SUPPLEMENTARY FILE (ONLINE APPENDIX)
TO ACCOMPANY

Ferraro, PJ[*] and CA Vossler[†]. 2010. The Source and Significance of Confusion in Public Goods Experiments.*The B.E. Journal of Economic Analysis & Policy (Contributions).*

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APPENDIX A
INSTRUCTIONS FOR EXPERIMENT 1 (UNFORMATTED)

Note: Instructions below are for the Virtual-Player Treatment. Instructions for the All-Human baseline are identical, except that they make clear that group members are humans in the experimental lab (i.e., the All-Human instructions are the same instructions as those used by Goeree, Holt and Laury, 2002).

This is an experiment about decision making. You will be paid for participating, and the amount of money you earn depends on the decisions that you make. At the end of today's session you will be paid privately and in cash for your decisions. A research grant has provided the funds for this experiment.

You will never be asked to reveal your identity to anyone during the course of the experiment. Your name will never be associated with any of your decisions. In order to keep your decisions private, please do not reveal your choices or otherwise communicate with any other participant.

There are three ways you will earn money in this study. First, before we get to the main experiment you will go through some examples. You will be paid by correctly performing calculations within the context of these examples. Second, you will earn money through choices you make in the experiment. Third, after the experiment is complete we will ask you a couple more questions and pay you for correct answers.

This experiment

In this experiment you will be asked to make a series of choices about how to allocate a set of tokens. You will be in groups for this experiment. However, you will **not** be grouped with others in the room. Your group will consist of yourself and "Virtual Players." These Virtual Players are **not** human and their decisions have already been determined. Your decisions will thus have absolutely **no effect** on how the Virtual Players behave. To assure you that the decisions of the nonhuman Virtual Players have indeed been determined already and will not change during the experiment, we have envelopes in which the investment decisions of the nonhuman Virtual Players in your group are printed on a piece of paper. We have placed these envelopes on your desk. AFTER the experiment is over, you may open your envelope and confirm that it contains the decisions made by the nonhuman Virtual Players in your group. PLEASE DO NOT OPEN THE ENVELOPE UNTIL THE EXPERIMENT IS COMPLETED.

In every choice, you will be told how many Virtual Players are in your group. In each choice you will have 50 tokens to allocate. You must choose how many of these tokens you wish to keep and how many tokens you wish to invest. The amount of money that you earn depends on how many tokens you keep, how many tokens you invest, and how many tokens the Virtual Players in your group invest.

Behavior of the Virtual Players in your Group

The Virtual Players in your group are <u>not</u> real students, but they behave as if they were real students. University of Tennessee students have gone through this experiment, but in their experiment all of their group members were human. In particular, participants played with other experiment participants.

The Virtual Players are simply the paper decision sheets filled out by the students in the past experiment. To select the choices of the Virtual Players in your group, we simply chose at random the decision sheets filled out by students in the past experiment and put them in the envelope on your desk. Thus, the Virtual Players are non-human, but they will behave as specific humans have behaved in the same experiment in the past. In other words, the Virtual Players in your group invest as if they were given 50 tokens for each choice and can choose to invest or keep them at the same rates of return which you will be offered.

Remember, your group is you and Virtual Players. None of the other students in the laboratory are in your group; they are working in different groups with different Virtual Players. Your earnings for the experiment will depend on your decisions and the decisions of your Virtual group members.

Examples of choices you will make in this experiment

You will face choices similar to those in the following two examples. Note that the computer will make all the relevant earnings calculations. However, as your earnings in the experiment are tied to these choices, it is important to us that you understand how earnings are calculated. We ask that you pay careful attention to the examples and do your best to make the relevant calculations correctly. As an incentive, we will give you $1 for <u>each</u> example you perform correctly.

