public good game. We consider agents that differ in their return form the public good. Institutions in the context of public good games

[1]Examples for this behavior are legion. The behavior of the republican party during the financial shutdown 2013 can be thought of as prime example. Willingly accepting the harsh consequences - also for their own party - in order to prevent the current administration from gaining large credit for their ability to avoid the fiscal cliff, describes such a situation.

[2]For instance, each year congress is supposed to adopt twelve bills in order to finance the operations of government, which are not necessarily interrelated. However it is also possible to bundle several or even all bills into one "omnibus" spending bill. This option has been found to be much more likely to pass and to receive fewer amendments (?? (Han)) than individual bills. This method was just recently used for the fiscal year 2014.

are mainly designed to increase contributions to the possible maximum. But equal and efficient contributions across agents will always result in unequal payoffs and in equity among participants, if agents are heterogeneous. A conflict between efficiency and equity arises from this setup. We introduce a second institution that is specifically designed to eliminate this conflict. It ensures equity among all participants at all times. This second institutions can either be introduced separately or can be bundled directly into one single institution. The latter will ensure in efficiency and equity simultaneously. We use the unanimity voting rule to govern the institution selection process. It ensures that participants cannot be governed by institutions against their will.

The theoretical predictions for these situations under standard preferences are straight forward. Any institution that is able to eliminate the social dilemma should receive unanimous support. However, if the agents are inequity averse, they might be willing to reject these institutions that fix contributions and lead to unequal monetary outcomes. The possibility to redistribute is predicted to eliminate this problem. If both concepts are bundled, the social dilemma should be eliminated even in the presence of heterogeneous agents. However if agents are able choose among the two concepts of redistribution and fixed contributions, the task to coordinate the conflicting interests could decrease contributions.

The data from the corresponding experiment support these predictions. The experiment featured five treatments differing in the institutions available to the subjects. In all treatments the subjects were divided into two types differing in their return from the public good, in order to introduce a conflict of interest among them. The two institutions addressed specifically one type of subject each. They either induced redistribution among subjects or fixed contributions to the public good. The treatments deployed the institution separately, simultaneously or bundled. Institutions that guarantee equity and efficiency in contributions among subjects receive the highest support. The simultaneous, but not bundled availability of two conflicting institutions, that both induce efficiency decreases the contributions to the public good compared to the combined case by 13%.

This paper addresses two distinct branches of literature. The presence of a social dilemma and its mitigation relates this paper to the literature on endogenous institution formation. The impact of conflicting interests in the presence of multiple initiatives is a topic in the literature on voting mechanisms.

Over the last decade a broad literature on institutions designed specifically to overcome social dilemmas has been established, partially focusing on decentralized institutions (Ostrom et al.

(1992), Fehr and Gächter (1999)), partially on centralized institutions (Falkinger and Fehr (2000), Kosfeld et al. (2009), Gerber and Wichardt (2009)). In succession numerous articles endogenized the process of institution formation either by explicit voting mechanisms (?? (Car), Ertan et al. (2009), Tyran and Feld (2006)) or by "voting by feet" (Gurerk et al. (2009)).
The redistribution of profits carried out centrally (Falkinger and Fehr (2000)) or by participating subjects (Sausgruber and Tyran (2007)) is able to overcome the social dilemma in homogeneous situations if presented exogenously. It remains unclear whether subjects would adopt this option, if they would have to give up potential advantages. Such potential advantages arise under heterogeneity of subjects in a public good game. Nonetheless even in such situations a norm of equity seems to be prevalent among subjects (Fisher et al. (1995), Reuben and Riedl (2013)). This supports evidence that social preferences are a key determinant for voluntary contributions. Under homogeneous condition this fosters the establishment of institutions that govern all subjects equally (Gerber et al. (2013), Fischer and Nicklisch (2007)). This in turn makes the unanimity voting rule highly desirable for such contexts. The conflicting interest concerning the two different institutions presented in this paper might converse this highly desirable feature of the unanimity voting rule.
A restriction of voting options might be able to align conflicting interests. Engelmann and Grimm (2012) support this hypothesis in the presence of private information by testing empirically the mechanism of Jackson and Sonnenschein (2007)[3]. They find that reductions of voting options as well as reputation built through repeated interaction are able to introduce truthful behavior and efficient voting. Along similar lines Güth et al. (2004) analyze the efficiency of a direct voting system in presence of multitude of initiatives to be implemented in succession. In their particular design majority voting on the different initiatives is able to induce efficient voting behavior, while bundling them leads to similar effects.

This paper focuses on the introduction of multiple institutions in the presence of a social dilemma. We suspect that the bundling of institutions in order to achieve equity and efficiency at the same time will increase approval rates. We conduct a laboratory experiment to test this hypothesis. The outline of the paper is as follows. Section 2 describes the experimental design. In Section 3 the theoretical predictions for the subjects' behavior will be derived, using both

[3]Their mechanism overcomes the problem that in presence of private information no incentive compatible mechanism is able to implement the ex-ante socially efficient solution. They address this issue by introducing an exogenous "budget" that limits the subjects' representation options in accordance with their empirical distribution.

standard and social (in the line of Fehr and Schmidt (1999)) preferences. Section 4 presents and discusses the empirical results. Section 5 concludes.

2 Experiment

In natural environments, the complexity of the process of institution formation makes it particularly difficult to draw causal conclusions about the conditions under which institutions come into being. As a starting point, we therefore use the controlled environment of laboratory experiments to study the endogenous formation of institutions. In this section, we present the design of our lab experiment and describe the implemented procedures.

Design

The basic game underlying our experiments is a standard public-goods game (VCM game), as it is frequently used in the literature to study elements of social dilemmas in the lab (e.g., Isaac and Walker (1988)). In the game, each player has a private endowment E. Players simultaneously decide on the amount c_i that they want to contribute to a public good, with $0 \leq c_i \leq E$, $i = 1, ..., n$. The returns from the public good are enjoyed by all players, independent of their individual contribution c_i. In some treatments, players are heterogeneous, i.e., not all players benefit from the public good to the same extent. To model heterogeneity, we allow the marginal per capita return (MPCR) γ_i from the public good to vary across players. Given the contributions of all players $(c_1, ..., c_n)$, player i's material payoff π_i is thus given by

$$\pi_i = E - c_i + \gamma_i \sum_{i=1}^{n} c_i.$$

In all treatments, parameters for γ_i are chosen such that a social dilemma arises. Efficiency, defined as the maximized sum of payoffs of all players, is reached if all players contribute their entire endowment. Yet, from an individual perspective, each player's material payoff is maximized by not contributing to the public good, regardless of the other players' contributions. Formally, this implies $\sum_{i=1}^{n} \gamma_i > 1$ and $\gamma_i < 1 \quad \forall i$.

The main treatment conditions feature an additional institution formation stage that takes place before players make their actual contribution decision to the public good. In this first stage the players decide on the implementation of one or two institutions that govern the contribution stage. Implementation of the institution is based on the unanimity rule, i.e. only if the institution is accepted by all participating parties it is implemented.[4] There are two kinds of institutions employed in the different treatments. The first institution determines the contributions made by the involved agents to the public good. In order to reach efficiency, contributions by all agents are set to be the maximum amount i.e their entire endowment E.[5] If the institution is adopted all contributions are fixed during the ensuing VCM. The second institution governs the distribution of the profits from the public good after all contributions were made. If adopted the institution will ensure equal total payoffs for all parties involved independently of their respective contribution to the public good. This redistribution of the payoffs from the original public good is done automatically and not by the involved players. Voting and implementation of the institutions are assumed to be costless.[6] Groups consisting of three players were formed. In each round all players received an identical endowment $E = 20$. The composition of all groups is identical. Within every group there are two types of players, which vary in their return from the public good (MPCR) γ_i. They all consist of two subjects with a return to the public good of $\gamma_h = 0.75$ and one subject with $\gamma_l = 0.5$. Consequently the overall return from the public good is equal to 2.

Across treatments the available institutions are varied. In the benchmark case (VCM) no institution at all is available and only the classical public good game is played. The second type of treatment employs one of each described institution separately. In the treatment FIX the institution -if adopted - forces all players to contribute their entire endowment of 20 tokens. This results in payoffs of 45 tokens for the players with $\gamma_h = 0.75$ and of 30 tokens for the player with $\gamma = 0.5$. In the treatment RE only the redistribution institution was available. If adopted all players would receive the same payoff independently of their contributions and their individual type.[7] In a third step the two different institution were combined in two different ways. The treatment SIM featured both institutions simultaneously. Both institutions were available and

[4]The unanimity rule is an obvious candidate to govern the implementation process. Cooperation becomes conditional on the cooperation of all other parties involved. Additionally it grants veto rights to all participants. Thus it is perfectly suited to mimic a political process, that requires support of all involved parties.

[5]We assume additionally that a -not-modelled- sanctioning institution is installed simultaneously. It is assumed to be deterring enough to ensure compliance with the contribution rules.

[6]In general the theoretical predictions are not affected by costs, as long as they do not outweigh the gain provided by the corresponding institution.

[7]The following example illustrates this mechanism further: If the player with $\gamma = 0.5$ and one of the players with $\gamma = 0.75$ contribute each 15 tokens to the public good, while the last player contributed 0 tokens. Under normal circumstances the payoffs would have been 27.5 and 42.5 tokens. However the institution distributes the total return from the public good (in this example 60 tokens) such that every subject receives the same payoff. Here the total payoff is 90 tokens. Consequently with the institution evry subject would receive 30 tokens.

players could vote on them separately. The institution which received unanimous support was installed with the same consequences as above. That implies that the adoption of both institutions led to a payoff of 40 tokens for every player. The treatment Bun bundled both institutions such that the same vote had to be cast on both institutions. Players had to support either both of them or neither. Consequently in the case of three positive votes all agents received 40 tokens.

Procedures

The experiment was computerized by using z-Tree (Fischbacher (2007)) and conducted at the BonnEconLab at the University of Bonn in 2012 and 2013. Students were recruited from all majors using Orsee (Greiner (2004)). In order to keep the results of the different treatments as comparable as possible all setup details and parameters were kept constant throughout the experiment. Each treatment was run twice. Except for one session of the treatment VCM which featured only 21 participants each session featured 24 participants. In total 237 subjects participated. The subjects were randomly allocated into groups of three, resulting in 16, respectively 15 independent observations per treatment. Each session lasted about 90 minutes. Interaction took place within the same group of three players (partner matching protocol), but it was anonymous and decisions were taken in private at the computer. The experiment consisted of 20 identical rounds. After each round the subjects were informed about the voting decisions and contribution of the other two team-members. Written instructions were distributed prior to the experiment and read out aloud. Afterwards subjects had the possibility to ask questions for clarification and had to answer several control questions. Throughout the entire experiment tokens were used as artificial currency, with 40 tokens equaling 1 Euro. The endowment for each single round was 20 tokens. The average payment for the subjects ranged between 14.03 Euro in the VCM treatment and 19.22 Euro in the treatment Bun. The payments were made in cash directly after the experiment.

3 Behavioral Predictions

For each treatment, we characterize players' equilibrium behavior under two alternative assumptions concerning the shape of the utility function. First, we assume standard risk-neutral agents i.e each player's utility function coincides with the monetary payoff of the game, π_i. Second, we generalize this framework to include potential social preferences: in addition to valuing own monetary payoff, players might suffer from inequality in monetary payoffs between themselves and other players, i.e. players being inequity-averse (compare Fehr and Schmidt (1999)). In our

Table 1: Behavioral Predictions Based on Standard Preferences

	VCM	Fix	Re	Bun	Sim
voting	-	implement institution	implement institution	implement both institutions	implement 1 institution
contribution	$c = 0$	$c = 20$	$c = 20$	$c = 20$	$c = 20$

experiment players might vote against the installment of institutions that decrease their utility, either due to redistribution or resulting inequality. Hence, we consider the model of Fehr and Schmidt (1999) as a natural choice to derive predictions for our setup. In the remainder of this section, we will provide an intuition for the behavioral predictions for each treatment under the two alternative assumptions on the shape of players' utility functions using the parameters of our design. More general proofs are provided in the Appendix, section A.

Table 1 summarizes the behavioral predictions for players with standard preferences. In any VCM game, players with standard preferences are predicted not to contribute to the public good at all. Whenever $\gamma_i < 1$, contributing does not pay off from an individual perspective.

