# Online Appendix A. Experimental Instructions

*[The* NoCom *treatment]*

Welcome! You are taking part in a decision making experiment.

You have earned $5 for showing up on time. In addition, you can earn more money in this experiment. The amount of money you earn will depend upon the decisions you make and on the decisions other people make. Your earnings in this experiment are expressed in EXPERIMENTAL CURRENCY UNITS, which we will refer to as ECUs. At the end of the experiment you will be paid IN CASH using a conversion rate of $1 for every 8 ECUs of earnings from the experiment (final payment will be rounded to the nearest 10 cents). Everyone will be paid in private. Please do not communicate with each other during the experiment. If you have a question, feel free to raise your hand, and an experimenter will come to help you.

Your unique Participant ID number is shown on top of your instructions. To ensure anonymity, your actions in this experiment are linked to this Participant ID number and at the end of the experiment you will be paid by Participant ID number.

The experiment consists of 8 decision rounds. In each round, you will be divided into groups of three, so you will be in a group with two other participants. But you will not know which of the other two people in this room are in your group. At the beginning of the experiment, you will be either a Person A, B, or C. Your role will remain the same for the whole experiment.

If you are Person A (or B), you will ALWAYS be grouped with a SAME Person B (or A) for the whole experiment, and you will meet a DIFFERENT Person C from round to round, that is, you will never meet the same Person C again.

If you are Person C, you are to be grouped with DIFFERENT pairs (Persons A and B) from round to round.

In other words, each group consists of a pair of two persons and a different third person in each round.

Each decision round has two phases:

Phase 1: Contribution Choice

Each person is given 10 tokens at the beginning of EACH ROUND in their Individual Fund. Tokens in the Individual Fund are worth 1 ECU each.

Each three-person group begins with a Group Fund of 0 ECU each round. You decide independently and privately whether or not to contribute any of your tokens from your Individual Fund into the Group Fund. Tokens in the Group Fund are worth 1.8 ECU each.

In other words, each token that a person adds to the Group Fund reduces the value of his/her Individual Fund by 1 ECU. Each token added to the Group Fund by a group member increases the value of the Group Fund by 1.8 ECU.

Each person can contribute up to a maximum of 10 tokens to the Group Fund. Decisions must be made in whole tokens. That is, each person can add 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 tokens to the Group Fund.

Three examples illustrate how the tokens added to the Group Fund relate to the value of your Individual and Group Funds.

- If you add 0 tokens to the Group Fund, it means you add 0 ($0 \times 1.8 = 0$) ECU to the Group Fund and 10 ECUs remain in your Individual Fund.

- If you add 5 tokens to the Group Fund, it means you add 9 ($5 \times 1.8 = 9$) ECUs to the Group Fund and 5 ECUs remain in your Individual Fund.

- If you add 10 tokens to the Group Fund, it means you add 18 ($10 \times 1.8 = 18$) ECUs to the Group Fund and 0 ECU remains in your Individual Fund.

You must press the "Calculate" button to see how many ECU will remain in your Individual Fund, once you are ready, you can click the "Next" button to proceed.

Phase 2: Allocation Choice

After all participants have made their decisions for the round, the computer will show the results:

ECUs in Group Fund = 1.8 × (Sum of tokens in the Group Fund)

You then decide how to allocate ONE-THIRD of the ECUs in the Group Fund between the other two group members.

The sum of your allocations between the other two group members will be one-third of ECUs in the Group Fund. In other words, each person can only divide one-third of ECUs in the Group Fund for the other two group members, and their own share of the Group Fund will be determined by the allocation decisions of the other two group members. Specifically,

- Person A will divide one-third of ECUs in the Group Fund between Person B and Person C.
- Person B will divide one-third of ECUs in the Group Fund between Person A and Person C.
- Person C will divide one-third of ECUs in the Group Fund between Person A and Person B.

The other two group members' individual contributions to the Group Fund and their roles will be shown on the upper right table when you are making the allocation choices. Click the calculator button on the lower-right corner if you need assistance with calculation.

Feedback and Earnings

After all participants have made their decisions for the round, the computer will show the results. A person's share of the Group Fund will be determined at the end of phase 2. Your earnings from the Group Fund will be the sum of ECUs that the other two group members allocate to you.

Your Earnings = ECUs in Individual Fund + Your Earnings of ECUs in Group Fund

At the end of each round, you will receive information on your Group Fund earnings and your total earnings for that round. You will also be informed of all group members' contributions to the Group Fund, their allocation decisions and their earnings in ECUs for that round.

Your total earnings for the experiment will be the sum of the earnings in all rounds.

This completes the instructions. Before we begin the experiment, to make sure that every participant understands the instructions, please answer several review questions on your screen.

*[The* PrivCom, PubReadOnly *and* AllChanCom *treatments]*

Welcome! You are taking part in a decision making experiment.

You have earned \$5 for showing up on time. In addition, you can earn more money in this experiment. The amount of money you earn will depend upon the decisions you make and on the decisions other people make. Your earnings in this experiment are expressed in EXPERIMENTAL CURRENCY UNITS, which we will refer to as ECUs. At the end of the experiment you will be paid IN CASH using a conversion rate of \$1 for every 8 ECUs of earnings from the experiment (final payment will be rounded to the nearest 10 cents). Everyone will be paid in private. Please do not communicate with each other during the experiment. If you have a question, feel free to raise your hand, and an experimenter will come to help you.

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The experiment consists of 8 decision rounds. In each round, you will be divided into groups of three, so you will be in a group with two other participants. But you will not know which of the other two people in this room are in your group. At the beginning of the experiment, you will be either a Person A, B, or C. Your role will remain the same for the whole experiment.

If you are Person A (or B), you will ALWAYS be grouped with a SAME Person B (or A) for the whole experiment, and you will meet a DIFFERENT Person C from round to round, that is, you will never meet the same Person C again.

If you are Person C, you are to be grouped with DIFFERENT pairs (Persons A and B) from round to round.

In other words, each group consists of a pair of two persons and a different third person in each round.

Each decision round has three phases:

*[The following paragraph is only present in the* PrivCom*:]*

<u>Phase 1: Chat</u>

At the beginning of each round, Persons A and B in each three-person group can chat via an online chatting program: they can type whatever they want in the lower box of the chat program (e.g., discussing game strategies). The messages will be only seen by Persons A and B. Meanwhile, Person C in the group will see a string of "#"s each time one of Persons A and B types a message. The length of "#"s equals the length of the message (including spaces and punctuations). This chat phase will last 90 seconds. (see the following screenshot *[see Figure 1 in the main text]*.)

*[The following paragraph is only present in the* PubReadOnly*:]*

<u>Phase 1: Chat</u> At the beginning of each round, Persons A and B in each three-person group can chat via an online chatting program: they can type whatever they want in the lower box of the chat program (e.g., discussing game strategies). This chat phase will last 90 seconds. There are two chat boxes: 1) In Private ChatBox, the messages will be only seen by Persons A and B. Meanwhile, Person C in the group will see a string of "#"s each time one of Persons A and B types a message. The length of "#"s equals the length of the message (including spaces and punctuations). 2) In Public ChatBox, the messages will be shared by all group members, that is, Person A, Person B and Person C can all see the message. But Person C cannot type messages. (see the following screenshot *[reproduced as in Figure A1 below]*.)

*[The following paragraph is only present in the* AllChanCom*:]*

<u>Phase 1: Chat</u> At the beginning of each round, all participants can chat via an online chatting program: they can type whatever they want in the lower box of the chat program (e.g., discussing game strategies). This chat phase will last 90 seconds. They can either chat via private chatbox or public chatbox: 1) In Private ChatBox, the messages will be only seen by the two persons indicated on top of the chat box. Meanwhile, the other person in the group will see a string of "#"s each time one of the pairs types a message. The length of "#"s equals the length of the message (including spaces and punctuations). 2) In Public

ChatBox, the messages will be shared by all group members. (see the following screenshot *[reproduced as in Figure A2 below].*)

*[The rest of the instruction is the same for all treatments:]*

<u>Phase 2: Contribution Choice</u>

Each person is given 10 tokens at the beginning of EACH ROUND in their Individual Fund. Tokens in the Individual Fund are worth 1 ECU each.

Each three-person group begins with a Group Fund of 0 ECU each round. You decide independently and privately whether or not to contribute any of your tokens from your Individual Fund into the Group Fund. Tokens in the Group Fund are worth 1.8 ECU each.

