Can non-binding promises increase cooperation in a voluntary contribution mechanism game? An Experiment*

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Abstract

We consider a modified voluntary contributions mechanism (VCM) game where the marginal per capita return (mpcr) for a group of responders is endogenously determined by the proposer. We allow the proposer to implement a mpcr that is different to the mpcr initially announced, after observing responders' contributions. Thus, the mpcr used to determine responders' payoffs may differ from the mpcr that was public information when responders decided their contributions. Our findings indicate that contributions increase with the announced mpcr even when the announced mpcr is non-binding. This suggests that promising a high mpcr in VCM type interactions can be successful at increasing individuals' contributions even if the eventual mpcr that determines payoff is substantially lower. Finally, we find that the marginal gains from the above strategy can be expected to decrease with experience.

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1 Introduction

Experimental evidence suggests that contributions in voluntary contributions mechanism (VCM) games often increase with the announced marginal per capita return (mpcr), even when positive contributions are strictly dominated (e.g., Isaac et al., 1984; Gunnthorsdottir et al., 2007; Brandts and Schram, 2001). The feature of such studies is that the announced mpcr is *binding,* in the sense that it is always used to determine the payoffs for all individuals. In this note, we investigate whether contributions continue to increase with the announced mpcr even when it is *non-binding*, i.e., when the mpcr used to determine payoffs may differ from the mpcr that was public information when individuals decided on their contributions.

Consider a society that would like to reduce its carbon foot-print. It is incumbent on individuals to make the costly efforts to mitigate climate change. A policy-maker might encourage this behaviour by advancing white papers or campaign pledges that allocate large expenditures towards building the infrastructure to support a "green society". For individuals, this can be interpreted as a promise of a high mpcr. However, infrastructure spending is allocated over extended periods of time and is vulnerable to political cycles and changing priorities for the policy-maker. Thus, the eventual funding made to the infrastructure, after individuals have decided on their costly efforts, could differ from the pledges initially made by the policy-maker i.e., the realised mpcr could differ from the initial pledge.

We capture the above intuition with the following game. There are 4 players, each endowed with $E = 10$. One player, the proposer, first announces the mpcr for a project, which could either be 0.4 (LOW), 0.8 (MED) or 1.2 (HIGH). The other $i = 1, 2, 3$ players, the responders, observe the proposer's announcement and each contribute $c_i \in [0, E]$ to the project. The proposer observes the total contributions ($C = \sum_i c_i$) and decides on the mpcr that is to be implemented. Two games are considered

- *Binding (BND) game.* The proposer has to implement the same mpcr as announced.
- *Non-binding (nBND) game.* The proposer can choose to implement a different mpcr to the one announced if he wishes to.

Payoffs for the proposer and responder i in each game are $\pi^P = E - \delta(\beta) + C$ and $\pi_i^R = E - c_i + \beta C$, respectively, where $\beta \in \{0.4, 0.8, 1.2\}$ is the implemented mpcr and $\delta(\beta) = 15 \cdot (\beta - 0.4)$ is the proposer's cost with implementing the mpcr.

Assuming perfectly selfish and rational players, the equilibrium predictions in the BND game are for responders to contribute $c_i = E$, if the HIGH mpcr is announced or otherwise

$c_i = 0$. The proposer best-responds by always announcing the HIGH mpcr. In equilibrium, the nBND game proposer does no worse by always announcing the HIGH mpcr and implementing the LOW mpcr. Anticipating this, responders will always contribute $c_i = 0$.[1]

However, the equilibrium predictions are unlikely to hold in practice. Amongst other reasons, nBND game proposers might be averse to "lying" (implementing a different mpcr than announced) to responders. Announcing a HIGH mpcr can also be risky to BND game proposers, if responders deviate from the equilibrium predictions. Finally, experimental evidence from the standard VCM design suggests that people often make positive contributions even when it is dominated (e.g., Ledyard, 1995; Chaudhuri, 2011).

The BND game is similar to the archetypical VCM design with the exception that the implemented mpcr is endogenously determined by the proposer. Here, all players strictly prefer the *efficient* outcome (i.e., $C = 3E$). However for any $C > 0$, responders' and proposer's payoffs are highest when the HIGH and LOW mpcr are implemented, respectively. In contrast to the BND game, any mpcr announcement in the nBND game is non-binding given that the proposer can always implement a different mpcr. In fact, the payoff structure suggests that a HIGH or MED mpcr is unlikely to be implemented even when announced, since the proposer maximises payoffs by always implementing the LOW mpcr.

Given the two games, we study (i) how contributions within each game vary with the announced mpcr and (ii) how contributions between games vary with the announced mpcr. We find that responders' contributions in the BND and nBND game are strictly increasing with the announced mpcr – nBND game proposers who announced the MED or HIGH mpcr often implemented the LOW mpcr. The between game differences in contributions depend on responders' *experience*: the number of experimental rounds played. For inexperienced responders, contributions in BND and nBND games are not significantly different when the LOW, MED and HIGH mpcr are announced. For experienced responders, contributions in the BND and nBND games are not significantly different when the LOW mpcr is announced and significantly lower in the nBND game when the MED and HIGH mpcr are announced. However, we also note that between game differences for experienced responders are small.

To summarise, we find that contributions in the VCM increase with the announced mpcr even when the announced mpcr is non-binding. This shows that a promising a high mpcr in VCM-type interactions can be successful at increasing individuals' contributions, even if individuals allow for the possibility that their payoffs may be determined by a lower mpcr. However, the marginal gains from such a strategy can be expected to decrease with

[1] Equilibrium payoffs are strictly higher for all players in the BND relative to the nBND game.

experience.

The rest of this note is organised as follows. Section 2 details our experimental procedures, Section 3 details the experiment findings and finally, Section 4 summarises. The experiment instructions and data are reported in the appendix.

2 Experimental procedures

Subjects were recruited in 2017 from the student cohort at the University of Erlangen-Nuremberg using ORSEE (Greiner, 2015) and the experiments were programmed with z-Tree (Fischbacher, 2007). Subjects in each session of the BND ($n = 52$ subjects, 2 sessions) and nBND ($n = 52$ subjects, 2 sessions) games were randomly assigned a role (proposer or responder) and played in the same role over three experiment rounds – with random matching of participants at each round. In addition to a €4 show up payment, one round was randomly selected for payment at the exchange rate of 4 ECU to €1.[2]

We used the *strategy method* to elicit the decision of responders. In each round, responders submitted their planned contributions for each possible announcement. In addition, they also submitted their beliefs about the contributions of the other two responders for each possible announcement.[3] To ensure that responders fully understood the experiment design, we also provided them with information about their potential payoffs given their contribution decisions and their beliefs about the contributions of others, for each possible announced and implemented mpcr. Given this information, responders could choose to either submit or revise their decisions. Thereafter, proposers and responders were matched and proposers observed the contribution decisions. The two games differed on whether the proposer can implement a different mpcr than earlier announced. Payoffs were realised at the end of each round and subjects received feedback on all decisions. Subjects also received a bonus of 2 ECU if their submitted beliefs were within two integers of the actual value.

