Online appendix
Leadership by Conditional Commitments

Appendix A

The purpose of this appendix is to demonstrate that positively increasing costs of contributing does not necessarily destroy the coordination equilibria obtained with a linear cost function. We modify the pro…t function by introducing quadratic costs, keeping bene…ts linear:

$$_i = \boldsymbol{z}_k \quad (\boldsymbol{c}_i) \; + \; _k \sum_j^n \boldsymbol{c}_j \tag{A1}$$

The marginal cost of own contribution is now 2 $\boldsymbol{c}_i$. Again the followers' return function shifts up at the point at which it triggers the leader's conditional contribution, denoted $\boldsymbol{c}_i^*$. For a coordination game to exist, the follower's private bene…t of providing $\boldsymbol{c}_i^*$ must be larger than or equal to the cost:

$$_F(\boldsymbol{c}_i^* + \boldsymbol{b}) \quad (\boldsymbol{c}_i) \tag{A2}$$

which simpli…es to:

$$\boldsymbol{b} \quad \frac{}{_F}(\boldsymbol{c}_i^*) \quad \boldsymbol{c}_i^* \tag{A3}$$

In addition, the leader must pro…t from inducing the followers to contribute $\boldsymbol{c}^*$. When the leader contributes $\boldsymbol{b}$ and each follower contributes $\boldsymbol{c}^*$, substituting into equation A1 provides the pro…t function of the leader:

$$_L = \boldsymbol{z}_L \quad \boldsymbol{b} \; + \; _L(\boldsymbol{b} + (\boldsymbol{n} \quad 1)\boldsymbol{c}^*) \tag{A4}$$

Substituting A3 into A4, assuming that the leader will not contribute more than what it takes to satisfy A3, and simplifying, the leader's pro…t can be expressed as a function of $\boldsymbol{c}^*$:

$$_L = \boldsymbol{z}_L \quad \frac{}{(\ _F)}(\boldsymbol{c}^*) \; + \; \frac{2}{_F}(\boldsymbol{c}^*) \; + \; \left(\frac{_L}{_F} \quad 1\right)(\boldsymbol{c}^*) \; + \; _L(\boldsymbol{n} \quad 2)(\boldsymbol{c}^*) \tag{A5}$$

The function in A5 may or may not attain positive values, depending on the size of . To maximize the pro…t function when it is positive, we take the …rst derivative wrt $\boldsymbol{c}^*$ and set it equal to zero:[1]

[1] The second order condition is $^{00}_L(\boldsymbol{c}\ ) = 2\frac{}{2} \; 6\boldsymbol{c} \quad _F \quad 6(\boldsymbol{c}\ )^2 \; ^2 \quad \frac{2}{_F} + \; _L \; _F \quad 0$. Given that $(\ _L; \ _F) = \mathrm{f}(:40; :40); (:64; :32)\mathrm{g}$ the second order condition holds if $6\boldsymbol{c} \quad _F \quad 6(\boldsymbol{c}\ )^2 \; ^2 \quad 0$ for T4 and T6 (in which $_F = \ _L$), and if $6\boldsymbol{c} \quad _F \quad 6(\boldsymbol{c}\ )^2 \; ^2 \quad \frac{2}{_F}$ for T5 and T7 (in which $2 \ _F = \ _L$). Thus the second order condition holds for T4 and T6 if $\frac{}{\boldsymbol{c}^*}$, and for T5 and T7 if $6\ \boldsymbol{c}\ (\ _F \quad \boldsymbol{c}\ ) \quad \frac{2}{_F}$.