In other words, each token that a person adds to the Group Fund reduces the value of his/her Individual Fund by 1 ECU. Each token added to the Group Fund by a group member increases the value of the Group Fund by 1.8 ECU.

Each person can contribute up to a maximum of 10 tokens to the Group Fund. Decisions must be made in whole tokens. That is, each person can add 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 tokens to the Group Fund.

Three examples illustrate how the tokens added to the Group Fund relate to the value of your Individual and Group Funds.

- If you add 0 tokens to the Group Fund, it means you add 0 ($0 \times 1.8 = 0$) ECU to the Group Fund and 10 ECUs remain in your Individual Fund.

- If you add 5 tokens to the Group Fund, it means you add 9 ($5 \times 1.8 = 9$) ECUs to the Group Fund and 5 ECUs remain in your Individual Fund.

- If you add 10 tokens to the Group Fund, it means you add 18 ($10 \times 1.8 = 18$) ECUs to the Group Fund and 0 ECU remains in your Individual Fund.

You must press the “Calculate” button to see how many ECU will remain in your Individual Fund, once you are ready, you can click the “Next” button to proceed.

<u>Phase 3: Allocation Choice</u>

After all participants have made their decisions for the round, the computer will show the results:

ECUs in Group Fund = 1.8 $\times$ (Sum of tokens in the Group Fund)

You then decide how to allocate ONE-THIRD of the ECUs in the Group Fund between the other two group members.

The sum of your allocations between the other two group members will be one-third of ECUs in the Group Fund. In other words, each person can only divide one-third of ECUs in the Group Fund for the other two group members, and their own share of the Group Fund will be determined by the allocation decisions of the other two group members. Specifically,

- Person A will divide one-third of ECUs in the Group Fund between Person B and Person C.
- Person B will divide one-third of ECUs in the Group Fund between Person A and Person C.
- Person C will divide one-third of ECUs in the Group Fund between Person A and Person B.

The other two group members' individual contributions to the Group Fund and their roles will be shown on the upper right table when you are making the allocation choices. Click the calculator button on the lower-right corner if you need assistance with calculation.

Feedback and Earnings

After all participants have made their decisions for the round, the computer will show the results. A person's share of the Group Fund will be determined at the end of phase 2. Your earnings from the Group Fund will be the sum of ECUs that the other two group members allocate to you.

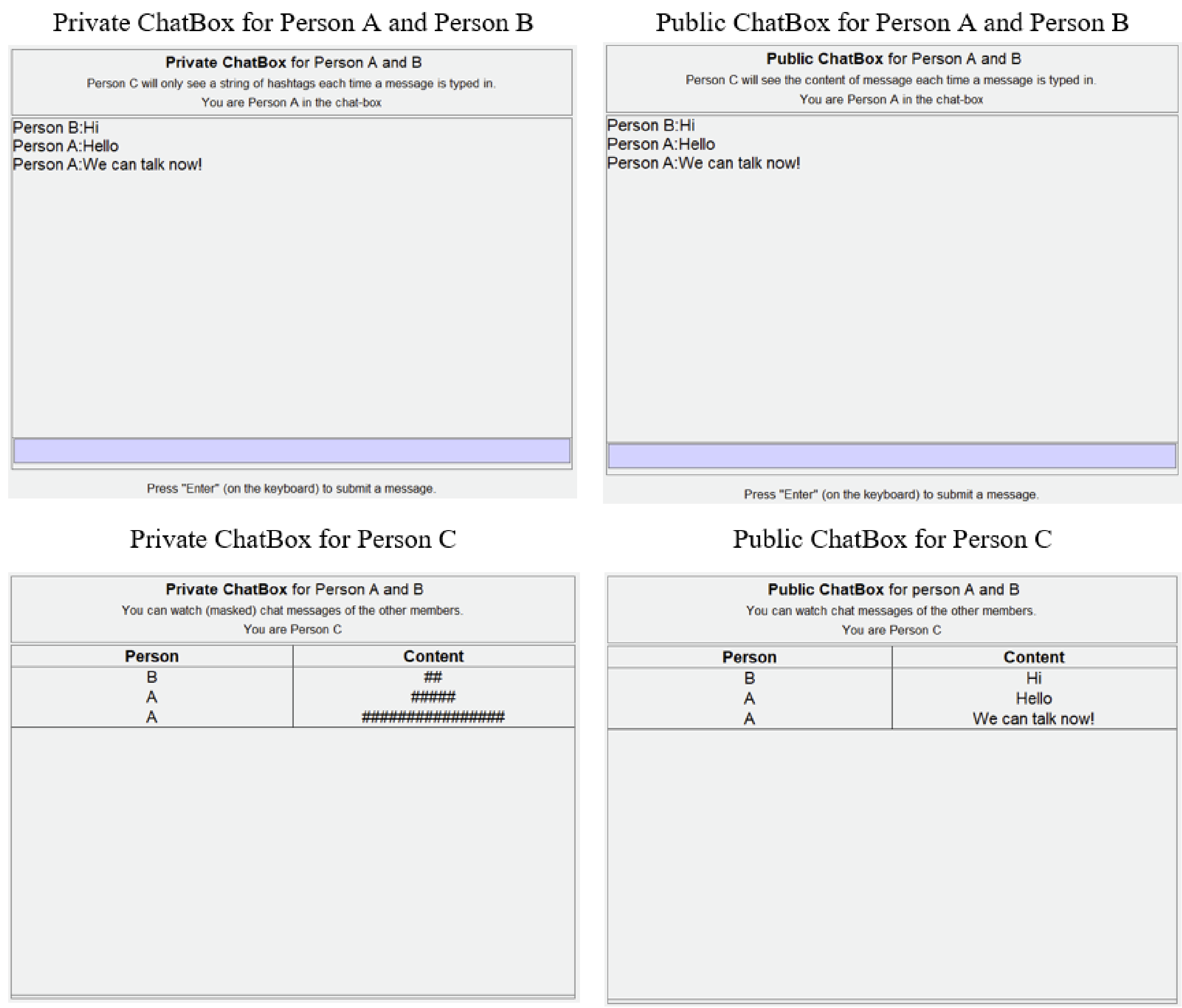
Your Earnings = ECUs in Individual Fund + Your Earnings of ECUs in Group Fund

At the end of each round, you will receive information on your Group Fund earnings and your total earnings for that round. You will also be informed of all group members' contributions to the Group Fund, their allocation decisions and their earnings in ECUs for that round.

Your total earnings for the experiment will be the sum of the earnings in all rounds.

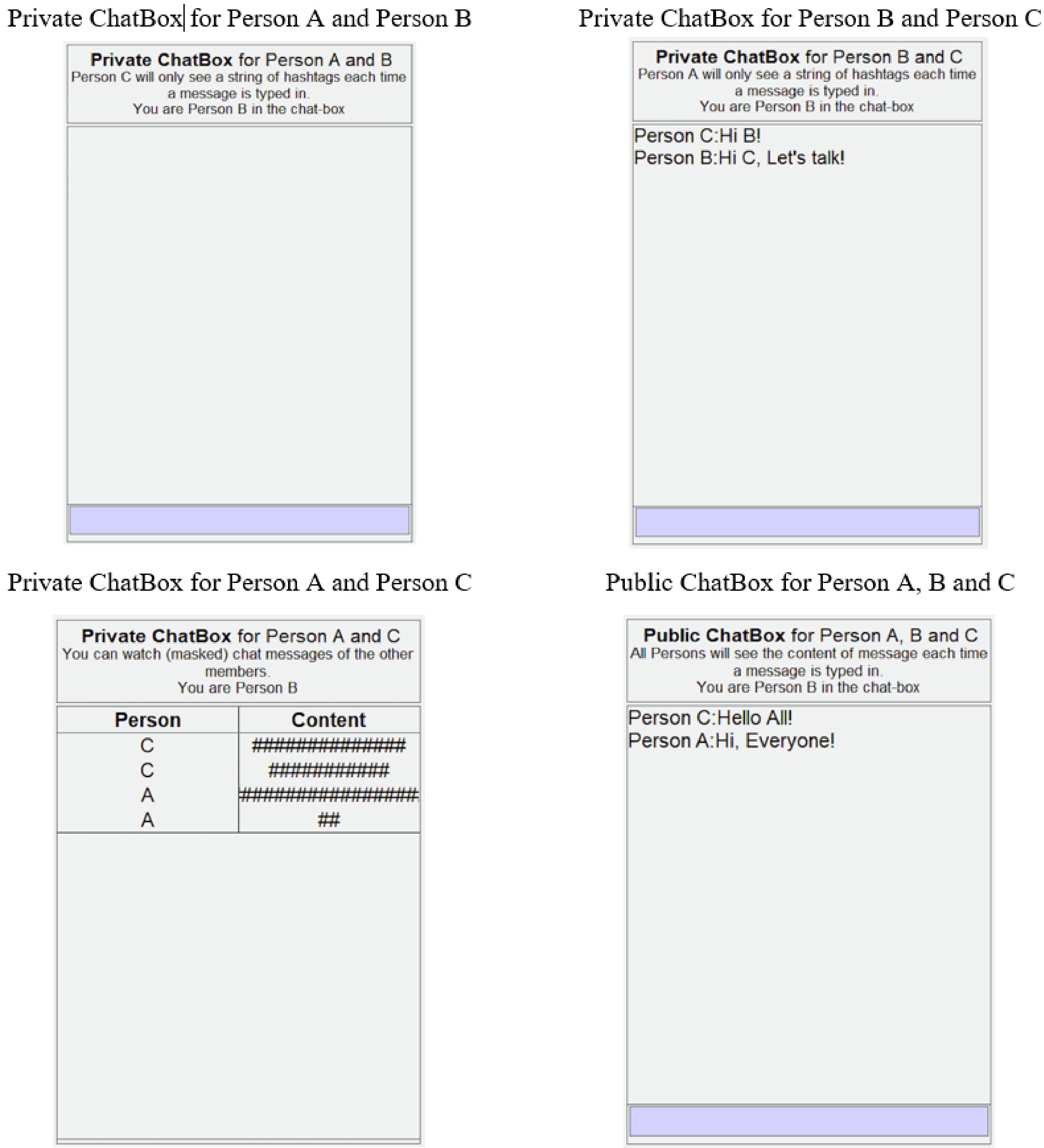
This completes the instructions. Before we begin the experiment, to make sure that every participant understands the instructions, please answer several review questions on your screen.