[2]There was also a second part of the experiment where we studied the effects of transition from one game to another i.e., from the BND to nBND game or vice versa. However, subjects were unaware of the second part's design upon submitting their decisions in the initial nBND and BND games.

[3]We did not elicit nBND responders' beliefs as to the proposers' announced and implemented mpcr since doing so might be complex given the different possible permutations.

3 Results

Figure 1 shows how frequently the LOW, MED and HIGH mpcr were announced and implemented in the BND and nBND treatments – announced frequencies in the BND and nBND treatments are significantly different (Fisher exact $p < 0.01$). Furthermore, 80% and 67% of nBND treatment proposers who announced the HIGH and MED mpcr, respectively, eventually implemented the LOW mpcr.

Result 1 *Proposers announced the HIGH mpcr more frequently in the nBND relative to BND game. Furthermore, proposers in the nBND game often implemented a lower mpcr than had been announced.*

With experience, Result 1 suggests that nBND treatment responders are less likely to assign a high probability to the proposer implementing a HIGH or MED mpcr. For the ease of exposition, we will use the short hand c^L, c^M and c^H to denote responders' contributions when the announced mpcr are LOW, MED and HIGH. Furthermore, to account for the role of experience, we will focus on responders' contributions in the first (inexperienced responders) and last (experienced responders) rounds.

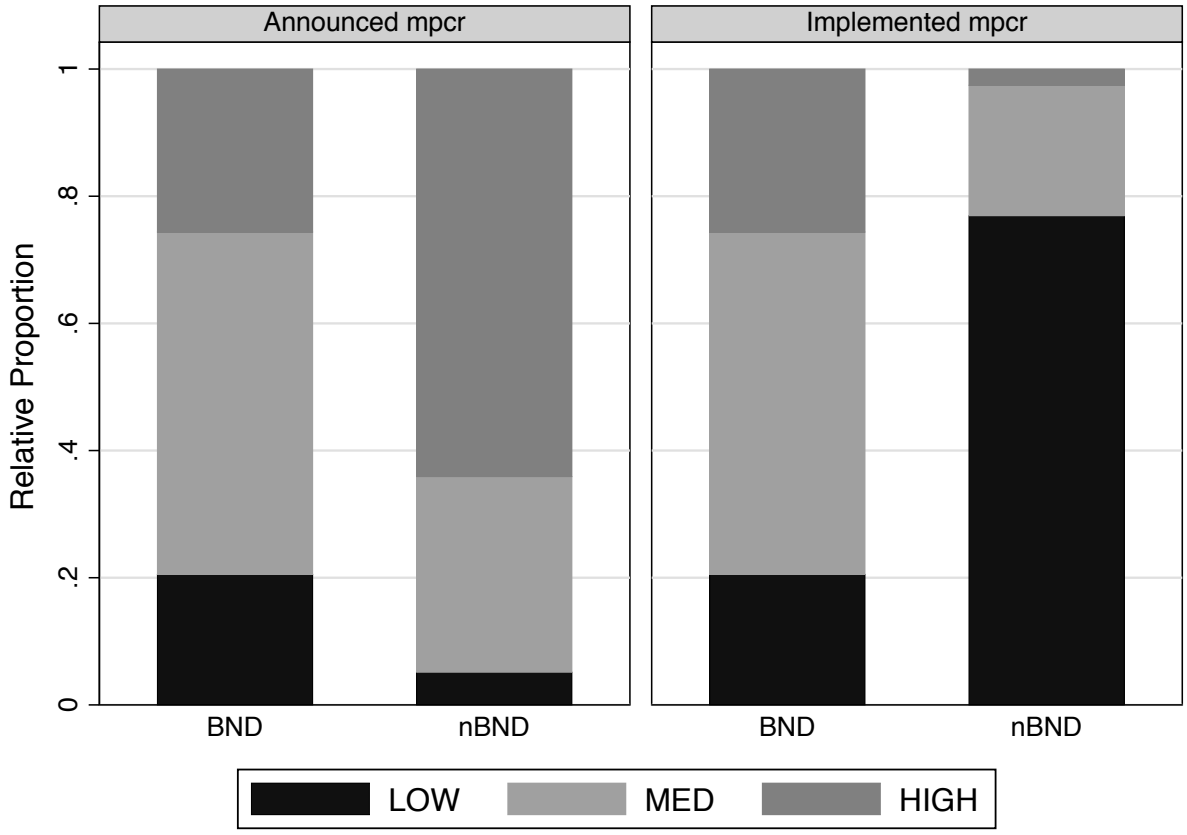
Figure 2 details responders' mean contributions, apportioned by rounds, treatments and announced mpcr.[4] Here, we see that contributions are significantly different from the equilibrium predictions (Signrank, $p < 0.001$ in each comparison).

Within-subject comparisons for both inexperienced and experienced responders in the BND and nBND treatments finds c^H to be significantly higher than c^M and c^L (Signrank, $p < 0.001$ in each comparison) and c^M to be significantly higher than c^L (Signrank, $p < 0.001$ in each comparison).

Result 2 *Contributions for both inexperienced and experienced responders in the BND and nBND games are strictly increasing with the announced mpcr.*