$'_L(\mathbf{c}^*$

Table B2: *WRS tests of di¤erences in average follower contribution by endowment (number of groups)*

Returns: Even	Uneven	Endowment:	Binding	***p***-value
T6 (8)	T7 (12)	Uneven	Y	**:**031
T4 (12)	T5 (8)	Even	Y	**:**440
T9 (10)	T10 (10)	Uneven	N	**:**821
T3 (10)	T8 (8)	Even	N	**:**002

Table B3: *WRS tests of di¤erences in average follower contribution by returns (number of groups)*

First, by comparing treatments vertically in Figure 1 in the main text (T4 vs. T3; T5 vs. T8; T6 vs. T9; T7 vs. T10), we appreciate that the e¤ect of binding promises is positive except when bene…ts are unevenly distributed. Thus, being able to set forth binding promises seems to help leaders induce followers to contribute, but only if the proceeds from the public account are distributed evenly. Wilcoxon rank-sum (WRS) tests con…rm this …nding.[3] The results in Table

	Coe¢ cient	***SdE***	***p***-value
Period	-1.04	.16	.000
Binding promise	7.91	3.80	.037
Large endowment	20.41	3.96	.000
Binding promise Period	.09	.33	.792
Large endowment Period	-.27	.35	.432
Constant	33.49	2.49	.000
R	0.12		
#Subjects	408		
#Observations	4 896		

Table C1: *Random (individual) e¤ects GLS with robust standard errors clustered at the group level. Dependent variable: contributions.*

Are conditional and unconditional contributions substitutes? An interesting question is whether conditional and unconditional contributions are substitutes in generating follower contributions. Table C2 contains a regression that includes these two variables on the right-hand side, together with the two treatment dummies found to be e¤ective in the previous analysis (large endowment, binding promise) and interaction terms between each of the former two variables and each of the latter two variables (i.e., four interaction terms). The results show that both conditional and unconditional contributions by the leader signi…cantly increase follower contributions. Thus, the two types of leader contributions seem to be substitutes.

Does the e¤ectiveness of conditional and unconditional contributions vary across treatments? The only interaction e¤ect found to be signi…cant is the one between unconditional contributions and binding promises. This interaction e¤ect is negative. The lack of other signi…cant interaction coe¢ cients may be due to the presence of multicollinearity.

	Coe¢ cient	***SdE***	***p***-value
Binding promise (BP)	11.031	4.491	.014
Large endowment (LE)	9.970	4.202	.021
Unconditional contribution (UC)	.341	.047	.000
Conditional contribution (CC)	.209	.039	.000
BP UC	-.136	.055	.014
LE UC	-.082	.055	.134
BP CC	.019	.046	.682
LE CC	-.032	.043	.451
Constant	5.874	2.811	.037
R	0.18		
#Subjects	312		
#Observations	3 744		

Table C2: *Random (individual) e¤ects GLS with robust standard errors clustered at the group level. Dependent variable: follower contributions.*

Trade-o¤ in target setting In our experiment, the optimal target is a function of the conditional commitment promised, and the optimal relationship between the two variables varies between treatments, as shown in section 3 of the main text. Table 2 in the main text lists

the theoretical equilibrium values for the two variables across the four treatments with binding promises. The mean values observed in the same groups are reported in Table C3. Comparing the two tables reveals that all the observed di¤erences between treatments have the theoretically predicted sign. WRS tests indicate that most of the di¤erences are signi…cant (at the 1% level). For conditional promises, theory predicts …ve pair wise di¤erences. All except one of these di¤erences are signi…cant (the exception being T6-T7). No di¤erence is predicted between T4 and T5, and indeed the data shows no signi…cant di¤erence. For the targets, three of the six predicted di¤erences are signi…cant (T6-T4, T6-T5, and T7-T5). In sum, the variations across treatments are consistent with theory. However, the results also show that leaders set the targets too high relative to the conditional promises.