Example 1: You are in a group of size **2** (you plus one Virtual Player). Both of you have 50 tokens to allocate. You will earn **6** cents (i.e., $0.06) for each token you keep. For each token you invest, you will earn **4** cents and the Virutal Player will "earn" **3** cents (a total of 7 cents for both of you together). *Of course, because the Virtual Player is not real, it does not actually receive any earnings.*

For each token the Virtual Player has chosen to keep, the Virtual Player will "earn" **6** cents. For each token the Virtual Player has chosen to invest, the Virtual Player will "earn" **4** cents and you will earn **3** cents (a total of 7 cents for the group).

To summarize, you will earn:
6 cents times the number of tokens you keep
+ **4** cents times the number of tokens you invest
+ **3** cents times the number of tokens the Virtual Player has chosen to invest.

You can choose any number of tokens to keep and any number to invest, but *the total number of tokens you keep plus the number of tokens you invest must sum to the total number of tokens you have been given to allocate.* So in this case:

Number of tokens kept + Number of tokens invested = 50 tokens

Please feel free to use the calculator provided by the experimenter to verify earnings and to ensure that all tokens have been allocated.
To be sure you understand how your earnings would be calculated in this example, please fill out the following:
If I keep ____ tokens and invest _____ tokens; and the Virtual Player in my group has chosen to invest ____ tokens, I will earn:
_____ cents for the tokens I keep (**6** cents each)
_____ cents for the tokens that I invest (**4** cents each)
_____ cents for the tokens the Virtual Player has chosen to invest (**3** cents each)
For a total of: _____ cents.

Please fill this out, and we will come to each of you individually to answer any questions that you have and to check your answers. When you are done, you may proceed to the second example.

Example 2: You are in a group of size **6** (you plus 5 Virtual Players). Each of you has 50 tokens to allocate. You will earn **6** cents for each token you keep. For each token you invest, you will earn **2** cents and each of the five Virtual Players in your group will "earn" **3** cents (a total of 17 cents for all six of you together). *Of course, because the Virtual Players are not real, they do not actually receive any earnings.*

For each token a Virtual Player in your group has chosen to keep, this Virtual Player will "earn" **6** cents. For each token the Virtual Player has chosen to invest,

this Virtual Player will "earn" **2** cents, the other four Virtual Players will each "earn" **3** cents, and you will earn **3** cents (a total of 17 cents for the group).

To summarize, you will earn:
6 cents times the number of tokens you keep
+ **2** cents times the number of tokens you invest
+ **3** cents times the number of tokens the Virtual Players in your group have chosen to invest.

As before, the number of tokens kept plus the number of tokens invested must sum to 50 tokens.

Again, to be sure you understand how your earnings would be calculated in this example, please fill out the following:

If I keep ____ tokens and invest _____ tokens; and the five Virtual Players in my group have chosen to invest a total of ____ tokens, I will earn:
_____ cents for the tokens I keep (**6** cents each)
_____ cents for the tokens that I invest (**2** cents each)
_____ cents for the tokens the Virtual Players have chosen to invest (**3** cents each)
For a total of: _____ cents

More about this experiment

You will be asked to make fifteen allocation choices like the examples we have just discussed. You will write these choices on the decision sheets provided to you. After everyone has finished making their choices, you will then be asked to submit these choices using the computer. This is so the computer can perform the relevant earnings calculations. Please do not enter any decisions on the computer until you are asked to do so.

In each of these choices you will have 50 tokens to allocate. The value of a token kept will always be 6 cents. What will change is the number of Virtual Players in your group, the amount you receive for every token you invest, the amount that your Virtual group members "receive" when you invest, and the amount you receive for every token your Virtual group members invest.

For the allocation choices the group size will be either two or six. Prior to this experiment we randomly assigned everyone, based on experiment ID numbers, to a group with five Virtual Players (group size of six) and a group with one Virtual

Player (group size of two). The decision sheet indicates whether your earnings will be based on the group of size six or the group of size two for that choice.