In every treatment featuring an institution the players are assumed to apply backward induction. If the institution has not been implemented in the voting stage, the players on the contribution stage are back in the VCM game analyzed above. They are predicted not to contribute to the public good. Therefore, each player's monetary payoff will be equal to the initial endowment of 20 tokens. The player will be supporting an institution, whenever the utility obtained under the institutional regime is larger than without ($U(INST) \geq U(VCM)$). In the case of the fixed contributions the resulting payoffs would be 45 tokens for the player with a high return and 30 tokens for the player with a low return. By the definition of a social dilemma the institution increases the monetary payoffs, hence in equilibrium the institution is anonymously supported. The same is true for the treatment Bun which results in payoffs of 40 tokens for every participating player. In the treatment Re the institution potentially changes the payoff function of the ensuing VCM. Under the conditions of redistribution it is denoted by $\pi_i = \frac{1}{3}\{60 + \sum_{j=1}^{3} c_j\}$. Consequently every player's payoff is increasing in their own contribution. In equilibrium this institution will incentivize every player to contribute the entire endowment of 20 tokens to the public good in order to maximize the payoff. Thus in equilibrium the payoff with institution is 40 tokens for every agent and the players will support it in the voting stage. The case of the simultaneous availability is more complex. Every combination of institutions alone will increase each players earnings, consequently at least one institution will always be used. But both institutions at the same time will never be used. If all agents vote to fix contributions, the players with the high return from the public good, will reject the institution in order to avoid being stuck with 40 tokens instead of 45. If, however the low type is rejecting the initiative to fix contributions, the best response of the high types is to support the redistribution. Consequently either the contributions will be fixed or the payoffs will be redistributed if both institutions are available at the same time but never both. Nonetheless standard theory predicts efficiency in both cases.

Table 2 displays the behavioral predictions for players with social preferences. If players have social preferences, there are multiple equilibria in the standard public good game.[8] The intuition is as follows: If all players are sufficiently averse to advantageous inequality (β sufficiently high)[9], they are all willing to exactly match any possible contribution level $c \in [0, E]$ of the other players to equalize payoffs. If players are not or only mildly averse to advantageous inequality (β low), the only equilibrium remains the one with zero contributions of all players. The basic mechanism driving the existence of equilibria with positive contributions is the same for VCMs featuring heterogeneous players as with homogeneous players. If players are sufficiently averse towards earning more than others, they contribute positive amounts as soon as the other players contribute positive amounts to prevent an unequal payoff distribution. However, to achieve equal payoffs for all three players, the low type contributes less than the two high types.

In the treatments Re and Bun the inclusion of inequity aversion into the utility function does not change the behavioral predictions at all. Both institutions ensure equality in monetary payoffs, simultaneously efficiency is induced by forcing (Bun) or incentivizing (Re) the players to contribute their entire endowment. Hence the payoff will be strictly larger than in the Vcm, as no equilibrium with full contributions by all players exists in the treatment Vcm.

The predictions change in the treatments Fix and Sim if players are inequity averse. Here the potential inequality that is created by fixing the contributions at the maximum without redistribution is the potential source of rejection. The low type players that would receive only 30 tokens, whilst the others receive 45, would reject that, if their measure for disadvantageous disutility is large (α). The same holds true if the players receiving 45 tokens were extremely sensitive towards

[8]The proof is provided in Fehr and Schmidt (1999).

[9]In the model of Fehr and Schmidt (1999), the parameter β captures the intensity of aversion to advantageous inequality, while the parameter α measures the degree of aversion to disadvantageous inequality.

Table 2: Behavioral Predictions Based on Social Preferences

	VCM	FIX	RE
voting	-	low type rejects if α_l high	implement institution
contribution	$(c_h, c_h, c_l = 2/5c_h)$, $c_h \in [0, 20]$ if $\beta_h > 2/7$ and $\beta_l > 2/5$; (0,0,0) otherwise	if reject: as in VCM otherwise: $c_h = c_l = 20$	$c = 20$
	SIM		BUN
voting	low type rejects FIX if α_l high high type supports RE if β_h high		implement both institutions
contribution	$c = 20$		$c = 20$

advantageous disutility (β large). Agents of both types might even prefer the outcome of a VCM without any contributions over this unequal split. Consequently no institution at all might be installed in treatment FIX. In treatment SIM however, definitely the additional availability of the second institution should be able to mitigate this problem. If the players are sufficiently inequity averse, they are able to overcome the social dilemma by employing the redistributional institution solely.[10] If the players are less inequity averse only the contributions should be fixed. If high types are highly adverse to advantageous disutility they also prefer an equal split over an unequal one and both institutions will remain. In all cases the maximum amount should be contributed to the public good ensuring efficiency. Nevertheless coordination for this equilibrium and the possibility of vendettas arising in repeated games make this treatment much more susceptible to players voting against one institution.

Building on these theoretical predictions, we will derive hypotheses on the differences in subject behavior across treatments. These hypotheses will be put to test in the ensuing results section. For the derivation of said hypotheses we will assume that a substantial part of subjects is actually to some degree averse towards disadvantageous outcomes. This claim is substantiated by the results of the questionnaire that was conducted in line with the experiment. Subjects were asked about their potential behavior in the classical ultimatum and dictator games. We find that only 16% of all subjects indicate that they would accept an offer below 40% of the total amount

[10]Consequently the interest of the low type would then be able to dictate the entire outcome of the game, as the claim to vote against fixed contributions is entirely credible.

divided by the proposer.

In the next chapter we use testable hypotheses derived from the behavioral predictions in order to discuss and interpret the evidence from the laboratory experiment. Each treatment will be analyzed separately first. Then the overall success of the main treatments Bun and Sim in terms of institution formation and payoff generation will be compared. In a last step the potential drawbacks of the simultaneous availability of institutions in repeated interactions will be discussed.

4 Results

All descriptive statistics used in the following chapter can also be found in comprised fashion in the Tables 3 and 4 in the Appendix B.

4.1 Baseline treatment VCM

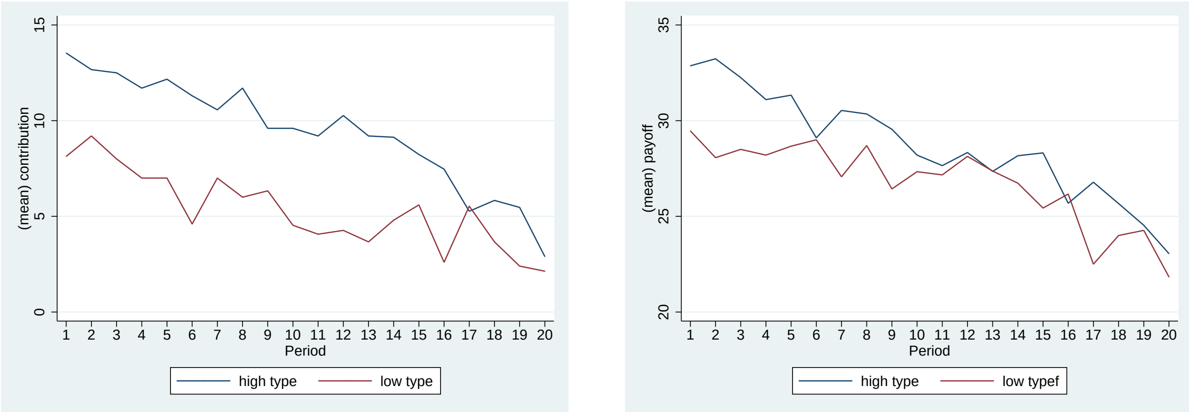
We start with the analysis of the standard public good game, as this is baseline treatment on which others are based.

Hypothesis 1:
Players with a lower valuation contribute less to the public good, keeping payoffs across types constant.

Figure 1 displays contributions and payoffs over time separated by type. As usually in public good games contributions exhibit a downward trend, which is highly significant (Spearman's Rho=-0.4706, $p < 0.01$). On average subjects contribute 8.05 tokens. High types contribute 9.42 tokens, while low type 5.33 contribute tokens. Standard deviations are rather high with 7.07 for the high types and 4.33 for the low types and can be partially explained by the downward trend visible in figure 1. Thus the first part of hypothesis 1 is confirmed: On average low types contribute less to the public good. A Mann-Whitney test using the 15 matching groups as independent observation confirms this difference to be highly significant ($p < 0.01$).[11] As payoffs are a linear function from contributions the general picture translates from contributions to payoffs.

[11]All subsequent Mann-Whitney tests use matching groups as independent observations. Consequently 15 and 16 independent observations are used for all test. All tests concerning time trends are based on 1 observation per matching group and period, resulting in 300 and 320 observations.

Figure 1: Average contribution and payoffs in treatment Vcm by type



Again the downward sloping time trend is visible and also highly significant. Nonetheless, the lower contributions of the low types induce a smaller gap between the payoffs between high types and low types as identical contributions would have created. On average the high types obtain a payoff of 28.7 with a standard deviation of 6.47. The low types receive on average 26.75 tokens (standard deviation 5.45). Due to the high the variance across time period the difference is not significant (Mann-Whitey test $p = 0.16$). Consequently we can support the tendency of hypothesis 1: Subjects with a lower valuation contribute less to the public such that the resulting payoffs across types are almost constant. All these results confirm the results of Fisher et al. (1995).

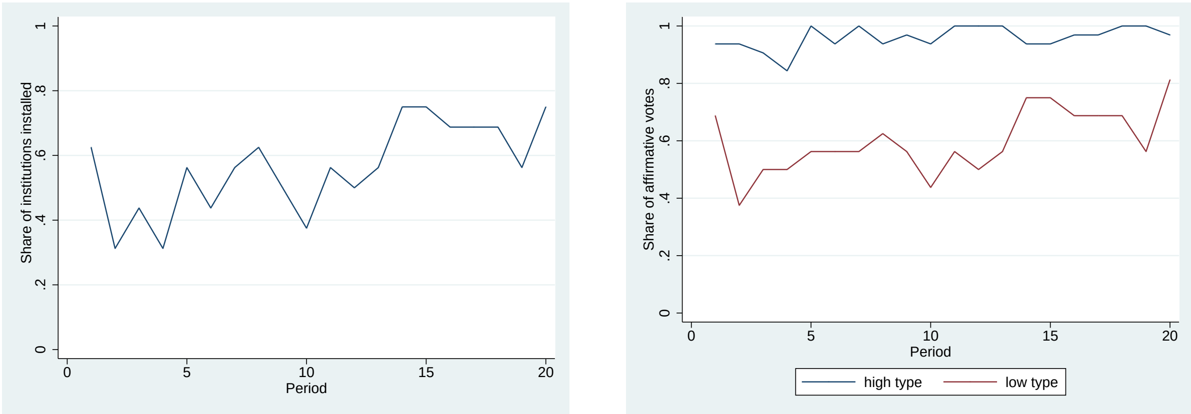
4.2 Single Institutions

In the next step we will look at the performance of the individual institutions Fix and Re. This will build the foundation upon which the following part will discuss whether the treatments featuring both institutions create larger contributions to the public good than the individual institutions alone.

Hypothesis 2:
In the treatment Fix the institution is not installed in all cases. Rejections of the institution arise mainly from subjects with a low valuation.

In the treatment Fix the institution is installed in 56% of all possible instances. Figure 2 reveals that the number of institutions formed increases slightly over time (Spearman's Rho=0.654, $p < 0.01$). Separating the underlying voting behavior across the two different types reveals that

Figure 2: Institution formation and voting behavior in treatment Fix



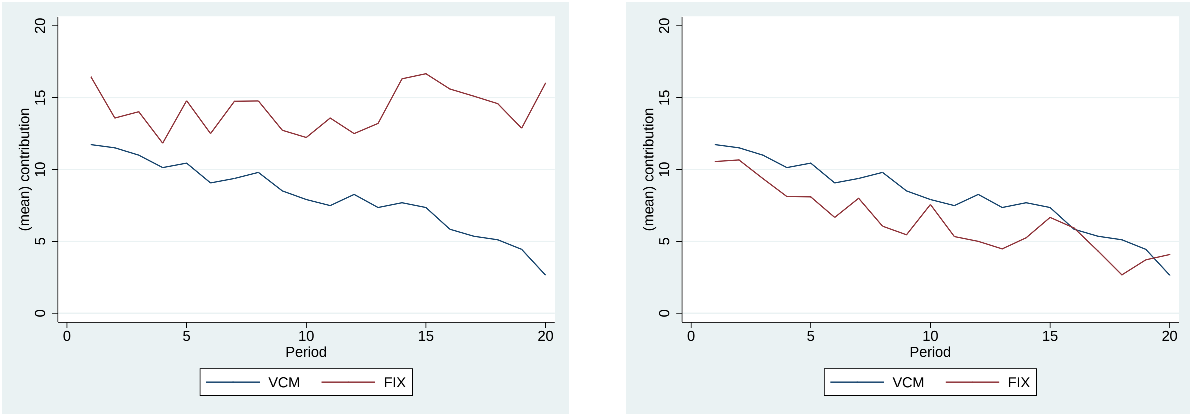
the results are mainly driven by the low types' rejections of the institution. With 96% affirmative votes the institution receives almost the unanimous support of the high types, while it gathers only 60% of votes with the low types. Across both types the support for the institution is increasing over time, even more so for the low types(Spearman's Rho = 0.571, $p < 0.01$ for the low types and 0.472, $p = 0.04$ for the high types).

As the left-hand side of Figure 3 shows, even though the institution is rejected frequently the average contributions to the public good are higher than in the baseline treatment. The average contributions rise to 14.2 tokens (standard deviation 7.98). The difference is highly significant (Mann-Whitney $p < 0.01$). If the institution is not installed the low types contribute 4.2 tokens, while the high types contribute 8.1. As in the baseline treatment the low types seem to react to their lower return by contributing less than the high types. Due to the fixed contributions the payoffs of player are now lower than the payoffs of their counterparts with a high valuation (28.2 vs. 37.2 tokens).