Treatment	Mean conditional promise	Mean target
T4	57.7	55.7
T5	61.0	50.9
T6	87.1	70.5
T7	95.1	61.7

Table C3: *Mean conditional promises and mean targets in treatments with binding promises*

We …nd no evidence of a hump-shaped relationship between Target and followers' contribution. Table C4 regresses follower contributions on the two treatment dummies found e¤ective in the previous analysis (binding promise and large endowment), the leader's unconditional contribution, the leader's conditional contribution, the target set by the leader (the endogenous treshold), and the target squared. We appreciate that followers' contribution is a monotonically increasing function of Target in the interval we observe (Target squared turns out to be insigni…cant).

	Coe¢ cient	***SdE***	***p***-value
Binding promise	7.589	3.215	.018
Large endowment	5.929	3.296	.072
Unconditional contribution	.172	.029	.000
Conditional contribution	.136	.024	.000
Target	.316	.122	.009
Target	-.001	.001	.354
Constant	1.134	2.786	.684
R	.20		
#Subjects	312		
#Observations	3 744		

Table C4: *Random (individual) e¤ects GLS with robust standard errors clustered at the group level. Dependent variable: follower contributions.*

Similarly scatterplots treatment by treatment do not reveal any hump shaped relationship between target and average follower contributions (Figure C1). The lack of a single optimal target may relate to the fact that in our experiment tresholds (i.e. targets) are endogenous.

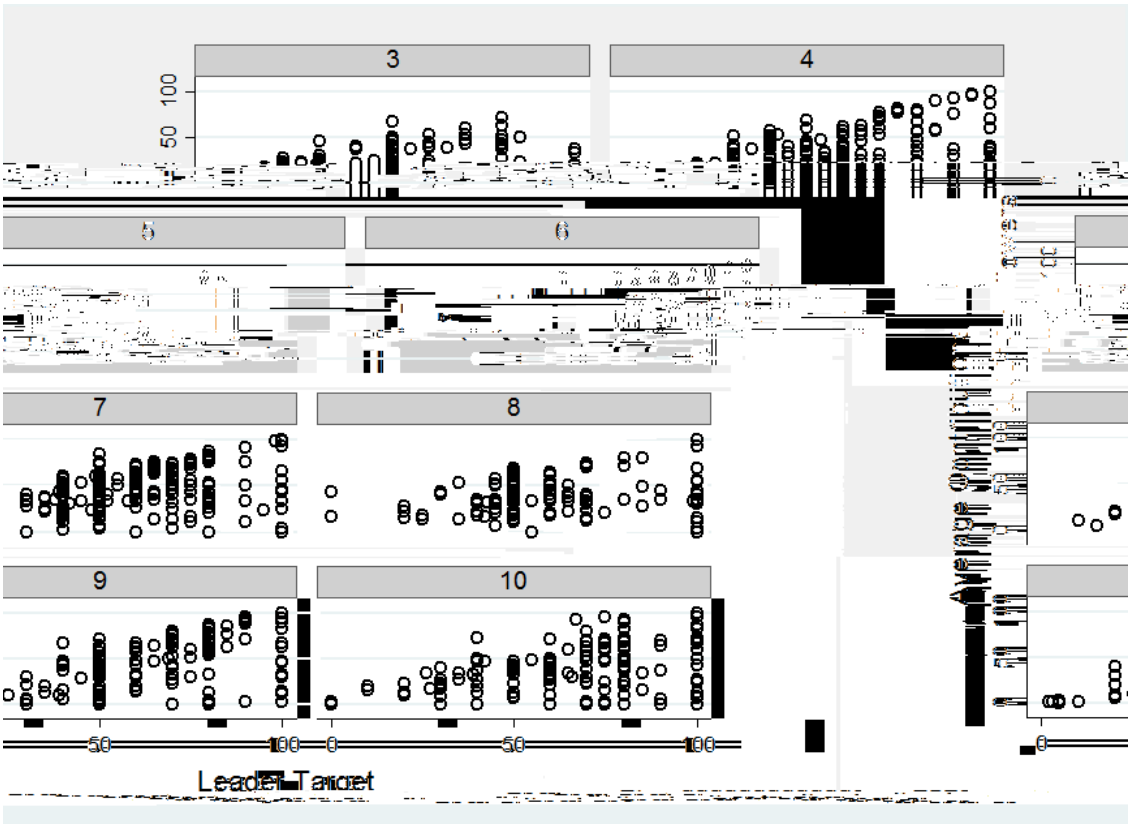


Figure C1: *Scatterplot of Average Follower Contributions by Leader Target, treatment by treatment..*

Appendix D

Sample instruction; T4, US session

Experimental Instructions

You are going to participate in an experiment …nanced by [institution x].