***Figure A1. ChatBoxes for*** PubReadOnly




*Notes:* The upper two ChatBoxes are for Person A and Person B. They can choose whether to exchange messages in either Private ChatBox or Public ChatBox. The lower two ChatBoxes are what Person C sees. Person C only sees hashtags for the messages exchanged in Private ChatBox for Persons A and B. But Person C can read the content of the messages exchanged in Public ChatBox, though Person C cannot type any messages.

*Figure A2. ChatBoxes for* AllChanCom




*Notes:* The screenshot shows four ChatBoxes Person B sees. Person B can exchange private messages with Person A in Private ChatBox for Person A and Person B, and the messages exchanged there will be displayed as hashtags for Person C. Likewise, the private messages exchanged in Private ChatBox for Persons B and C will be displayed as hashtags for Person A; the private messages exchanged in Private ChatBox for Persons A and C will be displayed as hashtags for Person B. In Public ChatBox, all team members can type and read messages exchanged there.

# Online Appendix B. Further statistical analysis

Table B1: Panel data regression of the partners' and loners' investments and their differences

| | (1) Partner | (2) Loner | (3) Diff. |
|---|---|---|---|
| PrivCom | 1.436*** | -2.859*** | 4.295*** |
| | (0.243) | (0.443) | (0.502) |
| PubReadOnly | 1.412*** | 0.113 | 1.294* |
| | (0.345) | (0.613) | (0.666) |
| AllChanCom | 1.424*** | 1.945*** | -0.521 |
| | (0.258) | (0.315) | (0.410) |
| Constant | 7.748*** | 5.840*** | 1.908*** |
| | (0.191) | (0.208) | (0.229) |
| H0: PrivCom=PubReadOnly | $p = 0.942$ | $p < 0.001$ | $p < 0.001$ |
| H0: PrivCom=AllChanCom | $p = 0.958$ | $p < 0.001$ | $p < 0.001$ |
| H0: PubReadOnly=AllChanCom | $p = 0.973$ | $p = 0.003$ | $p = 0.011$ |
| Observations | 1314 | 1314 | 1314 |

*Notes:* 1) The dependent variables in Columns (1)-(3) are the partners' investment, the loner's investment, and the difference between the partners' and loner's investments. The unit of observation is at the group-round level. That is, we take the average of each pair of partners in each group in each round. Similarly, the investment difference is the average investment of the partners minus the loner's investment. 2) The panel data regressions were estimated using population-averaged models instead of subject-specific random effects models. But random effects models produce very similar results. 3) NoCom is the base category in all regressions. 4) *, ** and *** denote, respectively, 10%, 5%, and 1% significance levels. Standard errors are clustered at the session level.

Table B2: How other players' previous allocations affect partners' one-round change in investment

| *Dependent variable:* | One round change in one of the partner's investment | | | |
|---|---|---|---|---|
| *Treatment:* | NoCom | PrivCom | PubReadOnly | AllChanCom |
| Get less than proportional from their partner | -0.267 | 0.240 | 0.983 | 0.980** |
| | (0.366) | (0.411) | (0.602) | (0.468) |
| Get more than proportional from their partner | 0.254 | 0.107 | -0.012 | 0.189* |
| | (0.205) | (0.143) | (0.071) | (0.106) |
| Get less than proportional from the loner | -0.402 | -0.224 | 0.023 | 0.736 |
| | (0.255) | (0.180) | (0.153) | (0.606) |
| Get more than proportional from the loner | 0.100 | 0.027 | 0.322 | 0.215 |
| | (0.206) | (0.198) | (0.252) | (0.200) |
| Constant | 0.384*** | 0.154 | -0.030 | 0.150 |
| | (0.120) | (0.206) | (0.152) | (0.142) |
| Observations | 448 | 1004 | 392 | 448 |

*Notes:* 1) This table shows the determinants of partners' one round change in investment. The base categories are where the partner receives proportional share from her partner and where she receives proportional share from the loner. 2) *, ** and *** denote, respectively, 10%, 5%, and 1% significance levels. Standard errors are clustered at the session level.

Table B3: Panel data regression of the partners' and loners' earnings and their differences

| | (1) Partner | (2) Loner | (3) Diff. |
|---|---|---|---|
| PrivCom | 1.295*** | -2.580*** | 3.876*** |
| | (0.244) | (0.472) | (0.610) |
| PubReadOnly | 1.592*** | -0.849 | 2.468*** |
| | (0.439) | (0.636) | (0.947) |
| AllChanCom | 1.239*** | 1.355*** | -0.116 |
| | (0.227) | (0.488) | (0.630) |
| Constant | 17.696*** | 11.676*** | 6.020*** |
| | (0.143) | (0.442) | (0.525) |
| H0: PrivCom=PubReadOnly | $p = 0.518$ | $p < 0.001$ | $p = 0.097$ |
| H0: PrivCom=AllChanCom | $p = 0.833$ | $p < 0.001$ | $p < 0.001$ |
| H0: PubReadOnly=AllChanCom | $p = 0.434$ | $p < 0.001$ | $p = 0.003$ |
| Observations | 1314 | 1314 | 1314 |

*Notes:* 1) The dependent variables in Columns (1)-(3) are the partners' earnings, the loner's earnings, and the difference between the partners' and loner's earnings. The unit of observation is at the group-round level. That is, we take the average of each pair of partners in each group in each round. Similarly, the investment difference is the average investment of the partners minus the loner's investment. 2) The panel data regressions were estimated using population-averaged models instead of subject-specific random effects models. But random effects models produce very similar results. 3) NoCom is the base category in all regressions. 4) *, ** and *** denote, respectively, 10%, 5%, and 1% significance levels. Standard errors are clustered at the session level.

Table B4: Panel data regression of the partners' and loners' investments and their differences in replication and symmetric matching treatments

| | (1) Partner | (2) Loner | (3) Diff. |
|---|---|---|---|
| PrivCom | 0.914*** | -1.938** | 2.852*** |
| | (0.106) | (0.797) | (0.752) |
| SymNoCom | 1.217*** | / | / |
| | (0.412) | | |
| SymCom | 1.732*** | -1.676*** | 3.408*** |
| | (0.169) | (0.592) | (0.688) |
| Constant | 7.141*** | 4.422*** | 2.719*** |
| | (0.104) | (0.213) | (0.106) |
| H0: PrivCom=SymCom | $p < 0.001$ | $p = 0.782$ | $p = 0.581$ |
| H0: SymNoCom=SymCom | $p = 0.221$ | / | / |
| Observations | 704 | 512 | 512 |

*Notes:* 1) The dependent variables in Columns (1)-(3) are the partners' investment (except for SymNoCom in which we use all players' investment), the loner's investment, and the difference between the partners' and loner's investments. The unit of observation is at the group-round level. That is, we take the average of each pair of partners in each group in each round. Similarly, the investment difference is the average investment of the partners minus the loner's investment. 2) The panel data regressions were estimated using population-averaged models instead of subject-specific random effects models. But random effects models produce very similar results. 3) Replication of NoCom is the base category in all regressions. 4) *, ** and *** denote, respectively, 10%, 5%, and 1% significance levels. Standard errors are clustered at the session level.