The contributions in cases where no institution had been established are slightly, but not significantly lower than in the baseline Vcm (Mann-Whitney $p = 0.12$). Overall the contributions exhibit the same time trend as the baseline treatment.[12] Overall this development supports the

[12]This stands in contrast to the usual result in the literature on public goods. Institution formation usually serves as a selection device of cooperative subjects into institutions, such that more uncooperative subjects remain in the standard VCM. This contrast can easily be explained by the possible selection of cooperative but inequity averse subjects into the standard VCM. It is backed up by the fact, that subjects, which exhibited a larger degree of inequity aversion in the unincentivized questionnaire following the experiment, have higher tendency to reject the institution. For this we correlate the minimal acceptable offer of an ultimatum game with the voting behavior

Figure 3: Average contributions including and excluding groups with successful institution formation in treatment Fix



hypothesis, that the higher contributions are indeed driven by the successful implementation of the institution and not by the pure availability of it.

Hypothesis 3a:

In treatment Re the institution receives almost unanimous support.

In the treatment Re the institution is installed in 79% of all cases. As in the case of treatment Fix the share of institutions installed increases of time (Spearman's Rho=0.45, $p < 0.05$). A split across types reveals no large differences. Low types favor the instalment of the institution in 97% of all cases, while the support of high types is slightly lower at 90%. The difference in voting behavior is yet significant (Mann-Whitney test $p = 0.02$). Only the voting patter of of high types exhibits a significant time trend. Spearman's Rho $= 0.03$, $p = 0.54$ for the low type and $= 0.163$, $p < 0.01$ for the high types. [13]

As the contributions are not exogenously fixed in case an institution is installed, it is important to determine, whether the subjects indeed increase their contributions to the efficient maximum, once the institution is in place. Across all periods the subjects contribute on average 15.6 tokens to the public good.

Hypothesis 3b:

Contributions in treatment Re reach the efficient level, if the institution is installed.

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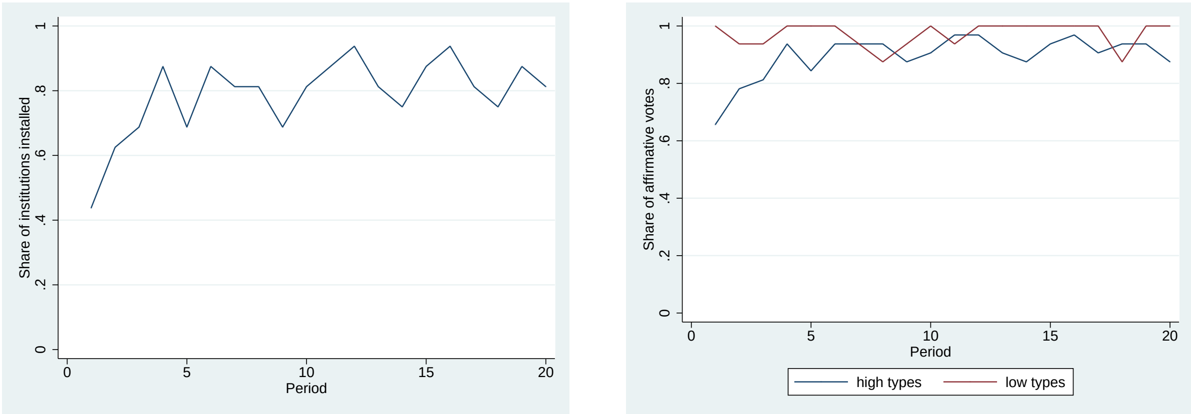
of low types (Correlation -0.11, $p = 0.05$).

[13]Consequently the increase in overall institution formation is driven by the high types and coincides with the decrease in contributions once no institution is installed.

Figure 4: Institution formation and voting behavior in treatment RE

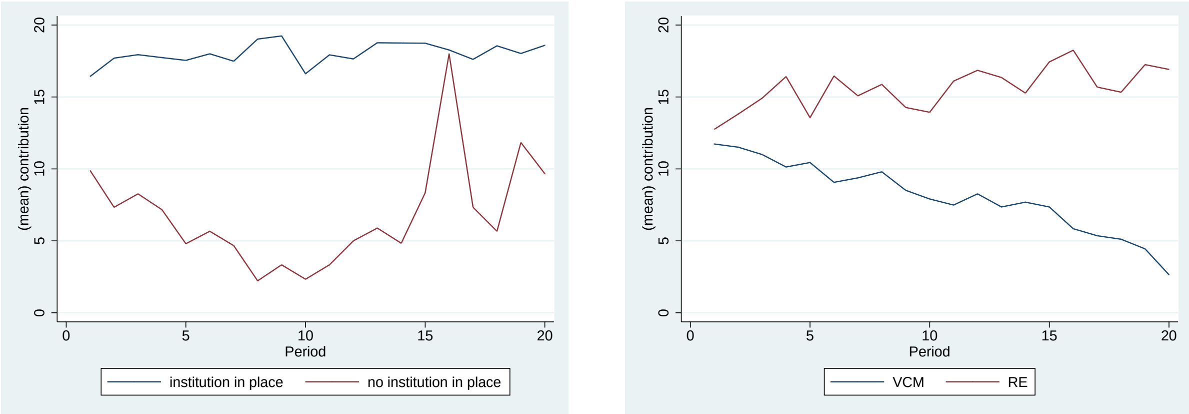


The left-hand side of Figure 4 displays the average contribution depending on the outcome of institution formation over time. The contributions rise quickly close to the efficient level. As expected by the nature of redistribution almost no difference in contributions between the two types can be observed, if the institution is in place. The high types contribute 18.2 tokens on average (standard deviation 4.4), while the low types contribute 18 tokens on average (standard deviation 5.04). If the institution is not installed a pronounced difference between the two types is visible again. Low types contribute 5.3 tokens and high types 7.3 tokens on average. Thus we conclude that it is almost, but not entirely possible to induce full contribution using solely the means of redistribution. Compared with the results of the baseline treatment it is obvious that redistribution is able to increase the average contributions drastically. The result is highly significant. A Mann-Whitney test yields $p < 0.01$. As in treatment FIX the increase hinges on successful institution formation, since contribution without redistribution displays clearly a lower trajectory. During the first periods the trend is similar to the baseline treatment. In the later periods it is driven by the behavior of singular groups. Comparing the results of treatment RE with the results of treatment FIX shows, that, while RE is able to induce more institutions to be formed (Mann-Whitney test, p=0.053), the overall effect on average contributions is not significant (Mann-Whitney test, p=0.41).

4.3 Treatment SIM

When analyzing the process of institution formation in the core treatments SIM and BUN, we have to be aware of the fact that in treatment SIM four different situations can arise. Either no, one or

Figure 5: Average Contribution depending on institution formation in treatment Re



two institutions can be installed. Whenever at least one institution is installed contribution are predicted to reach the efficient level.[14]

Hypothesis 4a:
At least one institution is installed in in almost all cases.

Hypothesis 4 can be confirmed only to a certain degree. Institutions are implemented in 74% of all possible cases. The number of institutions formed increases slightly over time (Spearman's Rho=0.403, $p = 0.058$). Differentiating the institutions into the different possibilities yields, that both institution were installed in 35% of all cases. Only the contributions were fixed in 31%, while solely redistribution was established in only 8% of all cases. Especially the high prevalence of both institution being installed hints either at a high degree of inequity aversion by the high type subjects or at a reciprocal exchange of votes among the different types. This question will be investigated in part 4.6 in greater detail. The voting behavior is in line with the behavior predicted in part 3. Each type of player votes more frequently for that institution that offers it the larger benefits. High types vote in favor of fixed contributions in 94% of all times and while they support the redistribution in only 68% of all cases. For low types the picture is just the opposite: 73% for fixed contributions and 88% for redistribution. The voting behavior over time does not display any significant time trends, only the support of high types for the fixed contributions rises over time (Spearman's Rho=0.227, $p < 0.01$). In line with the results of treatment Fix we find

[14]If one were to argue, that rejections of institutions are merely a result of errors or trembling hands on the side of the subjects, one would expect a larger share of institution installed in treatment Sim than in any other treatment. Treatment Sim offers two chances at installing an institution.

Figure 6: Share of groups with at least one institution formed in treatment Sim

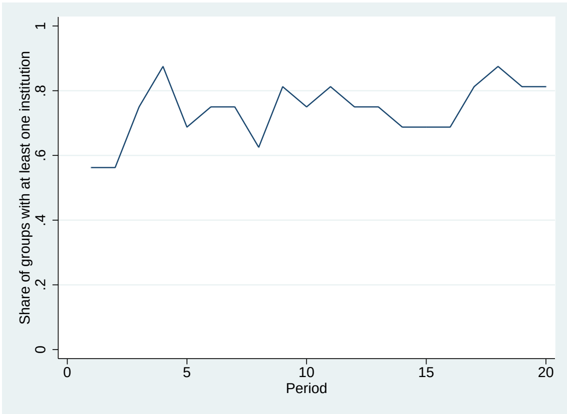
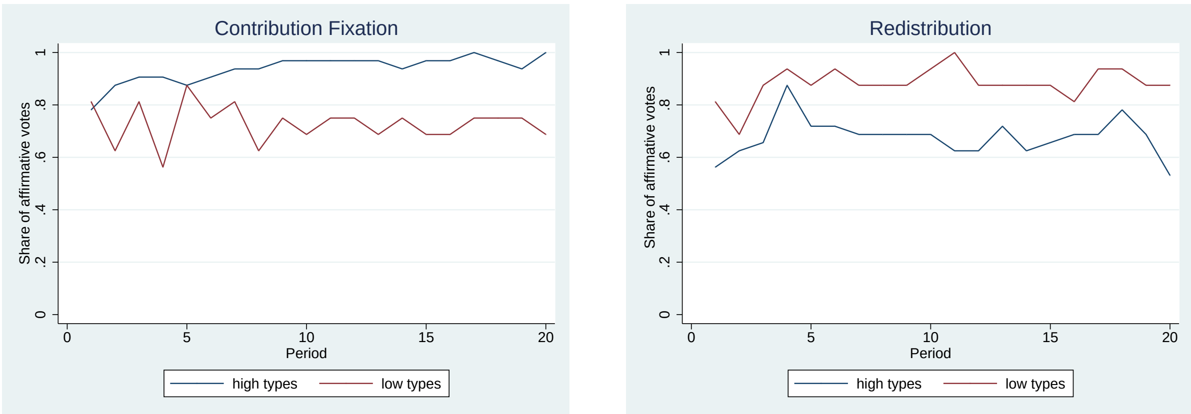


Figure 7: Voting beahvior on the two institutions by subject type in treatment Sim

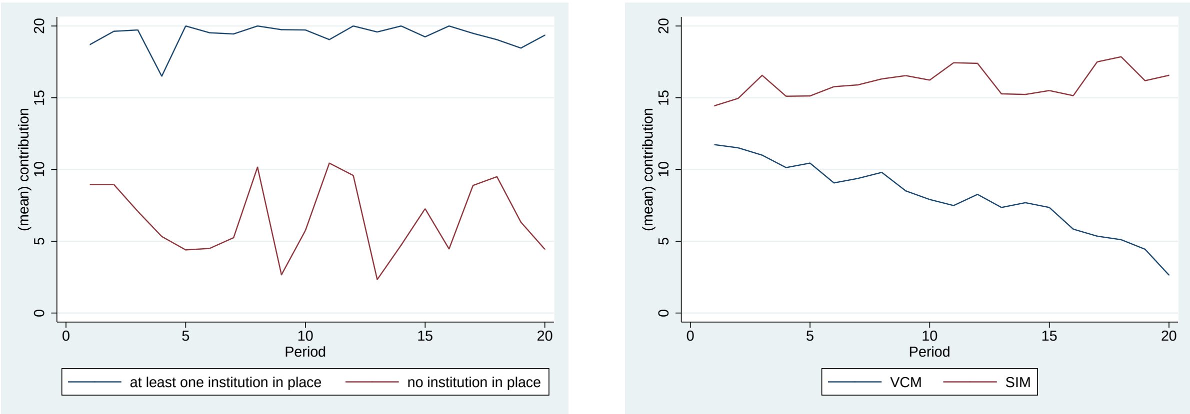


a correlation for the low types between inequity aversion as reported in the questionnaire and rejections of the institution that fixes contributions (Correlation -0.16, $p > 0.01$).

Hypothesis 4b:
Contributions in treatment Sim reach the efficient level.