You will earn money. How much you earn depends on the decisions you make, as well as on the decisions made by other subjects.

All interactions are anonymous and are performed through a network of computers. The administrators of the experiment will not be able to observe your decisions during the experiment.

40 subjects participate in the experiment. All participants are in this room, have been recruited in the same way as you have, and are now reading the same instructions as you are for the …rst time. It is important that you do not talk to other participants until the experiment is over.

In the experiment you will earn Experimental Currency Units (ECUs). At the end of the experiment, you will be paid in cash based on your total earnings in ECUs from the experiment. The exchange rate from ECUs to US Dollars (US$) is:

1 ECU = 0.015 US$

The more ECUs you earn, the more cash (in US$) you will receive.

Detailed information about the experiment

The experiment consists of 16 separate periods. Groups of 4 participants are formed randomly from the participants present in the lab. You will never know which other participants are in your group. The group composition is secret for every participant.

Once a group has been formed, it remains unchanged for all the 16 periods of the experiment. These 16 periods are divided into 4 sets; thus, each set consists of 4 periods.

In each set, one group member is THE EARLY CONTRIBUTOR, while the other 3 group members are LATE CONTRIBUTORS. Each group member is the early contributor in one of the 4 sets. Which group member is the early contributor in which set is decided by random.

Example:

Member 4 is the early contributor in set 1 (i.e., in periods 1, 2, 3, and 4);

Member 1 is the early contributor in set 2 (i.e., in periods 5, 6, 7, and 8);

Member 3 is the early contributor in set 3 (i.e., in periods 9, 10, 11, and 12);

Member 2 is the early contributor in set 4 (i.e., in periods 13, 14, 15, and 16).

The group member being the early contributor will see this in an “Information Window", which will appear on his/her screen at the beginning of the set.

What you have to do

At the beginning of each period, each participant will receive an endowment of 100 ECUs.

Your task (as well as the task of your fellow group members) is to decide how much of your endowment you will contribute to a PROJECT. Whatever you do not contribute, you will keep for yourself.

Example 1: Member 1 is the early contributor in period 1 and contributes 30 ECUs in stage 1. Moreover, member 1 promises to make an additional contribution of 30 ECUs in stage 3, provided the three other members' average contribution in stage 2 equals at least 50 ECUs. Knowing the contribution and the conditional promise of the early contributor, the three other members of the group contribute 0 ECUs , 100 ECUs and 80 ECUs, respectively, in stage 2. In other words, the average stage 2 contribution is 60 ECUs (and thus satis…es the early contributor's minimum requirement of 50 ECUs). In stage 3, therefore, the computer adds 30 ECUs to the early contributor's contribution. Member 1's earnings in period 1 will then be as follows:

ECU he or she keeps:	100 30 30		= 40
+ Income from the project:	0:4 (30 + 0 + 100 + 80 + 30) = 0:4	240	= 96
= Period earnings:	40 + 96		= 136

In contrast, the period earnings of the group member contributing 0 ECUs to the project will be as follows:

ECU he or she keeps:	100 0		= 100
+ Income from the project:	0:4 (30 + 0 + 100 + 80 + 30) = 0:4	240	= 96
= Period earnings:	100 + 96		= 196

