

SN181

Communication structure and coalition-proofness (2013)

Marco Mantovani

Version: 1.0 - 26/07/2017



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Website: www.unidata.unimib.it

E-mail: unidata@unimib.it

Tel.: +39 02 6448 7513

Fax: +39 02 6448 7561

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Università degli Studi di Milano-Bicocca
Via Bicocca degli Arcimboldi 8
20126 - Milano (Italia)

Methodological Notes¹

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¹The Methodological Notes are curated by Marco Mantovani. For more information, please contact marco.mantovani@unimib.it

Outline of experimental design

Treatments

We run four treatments. In each treatment, the subjects played eight rounds of the coalitional prisoner's dilemma, a three-player coordination game with Paretoranked equilibria (see file Instructions for details). The treatment variable was the structure of pre-play communication. Each treatment implemented one of four symmetric communication structures. Each subject took part only in one treatment. In a baseline condition (NoCom), there was no pre-play communication. In Public, each player sent a single message to both of the other group members. In Private, each player sent a message to each of the other group members. In Both, each player sent a message to both, and a message to each of the other group members. The subjects had to send a message when given the opportunity – i.e. they could not opt out from communication.

When pre-play communication was allowed, each round included four communication stages. In every stage, the players exchanged structured messages. Each message was in the form “I intend to choose action X (Y)”. All messages were received simultaneously. At the end of the communication phase, the subjects had to choose a pure action between X and Y. Agents could see the exchanged messages in that round when choosing a message or an action.

Belief elicitation

We elicited first order beliefs, asking the following question: “Coplayer 1 and Co-player 2 will choose between X and Y. What do you think they are going to choose? Please enter a number between 0 and 100, representing the probability that Co-Player 1(2) chooses X.”. After answering, they were asked the following question, eliciting second order beliefs: “Co-player 1 and Co-player 2 also answered the same question as you did. Regarding you, what number do you think they entered? Please enter a number between 0 and 100, representing the probability with which Co-player 1(2) thinks you are choosing X.” Thus, we elicit probabilistic first order beliefs, and point second order beliefs. Beliefs were incentivized using a quadratic scoring rule (see file Instructions for details). In NoCom, belief tasks were taken after choosing the action, before receiving feedback on the game. In all communication treatments we elicited beliefs twice. Subjects took the tasks once before the communication phase, and a second time after they had chosen an action, before receiving feedback on the game. As beliefs were stated before and after communication, we will refer to the first as prior beliefs, to the second as posterior beliefs. In total the players completed four belief tasks in each round under NoCom, eight tasks in the other treatments.

Rounds and matching

Summing up, the players stated their prior beliefs, communicated for four stages, chose their action, stated their posterior beliefs, and received feedback on the game and on the belief tasks. Only the last three steps were implemented in NoCom. This procedure was repeated eight times. We refer to these repetitions as rounds. We used a constrained stranger matching. The subjects were informed that they were being re-matched in every round with a new group of players. They were guaranteed they would not play twice in the same group with the same two co-players. We formed matching group of six people (at random). In every new round players were re-matched with others in their own matching group. The sequence of matching was predetermined to ensure that no group appeared twice in the sequence. The assignments of subjects to terminals, of terminals to matching groups, and of labels within the matching group were random. As a consequence, so was the sequence of groups for each individual subject. This procedure allowed us to collect one independent observation every six subjects, while preventing repeated game effects. We point out that all the information given to the subjects was correct.

Experimental instructions and materials

Welcome to this experiment in decision-making. You will receive 5€ as a show-up fee. Please, read carefully these instructions. The amount of money you earn depends on the decisions you and other participants make. In the experiment you will earn ECU (Experimental Currency Units). At the end of the experiment we will convert the ECU you have earned into Euro according to the rate: 1 Euro = 10 ECU. You will be paid your earnings privately and confidentially after the experiment. Throughout the experiment you are not allowed to communicate with other participants in any way. If you have a question please raise your hand. One of us will come to your desk to answer it.

The experiment consists of 8 identical rounds. At the beginning of every round the computer will pair you with two other participants in this room (labeled Partner 1 and Partner 2). Thus, you will form a new group in every new round and you will never play twice with the same group. In each round you will choose between 2 options, labeled A and B. You will have 30 seconds to make your choice. After you and your partners have chosen, you will be informed about the choice of your partners and of the ECUs you earned for the round. Your earnings will be determined according to the following four cases:

- Case 1: you and your partners all choose A. Everybody earns 80 ECU
- Case 2: you and your partners all choose B. Everybody earns 40 ECU
- Case 3: among you and your partners, two persons choose A and one person chooses B. Everybody earns 0 ECU.
- Case 4: among you and your partners, one person chooses A and two persons choose B. The person that chooses A earns 0 ECU. The persons that chose B earn 160 ECU.