Table B5: Random effects model on the share allocated to the partner in replication and symmetric matching treatments

| *Dependent variable:* | Share allocated to the partner $\frac{a_{ij}}{a_{ij}+a_{ik}}$ | | | | |
|---|---|---|---|---|---|
| *Treatments:* | NoCom | PrivCom | SymNoCom | SymCom | Pooled |
| $\beta_1$: Partner's relative investment $\frac{e_j}{e_j+e_k}$ | 0.560*** (0.062) | 0.418*** (0.033) | 0.911*** (0.107) | 0.432*** (0.074) | 0.410*** (0.019) |
| NoCom $\times \frac{e_j}{e_j+e_k}$ | | | | | 0.132*** (0.051) |
| SymNoCom $\times \frac{e_j}{e_j+e_k}$ | | | | | 0.498*** (0.103) |
| SymCom $\times \frac{e_j}{e_j+e_k}$ | | | | | 0.024 (0.069) |
| NoCom | | | | | -0.150* (0.079) |
| SymNoCom | | | | | -0.524*** (0.060) |
| SymCom | | | | | -0.033 (0.066) |
| $\beta_0$: Constant | 0.416*** (0.096) | 0.571*** (0.049) | 0.051 (0.054) | 0.546*** (0.065) | 0.577*** (0.032) |
| Clusters | 2 | 2 | 4 | 4 | 12 |
| Observations | 256 | 256 | 576 | 512 | 1600 |

*Notes:* This table shows a player's allocation to her partner in a round. loners' allocations are excluded. In the last column, PrivCom serves as the base category. *** denotes 1% significance level. Standard errors are clustered at the session level.

Table B6: Panel data regression of the partners' and loners' investments and their differences in HalfCom

| | (1) Partner | (2) Loner | (3) Diff. |
|---|---|---|---|
| PrivCom | 0.914*** | -1.937** | 2.852*** |
| | (0.109) | (0.797) | (0.752) |
| HalfCom(Chat) | 1.469*** | -0.953** | 2.422*** |
| | (0.324) | (0.423) | (0.584) |
| HalfCom(NoChat) | 0.687 | -1.070** | 1.758*** |
| | (0.538) | (0.527) | (0.675) |
| Constant | 7.141*** | 4.422*** | 2.719*** |
| | (0.106) | (0.213) | (0.106) |
| H0: PrivCom=HalfCom(Chat) | $p = 0.071$ | $p = 0.247$ | $p = 0.648$ |
| H0: PrivCom=HalfCom(NoChat) | $p = 0.668$ | $p = 0.339$ | $p = 0.274$ |
| H0: Chat=NoChat | $p = 0.076$ | $p = 0.569$ | $p = 0.186$ |
| Observations | 512 | 512 | 512 |

*Notes:* 1) The dependent variables in Columns (1)-(3) are the partners' investment, the loner's investment, and the difference between the partners' and loner's investments. The unit of observation is at the group-round level. That is, we take the average of each pair of partners in each group in each round. Similarly, the investment difference is the average investment of the partners minus the loner's investment. 2) The panel data regressions were estimated using population-averaged models instead of subject-specific random effects models. But random effects models produce very similar results. 3) Replication of NoCom is the base category in all regressions. 4) *, ** and *** denote, respectively, 10%, 5%, and 1% significance levels. Standard errors are clustered at the session level.

Table B7: Random effects model on the share allocated to the partner in HalfCom

| *Dependent variable:* | Share allocated to the partner $\frac{a_{ij}}{a_{ij}+a_{ik}}$ | |
|---|---|---|
| *Treatments:* | HalfCom | Pooled |
| $\beta_1$: Partner's relative investment $\frac{e_j}{e_j+e_k}$ | 0.554*** (0.033) | 0.557*** (0.047) |
| PrivCom $\times \frac{e_j}{e_j+e_k}$ | | -0.136*** (0.054) |
| HalfCom $\times \frac{e_j}{e_j+e_k}$ | | 0.005 (0.088) |
| PrivCom | | 0.151* (0.083) |
| HalfCom | | 0.019 (0.102) |
| Chat $\times \frac{e_j}{e_j+e_k}$ | 0.017 (0.111) | |
| Chat | -0.005 (0.109) | |
| $\beta_0$: Constant | 0.440*** (0.026) | 0.418*** (0.073) |
| H0: $\beta_1$ PrivCom=HalfCom | | $p = 0.076$ |
| H0: $\beta_0$ PrivCom=HalfCom | | $p = 0.104$ |
| Clusters | 4 | 8 |
| Observations | 512 | 1024 |

*Notes:* This table shows a player's allocation to her partner in a round. Loners' allocations are excluded. In the last column, NoCom serves as the base category. *** denotes 1% significance level. Standard errors are clustered at the session level.

Figure B1: Time-path of the average investment in replication and symmetric matching treatments

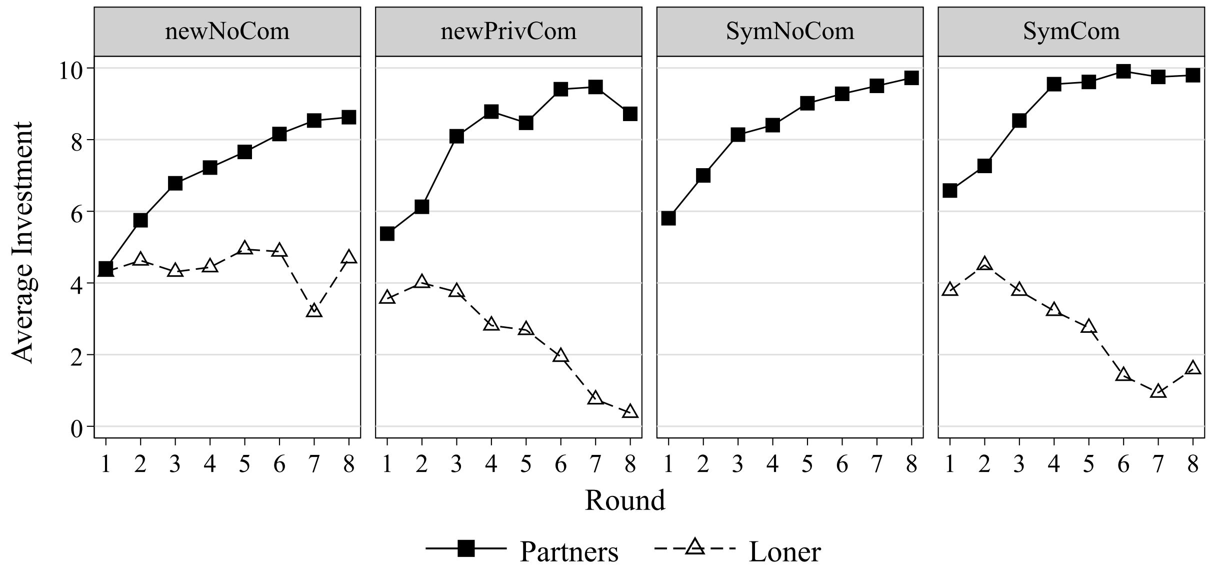
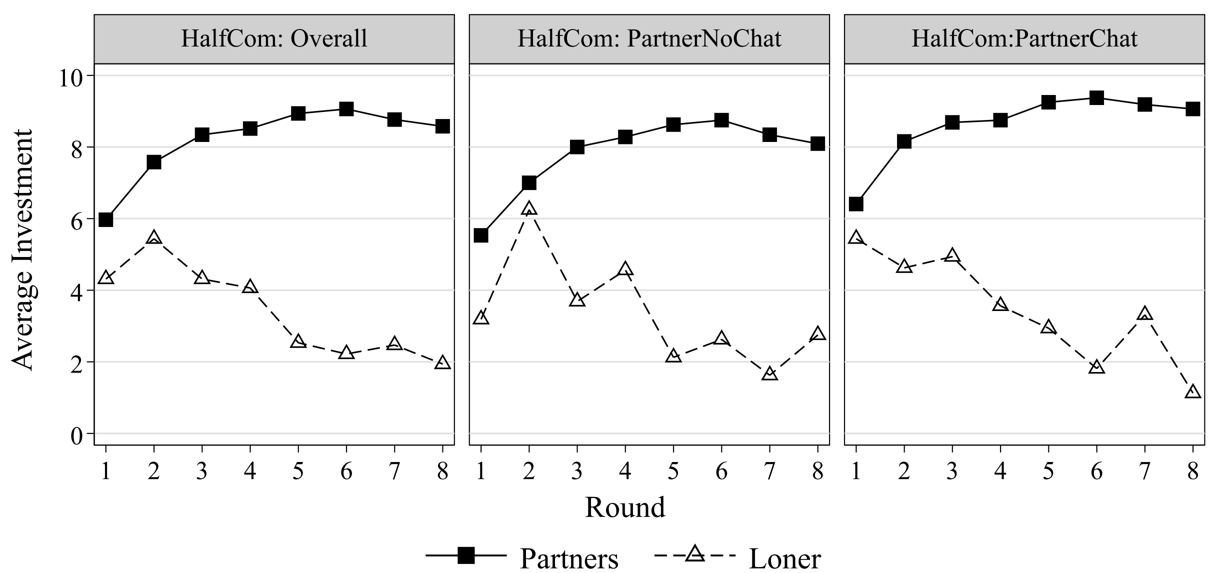