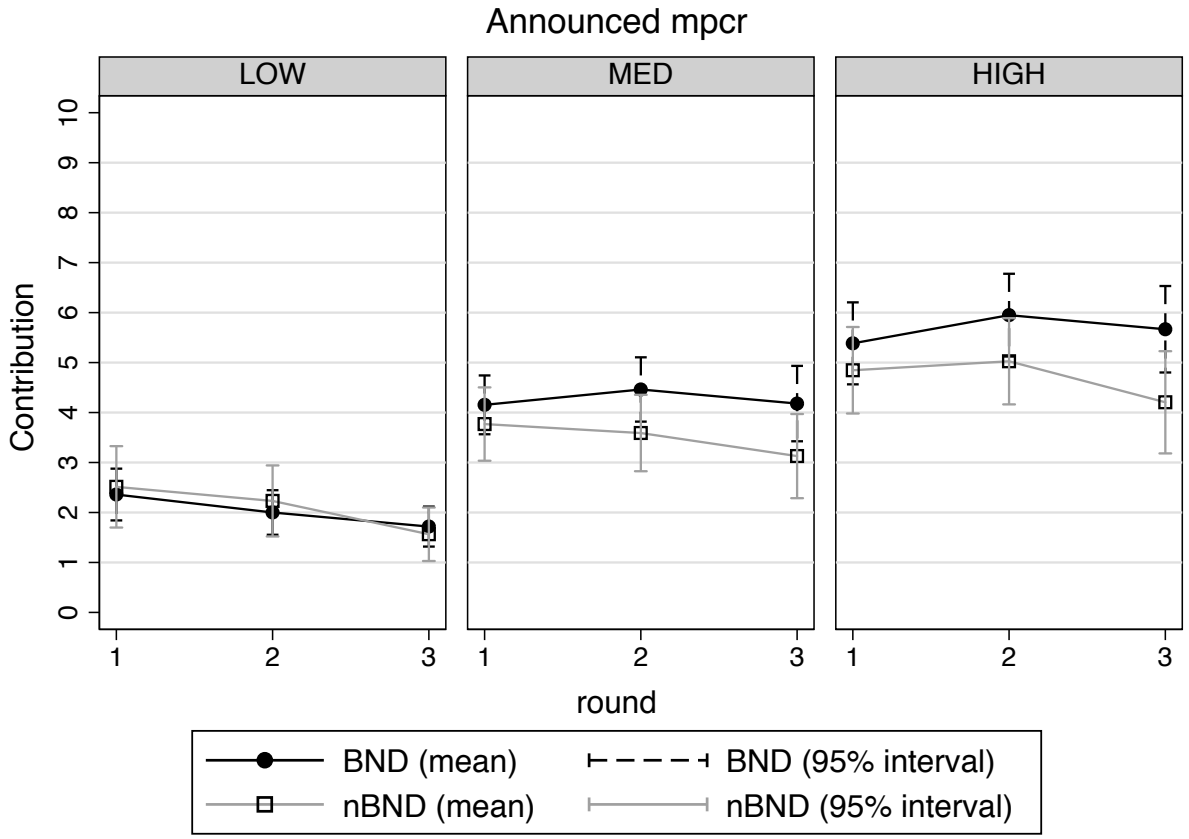
Turning our attention to the between-subject comparisons, we do not find c^L (Mann-Whitney, $p = 0.31$), c^M (Mann-Whitney, $p = 0.31$) and c^H (Mann-Whitney, $p = 0.36$) to be significantly different for inexperienced responders in the BND and nBND treatments. As for experienced responders, we find c^H (Mann-Whitney, $p = 0.03$) and c^M (Mann-Whitney, $p = 0.03$) to be significantly higher in the BND treatment – no significant differences for c^L (Mann-Whitney, $p = 0.38$).

[4]Responders contributions in both treatments are positively correlated to their beliefs about the contributions of other responders.



Note. The coloured regions in each bar denote the relative proportion of proposers who announced or implemented the LOW, MED and HIGH mpcr. There are $n = 39$ observations in each bar.

Figure 1: Proposers' announced and implemented mpcrs



Note. Each observation details the mean ($n = 39$) and 95% confidence interval of contribution.

Figure 2: Responders' contributions

Result 3 *Inexperienced responders' contributions in the BND and nBND games are not significantly different for each possible announced mpcr. In contrast, contributions when the announced mpcr is MED or HIGH, are significantly lower in the nBND relative to BND game.*

Further to Results 1 and 2, within-subject comparisons finds that BND and nBND treatment responders' beliefs about the contributions of other responders are strictly increasing with the announced mpcr (Signrank $p < 0.001$ for each comparison). However for inexperienced and experienced responders, between-subject comparisons do not find significant differences in beliefs in both treatments when the LOW, MED and HIGH mpcr are announced (Mann-Whitney, $\rho \geq 0.55$ for each comparison).

4 Conclusions

In this note, we show that contributions in a VCM game can increase with the announced mpcr even when the announced mpcr is non-binding. Furthermore, relative to the case where the announced mpcr is binding, the differences in contributions are only significant - albeit slightly, when responders are experienced.

Naturally, our findings raise broader questions about why contributions in the nBND game are increasing with the announced mpcr. A possible explanation is that the HIGH mpcr announcement acts as a focal point that helps responders to coordinate on a "good outcome". Testing this conjecture will be an ambition for future research.

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Appendix A: Instruction

There were two parts (A and B) to the experiment. Subjects first received the part A instructions and only received the part B instructions at the end of part A. Part A refers to discussions in the manuscript – 52 subjects received the BND game instructions and 56 subjects received the nBND game instructions. Part B, studied the transition from one game to another. Thus, the subjects who received the BND (nBND) instructions in part A were given the nBND (BND) instructions in part B.

The following details the instructions for both parts. Areas in the instructions that are unique to the BND and nBND games will be identified by "*text*" and "text", respectively.

A.1 Subjects' instructions

You are participating in an experiment on decision-making. If you follow the instructions and apply them carefully, you can earn some money in addition to the 4 Euro show-up payment which we will give you in any case. Please read the following instructions carefully. From now on, you are not allowed to talk to other participants. If you have any questions, please raise your hand and the experimenter will answer your questions privately. The experiment will consist of 2 parts (Part A and Part B).

The following instructions are for Part A which will consist of three rounds. You will earn a payoff denoted in ECU (the experimental currency units) for each round. At the end of Part A, you will receive the instructions for Part B. Part B will also consist of three rounds. Your payoff in each round of Part B is denoted in ECU. At the end of Part B, the computer will randomly pick one round from Part A and one round from Part B for payment. Your earnings from this experiment will be the average of both picked rounds and will be converted into cash at the exchange rate of 1 Euro = 2 ECU. In addition, you will also receive your show-up payment of 4 Euro. As we prepare your cash payments, we will greatly appreciate if you could complete a simple survey to provide feedback on your behaviour in both parts and potential improvements to the experiment.

Instructions for Part A (overview)

Each round of Part A will involve a group of four participants. Each participant will be assigned a role which could either be the Proposer or the Responder. The role determines the type of decisions a participant will be making in this experiment. There are 3 Responders and 1 Proposer in each group. You will keep the same role for all three rounds of Part A. You will be randomly matched with other participants in each round of Part A.

To help you better understand the experiment design, Section 2.1 will present an overview of the situation that Part A is based upon. At the end of Section 2.1 is a list of control questions. Please submit your answers to these questions on the computer. After everyone has completed the control questions, your role will be revealed to you. At this point, you will be given time to read Section 2.2 of this instruction, which details how you will be making your decisions in this experiment. Here, you can focus on the instructions that are relevant to your role.