Example 2: Member 1 is the early contributor in period 1 and contributes 20 ECUs in stage 1. Moreover, member 1 promises to make an additional contribution of 60 ECUs in stage 3, provided the three other members' average contribution in stage 2 equals (at least) 80 ECUs. Knowing the contribution and the conditional promise of the early contributor, the three other members of the group contribute 60 ECUs, 80 ECUs, and 100 ECUs, respectively, in stage 2. In other words, the average stage 2 contribution is 80 ECUs (and thus satis…es the early contributor's minimum requirement of 80 ECUs). In stage 3, therefore, the computer adds 60 ECUs to the early contributor's contribution. Member 1's earnings in period 1 will then be as follows:

ECU he or she keeps:	100 20 60		= 20
+ Income from the project:	0:4 (20 + 60 + 80 + 100 + 60) = 0:4	320	= 128
= Period earnings:	20 + 128		= 148

In this example, all members' contributions are equal (here: 80 ECUs). As a result, their period earnings will also be equal (here: 148 ECUs).

Example 3: Member 1 is the early contributor in period 1 and contributes 0 ECUs in stage 1. Moreover, member 1 promises to contribute 100 ECUs in stage 3, provided the other members' average contribution in stage 2 equals at least 80 ECUs. Knowing the contribution and the conditional promise of the early contributor, the three other members of the group contribute 0 ECUs each in stage 2. The average stage 2 contribution is thus 0 ECUs, which does not satisfy the early contributor's minimum requirement of 80 ECUs. In period 3, therefore, the computer adds nothing to the early contributor's contribution. This means that all members contribute 0 ECUs. Every member's period earnings will then equal his or her endowment (100 ECUs).

The information you receive at the end of each period

At the end of each period, you will receive information about the number of ECUs contributed by each of your fellow group members as well as about your own period earnings.

Your …nal earnings

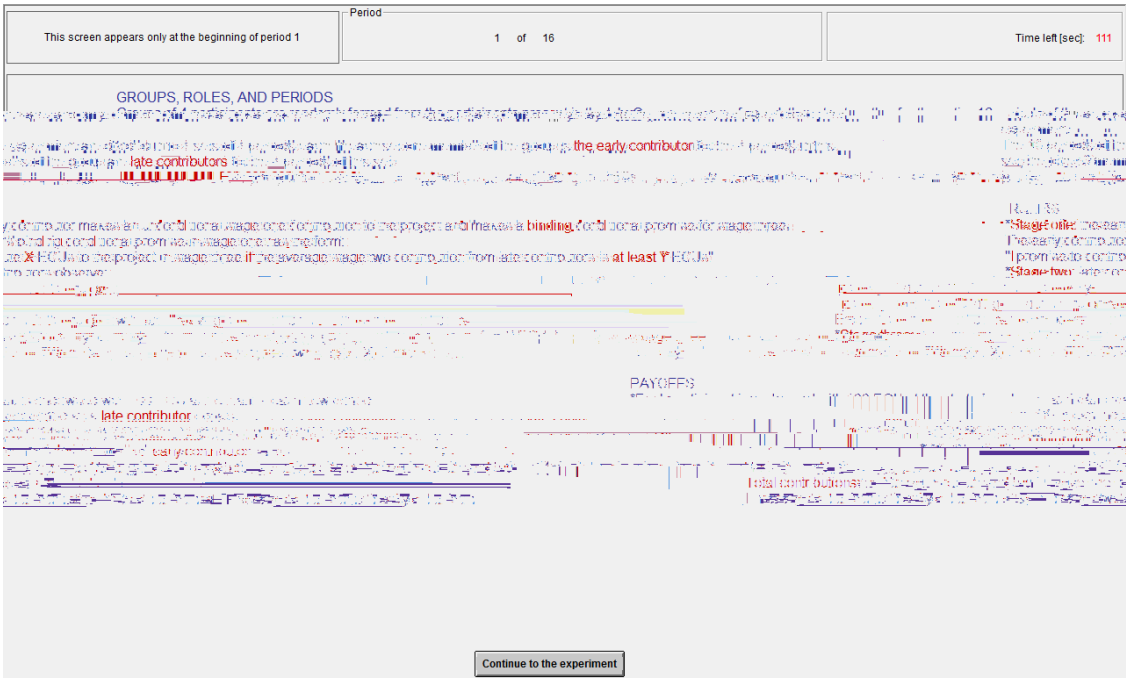
Your …nal earnings will be calculated as follows:

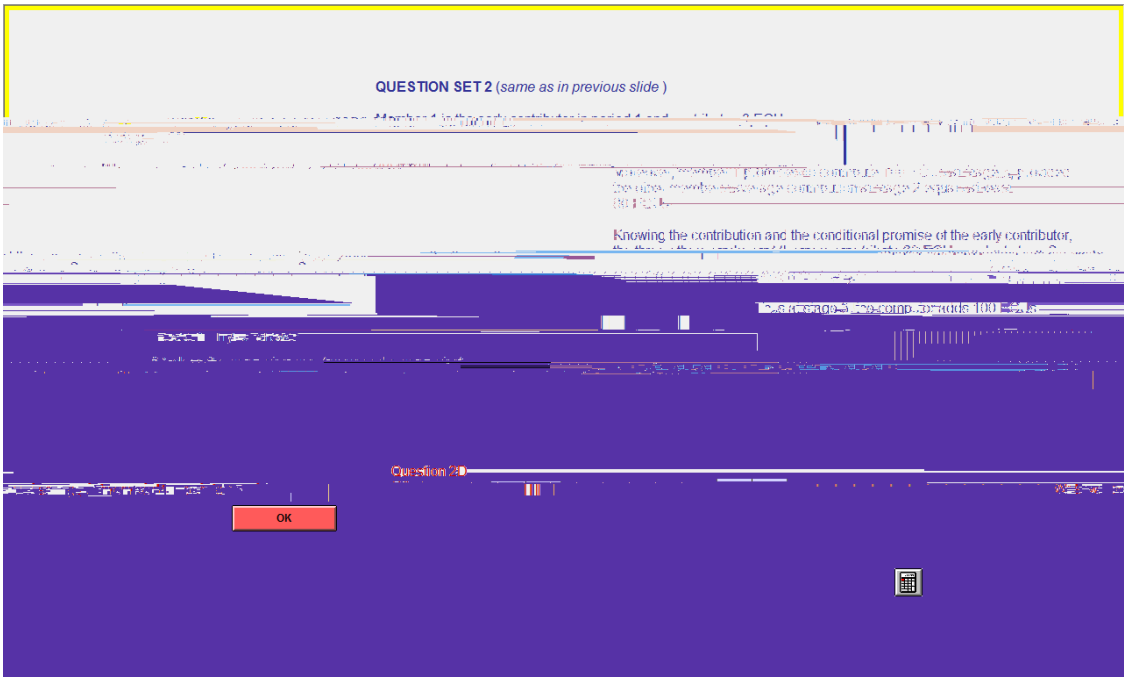
1. Your earnings in the 16 periods will be added up.
2. The resulting sum will be converted to US$ and paid to you in cash.