The laboratory evidence is able to support this hypothesis only partially. Average contribution reach 16 tokens. The development over time is displayed in Figure 8. Overall contributions are clearly on a higher level than in the baseline treatment. Additionally contributions increase over time. The left-hand side of Figure 8 reveals that this is due to an increase in overall institution formation and not due to increased contributions with or without institutions. Due to the high prevalence of fixed contributions, the average contributions are nearly identical across

Figure 8: Average contribution depending on institution formation in treatment Sim



types if at least one institution is installed. The high types contribute 19.4 (standard deviation=3) tokens the low types contribute 19.2 (3.3). As in all previous treatments the absence of all institutions decreases contributions markedly. Then the average contribution decrease to 8.2 (high types) and 3.7 (low types) tokens (standard deviations 7.5 and 5.7). If institutions are selected the simultaneous availability is able to induce almost efficient contributions, but the lack of institution formation decreases the overall efficiency of this particular voting procedure.
Comparing again the result of the treatment with the two previous treatments that featured institutions we find that average contributions are roughly on the same level as in the treatment Re (16.1 vs. 15.6 tokens) and Fix (16.1 vs.14.2 tokens). Both differences are not significant. A Mann-Whitney test yields $p = 0.174$ compared to treatment Fix and $p = 0.8652$ compared to treatment Re. The same is true for institution formation. The number of institutions formed lies between treatment Re and Fix and is not significantly different from either.

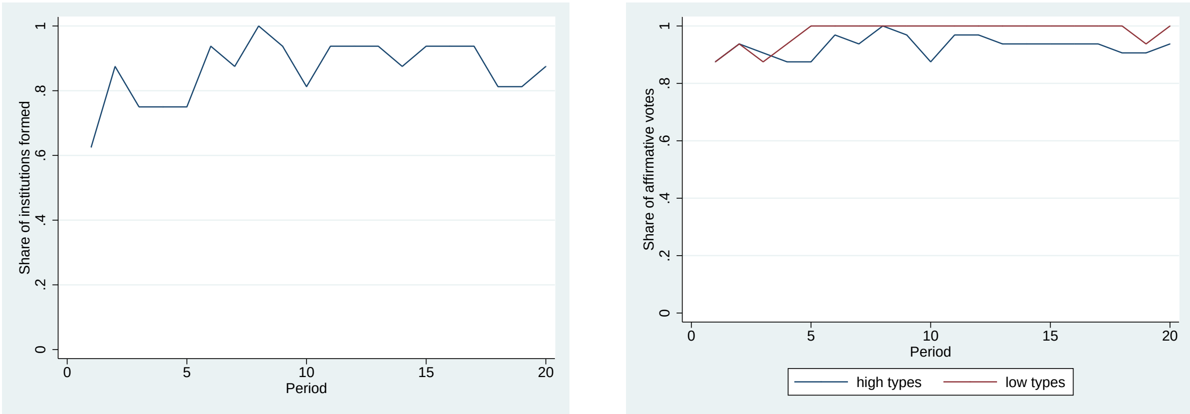
4.4 Treatment BUN

In a last step we want to determine the effect of a change in the voting options. For this end the only difference between treatments Bun and Sim is the range of option the subjects can vote upon. In treatment Bun the decisions of subjects are restricted, such that they either have to support both institutions or none. The data from the laboratory experiment show that this eliminated the potential conflicts that arise in treatment Sim.

Hypothesis 5:

Treatment Bun receives unanimous support and no differences can be observed in voting behavior

Figure 9: Institution formation and voting behavior in treatment BUN

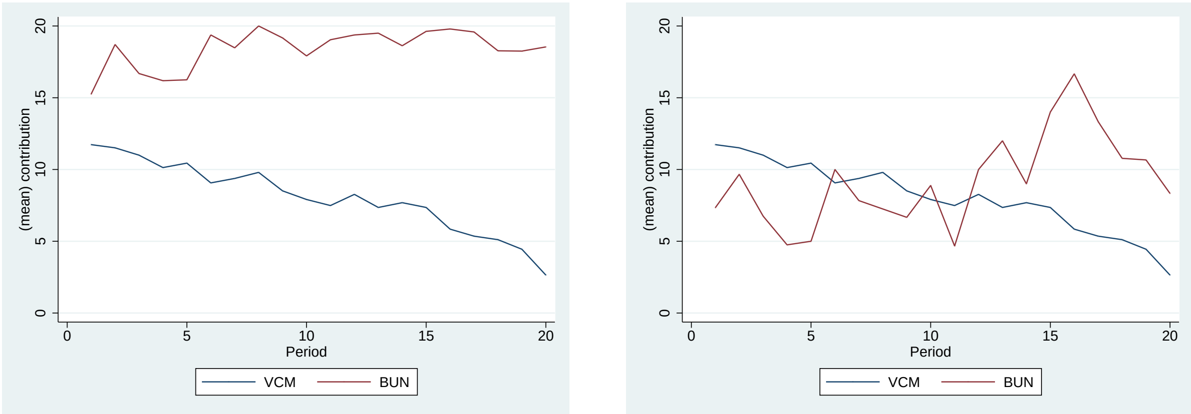


across the types.

In treatment BUN the institution is installed in 87% of all cases. Figure 9 illustrates that after a short learning period the institution is installed in nearly all groups. Consequently the time trend is slightly, but not significantly positive (Spearman' Rho=0.34, $p = 0.14$). The voting behavior across types is nearly identical. The institution receives close to unanimous support in both groups. The high types vote in favor 93% of the time, low types even 98%. Yet the difference is still significant at the 5% level (Mann-Whitney $p = 0.03$ test). From the right hand side of Figure 9 is obvious that the voting behavior of both types does not display a significant time trend after a learning phase in the first periods.

The average contributions are 18.43 (standard deviation 5) tokens, the highest value across all treatments. The average contributions display a slightly increasing trend (Spearman's Rho=0.36, $p = 0.09$), which is caused by the slight increase in institutions formed and the increase in contributions in groups without institution. The latter trend is surprising and stands in stark contrast to the behavior in the baseline treatment. The errant path of contributions in groups without institution is displayed in the right part of Figure 10. Nonetheless it has to be noted that this path is created by small number of observations (42) and should be treated with care. Even though the time trend is unusual, the average contributions across types in situations without institutions follow the usual pattern. High types contribute clearly more (11.1 tokens, standard deviation 7.9) than low types (2.9 tokens, standard deviation 5.6). Overall the combined institution is able to induce efficient contributions overall, due to the high support it gathers in the voting process. Contributions are significantly higher than in the treatment that features both

Figure 10: Average contribution depending on institution formation

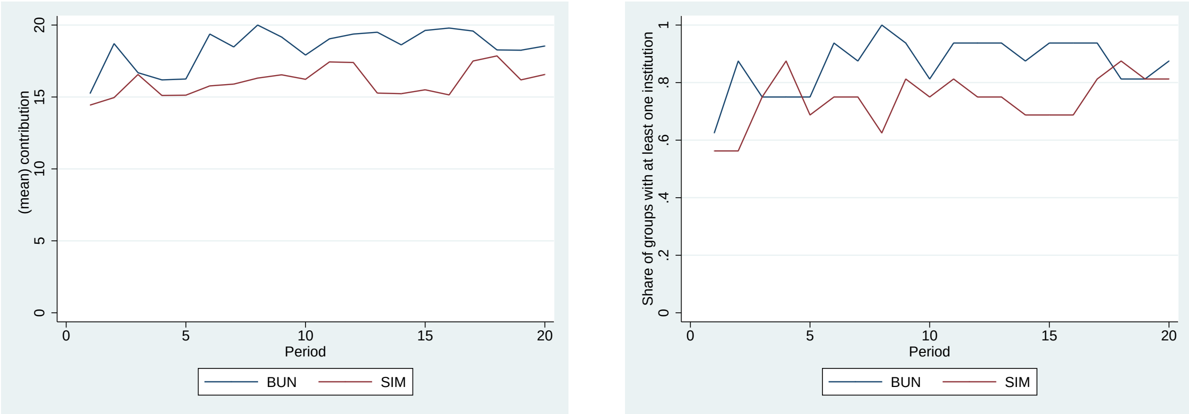


institutions individually. A Mann-Whitney test yields $p < 0.01$ if treatment BUN is compared with FIX and $p < 0.05$ compared with RE. The share of institutions installed is higher than in both these treatments, though it is not significant if compared with treatment RE (Mann-Whitney test $p = 0.54$).

4.5 Comparison of treatments SIM and BUN

In order to determine the influence of the voting options on the institution selection and ultimately on contributions to the public good, the two core treatments SIM and BUN need to be compared. Figure 11 illustrates that the combined voting procedure is able to induce a higher share of institution formed and consequently higher contributions as well. The difference in contributions is significant (Mann-Whitney test $p = 0.047$), while the share of institutions formed just falls short of significance at the 10% level (Mann-Whitney test $p = 0.109$). The gap between the two treatments persists over the entire time-span of the experiment. Consequently we conclude that restrictions that are put on the voting behavior in treatment BUN are able to force the subjects' hands into accepting both institutions. Cherry picking as exhibited in the frequent rejection of one of the two institutions in treatment SIM is no longer possible. Consequently the selection of a particular voting procedure (here a restriction of voting options) is able to increase contributions and institution formation, while simultaneously eliminating the danger of retaliation among subjects. This comparison raises the question, whether the substantial rejection of possible institutions in treatment SIM is indeed caused by coordination failure or by retaliation behavior. The results presented in part 4.6 indicate the latter.

Figure 11: Comparison between treatments Bun and Sim



4.6 Are rejections caused by previous behavior?

The large increase in support for the fixed contributions by the low types between treatments Fix and Sim is a striking contrast. The difference could hint at some kind of trust in the support of equal outcomes by the high types. This might have two causes. Either the low type subjects expect their counterparts to be inequity averse or they expect reciprocity for their own support of the fixed contribution[15]. Both situations would lead to support for the second institution. As a corollary from this observation the question is raised, whether the remaining difference between the types is a result of the low types' expectations that the high types will reject the redistribution. If this hypothesis is true one should expect a decrease in the support for the fixed contributions if the redistribution has been rejected previously. We find that the institution formation process hinges on the results of the previous period and its voting decisions. If institution formation was successful in the previous period, it is likely to continue to be successful in the current period. We find that lags of different length are valid predictors of period-t voting behavior. See Tables 5 and 6 in the appendix for further details on the determinants of individual voting behavior. The results of probit regressions are reported there in Table 7. The observed trend of continued institution formation has, of course, direct implications on contributions and exemplifies the repeated nature of the game. The specific outcomes of a given matching-group determine the future voting behavior to a large extent. This results in large variations in profits over time -

[15]As the voting decision is made simultaneously this kind of reciprocity would need to be belief driven. The beliefs on the action of the other subjects' actions have to wrong in the first place and are corrected in the rounds afterwards.

contributions spread apart as they adhere to different trajectories. Successful institution formation in the previous rounds increases the subjects' probability to vote for this particular institution again.

Note the special role of the treatment Sim. We observe that low types tend to reject fixing the contributions more frequently when the redistribution was rejected in the previous round. This indicates that the low types are willing to reject the fixing of contributions in order to secure them a more equal payoff. This behavior points at a struggle of "choosing" the preferred equilibrium or retaliation effects. Contrary behavior can be observed for high types. They seem to retaliate towards the unwanted voting results of previous rounds by rejecting the redistribution more frequently in the rounds to come. Though no crossover effects can be observed, the establishment of the redistribution function only impacts the voting decision on the redistribution but not on fixing contributions. This supports the hypothesis that the participants retaliate, if an unwanted equilibrium was chosen, but do not change their voting decision on their preferred institution.

5 Conclusion

This paper has investigated the effect of bundling institutions on the voting decisions of heterogeneous agents in the context of a public good game. The different institutions allowed subjects to overcome the free-rider problem of the social dilemma by either fixing contributions at a maximal level, redistributing payoffs, or by doing both at the same time. Players were allowed to vote on different institutions. In order to ensure that the support of each interest group is required, voting was governed by the unanimity voting rule. In each scenario, it was rational for self-centered agents to support the establishment of at least one of the available institutions. If one considered inequity averse subjects, a rejection of the fixed contributions was to be expected. In order to create a conflict of interest among subjects, different marginal returns to the public good were introduced. The predictions were partially supported as larger tendency of the players with a high MPCR to vote for fixed contributions and reject the redistribution was observed. The behavior of the low types exhibited the opposite tendency. This led to frequent rejections of either or even both institutions if they were offered simultaneously. We addressed this problem by offering the bundled institution, which limited subjects' decision on both institutions (or none at all).

The experiment has been able to show that the bundling of institutions is able to foster coordination and cooperation among subjects which have conflicting interests. The bundled institutions was installed about 17% more often than at least one institution in the treatment in which both institutions could be voted upon separately. Contributions were significantly higher in the Bun treatment, as well. It is important to note that the bundling of institution works as a commitment device for subjects. The data support the hypothesis that institutions are often rejected if the other subjects are not expected to cooperate by supporting both institutions themselves. Additionally, the high importance of path dependency is highlighted by the results: Successful institution formation in past periods was shown to predict institution formation in the present period. The longer the coordination was already running the more stable it became. On the contrary, then deviations from the cooperative behavior have been shown to be able to destroy trust and coordination among the subjects. This effect might have been severely aided by the fact that the experiment used fix groups over the entire time period of the experiment. Within a certain group the subjects had the possibility to signal certain preferences by taking different voting decisions. Nonetheless, direct communication was not possible across the parties involved. This lack of communication is the largest difference between the laboratory experiment and any potential real life situation.