Instructions for Part A (Section 2.1)

The following instructions explains the proceedings of a round in Part A. Each participant (Proposer or Responder) begins the round with an endowment of 10 ECU. The Proposer moves first and announces a marginal per capital return (MPCR) to the three responders – we will explain how the MPCR is used later. The Responders observe the Proposer's announcement (i.e., the MPCR) and must decide how much of their own endowment they would like to contribute to a public project. The minimum contribution per Responder is 0 ECU The maximum contribution per Responder is 10 ECU

The Proposer observes the total contributions of all Responders but is restricted to implementing the same MPCR which had been previously announced. The Proposer observes the total contributions of all Responders. The Proposer can choose to implement a MPCR which is identical or different to his announced MPCR. This means that the Proposer can choose a different MPCR from his announced MPCR if she or he wants to. Each MPCR is associated with a cost to the Proposer and benefits to the public project. This is summarised on Table A1

For example, if the Proposer initially announced the MPCR to be MEDIUM, she/he must also implement a MEDIUM MPCR after observing the contributions of all Responders. In doing so, the cost to the Proposer is 6 ECU and the benefits to the public project is 0.8. For example, if the Proposer initially announced the MPCR to be MEDIUM, she/he can choose

MPCR chosen by Proposer to be implemented	LOW	MEDIUM	HIGH
Cost to Proposer	0 ECU	6 ECU	12 ECU
Benefits to the public project	0.4	0.8	1.2

Table A1: Cost to Proposers and Benefits to Public Project

to implement a HIGH MPCR after observing the contributions of all Responders. In doing so, the cost to the Proposer is 12 ECU and the benefits to the public project is 1.2. After the Proposer has implemented the MPCR, the payoffs for all participants will be determined. The Proposer's payoff is as follows:

Proposer payoff = 10 - (Cost to Proposer) + (Contributions of ALL Responders)

Naturally, the cost to the Proposer depends on the implemented MPCR. Furthermore, the Proposers benefit when all Responders increase their contributions. To see the payoffs for Responders, we must first compute:

Value of Public Project = (Benefits to Public project) x (Contributions of ALL Responders)

Clearly, the value of the public project will depend on the implemented MPCR and the contributions of all Responders. Finally, the Responder's payoff is

Responder payoff = 10 - (own contribution) + (value of public project)

Here are some examples to help you better understand the payoff structure.

Example 1. The Proposer announces the MPCR to be MEDIUM. Upon observing the Proposer's announcement, Responder 1 contributes 4 ECU, Responder 2 contributes 5 ECU and Responder 3 contributes 6 ECU. The Proposer observes the total contribution to be $4 + 5 + 6 = 15$ ECU. *The Proposer is restricted to implementing the MEDIUM MPCR.* The Proposer implements the MEDIUM MPCR. The value of the public project is therefore $0.8 \times 15 = 12$. The payoffs for each participant is as follows:

- Proposer: $10 - 6 + 15 = 19 ECU$
- Responder 1: $10 - 4 + 12 = 18 ECU$

- Responder 2: $10 - 5 + 12 = 17 ECU$
- Responder 3:$10 - 6 + 12 = 16 ECU$

Example 2. The Proposer announces the MPCR to be *LOW* MEDIUM. Upon observing the Proposer's announcement, Responder 1 contributes 4 ECU, Responders 2 contributes 5 ECU and Responder 3 contributes 6 ECU. The Proposer observes the total contribution to be $4 + 5 + 6 = 15$ ECU. *The Proposer is restricted to implementing the LOW MPCR.* The Proposer implements the LOW MPCR. The value of the public project is therefore $0.4 \times 15 = 6$. The payoffs for each participant is as follows:

- Proposer: $10 - 0 + 15 = 25 ECU$
- Responder 1: $10 - 4 + 6 = 12 ECU$
- Responder 2: $10 - 5 + 6 = 11 ECU$
- Responder 3: $10 - 6 + 6 = 10 ECU$

Instructions for Part A (Section 2.2)

Please can you now submit your answers to the control questions on the screen. A calculator button is included for your convenience if required.

Q1. There are ___ rounds in Part A. The computer will randomly choose one of these rounds for payment.

Q2. You will be paired with ___ (1=same participants; 2=random participants) in each round of Part A.

Q3. The Proposer ___ (1=has to; 2=does not have to) implement the same MPCR as she/he had previously announced.

Q4. If the Proposer has announced a HIGH MPCR, she/he is ___ (1=able; 2=unable) to implement a LOW MPCR after observing the contributions of all Responders.

Q5. If the Proposer implements a HIGH MPCR, Responder 1 contributes 3, Responder 2 contributes 4 and Responder 3 contributes 5. (a) Responder 1's Payoff is ___ ECU. (b) Responder 2's Payoff is ___ ECU. (c) Responder 3's Payoff is ___ ECU. (d) Proposer's Payoff is ___ ECU.

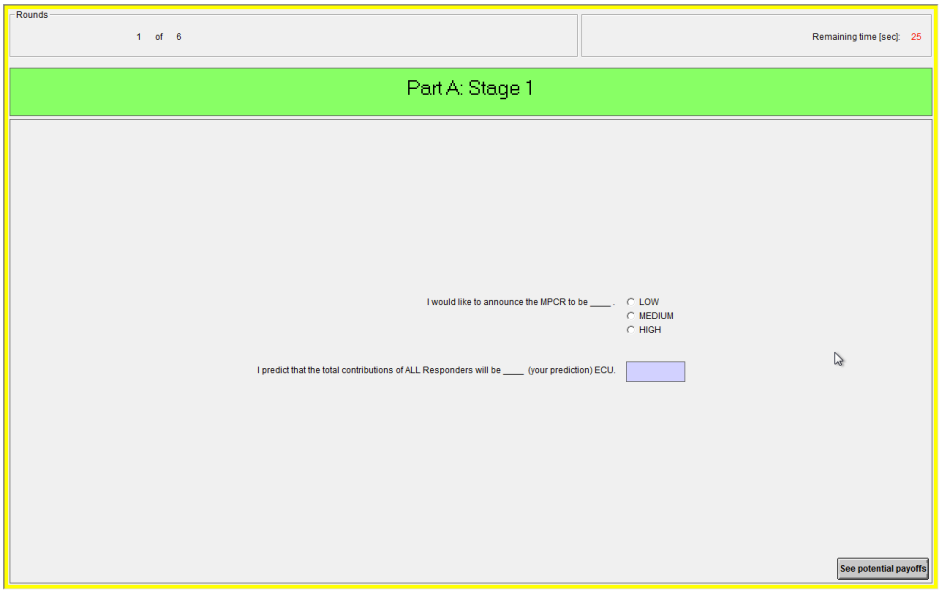

Figure A1: Proposer: Stage 1 (BND and nBND games)

Instructions for Part A (Section 2.3)

Your role in Part A should now be revealed to you. To help you understand the experiment design, we have organised the instructions as follows: Section 2.3.1: Instructions for the Proposer and Section 2.3.2: Instructions for the Responders.