[Treatment PUBLIC] Before you make your choice, you will be asked to communicate with your partners about which choice you intend to make. You will complete the message "I intend to choose:" with A or B. You will send one message to both of your partners. When you and your partners have sent the messages, you will be informed about the content of the messages that were sent to you. You will repeat this procedure 4 times; thus there will be 4 stages of communication, and you will have two minutes to complete all of them. After that you will make your choice as explained before. The messages that are sent do not limit your choice.

[Treatment PRIVATE] Before you make your choice, you and your partners will be asked to communicate with your partners about which choice you intend to make. You will complete the message "I intend to choose:" with A or B. You will send one

message to each of your partners; thus you will send two messages. You can send the same message or different messages. When you and your partners have sent the messages, you will be informed about the content of the messages that were sent to you. You will repeat this procedure 4 times; thus there will be 4 stages of communication, and you will have two minutes to complete all of them. After that, you will make your choice as explained before. The messages that are sent do not limit your choice.

[Treatment BOTH] Before you make your choice, you and your partners will be asked to communicate with your partners about which choice you intend to make. You will complete the message "I intend to choose:" with A or B. You will send one message to each of your partners and one message to both of your partners; thus, you will send three messages. You can send the same message or different messages. When you and your partners have sent the messages, you will be informed about the content of the messages that were sent to you. You will repeat this procedure 4 times; thus there will be 4 stages of communication, and you will have two minutes to complete all of them. After that you will make your choice as explained before. The messages that are sent do not limit your choice.

[All treatments] You will be also asked to state your beliefs both about your partners choice and about their beliefs regarding your own choice. For each of your partners you will be asked to complete two tasks, stating: a) a number between 1 and 100, representing the probability with which you think he will choose action A ; b) a number between 1 and 100, representing the probability with which you think he thinks you will choose action A. Thus you will be asked to state four numbers, corresponding to four belief tasks. The ECU you earn from the belief tasks depend on the accuracy of your beliefs. In particular, for task a) you earn more ECU the closer you are to the actual decision of your partner; for task b) you earn more ECU the closer you are to the number inserted by your partner in task a). The number of ECU you can earn ranges between 0 and 25. We enclose two tables displaying the ECU you earn in tasks a) and b), depending on your accuracy. Note that the ECU are chosen so that it is in your best interest to always state what you truly believe.

[Treatment NOCOM] You will state your beliefs after you made your choice.

[Treatments PUB,PRIV,BOTH] You will state your beliefs twice: before the communication phase and after you made your choice.

[All treatments] You will be paid only for one of the 8 rounds of the game and for only one single belief task you answered. At the end of the experiment, one number between 1 and 8 will be selected at random by the computer, and the corresponding game will be paid. The computer will select at random another round, different from the previous, and one single belief task in that round: the corresponding points will be paid. You will be informed of the chosen rounds, of your final payoff in ECU

and of the corresponding Euro. You have reached the end of the instructions. It is important that you understand them. If anything is unclear to you or if you have questions, please raise your hand. To ensure that you understood the instructions we ask you to answer a few control questions. The experiment will start after everyone has answered these control questions correctly.

TABLE 5: EARNINGS (ECU) FOR TASK a)

	Partner's actual choice	
	A	B
	0	25
	10	24.75
	20	24
	30	22.75
	40	21
Your belief	50	18.75
	60	16
	70	12.75
	80	9
	90	4.75
	100	0

TABLE 6: EARNINGS (ECU) FOR TASK b)

	Partner's belief in task a)										
	0	10	20	30	40	50	60	70	80	90	100
	25	24.75	24	22.75	21	18.75	16	12.75	9	4.75	0
	24.75	25	24.75	24	22.75	21	18.75	16	12.75	9	4.75
	24	24.75	25	24.75	24	22.75	21	18.75	16	12.75	9
	22.75	24	24.75	25	24.75	24	22.75	21	18.75	16	12.75
	21	22.75	24	24.75	25	24.75	24	22.75	21	18.75	16
Your belief	50	18.75	21	22.75	24	24.75	25	24.75	24	22.75	21
	60	16	18.75	21	22.75	24	24.75	25	24.75	24	22.75
	70	12.75	16	18.75	21	22.75	24	24.75	25	24.75	24
	80	9	12.75	16	18.75	21	22.75	24	24.75	25	24.75
	90	4.75	9	12.75	16	18.75	21	22.75	24	24.75	25
	100	0	4.75	9	12.75	16	18.75	21	22.75	24	24.75