Figure B2: Time-path of the average investment in HalfCom



# Online Appendix C. Instructions for Content Analysis

*For each treatment, we employed two research assistants (who are unaware of our research purpose) to code participants' conversations. Below is the instructions given to the assistant who coded messages in the* PrivCom. *Instructions for the other treatments are similar with additional categories (see main text).*

You will be given a list of messages. These messages were written by participants in an experiment. The following is a summary of the experiment:

1. Each group consists of three participants. They are randomly assigned to be Person A, Person B, and Person C. Their roles are fixed during the whole experiment.

2. There are in total 8 rounds, during which Persons A and B are always paired together. But Person C meets different pairs of Persons A and B every round.

3. Persons A and B have 90 seconds before each round to discuss (hence the list of messages) with each other, while Person C cannot see the content of the message.

4. After the 90 seconds, Persons A, B, and C play the following game: 1) each participant is endowed with 10 tokens at the beginning of each round; 2) each participant decides independently how many tokens to invest in a group fund, and keeps the tokens that are not invested; 3) the tokens invested to the group fund will be pooled together and multiplied by a factor of 1.8; 4) each participant allocates one third of the group fund between the other two group members. 5) each participant's payoff in a round is then the sum of the uninvested tokens and the share of the group fund received from the other two group members.

Your task is to classify the conversations between A and B in each round according to the categories given to you. While for coding the conversations, please use the following categories (you can pick multiple categories for the same conversation):

*For Person A and B*:

1. suggested a FAIR share to C (proportional to C's relative investment). Note that this includes suggesting fair allocation to all group members.
2. suggested a LESS THAN FAIR share (but more than nothing) to C.
3. suggested to allocate NOTHING to C.
4. suggested to use OTHER allocation strategies.
5. suggested to use the SAME STRATEGY as last round.
6. concerned about C's welfare. This includes any conversation mentioning C: either showing pity or laughing at C's misfortune.
7. talked about something else.

Note: In A and B's conservations, they may explicitly discuss the allocations to C or discuss the allocations to each other (A and B). In either case, please select the category according to their intent of allocations to C.

While for coding the conversations, please pay attention to the following:

- You should code all conversations independently. Please do not discuss with anyone else how to code the conversations.
- Your job is to evaluate how Persons A and B decided their allocations to C.
- The unit for coding is the whole conversation in each channel of each group in a round, not every message.
- When you complete the coding, please go through the entire list of messages a second time to (i) review all your codes and revise them if needed for accuracy; (ii) make sure that you have coded every conversation.

To evaluate the conversations, you need to first understand the experiment. The instructions attached below are the instructions the participants read in the experiment. Please read them carefully, answer the comprehensive questions, and email me the answers. Only after you answered all the questions correctly, can you begin to code the messages.

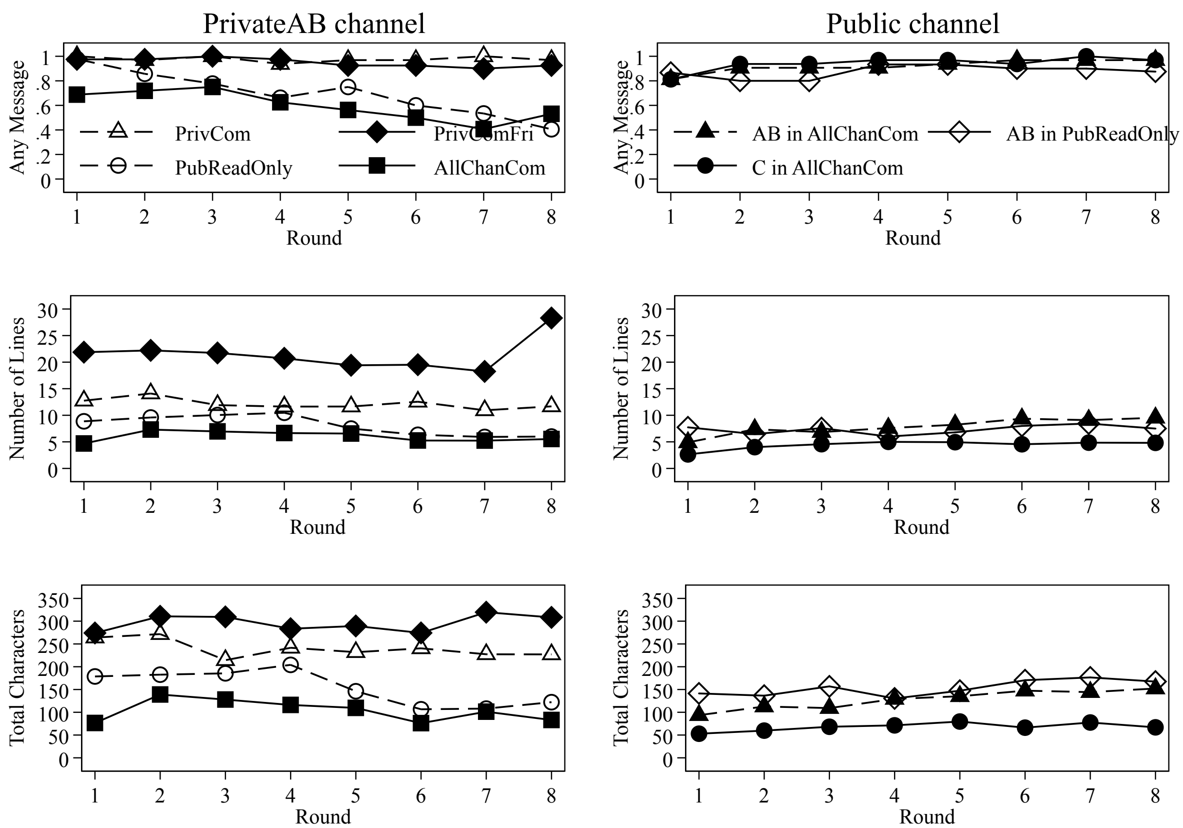
# Online Appendix D. Detailed Analysis of Conversations

In this appendix, we present detailed analysis of players' messages in all communication channels to shed light on why private communication caused the partners to behave unfairly toward the loner and caused the latter to underinvest, and why public communication helped bring about fairer allocations from the partners and higher investment from the loner.

## D1 Descriptive Statistics of Conversations

We first look at the volumes of messages exchanged in each communication channel. Table D1 shows, in the private communication treatments, that the partners communicated over 95% of the time. (In the main text, we pool the data from the two private communication treatments. Here we named them as PrivCom and PrivComFri and separately reported the results.) However, when the public channel was available, partners were more likely to exchange messages in the public channel than in their private channel. For example, only two thirds of the partners talked in private channels in PubReadOnly, and the volume of messages was further reduced by one-third in AllChanCom. It looks like the partners were eager to reach out to the loner, presumably to encourage the loner to invest, though they were not necessarily planning to allocate fairly. In AllChanCom, the loner communicated 94% of the time, producing a comparable volume of messages to an average partner. But the loner did not seem to attempt to communicate privately with either of the partners. Message exchanges occurred in 29% of cases in the Private AC channel and 21% of cases in the Private BC channel. In each conversation, about 3.5 lines (or about 43 characters) were exchanged; they were mostly greetings to each other. These statistics are consistent over the course of 8 rounds (see Figure D1).