Earning money in this experiment

We will calculate your earnings as follows:

You will be paid for two of the choices. These choices will be selected by the computer at random and you will not know for which choices you will be paid until everyone has submitted their decisions. Earnings will be calculated exactly as described in the choices. That is, for each selected choice, you will earn money based on the number of tokens you kept in this choice, the number of tokens you invested in this choice, and the number of tokens invested by the Virtual Player(s) in your group.

After everyone has entered their choices on the computer, we will ask you a couple of questions related to the experiment. You will be paid for correct answers. After this is completed, the computer will display an earnings summary.

During the experiment, you are not permitted to speak or communicate with the other participants. If you have a question while the experiment is going on, please raise your hand and an experiment coordinator will come to your station to answer it.

On the following pages are the fifteen choices we would like you to make. Please take all the time you need to be accurate.

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DECISION SHEET FOR EXPERIMENT 1 (UNFORMATTED)
Note: Each subject completed a decision sheet with pen and paper, and then entered their choices on a computer.

Please fill in all of the blanks for each choice below. Make sure that the number of tokens listed under *Keep* plus the number listed under *Invest* equals 50 tokens.

Choice 1. You are in a group of size _2_ (you plus one Virtual Player). Each of you has 50 tokens to allocate. You will earn _6 cents_ for each token you keep. For each token you invest, you will earn _2 cents_ and the Virtual Player in your group will "earn" _4 cents_ (a total of 6 cents for both of you together). *Of course, because the Virtual Player is not real, it does not actually receive any earnings.*

For each token the Virtual Player in your group keeps, the Virtual Player will "earn" 6 cents. For each token the Virtual Player invests, the Virtual Player will "earn" 2 cents, and you will earn 4 cents (a total of 6 cents for the group).

To summarize, you will earn:

6 cents times the number of tokens you keep
+ 2 cents times the number of tokens you invest
+ 4 cents times the number of tokens the Virtual Player in your group has chosen to invest.

Keep _____ tokens Invest _____ tokens.
(These choices must sum to 50 tokens)

Choice 2. You are in a group of size 2 (you plus one Virtual Player). Both of you have 50 tokens to allocate. You will earn 6 cents for each token you keep. For each token you invest, you will earn 2 cents and the Virtual Player will "earn" 6 cents (a total of 8 cents for both of you together). *Of course, because the Virtual Player is not real, it does not actually receive any earnings.*

For each token the Virtual Player in your group keeps, the Virtual Player will "earn" 6 cents. For each token the Virtual Player invests, the Virtual Player will "earn" 2 cents, and you will earn 6 cents (a total of 8 cents for the group).

To summarize, you will earn:

6 cents times the number of tokens you keep
+ 2 cents times the number of tokens you invest
+ 6 cents times the number of tokens the Virtual Player in your group has chosen to invest.

Keep _____ tokens Invest _____ tokens.
(These choices must sum to 50 tokens)

Choice 3. You are in a group of size 6 (you plus five Virtual Players). Each of you has 50 tokens to allocate. You will earn 6 cents for each token you keep. For each token you invest, you will earn 2 cents and each of the five Virtual Players in your group will "earn" 2 cents (a total of 12 cents for all six of you together). *Of course, because the Virtual Players are not real, they do not actually receive any earnings.*

For each token a Virtual Player in your group keeps, this Virtual Player will "earn" 6 cents. For each token this Virtual Player invests, this Virtual Player will "earn" 2 cents, the other four Virtual Players will each "earn" 2 cents, and you will earn 2 cents (a total of 12 cents for the group).

To summarize, you will earn:

6 cents times the number of tokens you keep

+ 2 cents times the number of tokens you invest
+ 2 cents times the number of tokens the Virtual Players have chosen to invest.

Keep _____ tokens Invest _____ tokens.
(These choices must sum to 50 tokens)

Choice 4. You are in a group of size 2 (you plus one Virtual Player). Each of you has 50 tokens to allocate. You will earn 6 cents for each token you keep. For each token you invest, you will earn 6 cents and the Virtual Player in your group will "earn" 6 cents (a total of 12 cents both of you together). *Of course, because the Virtual Player is not real, it does not actually receive any earnings.*

For each token the Virtual Player in your group keeps, this Virtual Player will "earn" 6 cents. For each token the Virtual Player invests, the Virtual Player will "earn" 6 cents, and you will earn 6 cents (a total of 12 cents for the group).