The design of this experiment is based upon the discussion in Section 2.2. As such, you can focus on the instructions that are relevant for you. Nevertheless, you could also read the instructions for the other roles if you want to.

Instructions for Part A (Section 2.3.1)

You will submit your decisions over three stages.

Stage 1 (See Figures A1, A2 and A3). You will choose the MPCR you would like to announce. This could be LOW, MEDIUM or HIGH. In addition, you will also submit your prediction as to the total contribution of all responders. Given your decisions here, we will also show you the predicted payoffs for all possible MPCR you can implement.

Stage 2 (See Figures A4 and A5). You will observe the contribution of all Responders and implement your MPCR. *You will be restricted to implementing the same MPCR as you had announced in Stage 1.* You could choose to implement a MPCR which is different from

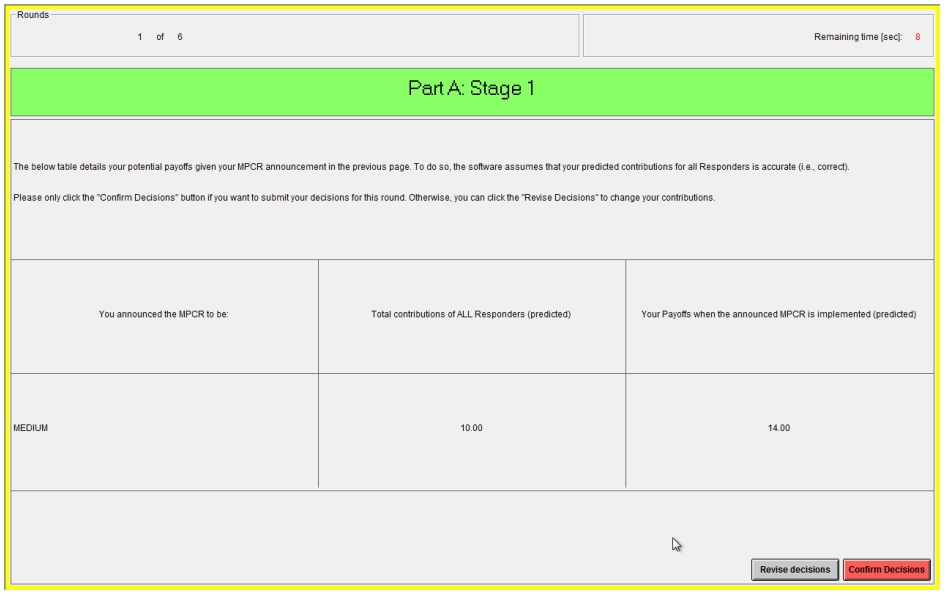

Figure A2: Proposer: Stage 1 (BND game only)

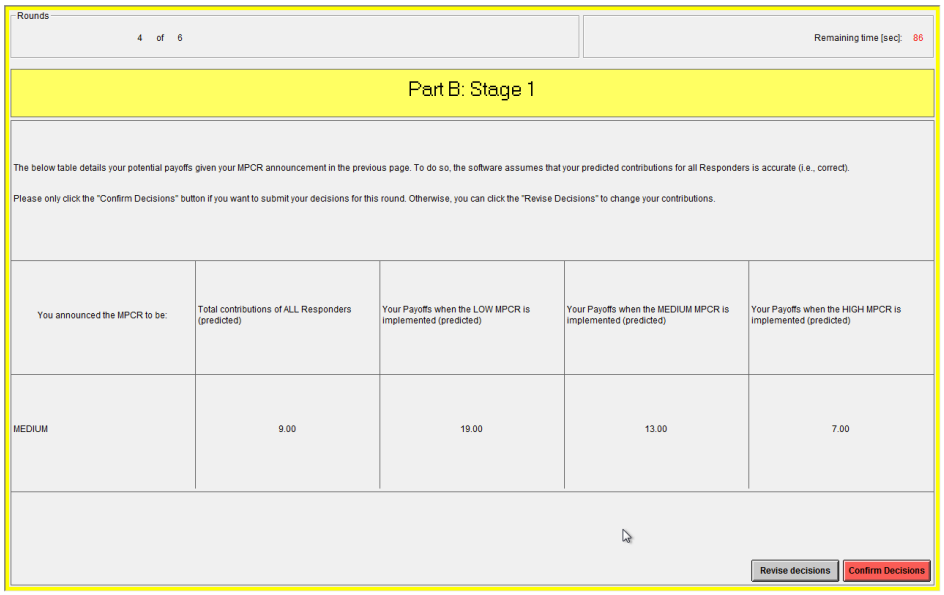

Figure A3: Proposer: Stage 1 (nBND game only)

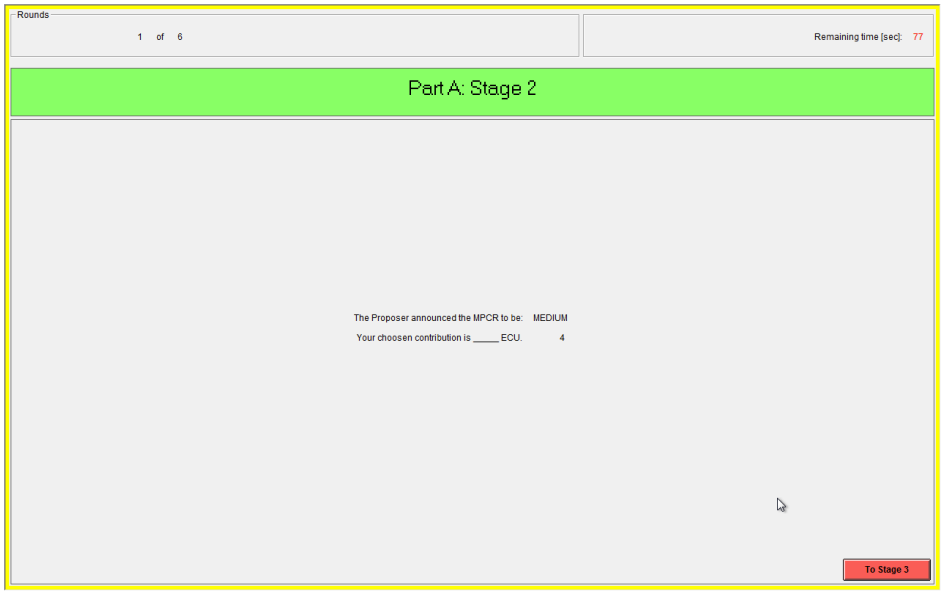

Figure A4: Proposer: Stage 2 (BND game only)

your announced MPCR in stage 1 if you want to.