Figure D1: Evolution of the statistics of conversations




*Notes:* This figure shows the evolution of "Any Message," "Number of Lines," and "Total Characters" in different communication channels over 8 rounds. The volume and frequency of communication remain roughly consistent over time.

We next study the content of the conversations in each channel. To do that, we employed a different pair of research assistants (who were not aware of our research questions) for each treatment. Their task was to assign the conversation in each group of each channel for each round to one or more semantic domains. For the two private communication treatments, we classify the conversation as "Fair" (the partners planned to allocate proportionally to each other's relative investment), "Less than fair" (the partners planned to allocate less than proportionally, but not nothing to the loner), "Nothing" (the partners planned to allocate nothing to the loner regardless of her investment), "Other" (the partners planned to allocate according to other strategies), and "Concern for C" (the partners showed pity for the loner

Table D1: Descriptive statistics of conversations

| | | PrivCom | PrivComFri | PubReadOnly | AllChanCom |
|---|---|---|---|---|---|
| Private AB | Any Messages | 98% | 95% | 67% | 60% |
| | Lines of Messages | 12.1 | 21.5 | 8.5 | 6.1 |
| | Total Characters | 239.8 | 296.0 | 162.9 | 105.8 |
| Public (AB) | Any Message | | | 88% | 92% |
| | Lines of Messages | | | 7.3 | 8.4 |
| | Total Characters | | | 152.5 | 136.9 |
| Public (C) | Any Message | | | | 94% |
| | Lines of Messages | | | | 4.6 |
| | Total Characters | | | | 71.1 |

*Notes:* 1) The statistics are summarized for conversations that occurred per group per round. 2)"Any Messages" refers to the fraction of groups where at least one message was sent in that channel. Among these groups, "Lines of Messages" refers to the average number of messages by designated person types in that channel and "Total characters" refers to the total volume of letters, spaces and punctuations. 3) "Public(AB)" means the messages sent by the partners in the public channel, and "Public(C)" means the messages sent by the loner in the public channel. "Private AC" and "Private BC" are included for analysis as communication only occasionally occurred in these channels (see **??**).

or they laughed at the loner's misfortune). We also asked research assistants to classify the conversation as "Same strategy" when the partners planned to use the same strategy as last round and as "Else" for all other contents. In our data analysis, if the coder ticks "Same strategy", we impute the categories of the current round from the categories chosen by the coder for the previous round. We classify a conversation to a semantic domain if at least one of the research assistants assigns it to that domain. We also conducted the same analysis by classifying a conservation to a domain if and only if both research assistants assign it to the same domain. The analysis produces qualitatively similar results. Appendix C includes the instructions for the content analysis. For the two public communication treatments, we further classify the conversation in the private and public channels as "High contribution" (the partners suggested a high contribution ($> 5$) from the loner). Moreover, for AllChanCom, we additionally label the loner's messages as "Fair" (the loner asked for a fair allocation from the partners) and "High contribution" (the loner suggested a high contribution ($> 5$) from the partners). Table D2 reports the frequency of each semantic domain by channel and by treatment.

Table D2: Fraction of conversations belonging to each semantic domain

| Channel | Content | PrivCom | PrivComFri | PubReadOnly | AllChanCom |
|---|---|---|---|---|---|
| Private AB | Allocate fair amount to C | 11% | 11% | 11% | 3% |
| | Allocate less than fair to C | 14% | 23% | 12% | 5% |
| | Allocate nothing to C | 53% | 54% | 22% | 9% |
| | Allocate other fraction to C | 25% | 14% | 17% | 5% |
| | Concern for C | 66% | 75% | 29% | 15% |
| | Suggest high investment | | | 44% | 13% |
| Public (AB) | Allocate fair amount to C | | | 63% | 75% |
| | Allocate less than fair to C | | | 8% | 0% |
| | Allocate nothing to C | | | 3% | 0% |
| | Allocate other fraction to C | | | 34% | 7% |
| | Concern for C | | | 27% | 5% |
| | Suggest high investment | | | 75% | 83% |
| Public (C) | Ask for fair allocation | | | | 66% |
| | Suggest high investment | | | | 69% |

*Notes:* 1) The statistics are summarized for conversations per group per round. 2) "Public (AB)" refers to messages sent by the partners in the public channel, and "Public (C)" means the messages sent by the loner in the public channel.

More than half the time, conversations in the private communication treatments were about allocating unfairly toward the loner. The frequency of these conversations decreased in the public communication treatments. In public channels, not surprisingly, partners talked about different things; they often encouraged the loner to invest more and promised fair allocations. For example, the partners suggested fair allocations 63% of the time in public conversations in PubReadOnly, and the frequency increased to 75% in AllChanCom.

Although the public channel encouraged cooperation, it also created an opportunity for the partners to deceive the loner. For example, while the partners conspired about unfair allocations toward the loner in their private channel, they might suggest high investment and promise fair allocations in the public channel. In this way, they deliberately tricked the loner and exploited the spoils. We indeed found some partners attempted to do just that. Among all cases where the partners both suggested fair allocation and advocated high investment in the public channel, they suggested unfair allocations toward the loner in their private channel 18.7% of the time in PubReadOnly, though this decreased to 10.1% in

AllChanCom. These partners' actual allocations were indeed unfair. To see whether their plans were correlated with their allocation decisions at the individual level, we estimate the same regression as in Table 2 only for the subsample where the partners suggested high investment in the public channel and unfair allocation in the private channel. The results show that $\beta_1 = 0.141$ in PubReadOnly and 0.373 in AllChanCom, both of which were not significantly different from zero (though the number of observations is low). Thus, the partners' allocations were much less fair than in the full sample.

**Result 6.** *In private communication treatments, 95% of the time, the partners exchanged messages. Most of the time, private communications included discussions about allocating unfairly toward the loner. When public channels were present, the partners were more likely to communicate in public channels than private channels. They often talked about fair allocations in the public channel. Sometimes the partners conspired about unfair allocation toward the loner in private channels but suggested high investment and promised fair allocation in public channels.*

## D2 Conversation Contents and the loner's Investment

Recall that loners' investment increased when public communication channels were present. We next estimate a random effects regression to investigate whether the loner's investment decisions were correlated with communication contents. The dependent variable is the loner's investment, and the independent variables include different semantic domains of the messages exchanged in the public channel classified separately for the partners (AB) and the loner (C). We also include the volume of the partners' private conversations, i.e. the number of hashtags (same as total characters, as in Table D1) the loner saw in the partners' private channel to understand the effect exclusionary communication had on the loner's investment.

Table D3 reports the estimates. We first look at the effect of hashtags (from the partners) on the loner's investment. In PrivCom, the loner's investment decreased marginally for each hashtag she saw. Since the average length of each conversation was about 240 characters,

Table D3: loner's investment and messages

| *Dependent variable:* | loner's investment | | | |
|---|---|---|---|---|
| *Treatment:* | PrivCom | PrivComFri | PubReadOnly | AllChanCom |
| Number of hashtags | -0.004* | -0.000 | -0.005*** | -0.006 |
| from PrivateAB | (0.002) | (0.001) | (0.001) | (0.006) |
| Public (AB): fair allocation | | | 0.912* | 0.236 |
| | | | (0.525) | (1.245) |
| Public (AB): less than fair | | | -1.503 | 0.000 |
| | | | (1.429) | (.) |
| Public (AB): nothing to C | | | 1.004 | 0.000 |
| | | | (1.432) | (.) |
| Public (AB): concern for C | | | 0.488 | -0.876 |
| | | | (0.468) | (0.564) |
| Public (AB): high investment | | | 1.168*** | 1.151 |
| | | | (0.258) | (0.995) |
| Public (C): fair allocation | | | | 0.441* |
| | | | | (0.232) |
| Public (C): high investment | | | | 2.203*** |
| | | | | (0.610) |
| Constant | 4.535*** | 2.533*** | 5.034*** | 5.277*** |
| | (0.431) | (0.475) | (0.607) | (0.437) |
| Clusters | 4 | 5 | 4 | 4 |
| Observations | 256 | 320 | 226 | 256 |

*Notes:* 1) This table uses random effect models to estimate the determinants of the loner's investment. 2) The coefficients of "Public (AB): less than fair" and "Public (AB): nothing to C" cannot be estimated in AllChanCom because there is no conversation in that channel that can be categorized as such. 3) *, ** and *** denote, respectively, 10%, 5%, and 1% significance levels. Standard errors are clustered at the session level.

the loner lowered their investment by about 1 unit after seeing conversations they could not interpret. The effect of seeing hashtags was also significant in PubReadOnly: the average length of around 160 characters decreased the loner's investment by around 0.8 units. However, in PrivComFri and AllChanCom, seeing hashtags did not appear to matter to the loner's investment. One explanation is that in PrivComFri, the loner's investment was already very low even when the partners did not talk behind her back, thus leaving little room for her investment to go even lower. In AllChanCom where the loner could talk in the public channel, her investment was probably more likely to be affected by the conversation in the public channel (though we should note that the absolute size of the imprecisely estimated effect of seeing hashtags in AllChanCom is no smaller than in either PrivCom or PubReadOnly).