However, the experimental observation supports evidence from political events as described by Burkhart and Manow (Burkhart and Manow). Large "packages" of bills in parliament often are a bundle of several different initiatives. Commitment to support such a bundle of bills can be credible. In the context of referenda, a bundling of bills would allow politics to "sell the good with the bad", and thereby reach support for both initiatives. Note, however, that this method is susceptible to abuse. The bundling of initiatives is equal to the bundling of products which has been extensively discussed in the literature on industrial organization.

A staring point for further treatments to determine the effect of different institutions in settings with heterogeneous agents arose from the questionnaire data collected. Many subjects mentioned that they supported redistribution as they perceived it to be the "fair" outcome. The low types were not viewed to be responsible for their ex-ante disadvantage (in the form of lower marginal returns to the public good). This exemplifies that subjects often do not feel attached to their roles, resulting in more egalitarian outcomes. This lack of affiliation with their own types might be rather unrealistic. People tend to interpret advantages as "deserved". A possible way for creating earned advantages would be to allocate the roles on the basis of previous tests that involved mathematical questions or real effort tasks. As discussed by Cappelen and Konow (2013) outcomes under these constellations might be severely different.

This paper argued that heterogeneity among subjects induces coordination problems in the presence of a more complex voting procedure. A restriction of the voting options is able to exclude these issues. The results further emphasize the need for commitment devices in the presence of conflicting interests.

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Appendix A

Model

In this section the following public good game with n players will be analyzed formally. Each player possesses an identical private endowment E. The player can decide individually on a contribution $c_i \in 0, E$ which she contributes to the public good. Given all players contributions $(c_i, ..., c_n)$ the material payoff of player i is denoted by

$$\pi_i = E - c_i + \gamma_i \sum_{j=1}^{n} c_j.$$

In order to create a social dilemma $0 < \gamma_i < 1$ and $\sum_{i=1}^{n} \gamma_i > 1$ is assumed. The first condition ensures that a self-centered player never profits from contributing to the public good, while the second assumption creates the effect that a contribution equal to the endowment by all players would be socially efficient. The individual return to the public good (MPCR) induces heterogeneity among the players. Throughout the complete analysis heterogeneity will always refer to this difference in MPCRs and not to any other difference in individual preferences.

The mechanism described in chapter two is a two stage n player coordination game. During the first stage the players can vote on the establishment of an institutional regime. The treatment as introduced before differ in the kind of institution that is available. The second stage of the game is the contribution stage with each player choosing the personal contribution to the public good simultaneously. In order to keep the analysis comprehensible perfect information about all characteristics of the players is assumed. From this can be inferred that the players on the voting stage posses complete information about the outcome on the later stage of the game. The method to solve the game will always be that of a subgame perfect Nash equilibrium. We treat the experiment as a one shot game with the behavior within a single period being predicted. The addition of additional rounds does not change the predictions as the number of rounds within the experiment is exogenously given and fixed. Hence, if all players apply backward induction, the number of round has no influence on the decisions compared to the one shot game. Due to the unanimity voting rule a large number of SPNE arise. If one player rejects an institution it will never be established. Hence the other players will always be indifferent between voting in favor or rejecting the institution. This problem has already been discussed intensively in the literature. Kosfeld et al. (2009,) for instance, focus on stagewise strict equilibria. By definition a Nash equilbrium is stagewise strict, if on every stage game each player's strategy is a unique best response towards the . Unfortunately this refinement is too strict for most situations considered here. If a rejection of a institution is justified for a player, the other players' decision does not influence the voting outcome. Thus no stagewise strict equilibrium can exist, if rejections are reasonable. Hence we will deploy a slightly different refinement. Gerber et al. (2012) introduce a more relaxed version of strictness in that sense, that they consider only these Nash equilibria, for which in every stage game exists at least one player whose equilibrium strategy is unique best response to the other players' equilibrium strategies. In the following analysis we will concentrate on this class of "semi-strict" equilibria exclusively.

Standard Predictions

Proposition 1 (voting behavior and contributions of heterogeneous players) *In treatment* VCM*, all players contribute* $c_i = 0$*.*
In treatments Fix*,* Re *and* Bun *it is as subgame perfect Nash equilibrium for all players to vote in favor of implementing the proposed institutions. The institutions are always implemented. In case of the treatments* Fix *and* Bun *all players contribute according to the institutional rules, i.e.,* $c_i = E$*,* $i \in h, l$*. In the treatment* Re *the players will contribute their complete endowment,* $c_i = E, \forall i$ *voluntarily.*
In the treatment Sim *exists a subgame perfect Nash equilibrium in which the low types support both institutions. The high type players' unique best response is support for the fixed contributions only.*

The proof of proposition 1 will be structured the following way: First the baseline scenario will be analyzed. The results of the VCM treatment will then be used in order to compare the payoffs under the different institutions using backward induction.

Heterogeneous VCM

In treatment VCM both the two high types and the low type are predicted not to contribute to the public good at all: $\frac{\partial \pi_i}{\partial c_i} = -1 + \gamma_i < 0$ for both types of players because $\gamma_i < 1$ by definition of the VCM game. This behavior will be used in all following treatments as result from the VCM. All other potential behavior will be ignored.

Fixed Contributions

In the two-stage game defined in treatment FIX, players will apply backward induction. If the institution has not been implemented in the voting stage, the players on the contribution stage are back in the VCM game analyzed above. They are predicted not to contribute to the public good. Therefore, each player's monetary payoff will be equal to the initial endowment E. If players have unanimously agreed on implementing the institution in the voting stage, all players are obliged to contribute their whole initial endowment E and will earn $\gamma_i nE$. $\gamma_i nE > E$ whenever $\gamma_i > \frac{1}{n}$. This condition has to hold for all players of type $\gamma_i = \gamma_l$. Otherwise these players obtain a payoff smaller than their initial endowment under the symmetric institution and will consequently reject it. The values used for γ in our experiment fulfill this condition ($\gamma_l = \frac{1}{2} > \frac{1}{3}$) With unanimity voting it is consequently a unique best response for all players to vote in favor of the symmetric institution that requires each player to contribute the efficient contribution level E. Intuitively this is clear from the beginning as the players will support the institution, if they profit from it.

Pure Redistribution

In order to determine the behavior of the players in the treatment in which only the redistribution institution is available, the behavior in the subsequent VCM with the redistribution mechanism must be analyzed and contrasted with the predictions for the standard VCM without any institution. The redistribution changes the payoff from the public entirely. As assumed the redistribution takes place in such way that every player receives the same monetary payoff. Hence for the decision of the player only the sum of all payoffs is important. As efficiency of the public good was assumed in that sense, that $\sum_{i=1}^{n} \gamma_i > 1$, the total payoff from public good under full contributions, is larger than the endowments. Technically this can be seen by the fact that the payoff from the public good in now denoted by $\pi_i = \frac{nE - c_j + (\sum_{j=1}^{n} \gamma_j - 1)\sum_{j=1}^{n} c_j}{n}$. Whenever $\frac{\partial \pi_i}{\partial c_i} = \frac{\sum_{j=1}^{n} \gamma_j - 1}{n} > 0$ the costs of the contribution are smaller than the accumulated benefit. Hence under the given redistribution rule a self-centred, money maximizing player will always contribute the complete endowment E. As this is the condition for the efficiency of a public good, it will always be satisfied. Thus all players will always contribute their complete endowment E. Their contributions lead to a payoff of $\pi_i = \sum_{j=1}^{n} \gamma_j E$. This payoff is compared to the payoff from the normal VCM without institution, which has been shown to be E. Comparing the payoffs reveals that the payoff under the institutional regime will always be larger if $\sum_{j=1}^{n} \gamma_j > 1$ which is again the condition for the efficiency of the public good. Thus every player will always earn a higher payoff with the institution in place and consequently support it on the voting stage. The redistribution mechanism eliminates the free-rider problem by distributing the benefits of the public good equally among all players. Hence the players profit from their own contributions the same way the profit from other players' contributions. Thus it has been shown that costless redistribution should be able to overcome the social dilemma. This result can be generalized to costly redistribution mechanisms as well. As long as the marginal costs for the redistribution are lower than the marginal gain achieved by the public good, contribution can be expected.

Bundled Institutions

As the players will apply backward induction, they will compare their payoff from the bundled institution with the payoff from the normal VCM. As the players are predicted not to contribute at all in the VCM, the payoffs which need to be compared are again the endowment E in the case of the VCM and $\sum\limits_{j=1}^{n} \gamma E$ under the institutional regime. Hence it is once more the mutual unique best response to support the institution. Thereby the predicted results for the bundled institution are identical to the treatment in which only the institution for redistribution is available.

Simultaneous Availability

The analysis of the decision in the presence of two individually selectable institutions is not as easy as before, because the players have to reach two decisions. The strategy of each player is now a pair of actions, one action representing the vote on one of the two institutions. Hence each player has now four possible bundles of actions. In order to create a simultaneous move game with only on stage, it is again assumed that backward induction is applied. Hence E is used as payoff if no institution at all is established, and $\sum\limits_{j=1}^{n} \gamma_i E$, if only the redistributional institution or both institutions are implemented. As their payoffs will always be the same independently of their actions, it can be assumed that the players of the same type will always act identical. Consequently their payoffs can be presented in the 2x2 matrix below. Here the possible actions have the following form: The first part denotes the vote towards the fixed contributions and the second part the vote towards the redistribution.

		high type			
		yes, yes	yes, no	no, yes	no, no
low type	yes, yes	$\sum \gamma_i E, \sum \gamma_i E$	$\gamma_h nE, \gamma_l nE$	$\sum \gamma_i E, \sum \gamma_i E$	E, E
	yes, no	$\gamma_h nE, \gamma_l nE$	$\gamma_h nE, \gamma_l nE$	E, E	E, E
	no, yes	$\sum \gamma_i E, \sum \gamma_i E$	E, E	$\sum \gamma_i E, \sum \gamma_i E$	E, E
	no, no	E, E	E, E	E, E	E, E

As $\sum_{j=1}^{n} \gamma_i \geq \gamma_l n$, it is obvious that the low type's voting decision "yes, yes" offers a payoff at least as large as all other voting options. The unique best response of the high type would then be to play "yes, no", which would result in the acceptance of the fixed contributions and the rejection of the redistribution. However, this concentration on these stricter Nash equilibria excludes other equilibria. There are some more pure strategy equilibria to find. In that sense the strategies "no, no" played by at least two players forms a Nash equilibrium as well, like in all other treatments. The last two equilibria arise if at least one of the low type players chooses "no, yes". Then the best response by the high types is to play either "yes, yes" or "no yes", which both result naturally in the same payoff. Nevertheless no strategy is a unique best response as always the decisions "yes, yes" and "no, yes" if played by all players induce the same outcome. It can be concluded that in a Nash equilibrium at most one, but never both of the institutions will be accepted.

Under standard predictions in all institutional treatments efficiency is expected independently of the institution available. This is either created by forced contributions or voluntary full contributions in the treatment Re. Hence the voting procedure should have no influence on the contributions. In all treatments at least one institution should be adapted at all times, if the players behave according to the standard preferences.

Fehr-Schmidt (1999) Preferences

In the next part behavioral predictions will be determined using not the standard model of rational self-centred players. Instead the canonical model of inequity aversion developed by Fehr and Schmidt (1999) will be used. This model assumes that players compare their outcome with the outcome of all other players. In order to model this departure from the standard model they introduce the following utility function:

$$U_i = \pi_i - \alpha_i \frac{1}{n-1} \sum_{j=1}^{n} max\{\pi_j - \pi_i; 0\} - \beta_i \frac{1}{n-1} \sum_{j=1}^{n} max\{\pi_i - \pi_j; 0\}$$

The first term represents the monetary payoff obtained from the game. The second term captures disadvantageous utility derived from being worse off than other players. α_i is hereby the individual envy parameter. The last term denotes losses the player receives from being better off than the other players. β_i is typically interpreted as a measure for compassion. Additionally two important properties are assumed. The first is $\alpha_i \geq \beta_i$, which indicates that envy is at least as strong as compassion and secondly $\beta_i < 1$, which prevents potential players from "burning" money to achieve a larger degree of equality. In the described setup with heterogeneous returns to the public good players might vote against the establishment of a symmetric institution in order to prevent inequality. Hence we consider the model of Fehr and Schmidt (1999) as a natural choice to derive predictions for this setup. In order to keep the following part as comprehensible as possible, the analysis of the treatments featuring heterogeneous players with social preferences will be restricted to the case of three players. For the case of heterogeneous players one player with $\gamma_i = \gamma_l$, two players with $\gamma_i = \gamma_h$ and with $\gamma_h - \gamma_l = \Delta\gamma \leq \frac{1}{2}$ will be described during the analysis. A generalization of this results to n players would create a larger amount of asymmetric equilibria and thereby crowd the analysis unnecessarily.
The formal analysis of the experiment using Fehr-Schmidt (1999) preferences will be structured as follows: First the behavior in the standard VCM with heterogeneous players is determined. Afterwards the possible payoffs will be compared to the payoffs created by the institutional regimes, in order to derive the predictions for the treatments Fix, Re, Bun and Sim. First the decision of the low type in the heterogeneous treatments will be analyzed, the decision of the high types follows afterwards.