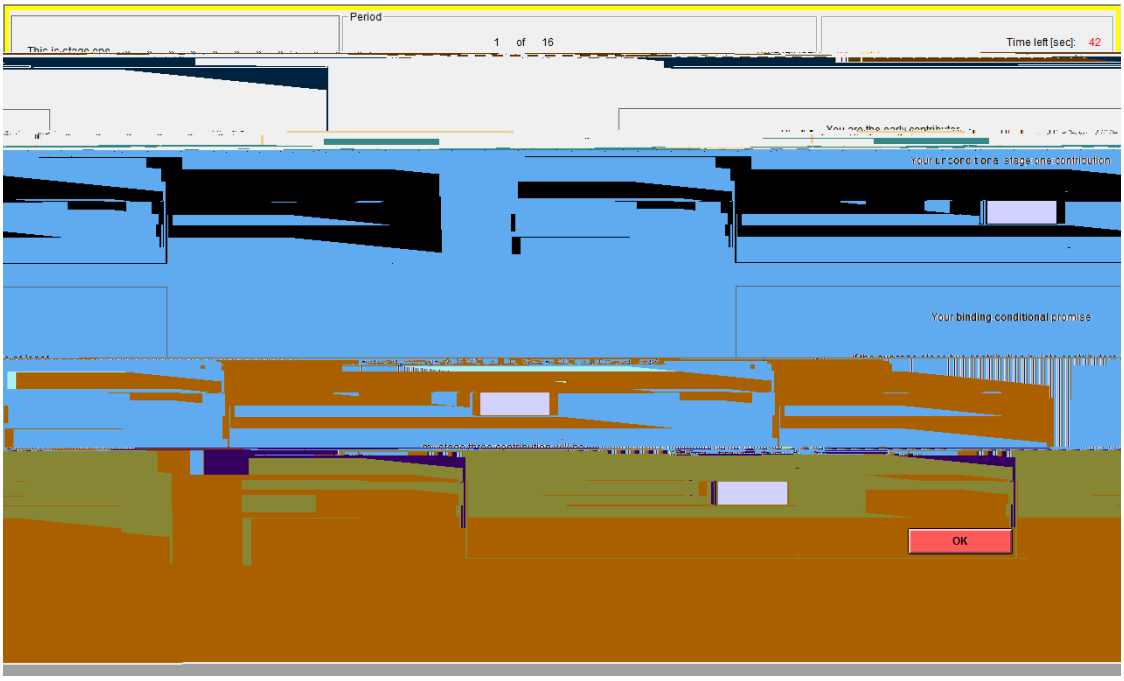
Before the experiment starts, we will run a control questionnaire to verify your understanding of the experiment.

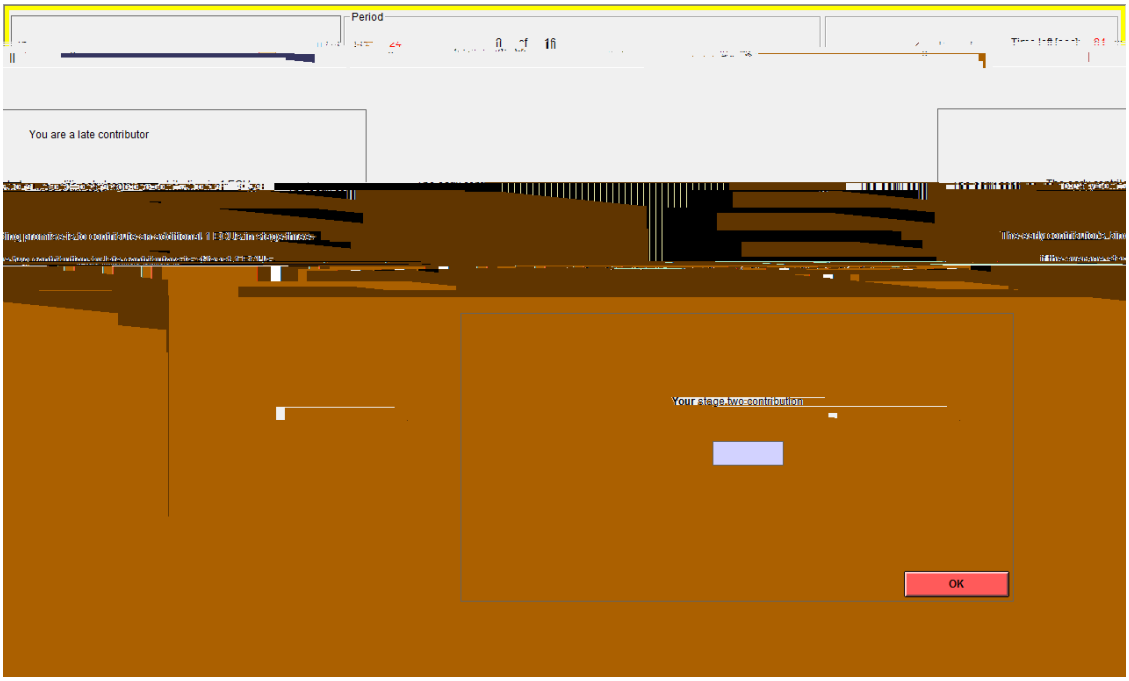
Please remain seated quietly until the experiment starts. If you have any questions, please raise your hand now.