To summarize, you will earn:

6 cents times the number of tokens you keep
+ 6 cents times the number of tokens you invest
+ 6 times the number of tokens the Virtual Player in your group has chosen to invest.

Keep _____ tokens Invest _____ tokens.
(These choices must sum to 50 tokens)

Choice 5. You are in a group of size 2 (you plus one Virtual Player). Both of you have 50 tokens to allocate. You will earn 6 cents for each token you keep. For each token you invest, you will earn 1 cent and the Virtual Player will "earn" 12 cents (a total of 13 cents for both of you together). *Of course, because the Virtual Player is not real, it does not actually receive any earnings.*

For each token the Virtual Player in your group keeps, this Virtual Player will "earn" 6 cents. For each token this Virtual Player invests, this Virtual Player will "earn" 1 cent, and you will earn 12 cents (a total of 13 cents for the group).

To summarize, you will earn:

6 cents times the number of tokens you keep
+ 1 cent times the number of tokens you invest
+ 12 cents times the number of tokens the Virtual Player in your group has chosen to invest.

Keep _____ tokens Invest _____ tokens.
(These choices must sum to 50 tokens)

Choice 6. You are in a group of size 6 (you plus five Virtual Players). Each of you has 50 tokens to allocate. You will earn 6 cents for each token you keep. For each token you invest, you will earn 4 cents and each of the five Virtual Players in your group will "earn" 4 cents (a total of 24 cents for all six of you together). *Of course, because the Virtual Players are not real, they do not actually receive any earnings.*

For each token a Virtual Player in your group keeps, this Virtual Player will "earn" 6 cents. For each token this Virtual Player invests, this Virtual Player will "earn" 4 cents, the other four Virtual Players will each "earn" 4 cents, and you will earn 4 cents (a total of 24 cents for the group).

To summarize, you will earn:

6 cents times the number of tokens you keep
+ 4 cents times the number of tokens you invest
+ 4 cents times the number of tokens the Virtual Players have chosen to invest.

Keep _____ tokens Invest _____ tokens.
(These choices must sum to 50 tokens)

Choice 7. You are in a group of size 2 (you plus one Virtual Player). Both of you have 50 tokens to allocate. You will earn 6 cents for each token you keep. For each token you invest, you will earn 4 cents and the Virtual Player will "earn" 4 cents (a total of 8 cents for both of you together). *Of course, because the Virtual Player is not real, it does not actually receive any earnings.*

For each token the Virtual Player in your group keeps, this Virtual Player will "earn" 6 cents. For each token this Virtual Player invests, this Virtual Player will "earn" 4 cents, the other four Virtual Players will each "earn" 4 cents, and you will earn 4 cents (a total of 8 cents for the group).

To summarize, you will earn:

6 cents times the number of tokens you keep
+ 4 cents times the number of tokens you invest
+ 4 cents times the number of tokens the Virtual Player in your group has chosen to invest.

Keep _____ tokens Invest _____ tokens.
(These choices must sum to 50 tokens)

Choice 8. You are in a group of size 2 (you plus one Virtual Player). Both of you have 50 tokens to allocate. You will earn 6 cents for each token you keep. For each token you invest, you will earn 2 cents and the Virtual Player will "earn" 12 cents (a total of 14 cents for both of you together). *Of course, because the Virtual Player is not real, it does not actually receive any earnings.*

For each token the Virtual Player in your group keeps, this Virtual Player will "earn" 6 cents. For each token this Virtual Player invests, this Virtual Player will "earn" 2 cents, and you will earn 12 cents (a total of 14 cents for the group).

To summarize, you will earn:

6 cents times the number of tokens you keep
+ 2 cents times the number of tokens you invest
+ 12 cents times the number of tokens the Virtual Player in your group has chosen to invest.