Stage 3. Your payoff for the round is determined. Again, this will depend on (i) Your implemented MPCR and (ii) The total contribution of all Responders. In addition, you will receive a bonus of 2 ECU if your stage 1 prediction as to the contribution of all Responders is within two integers of the actual contribution.

Instructions for Part A (Section 2.3.2)

You will submit your decisions over three stages.

Stage 1 (See Figures A6, A7 and A8). You will decide on your contribution amounts if the Proposer had announced the MPCR to be LOW, MEDIUM or HIGH. For each possible MPCR, you will also submit your predictions as to the total contributions of the other two responders. You will see a table much like the one below (Table A2): Given your decisions here, we will also show you the predicted payoffs for yourself.

Stage 2. You observe the announced MPCR of the Proposer. Your contribution amount will thus be determined by your decisions in Stage 1.

Stage 3. Your payoff for the round is determined. Again, this will depend on (i) The implemented MPCR, (ii) Your own contribution and (iii) The total contribution of all Re-

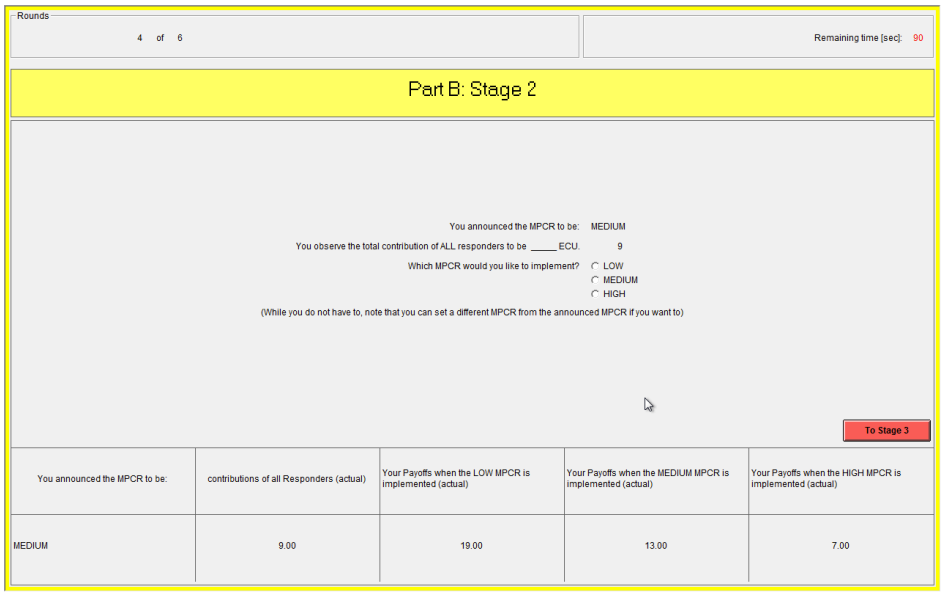

Figure A5: Proposer: Stage 2 (nBND game only)

MPCR	Your Contribution	Your Prediction
If the proposer had announced the mpcr to be:	I would like to contribute ECU.	I predict that the total contribution of all other Responders is ECU.
LOW	"Enter your decision here"	"Enter your decision here"
MEDIUM	"Enter your decision here"	"Enter your decision here"
HIGH	"Enter your decision here"	"Enter your decision here"

Table A2: How Responders submit their decisions

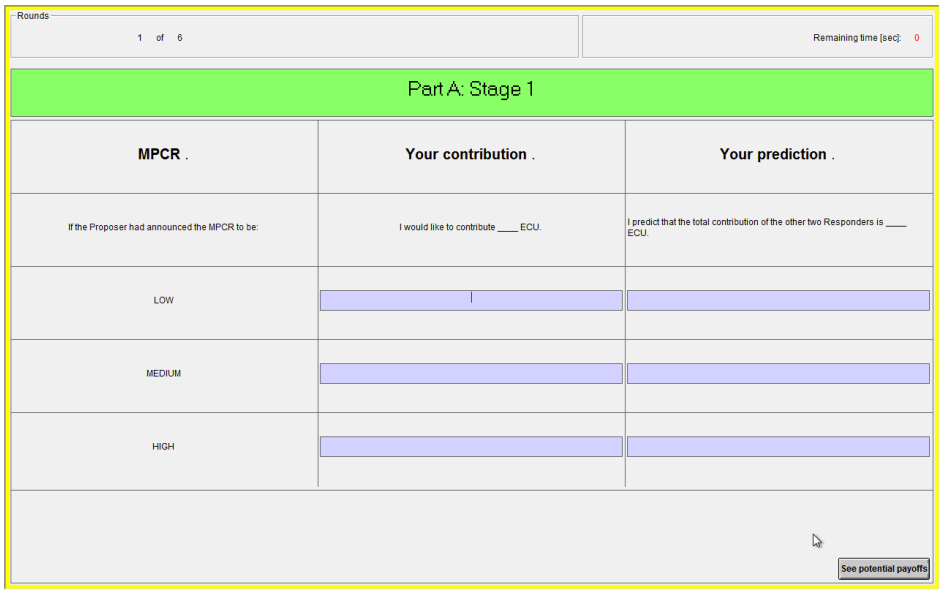

Figure A6: Responders: Stage 1 (BND and nBND games)

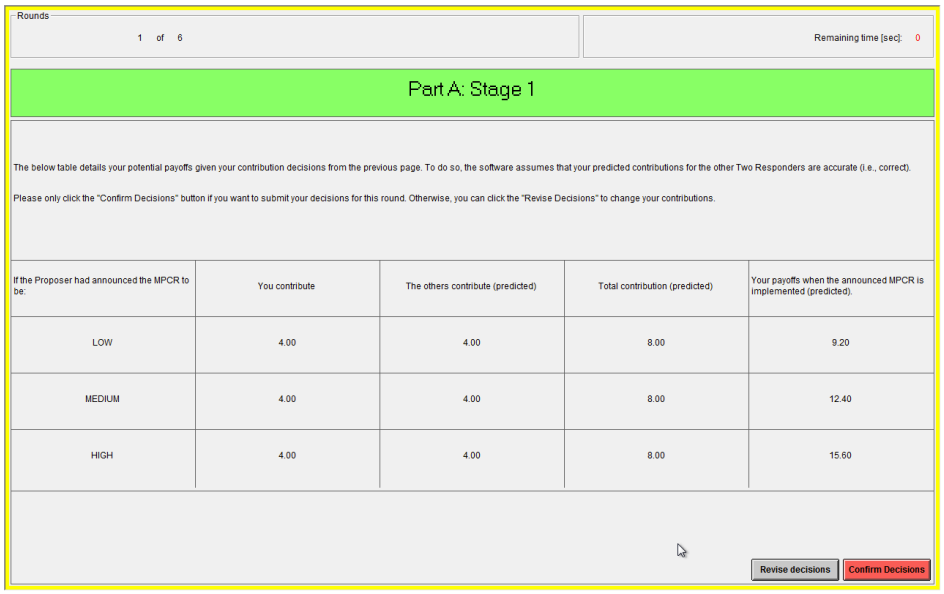

Figure A7: Responders: Stage 1 (BND game only)