Heterogeneous-VCM

Proposition 2 (contributions of heterogeneous players) *In treatment* VCM, *if* $\beta_h < \frac{1-\gamma_h}{1-\frac{1}{2}\Delta\gamma}$ *for at least one high type player, there exists a unique equilibrium in which all players contribute* $c_i = 0$.
If $\beta_h \geq \frac{1-\gamma_h}{1-\frac{1}{2}\Delta\gamma}$ *for both high types and* $\beta_l \geq \frac{1-\gamma_l}{1+\Delta\gamma}$ *for the low type positive contributions are sustainable in equilibrium with the contributions being* $c_h \in [0, E]$ *and* $c_l = c_h \frac{1-2\Delta\gamma}{(1+\Delta\gamma)}$. *(symmetric equilibria)*
If $\beta_l < \frac{1-\gamma_l}{1+\Delta\gamma}$ *for the low type player and* $\beta_h \geq 2(1-\gamma_h) + \alpha_h(1-\Delta\gamma)$ *for both high type players,*

an other class of equilibria with $c_i \geq 0$ exists, in which both high type players contribute the same amount $c_h \in [0, E]$ and the low type player contributes $c_l = 0$. (asymmetric equilibria)

The basic mechanism that drives the possible existence of equilibria with positive contributions is the same as in the homogeneous VCM, which is analyzed for the n player case in Fehr and Schmidt (1999). If the players are sufficiently averse towards advantageous utility, they contribute in order to prevent an unequal payoff distribution. A main focus of the Fehr-Schmidt model is the concentration on the monetary payoff as source for disutility. This leads to the fact that the low type will contribute less than the high types in order to achieve equality in payoffs.
In the following the subscript l will used to mark all decisions, characteristics and consequences for the player with the low level of MPCR (low type). Similar the other two players will be marked using the numbers 1 and 2 (high types). Without any restriction we will only analyze the decisions of the high type player 1. Let further $\bar{c}$ denote that level of contribution by the low type that induces equal payoffs between the low type and at least one other high type, given both high types players level of contribution. c_h will always denote the equilibrium level contribution of the high types.

Low-Type

This section will determine the behavior of the low type. For this end we will consider each possible relation of payoffs between the three players. we start by assuming that the low type contributes in such a way that her monetary payoff is smaller than the payoff of both high types ($\pi_l < \pi_1$ and $\pi_l < \pi_2$). The corresponding utility function for the low types is then denoted by: $U_l = E - c_l + \gamma_l(c_l + c_1 + c_2) - \frac{\alpha_l}{2}(c_l - c_1 + \Delta\gamma(c_l + c_1 + c_2)) - \frac{\alpha_l}{2}(c_l - c_2 + \Delta\gamma(c_l + c_1 + c_2)$ The derivative with respect to c_l is given by $\frac{\partial U_l}{\partial c_l} = -1 + \gamma_l - \alpha_l(1 + \Delta\gamma)$ and will always be negative as $\gamma_l < 1$ and $\Delta\gamma \geq 0$. Hence a reduction in the contribution would increase the low type's utility. Consequently the low type will never contribute in such way that her payoff will be lower than the payoff of both high types.
The next possible case arises, if one considers a low type and the two high types contributing in such way that $\pi_1 > \pi_l > \pi_2$. The derivative of the utility function is now $\frac{\partial U_l}{\partial c_l} = -1 + \gamma_l - 1/2(\alpha_l - \beta_l)(1 + \Delta\gamma)$. The derivative again will be strictly negative, as disadvantageous disutility is assumed to be at least at strong as advantageous disutility ($\alpha_i \geq \beta_i$). Thus the low type will never contribute in such way that her payoff is lower than the payoff of either of the high types. This is intuitively clear: By reducing the contribution the low type will increase her own

monetary payoff and simultaneously decrease the disadvantageous disutility faster than increase the advantageous disutility.

The last possible case arises, if the payoff of the low type is larger than the monetary payoff of both high types ($\pi_l > \pi_1$ and $\pi_l > \pi_2$). The utility function is now denoted by $U_l = E - c_l + \gamma_l(c_l + c_1 + c_2) - \frac{\beta_l}{2}(c_1 - c_l - \Delta\gamma(c_l + c_1 + c_2)) - \frac{\beta_l}{2}(c_2 - c_l - \Delta\gamma(c_l + c_1 + c_2)$. This results in the derivative given by $\frac{\partial U_l}{\partial c_l} = -1 + \gamma_l + 1/2\beta_l)(1 + \Delta\gamma)$. This expression is nonnegative if $\beta_l \geq \frac{1-\gamma_l}{1+\Delta\gamma}$. If this condition on β_l is fulfilled the low type will contribute in such a way, that the payoffs of herself and of the high type with the lower contribution to the public good are equal. Otherwise the player will never contribute to the public good.

If one uses the calibration of the experiment the predicted behavior of the low type player can be summarized as follows:

1. If $\beta_l \geq \frac{2}{5}$ and both high types contribute a positive amount, the low type will contribute until the payoff of herself and the high type contributing less will be equalized.

2. Otherwise the low type will never contribute a positive amount to the public good.

High type

The next section will analyze the decision of one high type - player 1 - given the actions of the other high type - player 2 - and the low type l. Again each possible relation of payoffs will be considered in order to cover every possible situation.

The first case arises if one assumes contributions such that $\pi_l > \pi_1$ and $\pi_2 > \pi_1$. Then the considered high type obtains the lowest monetary payoff. Consequently the utility function of player 1 will be $U_1 = E - c_1 + \gamma_h(c_l + c_1 + c_2) - \frac{\alpha_1}{2}(c_1 - c_l - \Delta\gamma(c_l + c_1 + c_2)) - \frac{\alpha_l}{2}(c_1 - c_2)$. The derivative with respect to the own contributions c_i $\frac{\partial U_1}{\partial c_1} = -1 + \gamma_h - \alpha_1(1 - \frac{\Delta\gamma}{2})$ will always be negative as $\gamma_h < 1$ and $\Delta\gamma \leq 1/2$. Thus the high type player will never contribute an amount that leads to her payoff being smaller than the payoff of both other players. By reducing the contribution the player will increase her monetary payoff and simultaneously decrease the amount of inequality present.

A possible second case is created by a situation in which the considered high type is worse off than the other high type, but better than the low type. We consider now contributions c_1, c_2 and c_l such that $\pi_2 > \pi_1 > \pi_l$. This case can be directly excluded as the analysis of the low type's behavior has shown, that the low type will never contribute in such a way that her payoff is smaller than the payoff of both high types.

In the next case the contribution are chosen in such a way, that the payoff of the high type is larger than the payoff of both other players. The utility function is now denoted by: $U_1 = E - c_1 + \gamma_h(c_l + c_1 + c_2) - \frac{\beta_1}{2}(c_l - c_1 + \Delta\gamma(c_l + c_1 + c_2)) - \frac{\beta_1}{2}(c_2 - c_1)$ The derivative with respect to c_i is given by $\frac{\partial U_1}{\partial c_1} = -1 + \gamma_h + \beta_1(1 - \frac{\Delta\gamma}{2})$ and turns nonnegative for $\beta_1 \geq \frac{1-\gamma_h}{1-\frac{1}{2}\Delta\gamma}$. This implies that for sufficiently large values of β_1 the player will increase her contribution to the public good until at least one other player obtains the same payoff as her. Otherwise the player contributes nothing. Intuitively the player will contribute in order to reduce the existing inequality towards both other players.

The last case considers contributions such that $\pi_l > \pi_1 > \pi_2$ resulting in the utility function $U_1 = E - c_1 + \gamma_h(c_l + c_1 + c_2) - \frac{\alpha_1}{2}(c_1 - c_l - \Delta\gamma(c_l + c_1 + c_2)) - \frac{\beta_1}{2}(c_2 - c_1)$. Setting the derivative with respect to c_i ($\frac{\partial U_1}{\partial c_1} = -1 + \gamma_h - \frac{\alpha_1}{2}(1 - \Delta\gamma) + \frac{\beta_1}{2}$) larger or equal than zero, results in the condition $\beta_1 \geq 2(1 - \gamma_h) + \alpha_1(1 - \Delta\gamma)$. If this condition is met, the high type will match the contribution of the other high type even though the low type will not contribute at all to the public good. In the following these equilibria will be called asymmetric, as they induce unequal payoffs among the players.
However, if the parameters chosen within the experiment are used, the condition for asymmetric equilibria determined before is reduced to $\beta_1 \geq \frac{1}{2} + \frac{3}{4}\alpha_1$. Obviously this condition can never be satisfied. In order to show this we will only consider the limiting case of $\alpha_1 = \beta_1$. This results in $\frac{\beta_1}{4} \geq \frac{1}{2}$, which can not hold as within the Fehr-Schmidt model $\beta_i < 1$ is assumed.

The predicted behavior of the high type players using the calibration of the experiment can be summarized as follows:

1. If $\beta_{1/2} \geq \frac{2}{7}$ and both other players contribute a positive amount to the public good the high type will contribute in such a way that the payoff of herself and the monetary payoff of the player with the second highest payoff will be equalized.

2. Otherwise the high type will never contribute a positive amount to the public good.

3. Both high types will always contribute the same amount to the public good.

These findings result in the following possible equilibria for the treatment VCM:

1. If $\beta_{1/2} \geq \frac{2}{7}$ and $\beta_l \geq \frac{2}{5}$ every level of contribution with $c_1 = c_2 \in \{O; E\}$ and $c_l = c_1\frac{2}{5}$ is an equilibrium.

2. If $\Delta\gamma = \frac{1}{2}$, the contribution of the low type resulting in equal payoffs will be zero. Thus the low type will never contribute in any equilibrium. Hence if $\beta_{1/2} \geq \frac{2}{7}$, but $\beta_l < \frac{2}{5}$ it is still possible that both high types will contribute $c_1 = c_2 \in \{0; E\}$

3. Otherwise the only remaining equilibrium is characterized by $c_1 = c_2 = c_l = 0$

The other possible, asymmetric equilibria have been eliminated due to the chosen parametrization of the experiment.

Fixed Contributions

Proposition 3 (voting behavior of players in the treatment Fix) *In treatment* FIX*, if only symmetric equilibria are played in the VCM, the low type votes against implementing the proposed institution, if* $\alpha_l > \frac{3\gamma_l - 1}{3\Delta\gamma} - \frac{c_h}{3E\Delta\gamma}(\frac{2\gamma_h + \gamma_l - 1}{1+\Delta\gamma})$*. The high types vote against implementing the proposed institution if* $\beta_{1/2} > \frac{2}{3}\frac{3\gamma_h - 1}{\Delta\gamma} - \frac{2c_h}{3E\Delta\gamma}(\frac{2\gamma_h + \gamma_l - 1}{1+\Delta\gamma})$*. If the institution is not implemented, contribution levels are identical to those in the treatment VCM. Otherwise all players support the institution and contribute according to its rules.*
If an asymmetric equilibrium would be played in the potential VCM, the low type will reject the institution if $\alpha_l > \frac{3\gamma_l - 1}{3\Delta\gamma} - \frac{c_h}{3E\Delta\gamma}(2\gamma_l - \beta_l(1 - 2\Delta\gamma))$*, while the high types reject it for* $\beta_{1/2} > \frac{2}{3}\frac{3\gamma_h - 1}{\Delta\gamma} - \frac{c_h}{E}(2\gamma_h - 1 - \frac{\alpha_{1/2}}{2}(1 - 2\Delta\gamma))$*.*

The fact that the VCM produces mainly equilibria with equal payoffs in the case of three players facilitates the striking difference in the predictions between the standard model and the Fehr-Schmidt model concerning the treatment FIX. Whereas in the standard model the players support the institution as it offers a higher monetary payoff than the VCM, in the Fehr-Schmidt model especially low type players will reject the formation of such an institution. This stems from the fact that the symmetric contributions will induce inequity, whilst the VCM offers a potentially higher outcome with equal payoffs.
In order to project the players' behavior for the treatments including voting decisions, we assume the players use backward induction to compare the possible the payoff from a potentially established institution and the payoff from the public good game. The decision of the low type player will be considered first. The utility under the constant contribution rule for the low type is given by $U_l^f = 3E(\gamma_l - \alpha_l\Delta\gamma)$. As it has been shown in the previous analysis of the treatment VCM, there are many different equilibria possible in the public good game, if social preferences and

heterogeneous MPCRs are assumed. Hence the payoff on the second stage for all players depends on the kind of the equilibrium that is played in a possible public good game. If a symmetric equilibrium is played the utility of the low type can be rewritten as $U_l^g = U_h^g = E + c_h(\frac{2\gamma_h+\gamma_l-1}{1+\Delta\gamma})$, in which c_h denotes the contribution level of the high types. If the utility obtained in the public good game exceeds the one under the institutional regime, the low type will never vote in favor of the symmetric institution. Thus the low type will not vote "yes", if $U_l^g > U_l^f$. This is fulfilled whenever $\alpha_l > \frac{3\gamma_l-1}{3\Delta\gamma} - \frac{c_h}{3E\Delta\gamma}(\frac{2\gamma_h+\gamma_l-1}{1+\Delta\gamma})$.
In the next step the behavior of the low type is analyzed, if an asymmetric equilibrium is played. The payoff under the institutional regime remains unchanged. The payoff from the public good game is now given by $U_l^g = E + c_h(2\gamma_l - \beta_l(1-2\Delta\gamma))$. Comparing the payoffs leads to $\alpha_l > \frac{3\gamma_l-1}{3\Delta\gamma} - \frac{c_h}{3E\Delta\gamma}(2\gamma_l - \beta_l(1-2\Delta\gamma))$. This implies:The larger the contributions in the following public good game will be, the lower the sensitivity towards disadvantageous disutility can be in order to warrant a rejection.