For the effects of semantic domains in the public channel, in PubReadOnly, the loner's investment significantly increased by around 2 units when the partners suggested both fair allocation and high investment. In AllChanCom, the loner's investment was positively correlated with her own suggestion of fair allocation and high investment. The partners' suggestions of fair allocation and high investment had positive but not statistically significant effects. (The effects of the partners' messages were largely picked up by the loner's messages, suggesting that the content of their conversations was highly correlated. If we exclude the loner's semantic domains, the partners' suggestions of fair allocation and high investment were jointly significant and increased the loner's investment by 3.3 units.) All other domains appeared to have no significant impact on the loner's investment.

**Result 7.** *The number of hashtags caused by the partners' exclusive conversations had negative effects on the loner's investment, especially in* PubReadOnly. *The partners' suggestion of fair allocation and high investment in public channels led to higher investment from the loner in* PubReadOnly. *In* AllChanCom*, the loner's own suggestion of fair allocation and high investment in public channels was correlated with her higher investment.*

## D3 Conversation Contents and the Partners' Allocations

Last, we look at whether these semantic domains were correlated with the partners' actual allocation decisions. We augment the regression in Table 2 by adding dummy variables of whether the partners communicated in corresponding channels and the semantic domains about allocation ("Fair," "Less than fair," and "Nothing to C"). We also include "Concern for C," as it is likely to correlate with the partners' intention to be fair. In AllChanCom, the loner's semantic domain of "Fair allocation" is included (as the loner's "High contribution" domain was highly correlated with the "Fair allocation" domain, we do not include the former in the regression). We further interact the partner's relative investment with different semantic domains to see the marginal effect of each domain on $\beta_1$, i.e. the weight on the proportional share in allocation decisions.

Table D4 reports the results. Unsurprisingly, the partners' messages in their private channels were consistent with their allocation decisions across all treatments: when fair allocation was suggested in private, their allocation decisions were indeed much fairer as indicated by the significant decrease in the fixed share to the other partner and the increase in the proportional share (the only exception is in PubReadOnly where it went in the right direction but was not statistically significant); when unfair allocation (zero allocation) to the loner was suggested, the partners were much less fair. The results also suggest that the fact of partners' exchanging messages in private led to fairer allocations in the private communication treatments. An explanation of this is that the partners who sent no messages in a round (which occurred less than 5% of the time) might have reached an agreement in the previous round for unfair allocations. (Note that the intercept and $\beta_1$ estimate of the regression show that in the baseline cases where no messages were sent in private, the partners allocated almost everything to each other regardless of the loner's investment.) When the partners could also communicate publicly, their exchanging messages in private led to less fair allocations. Nevertheless, when the partners expressed concern for the loner in private, they were more likely to allocate proportionally, especially in the private communication treatments. We interpret this as sentimental expressions contributing to fairer allocation decisions.

In PubReadOnly, the partners' speaking in the public channel led to fairer allocations: the fixed share to the other partner decreased and they more often allocated according to the other partner's relative investment. However, suggesting fair allocation in public channels was not significantly correlated with their actual allocations. An explanation for this is that speaking in the public channel was highly correlated with suggesting fair allocations. Nevertheless, when the partners suggested unfair allocations (zero allocation) in public channels,

Table D4: The effect of semantic domains on the relative share allocated to the partner

| *Dependent variable:* | Share allocated to the partner | | | |
|---|---|---|---|---|
| *Treatment:* | PrivCom | PrivComFri | PubReadOnly | AllChanCom |
| $\beta_1$: Partner's relative investment | -0.159 | 0.019 | 0.211*** | 0.843*** |
| | (0.514) | (0.032) | (0.047) | (0.063) |
| ***A&B in Private AB Channel*** | | | | |
| A&B speak in Private Channel | -0.491 | -0.366*** | 0.040 | 0.176** |
| | (0.459) | (0.015) | (0.112) | (0.074) |
| Allocate fairly to C | -0.295*** | -0.541*** | -0.202*** | -0.221*** |
| | (0.086) | (0.107) | (0.076) | (0.030) |
| Allocate unfairly to C | 0.368*** | 0.330*** | 0.323*** | 0.272*** |
| | (0.131) | (0.036) | (0.054) | (0.104) |
| Concerns for C | -0.042*** | -0.132** | -0.069 | -0.100 |
| | (0.006) | (0.065) | (0.109) | (0.160) |
| Relative Inv. × A&B speak privately | 0.705 | 0.361*** | -0.017 | -0.167** |
| | (0.619) | (0.019) | (0.156) | (0.083) |
| Relative Inv. × Allocate fairly to C | 0.236* | 0.548*** | 0.206** | 0.279*** |
| | (0.130) | (0.107) | (0.093) | (0.047) |
| Relative Inv. × Allocate unfairly to C | -0.398*** | -0.333*** | -0.377*** | -0.268* |
| | (0.143) | (0.030) | (0.087) | (0.155) |
| Relative Inv. × Concern for C | 0.061* | 0.146** | 0.080 | 0.092 |
| | (0.036) | (0.067) | (0.135) | (0.202) |
| ***A&B in Public Channel*** | | | | |
| A&B speak in Public channel | | | -0.511*** | -0.040 |
| | | | (0.051) | (0.141) |
| Allocate fairly to C | | | 0.167 | -0.037 |
| | | | (0.134) | (0.111) |
| Allocate unfairly to C | | | 0.368*** | 0.000 |
| | | | (0.087) | (.) |
| Concern for C | | | -0.077 | -0.016 |
| | | | (0.051) | (0.057) |
| Relative Inv. × A&B speak publicly | | | 0.543*** | 0.096 |
| | | | (0.039) | (0.199) |
| Relative Inv. × Allocate fairly to C | | | -0.150 | 0.049 |
| | | | (0.150) | (0.179) |
| Relative Inv. × Allocate unfairly to C | | | -0.396*** | 0.000 |
| | | | (0.152) | (.) |
| Relative Inv. × Concern for C | | | 0.073 | 0.027 |
| | | | (0.068) | (0.043) |
| ***C in Public Channel*** | | | | |
| C speaks in Public channel | | | | 0.093 |
| | | | | (0.134) |
| Suggest fair allocation | | | | -0.030 |
| | | | | (0.048) |
| Relative Inv. × C speak publicly | | | | -0.130 |
| | | | | (0.156) |
| Relative Inv. × Allocate fairly | | | | 0.060 |
| | | | | (0.047) |
| Constant | 0.935** | 0.972*** | 0.715*** | 0.111 |
| | (0.383) | (0.031) | (0.037) | (0.071) |
| Clusters | 4 | 5 | 4 | 4 |
| Observations | 512 | 640 | 452 | 512 |

*Notes:* 1) This table uses random effects models to estimate the effects of semantic domains in each communication channel on the relative share allocated to the partner. 2) *, ** and *** denote, respectively, 10%, 5%, and 1% significance levels. Standard errors are clustered at the session level.

they were less likely to allocate proportionally.

In AllChanCom, messages in public channels did not correlate with the partners' allocation decisions. Requests from loners for fair allocations also did not appear to matter to the partners' allocation decisions. It is worth noting that the intercept and $\beta_1$ estimate of the regression show that in the baseline cases where no messages were sent in the public channel, the partners allocated almost proportionally to the other team member's relative investment. These results seem to suggest that fair allocations might be considered as a norm when every group member could participate in conversations.