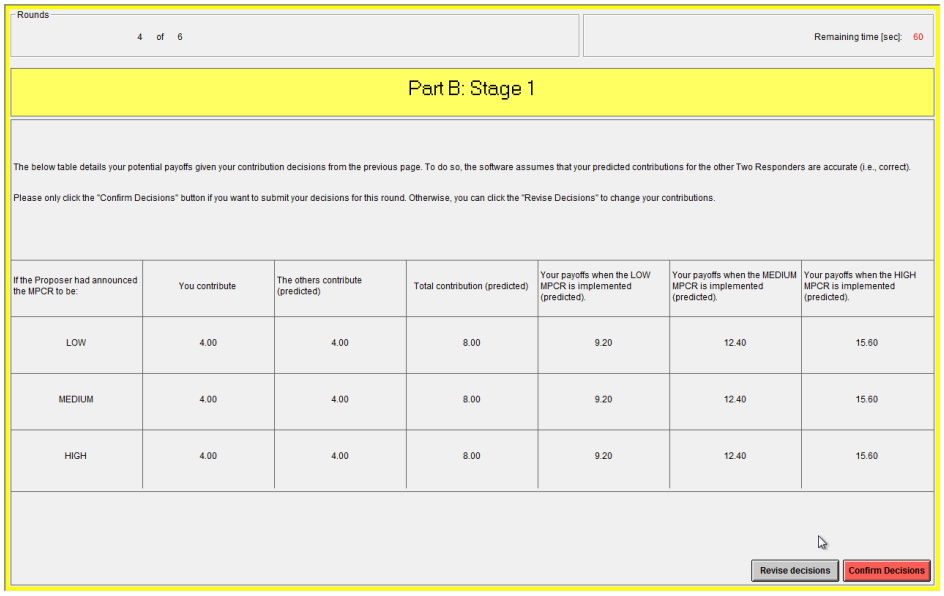

Figure A8: Responders: Stage 1 (nBND game only)

sponders. In addition, you will receive a bonus of 2 ECU if your stage 1 prediction as to the contribution of all other Responders is within two integers of the actual contribution.

Instructions for Part B

Part B will again involve 3 Responders and 1 Proposer in each group. You will keep the same role as in Part A. You will keep the same role for all rounds of Part B. You will be randomly matched with other participants in each round of Part B. Part B will consist of three rounds. Each participant (Proposer or Responder) begins the round with an endowment of 10 ECU.

The Proposer first announces the MPCR (LOW, MEDIUM or HIGH) to all Responders. Observing the Proposer's announcement, the Responders decide on their contributions. The Proposer observes the contributions of all Responders. *The Proposer is now restricted to implementing the same MPCR which had been previously announced.* The Proposer is now allowed to implement a MPCR which is identical or different to his announced MPCR. This means that the Proposer can choose a different MPCR from his announced MPCR if she/he wants to.

Please can you now submit your answers to the control questions on the screen. A calculator button is included for your convenience if required.

Q1. There are ___ rounds in Part B. The computer will randomly choose one of these rounds for payment.

Q2. You will be paired with ___ (1=same participants; 2=random participants) in each round of Part B.

Q3. The Proposer ___ (1=must; 2=does not have to) implement the same MPCR as she/he had previously announced.

Q4. If the Proposer has announced a HIGH MPCR, she/he is ___ (1=able; 2=unable) to implement a LOW MPCR after observing the contributions of all Responders.

Appendix B. Experiment Data

The experiment comprised of parts A (Round 1-3) and B (Round 4-6). Subjects only received information about the Part B design at the end of Part A. Here, 52 subjects first participated in each of the BND and nBND games. Thereafter, subjects who participated in the BND (nBND) game in part A would participate in the BND (nBND) game in part B.

		BND			nBND		
Round	Description	LOW	MED	HIGH	LOW	MED	HIGH
I	♯ Announced	2	9	2	1	7	5
	♯ Implement	2	9	2	8	5	0
	Beliefs	8.08(6.73)	3.69(6.20)	16.69(8.84)	4.85(3.60)	5.23(7.06)	10.31(9.35)
II	♯ Announced	4	6	3	1	3	9
	♯ Implement	4	6	3	10	3	0
	Beliefs	8.54(9.91)	7.69(9.79)	13.69(9.43)	4.92(3.40)	6.77(5.46)	4.38(6.97)
III	♯ Announced	2	6	5	0	2	11
	♯ Implement	2	6	5	12	1	0
	Beliefs	7.62(6.25)	7.54(9.84)	10.46(9.39)	5.08(3.68)	6.23(5.02)	2.38(5.82)
IV	♯ Announced	2	5	6	1	5	7
	♯ Implement	2	5	6	11	2	0
	Beliefs	5.62(4.59)	6.38(7.30)	8.92(9.20)	5.85(4.67)	6.23(6.93)	8.31(10.27)
V	♯ Announced	3	4	6	1	7	5
	♯ Implement	3	4	6	13	0	0
	Beliefs	3.92(4.17)	6.85(6.32)	6.54(7.89)	7.62(5.80)	4.23(5.93)	10.54(9.55)
VI	♯ Announced	4	6	3	1	5	7
	♯ Implement	4	6	3	12	1	0
	Beliefs	4.00(4.38)	4.08(5.06)	9.69(6.51)	7.15(6.04)	5.54(6.09)	6.23(7.24)

Note. The first and second rows of each round details the number of proposers who had announced and implemented, respectively, the LOW, MED and HIGH mpcr. The third row reports the proposers mean beliefs (standard deviation in parenthesis) about the total contributions of all responders.