Now we will focus on the voting decision of the high types. For the analysis of the decision in the treatment FIX one must again distinguish between symmetric and asymmetric equilibria in the public good game. If a symmetric equilibrium is played in the second stage the payoff is equal for all players $U_h^g = E + c_h(\frac{2\gamma_h+\gamma_l-1}{1+\Delta\gamma})$. In order to induce a rejection this must be greater then the utility under the symmetric institutional regime, which is denoted for the high type player 1 by $U_1^f = 3E(\gamma_h - \frac{\beta_1}{2}\Delta\gamma)$. Setting $U_1^g > U_1^f$, using the expressions above and rearranging leads to the condition $\beta_1 > \frac{2}{3}\frac{3\gamma_h-1}{\Delta\gamma} - \frac{2c_h}{3E\Delta\gamma}(\frac{2\gamma_h+\gamma_l-1}{1+\Delta\gamma})$. If the sensitivity towards advantageous disutility and the contributions in the public good game are large enough, high types might vote against a constant contribution rule in order to achieve an outcome with equal payoffs rather than higher, but unequal payoffs.
The next case arises, if an asymmetric equilibrium would be played in the second stage of the game. Then the utility of the high types is given by $U_1^g = E + c_h(2\gamma_h - 1 - \frac{\alpha_1}{2}(1-2\Delta\gamma))$, while the utility with fixed contributions remains unchanged. We then set again $U_1^g > U_1^f$. Rearranging leads to $\beta_1 > \frac{2}{3}\frac{3\gamma_h-1}{\Delta\gamma} - \frac{c_h}{E}(2\gamma_h - 1 - \frac{\alpha_1}{2}(1-2\Delta\gamma))$. In order for this relation to be satisfied extremely strict values for the parameters need to be fulfilled. It can be shown that this relation can never hold if $\gamma_l \geq \frac{1}{3}$.

Hence for treatment Fix the predicted behavior of players with Fehr-Schmidt preferences can be summarized as follows:

Using the parametrization of the experiment will simplify the results drastically as it has be shown previously that equilibria with asymmetric payoffs cannot arise. Hence under the given parameters one expects:

1. The players with $\gamma_l = 0.5$ will reject the establishment of the proposed contribution rule for $\alpha_l > \frac{2}{3} - \frac{4}{75}c_h$.
2. The players with $\gamma_h = 0.75$ will never reject the establishment of the contribution rule.

Pure Redistribution

Proposition 4 (Behavior in treatments Re and Bun) *The high types will always prefer the establishment of the institution over the VCM in treatment* Re.
Low type players will only reject the redistribution, if an asymmetric equilibrium is played in the subsequent VCM. The low type players will then reject whenever $\frac{c_h}{E} > \frac{2\gamma_h+\gamma_l-1}{2\gamma_l-\beta_l(1-\Delta\gamma)}$. *Otherwise the low type will always support the institution.*
With redistribution all players will always contribute their complete endowment. (i.e $c_i = E; \forall i$*)*
The voting behavior in treatment Bun *is identical to the voting behavior of all players in treatment* Re.

The predictions for the VCM with redistribution are the same as under standard preferences. Since the redistribution rule prevents the existence of inequality between the players the utility function remains the same as above and thereby the predictions do not change. All players will contribute completely and receive $U_i^r = (2\gamma_h + \gamma_l)E$. Nonetheless, differences might arise, if the players compare this outcome with their payoffs from the normal VCM, in which under the existence of social preferences other equilibria are possible. If the players compare this payoff with the one from the VCM, it is obvious that if a symmetric equilibrium is played in the VCM all players will support the redistribution. Consequently all players obtain the same payoff in the VCM, but efficiency is not reached, as the low type does not contribute her complete endowment. As both efficiency and equity is reached by redistribution, this payoff must consequently be larger than the payoff from the VCM. Technically this can be seen by the fact that the highest possible payoff from the VCM is denoted by $U_l^g = U_h^g = \gamma_h E(\frac{3}{1+\Delta\gamma})$. In order to induce rejection this must be a larger than $U_i^r = (2\gamma_h + \gamma_l)E$. Comparing the two results leads to $2\gamma_h + \gamma_l > 1$ as condition for the support of the institution. The condition for the efficiency of the public good will always be fulfilled. In a second step the behavior of the low type in the presence of asymmetric equilibria in a potential VCM will now be discussed. As shown previously the low type's payoff from an asymmetric equilibrium is denoted by $U_l^g = E + c_h(2\gamma_l - \beta l(1 - \Delta\gamma))$. A comparison of the payoffs establishes the result, that for $\frac{c_h}{E} > \frac{2\gamma_h+\gamma_l-1}{2\gamma_l-\beta_l(1-\Delta\gamma)}$ the low type will reject the establishment of the redistribution as the material payoff will be larger in the VCM. This condition is fulfilled only, if the high types contribute a fraction large enough of their endowment to the public good. The high type will never reject the redistribution. This is obvious, as the highest payoff from a asymmetric equilibrium is smaller than the highest payoff from the symmetric equilibrium, since the low types contributes a positive amount. As shown above, the redistribution implies a higher payoff for every player than the symmetric equilibrium of the standard VCM. Thus the payoff from the asymmetric equilibrium must be smaller than the payoff under the institutional regime as well.

Again the chosen parameters exclude the existence of asymmetric equilibria. This simplifies the result such that the support of the institution guarantees tall players a payoff, which is at least as large as the maximum payoff from the VCM.

5.0.1 Bundled Institutions

The predictions for the Bundled institution are identical to the to the analysis done for the treatment Re. This can be seen easily. As has been shown previously under the existence of the redistributional regime, all players will contribute their complete endowment and thereby induce the same result as the Bundled institution, which enforces full contribution. Hence the voting decisions on the Bundled institution are identical to the decisions on the redistribution mechanism.

Simultaneous Availability

Proposition 5 (Behavior in treatment Sim) *If no asymmetric equilibria are played the low type will prefer the implementation of both institutions as long as* $\alpha_l < \frac{3\gamma_l-1}{3\Delta\gamma} - \frac{c_h}{3E\Delta\gamma}(\frac{2\gamma_h+\gamma_l-1}{1+\Delta\gamma})$. *The best response for the high types will be the rejection of the redistribution, if* $\beta_{1/2} < \frac{2}{3}$, *and the support of both institutions, if* $\beta_{1/2} \geq \frac{2}{3}$.

If $\alpha_l > \frac{3\gamma_l - 1}{3\Delta\gamma} - \frac{c_h}{3E\Delta\gamma}(\frac{2\gamma_h+\gamma_l-1}{1+\Delta\gamma})$ *and only symmetric equilibria are played, the low type will support only the redistribution. The best response of the high types is then to support this one as well. If asymmetric equilibria would be played during the VCM, the low type will reject both institutions if* $\frac{c_h}{E} > \frac{2\gamma_h+\gamma_l-1}{2\gamma_l-\beta_l(1-\Delta\gamma)}$. *Otherwise the behavior remains the same as in the case of symmetric equilibria, with the threshold for the rejection of the fixed contributions by the low type now being* $\beta_l > \frac{2}{3}\frac{3\gamma_h-1}{\Delta\gamma} - \frac{2c_h}{3E\Delta\gamma}(\frac{2\gamma_h+\gamma_l-1}{1+\Delta\gamma})$.

The treatment in which the two institutions are available independently is the most complex treatment to analyze. This stems from the fact that the outcome of the potential VCM is not unique. Thus the results from all the treatments above will be combined. The following table shows the outcomes for each decision combination under the simplification that the two high players are summarized here as one player. This is done solely for reasons of visualization. Nonetheless the two high type players might vote differently due to differences in their specific values of α and β. When using the following representation, one must keep in mind that each institution will only be established, if it is supported by all three players. The cells display to which other treatment the voting results correspond. Then the already established knowledge about the treatments will be used to determine the subgame perfect Nash Equilibria.

		high type			
		yes, yes	yes, no	no, yes	no, no
low type	yes, yes	Bun	Fix	Re	Vcm
	yes, no	Fix	Fix	Vcm	Vcm
	no, yes	Re	Vcm	Re	Vcm
	no, no	Vcm	Vcm	Vcm	Vcm

In order to determine possible equilibria, the proof for proposition 5 will be divided into two parts. Like before in the first part the behavior of the players will be analyzed under the assumption that an symmetric equilibrium is played during the VCM. The second part considers the behavior under possible asymmetric equilibria. In the next step a preference relation between the different treatments for the two types of players types will be established in order to solve the two player game above. In section 3.3.3 it has been shown that in the presence of symmetric equilibria the low type will always prefer the identical treatments Re and Bun over the treatment Vcm. Obviously they will prefer as well these two over the treatment Fix as they offer a higher monetary payoff with less inequality among the players. Furthermore as shown in section 3.3.2 the VCM offers a higher utility than Fix if $\alpha_l > \frac{3\gamma_l - 1}{3\Delta\gamma} - \frac{c_h}{3E\Delta\gamma}(\frac{2\gamma_h+\gamma_l-1}{1+\Delta\gamma})$ in case of a symmetric equilibrium being played. This results in two possible preference ordering of the treatments:

1. $Re \sim Bun \succ FixVCM$, if $\alpha_l \leq \frac{3\gamma_l - 1}{3\Delta\gamma} - \frac{c_h}{3E\Delta\gamma}(\frac{2\gamma_h+\gamma_l-1}{1+\Delta\gamma})$ (type 1)
2. $Re \sim Bun \succ VCM \succ Fix$, else (type 2)

If one takes now a closer look at the table presented above, it becomes obvious that the support of both institution is weakly preferred over all other voting decisions by type 1, given the behavior in the ensuing VCM. Conversely type 2 weakly prefers the voting decision "no, yes" over all other options and supports thereby the redistribution only.

The next step will determine the high types' possible best answers to the proposed strategies. For this a preference ordering similar to the one presented above needs to be established. As shown before, the high type will always prefer the establishment of the identical outcome of the treatments Bun and Re over the VCM. High type players will actually prefer the case of full contribution with redistribution (Bun) to the case without redistribution (Fix) if their sensitivity towards advantageous utility is too strong. In order to derive this threshold the payoff from the two different scenarios will be compared. The payoff without redistribution is $U_1^f = 3\gamma_h - \frac{\beta_1}{2}3E\Delta\gamma$ and with redistribution $U_1^r = (2\gamma_h + \gamma_l)$. Thus the high type will prefer the redistribution institution whenever $\beta_{1/2} > \frac{2}{3}$. Additionally it has been shown, that the high type will prefer the VCM over Fix if $\beta_h > \frac{2}{3}\frac{3\gamma_h - 1}{\Delta\gamma} - \frac{2c_h}{3E\Delta\gamma}(\frac{2\gamma_h+\gamma_l-1}{1+\Delta\gamma})$, in case of a symmetric equilibrium. Moreover it is known, that the treatments Re and Bun are equivalent and preferred over the outcome of treatment Vcm. Thus we derive the following three possible preference relations for the high type.

1. $FIX \succ RE \sim BUN \succ VCM$, if $\beta < \frac{2}{3}$ (type 1)
2. $RE \sim BUNFIX \succ Vcm$, if $\beta \geq \frac{2}{3}$ and $\beta_h < \frac{2}{3}\frac{3\gamma_h - 1}{\Delta\gamma} - \frac{2c_h}{3E\Delta\gamma}(\frac{2\gamma_h+\gamma_l-1}{1+\Delta\gamma})$ (type 2)
3. $RE \sim BUN \succ VCMFix$, else (type 3)

The high type player of type 1 will react to a support of both institutions by the low type with a rejection of the redistribution institution. Under these circumstances Fix would be played. Players of type 2 and 3 will react to a support of both institutions by either supporting institutions as well or only the redistributing one. This behavior results in the treatments Re or Bun being played and in the same payoffs for all players. If, however, the low type is of type 2 and will always support only the redistribution institution the high type can decide between the treatments VCM and RE being played. Here all high types are predicted to support the institution RE. RE is hence always established in equilibrium, if the low type is of type 2. That results in the following equilibria: [16]

1. If the low type is of type 1 and both high types are of type 1 only the fixed contributions will be established. The results are the same as for standard predictions.
2. If the low type is of type 1 and one of the high types is of type 1, while the other is of type 2 or 3, only the redistribution will be supported.
3. If the low type is of type 1 and both high types are of type 2 or 3, either both institutions or the redistribution will be established.
4. If the low type is of type 2, the fixed contributions will always be rejected and the redistribution will always be established.