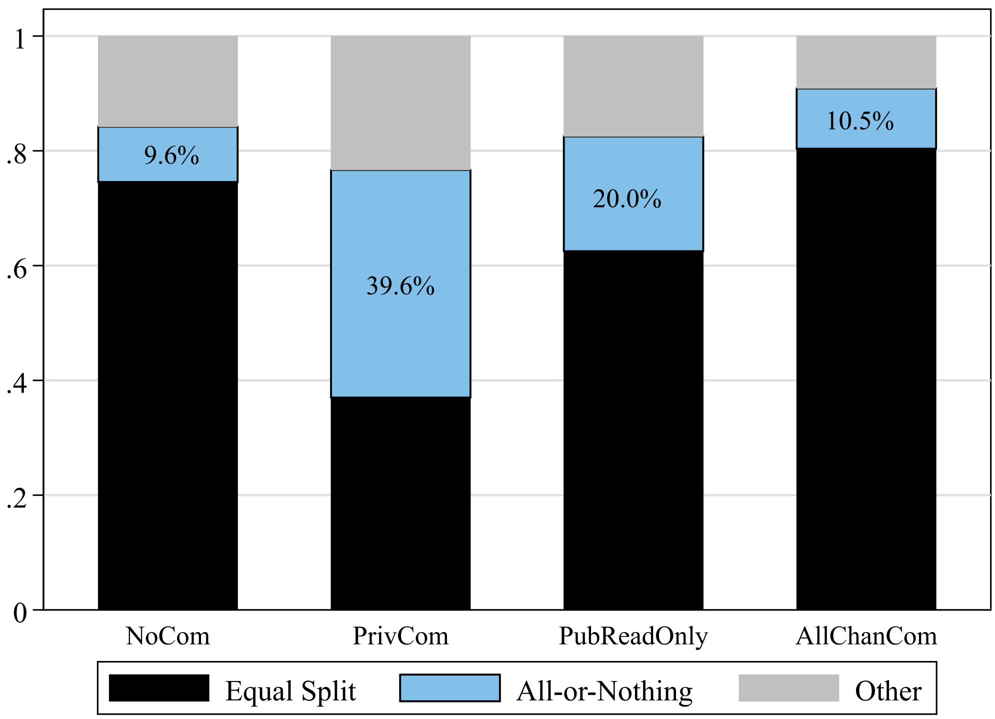
**Result 8.** *The partners' private conversations were largely consistent with their actual allocation decisions. In* PubReadOnly*, speaking in the public channel made the partners allocate more proportionally. In* AllChanCom*, fair allocation might already be considered a norm, as the messages in the public channel did not appear to matter to the partners' allocation decisions.*

# Online Appendix E. The loner's Allocation

In this appendix, we briefly examine how the loner allocated between the partners. Since in our experiments there is little reason for the loner to be biased against one of the anonymous partners, the most natural allocation is proportional to their relative investment. In the case where the partners invested equally (which often occurred), the loner was expected to allocate equally between them. (One third of the pie is always a multiple of 0.2, so participants can easily perform the division by 2.) However, the loner might not allocate fairly out of anger or disappointment if she had been treated unfairly in previous rounds. Thus, unfair allocations may serve as a vehicle of the loner's revenge or punishment toward a random member of the partners, though at the same time rewarding the other partner (recall in the experimental design that the loner cannot identify an individual partner). Or it may serve a "strategic" purpose for possibly only the benefit of other loners: by causing unequal returns to the partners, it may disturb the partners' trusting relationship which is at least partly based on mutual benefits. Figure E1 shows the loner's allocation when the partners invested an *equal* amount. The allocation falls into three categories: equal split, all-or-nothing (i.e. one partner received everything and the other received nothing), and in-between allocations. We found that in many cases the loner did not allocate equally. In particular, a substantial number of allocations was all-or-nothing. Interestingly, it appears that at the treatment level, the fairer the partners' allocation, the less likely the loner would do the all-or-nothing allocation. The all-or-nothing allocation happened strikingly 40% of the time in the private communication treatments. In the public communication treatments where the partners' allocations were fairer than in the private communication treatments, the all-or-nothing allocation happened about 10%$\sim$20% of the time.

At the individual level, however, we did not find that the likelihood of the all-or-nothing allocation was correlated with the loner's experience of the partners' allocations in previous rounds (See Table E1 for random effects regressions on the likelihood of the all-or-nothing allocation). Thus, this seems to suggest that the loner did so *not* directly because of their bad experience in previous rounds, but probably as a strategic move to "punish" one of the partners or create distrust between the partners even though they would not meet each other again. Table E2 additionally shows the number of times the loner made the all-or-nothing allocation in each treatment. It shows that some loners often made the all-or-nothing allocation. For example, in PrivCom, there were 15 persons (out of 72) who did so at least six times.

Figure E1: Loners' allocations to the partners who invested equally




*Notes:* This figure shows loners' allocation decisions toward the partners who invested equally. All-or-nothing is to allocate all to one of the partners and nothing to the other. Below are the number of observations for each treatment: 114 out of 256 (44.5%) in NoCom, 527 out of 576 (91.5%) in PrivCom, 200 out of 226 (88.5%) in PubReadOnly, and 219 out of 256 (85.5%) in AllChanCom

Nevertheless, the all-or-nothing allocation did not appear to matter to the partners' investment as we did not observe a significant difference in their investment across treatments. Table E3 reports random effects regressions on the one-round change in the partners' investment for the subsample where the two partners invested an equal amount. We find that the partners' investment changes were not significantly correlated with whether they received zero or everything from the loner in previous rounds (with receiving something in between as the reference category).

**Result 9.** *The loner frequently allocated all-or-nothing to one of the partners rather than equal shares between the partners who invested equally. At the treatment level, the fairer the partners' allocations (in an increasing amount from private communication treatments to public communication treatments), the less likely the loner would make the all-or-nothing allocation.*

Table E1: How partners' previous allocations affect loners' propensity to do all-or-nothing allocations

| *Dependent variable:* | 1 if the loner adopted all-or-nothing next round | | | |
|---|---|---|---|---|
| *Treatment:* | NoCom | PrivCom | PubReadOnly | AllChanCom |
| Get less than proportional | 0.010 | -0.050 | 0.024 | 0.009 |
| from the partners | (0.039) | (0.048) | (0.023) | (0.052) |
| Get more than proportional | 0.093 | -0.064 | -0.053 | 0.116 |
| from the partners | (0.086) | (0.125) | (0.194) | (0.165) |
| Constant | 0.069 | 0.442*** | 0.205** | 0.096* |
| | (0.045) | (0.035) | (0.082) | (0.051) |
| Observations | 91 | 399 | 152 | 175 |

*Notes:* 1) This table shows the determinants of loners' adoption of "all-or-nothing" strategy in the subsequent round. The base category is where the loner receives a proportional amount from the partners. 2) *, ** and *** denote, respectively, 10%, 5%, and 1% significance levels. Standard errors are clustered at the session level.

Table E2: Distribution of loners' all-or-nothing allocations

| Number of All-or-Nothing allocations | Treatment | | | |
|---|---|---|---|---|
| | NoCom | PrivCom | PubReadOnly | AllChanCom |
| 0 | 17 | 10 | 12 | 17 |
| 1 | 9 | 11 | 4 | 5 |
| 2 | 1 | 8 | 4 | 5 |
| 3 | 3 | 12 | 5 | 4 |
| 4 | 0 | 11 | 2 | 0 |
| 5 | 1 | 5 | 2 | 0 |
| 6 | 1 | 8 | 1 | 0 |
| 7 | 0 | 4 | 0 | 1 |
| 8 | 0 | 3 | 0 | 0 |
| Mean number of A-or-N | 0.97 | 3.2 | 1.7 | 1.1 |
| Number of loners | 32 | 72 | 30 | 32 |

*Notes:* This table shows the distribution of loners' all-or-nothing allocations by treatment.

Table E3: How loners' all-or-nothing allocations affect partners' investments

| *Dependent variable:* | One round change in one of the partner's investment | | | |
|---|---|---|---|---|
| *Treatment:* | NoCom | PrivCom | PubReadOnly | AllChanCom |
| Get all from | -0.273 | 0.087 | 0.167 | -1.256 |
| the loner | (0.373) | (0.105) | (0.166) | (1.094) |
| Get nothing from | -0.626 | -0.068 | -0.181 | -1.413 |
| the loner | (1.056) | (0.098) | (0.297) | (1.125) |
| Constant | -0.079 | 0.033 | -0.151 | 0.098 |
| | (0.239) | (0.071) | (0.146) | (0.149) |
| Observations | 194 | 916 | 346 | 376 |

*Notes:* 1) This table shows whether a partner receives all-or-nothing from the loner affects her one round change in investment. 2) The regressions only include cases where both partners made the same investment. 3) *, ** and *** denote, respectively, 10%, 5%, and 1% significance levels. Standard errors are clustered at the session level.