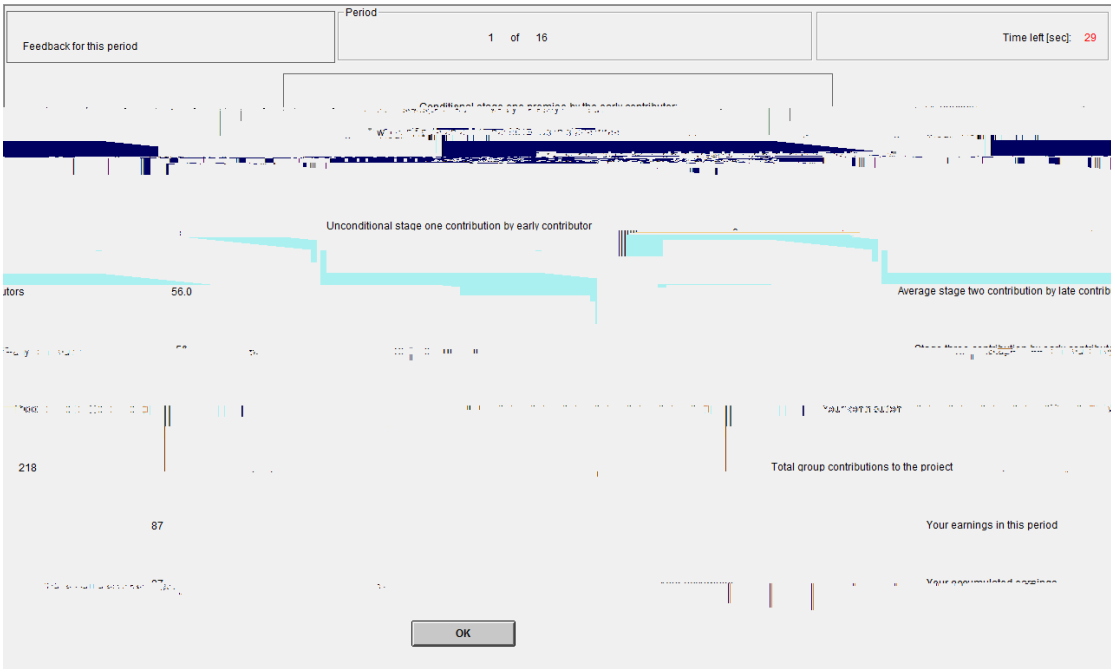
Sample screen shots T4:
contains …rst and last of a total of 8 control questions; information screen prior to …rst game; leader and follower decision screens; two common feedback screens.




QUESTION SET 2 (same as in previous slide)
Knowing the contribution and the conditional promise of the early contributor,
OK


Period
1 of 16
Time left [sec]: 42
Your binding conditional promise
OK


Period
You are a late contributor
Your stage two contribution
OK


Feedback for this period
Period
1 of 16
Time left [sec]: 29
Unconditional stage one contribution by early contributor
56.0
Average stage two contribution by late contrib
218
Total group contributions to the project
87
Your earnings in this period
OK