The next section will analyze the behavior, if an asymmetric equilibrium would be played during the VCM. These new possible equilibria changes only the payoff of the VCM. In this case it has been shown previously that the low type will prefer the treatment VCM over the institutions in the treatments RE and BUN whenever $\frac{c_h}{E} > \frac{2\gamma_h+\gamma_l-1}{2\gamma_l-\beta_l(1-\Delta\gamma)}$ and over the fixed contributions whenever $\alpha_l > \frac{3\gamma_l-1}{3\Delta\gamma} - \frac{c_h}{3E\Delta\gamma}(2\gamma_l - \beta_l(1-2\Delta\gamma))$. This implies again that the contributions by the high types must be large enough warrant a rejection of the institutions. As before the redistribution effect and the Bundled institution is preferred over the fixed contributions. In this case three preference orderings are possible.

1. $RE \sim BUN \succ FIX \succ VCM$, if $\alpha_l < \frac{3\gamma_l-1}{3\Delta\gamma} - \frac{c_h}{3E\Delta\gamma}(\frac{2\gamma_h+\gamma_l-1}{1+\Delta\gamma})$ (type 1)
2. $RE \sim BUNVCMFIX$, if $\alpha_l \geq \frac{3\gamma_l-1}{3\Delta\gamma} - \frac{c_h}{3E\Delta\gamma}(\frac{2\gamma_h+\gamma_l-1}{1+\Delta\gamma})$ and $\frac{c_h}{E} \leq \frac{2\gamma_h+\gamma_l-1}{2\gamma_l-\beta_l(1-\Delta\gamma)}$ (type 2)
3. $VCM \succ RE \sim BUN \succ FIX$, if $\frac{c_h}{E} > \frac{2\gamma_h+\gamma_l-1}{2\gamma_l-\beta_l(1-\Delta\gamma)}$ (type 3)

The preference relation of the two first two types is the same as in the case of symmetric equilibria. Hence their behavior must be the same as well. The only difference is type 3. For this type it

[16] These are not the only equilibria possible. Nevertheless, they are the only equilibria in which only voting decisions are selected whose outcome are weakly preferred over the outcomes of all other voting decisions, given the behavior in the VCM game. Thus we concentrate on these during the analysis. The description of all equilibria existing in pure strategies would crowd the analysis further. An example of an omitted Nash equilibrium is the rejection of all institutions by all players.

is always the best response to reject both institutions in order to force that the VCM is played during the second stage of the game. Hence the decision of the high types does not matter in this case at all. Thus only the behavior in case of support of both institutions (type 1) and the redistributional institution (type 2) must be analyzed. Fundamentally the behavior of the of the high types remains unchanged. They still prefer the Bundled institutions over fixed contributions whenever $\beta \geq \frac{2}{3}$ and prefer them always over the VCM. However the cutoff value for the high types to prefer the VCM over the fixed contributions is now different. As given in section 3.3.2, it is now denoted by $\beta_1 > \frac{2}{3}\frac{3\gamma_h - 1}{\Delta\gamma} - \frac{c_h}{E}(2\gamma_h - 1 - \frac{\alpha_1}{2}(1 - 2\Delta\gamma))$. Thus the following equilibria are possible under asymmetric equilibria, if only voting decisions are made that are weakly preferred over all other voting options, given the behavior of all player in the VCM:

1. If the low type is of type 1 and both high types are of type 1, only the fixed contributions will be established. The results are the same as for standard predictions.

2. If the low type is of type 1 and one of the high types is of type 1, while the other is of type 2 or 3, only the redistribution will be supported.

3. If the low type is of type 1 and both high types are of type 2 or 3, either both institutions or the redistribution will be established.

4. If the low type is of type 2, the fixed contribution will always be rejected and the redistribution will always be established.

5. If the low type is of type 3, no institution will be established.

The results are much less crowded, if the parametrization of the experiment is used. As before the asymmetric equilibria are excluded. Then it is known that the high type will always prefer the fixed contribution over the VCM. Thus it can be established, that the low type will support both institutions or only the redistribution. If $\alpha_l > \frac{2}{3} - \frac{4}{75}c_h$ the fixed contribution will be rejected. High types will support the redistribution institution only if the fixed contribution is already rejected by the low type or if their sensitivity towards disadvantageous disutility is too large ($\beta > \frac{2}{3}$). Thus three possible outcomes remain. If the high types care about advantageous disutility, both institutions should be established. If the low type is susceptible to disadvantageous disutility, only the redistribution is established. If inequity aversion is rather small for all participants, the outcome of the standard predictions will be realized.

Appendix B

Table 3: Institution Formation

Implemented Institutions	Fix	Re	Bun	Sim
Fixed contributions only	.56	-	-	.31
Redistribution only	-	.79	-	.08
Both Institutions	-	-	.87	.35

We use institutions formed per matching group and period as unit of observation.

Table 4: Descriptive Statistics

Institution	Type	VCM	FIX	RE	BUN	SIM
		CONTRIBUTIONS				
No	High	9.42	8.05	7.27	11.05	8.22
		(7.07)	(6.75)	(7.24)	(7.93)	(7.54)
	Low	5.33	4.17	5.26	2.88	3.67
		(4.33)	(4.41)	(6.07)	(5.55)	(5.69)
Yes	High	-	20	18.18	20	19.4
		-	-	(4.4)	-	(3.04)
	Low	-	20	18.0	20	19.18
		-	-	(5.04)	-	(3.34)
Yes or No	High	-	14.77	15.72	18.8	16.5
			(7.42)	(7.09)	(4.21)	(6.75)
	Low	-	13.07	15.43	17.7	15.16
		-	(8.38)	(7.14)	(6.18)	(7.93)
	High or Low	8.05	14.21	15.63	18.43	16.05
		(6.57)	(7.79)	(7.11)	(5.0)	(7.19)
		PAYOFFS				
No	High	28.7	27.15	27.58	27.69	26.87
		(6.47)	(5.93)	(7.67)	(7.57)	(6.89)
	Low	26.75	25.96	24.64	29.6	26.39
		(5.45)	(5.77)	(5.31)	(6.19)	(6.71)
Yes	High	-	45	38.06	40	41.41
		-	-	(3.2)	-	(3.77)
	Low	-	30	38.06	40	35.15
		-	-	(3.2)	-	(4.9)
Yes or No	High	-	37.19	35.84	38.35	37.64
		-	(9.69)	(6.24)	(5.03)	(8.0)
	Low	-	28.23	35.21	38.6	32.87
		-	(4.3)	(6.65)	(4.2)	(6.64)
	High or Low	30.72	34.21	35.63	38.43	36.05
		(7.83)	(9.3)	(6.38)	(4.77)	(7.87)
		AFFIRMATIVE VOTING				
Fixed contributions	High	-	.96	-	.93	.94
	Low	-	.6	-	.98	.73
Redistribution	High	-	-	.9	.93	.68
	Low	-	-	.97	.98	.88

Values are means. Contributions and payoffs are in tokens. The values for voting represent fractions. For the treatment SIM "Yes" implies, that at least one institution had been formed. Standard deviations in parentheses.

Table 5: Determinants of individual voting behavior on fixed contributions

	(1)	(2)	(3)	(4)	(5)
	vote_fix	vote_fix	vote_fix	vote_fix	vote_fix
Fix	0.072	0.004	0.297		
	(0.19)	(0.01)	(0.87)		
Bun	0.964**	0.860**	0.589		
	(2.49)	(2.47)	(1.64)		
hightype		1.111***	1.225***	0.403	1.541***
		(4.02)	(4.41)	(0.76)	(3.25)
ownl1_fix		0.455***		0.545*	0.194
		(3.92)		(1.83)	(0.71)
grpl1_fix			0.239***	0.802***	1.057***
			(3.80)	(2.68)	(2.96)
grpl1_re*			0.765***		
sim			(4.74)		
low*fix_onlyl1				-2.500***	
				(-7.14)	
fix_onlyl1					-1.325***
					(-4.51)
re_onlyl1					0.150
					(0.53)
female	-.901**	-0.708***	-0.785*	-0.727	-0.714
	(-2.05)	(-1.82)	(-1.99)	(-0.82)	(-0.88)
cons.	2.979	1.753	1.464	-2.721	-0.732
	(0.96)	(0.70)	(0.58)	(-0.58)	(-0.17)
lnsig2u	0.615	0.205	0.231	-0.715	-0.873
other controls	YES	YES	YES	YES	YES
N	2880	2736	2736	912	912

Table reports the results of probit panel regressions. We use subjects per period as unit of analysis. Regression (4) and (5) include only treatment Sim.
z statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
ownl1_fix indicates the subject's vote on the fixation in the previous period.
grpll1_fix and grpl1_re indicate whether the respective institutions were installed in the previous period.
fix_onlyl1 and re_onlyl1 indicate whether the respective institutions were installed as the only institutions in the previous period.

Table 6: Determinants of individual voting behavior on redistribution

	(1)	(2)	(3)	(4)	(5)
	vote_re	vote_re	vote_re	vote_re	vote_re
RE	0.929***	0.729***	0.834***		
	(3.21)	(3.10)	(2.97)		
BUN	1.406***	1.171***	1.306***		
	(4.56)	(4.49)	(4.26)		
hightype		-0.787***	-0.967***	-1.200***	-1.237***
		(-3.47)	(-3.82)	(-3.71)	(-3.98)
ownl1_re		0.896***		0.805***	0.794***
		(7.71)		(4.13)	(4.07)
grpl1_re			0.714***	0.373*	0.517**
			(6.68)	(1.76)	(2.10)
grpl1_fix			0.238		
sim			(1.61)		
high*re_onlyl1				-0.757***	
				(-2.69)	
fix_onlyl1					0.047
					(0.28)
re_onlyl1					-0.852***
					(-3.24)
female	-.765**	-0.689**	-0.815**	-0.364	-0.354
	(-2.21)	(-2.33)	(-2.47)	(-0.66)	(-0.66)
cons.	-0.099	1.207	1.223	-1.714	-1.780
	(-0.46)	(0.66)	(0.60)	(-0.58)	(-0.62)
lnsig2u	0.142	-0.456	-0.175	1.435	-1.559
other controls	YES	YES	YES	YES	YES
N	2880	2736	2736	912	912

Table reports the results of probit panel regressions. We use subjects per period as unit of analysis. Regression (4) and (5) include only treatment SIM.

z statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

ownl1_re indicates the subject's vote on the redistribution in the previous period.

grpll1_fix and grpl1_re indicate whether the respective institutions were installed in the previous period.

fix_onlyl1 and re_onlyl1 indicate whether the respective institutions were installed as the only institutions in the previous period.

Table 7: Impact of treatments and past institution formation on institution formation

	(1) one inst.	(2) all inst.	(3) one inst.	(4) all inst.	(5) one inst.	(6) one inst.
Fix	-0.575	1.011**	-0.534	0.678*	-0.358	-0.374
	(-1.50)	(2.28)	(-1.53)	(1.77)	(-1.33)	(-1.32)
Re	0.226	1.821***	-0.302	1.483***	0.263	0.281
	(0.58)	(4.04)	(0.84)	(3.68)	(0.95)	(0.96)
Bun	0.535	2.129***	0.545	1.703***	0.455	0.481
	(1.37)	(4.73)	(1.52)	(4.21)	(1.60)	(1.61)
grpl1_oneinst			0.630***		0.679***	0.644***
			(5.30)		(4.88)	(4.61)
grpl3_oneinst					0.555***	0.506***
					(4.22)	(3.77)
grpl1_allinst				0.903***		
				(7.26)		
learning						-0.238
						(-1.52)
endgame						0.066
						(0.54)
cons.	0.876***	0.685**	0.456*	-0.891***	0.009	0.088
	(3.20)	(-2.17)	(1.72)	(-3.23)	(0.04)	(0.34)
lnsig2u	0.014	0.303	-0.236	-0.049	-0.917	-0.783
N	1280	1280	1216	1216	1088	1088

Table reports the results of a probit panel regression. We use matching groups per period as unit of analysis. Sim is the baseline. z statistics in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

grpl1_oneinst indicates whether at least one institution was implemented in the previous period.

grpl3_oneins indicates whether at least one institution was implemented three periods earlier.

grpl1_allinst indicates whether all possible institutions were implemented in the previous period.