Table B1: Proposer: Announced mpcr, Implemented mpcr and Beliefs

Table B1 reports the frequencies that the LOW, MED and HIGH mpcrs were announced and implemented in the BND and nBND games, as well as the proposers' beliefs as to the total contributions of all responders.[5] For example, 2, 9 and 2 proposers announced the LOW, MED and HIGH mpcr, respectively, in round I of the BND game. In equilibrium,

[5]Proposers had to submit their beliefs for all possible announced mpcr. However, only the beliefs that corresponded to their announced mpcr were used to determine whether they were awarded a bonus for the accuracy of their beliefs.

		BND			nBND		
Round	Description	LOW	MED	HIGH	LOW	MED	HIGH
I	Contribution	2.36(1.60)	4.15(1.81)	5.38(2.53)	2.51(2.51)	3.77(2.26)	4.85(2.67)
	Belief	2.77(1.44)	4.01(1.64)	5.17(2.39)	3.00(2.09)	4.10(2.00)	5.40(4.61)
	Correlation (ρ)	0.60	0.51	0.50	0.63	0.57	0.59
II	Contribution	2.00(1.38)	4.46(1.98)	5.95(2.55)	2.23(2.19)	3.59(2.36)	5.03(2.66)
	Belief	2.68(1.54)	4.32(1.51)	5.58(2.18)	2.82(1.49)	4.32(1.70)	5.65(2.23)
	Correlation (ρ)	0.63	0.52	0.33	0.59	0.66	0.67
III	Contribution	1.72(1.23)	4.18(2.33)	5.67(2.67)	1.56(1.65)	3.13(2.60)	4.21(3.16)
	Belief	2.47(1.37)	4.29(1.56)	5.64(2.25)	2.58(1.89)	3.96(2.05)	5.31(2.47)
	Correlation (ρ)	0.38	0.32	0.20	0.52	0.57	0.47
IV	Contribution	1.90(2.22)	4.00(2.81)	6.36(3.17)	1.79(1.99)	4.00(2.63)	5.69(3.25)
	Belief	2.64(1.81)	4.44(2.10)	6.26(2.42)	2.17(1.51)	3.96(1.67)	5.40(2.39)
	Correlation (ρ)	0.76	0.84	0.66	0.82	0.72	0.61
V	Contribution	1.38(2.09)	3.46(3.01)	6.26(3.43)	1.64(1.56)	3.26(2.34)	5.08(3.13)
	Belief	2.26(1.70)	4.22(2.17)	6.22(2.63)	2.46(1.89)	3.85(1.95)	5.56(2.47)
	Correlation (ρ)	0.73	0.72	0.72	0.50	0.61	0.56
VI	Contribution	1.41(2.10)	3.33(2.78)	6.03(3.46)	1.31(1.42)	2.74(2.35)	4.23(3.43)
	Belief	2.32(1.77)	4.23(2.05)	6.29(2.46)	1.97(1.53)	3.32(1.45	4.64(2.10)
	Correlation (ρ)	0.65	0.68	0.73	0.60	0.68	0.66

Note. Beliefs here refer to proposers' beliefs as to the average contribution of another responder. Each cell denotes the mean submitted with the standard deviation in parenthesis. There are $n = 39$ observations in each cell. We also report the Spearman's correlation between contributions and beliefs.

Table B2: Responders' Contributions and Submitted Beliefs

proposers in both games should always announce the HIGH mpcr. However, Table B1 shows that proposers often announce the HIGH mpcr more frequently in the nBND relative to the BND game. To shed light on this matter, we turn our attention to BND proposers' beliefs about the total contributions of all responders when the HIGH mpcr is announced. Here, beliefs at each round are not significantly different from 12 (Signrank $\rho \geq 0.07$ for each comparison) – BND game proposers' payoff are negative when the HIGH mpcr is announced and total contributions are less than 12. This suggests that most BND proposers refrained from announcing the HIGH mpcr as they did not expect to benefit from doing so.

Table B2 details the mean contributions of responders, responders' mean beliefs as to the average contribution of another responders and finally, the correlation between contributions and beliefs. There is some evidence that responders in both games are *conditional cooperator* in the sense that their own contributions increase with their expectations as to the contributions of others. Whilst the positive correlation between contributions and beliefs

can generally be expected, it is somewhat surprising to also find this relationship in the BND game when the HIGH mpcr is announced given that contribution is a dominant strategy in equilibrium.

Within-subject comparisons find contributions in the BND and nBND games at each round to be strictly increasing with the announced mpcr (Signrank $p < 0.01$ for each comparison). Between-subject comparison does not find contributions in the BND and nBND games to be significantly different when the LOW mpcr is announced (Mann-Whitney ,$p \geq 0.18$ at each round). Comparisons when the MED mpcr is announced find contributions to be significantly higher in BND game for rounds 2 and 3 (Mann-Whitney, $p \leq 0.04$) but no significant differences in all other rounds (Mann-Whitney, $p \geq 0.30$). Finally, comparisons when the HIGH mpcr is announced find contributions to be significantly higher in the BND game for rounds 3 and 6 (Mann-Whitney, $p \leq 0.03$) but no significant differences in all other rounds (Mann-Whitney, $p \geq 0.12$).

B.2 Transition From One Game to Another

Dependent Variable: Responders' contribution						
	BND			nBND		
Round	LOW	MED	HIGH	LOW	MED	HIGH
Part-B	-0.31	-0.71	0.08	-0.11	0.13	0.46
	(0.32)	(0.42)	(0.52)	(0.28)	(0.37)	(0.46)
Belief	0.60 [a]	0.58 [a]	0.58 [a]	0.67 [a]	0.72 [a]	0.63 [a]
	(0.05)	(0.06)	(0.06)	(0.06)	(0.07)	(0.07)
Constant	0.43	1.78 [a]	2.47 [a]	0.21	0.52	1.22 [b]
	(0.27)	(0.40)	(0.50)	(0.26)	(0.46)	(0.50)
n	234	234	234	234	234	234

Note. Beliefs here refer to proposers' beliefs as to the average contribution of another responder. "Part-B" is a dummy coefficient referring to observations from rounds IV-VI. [a] and [b] denote significance at the 1% and 5% levels.

Table B3: Random Effects Linear Estimates

The motivation of two part (i.e., parts A and B) experiment design was to investigate whether contribution behaviour in the BND and nBND games were consistent. That is, whether contributions in the latter three rounds depended on whether subjects first played the BND or nBND games. To study this, we report on Table B3 the random effects linear estimates of responders' contributions.[6] Here, we see that the coefficient estimates for the

[6]The estimate conclusion holds even with the fractional logit model.

"Part-B" dummy variable is not significant in all regressions. This suggests that responders' contribution decision in Part B of the experiment do not depend significantly on the game played in Part A of the experiment.