Keep _____ tokens Invest _____ tokens.
(These choices must sum to 50 tokens)

Choice 9. You are in a group of size 6 (you plus five Virtual Players). Each of you has 50 tokens to allocate. You will earn 6 cents for each token you keep. For each token you invest, you will earn 6 cents and each of the five Virtual Players in your group will "earn" 6 cents (a total of 36 cents for all six of you together). *Of course, because the Virtual Players are not real, they do not actually receive any earnings.*

For each token a Virtual Player in your group keeps, this Virtual Player will "earn" 6 cents. For each token this Virtual Player invests, this Virtual Player will "earn" 6 cents, the other four Virtual Players will each "earn" 6 cents, and you will earn 6 cents (a total of 36 cents for the group).

To summarize, you will earn:

6 cents times the number of tokens you keep
+ 6 cents times the number of tokens you invest
+ 6 cents times the number of tokens the Virtual Players have chosen to invest.

Keep _____ tokens Invest _____ tokens.
(These choices must sum to 50 tokens)

Choice 10. You are in a group of size 2 (you plus one Virtual Player). Both of you have 50 tokens to allocate. You will earn 6 cents for each token you keep. For each token you invest, you will earn 2 cents and the Virtual Player will "earn" 2 cents (a total of 4 cents for both of you together). *Of course, because the Virtual Player is not real, it does not actually receive any earnings.*

For each token the Virtual Player in your group keeps, this Virtual Player will "earn" 6 cents. For each token this Virtual Player invests, this Virtual Player will "earn" 2 cents, and you will earn 2 cents (a total of 4 cents for the group).

To summarize, you will earn:

6 cents times the number of tokens you keep
+ 2 cents times the number of tokens you invest

+ 2 cents times the number of tokens the Virtual Player in your group has chosen to invest.

Keep _____ tokens Invest _____ tokens.
(These choices must sum to 50 tokens)

Choice 11. You are in a group of size 2 (you plus one Virtual Player). Each of you has 50 tokens to allocate. You will earn 6 cents for each token you keep. For each token you invest, you will earn 4 cents and the Virtual Player will "earn" 12 cents (a total of 16 cents for both of you together). *Of course, because the Virtual Player is not real, it does not actually receive any earnings.*

For each token the Virtual Player in your group keeps, the Virtual Player will "earn" 6 cents. For each token the Virtual Player invests, the Virtual Player will "earn" 4 cents, and you will earn 12 cents (a total of 16 cents for the group).

To summarize, you will earn:

6 cents times the number of tokens you keep
+ 4 cents times the number of tokens you invest
+ 12 cents times the number of tokens the Virtual Player in your group has chosen to invest.

Keep _____ tokens Invest _____ tokens.
(These choices must sum to 50 tokens)

Choice 12. You are in a group of size 6 (you plus five Virtual Players). Each of you has 50 tokens to allocate. You will earn 6 cents for each token you keep. For each token you invest, you will earn 2 cents and each of the five Virtual Players in your group will "earn" 4 cents (a total of 22 cents for all six of you together). *Of course, because the Virtual Players are not real, they do not actually receive any earnings.*

For each token a Virtual Player in your group keeps, this Virtual Player will "earn" 6 cents. For each token this Virtual Player invests, this Virtual Player will "earn" 2 cents, the other four Virtual Players will each "earn" 4 cents, and you will earn 4 cents (a total of 22 cents for the group).

To summarize, you will earn:

6 cents times the number of tokens you keep
+ 2 cents times the number of tokens you invest
+ 4 cents times the number of tokens the Virtual Players have chosen to invest.

Keep _____ tokens Invest _____ tokens.
(These choices must sum to 50 tokens)

Choice 13. You are in a group of size 2 (you plus one Virtual Player). Each of you has 50 tokens to allocate. You will earn 6 cents for each token you keep. For each token you invest, you will earn 1 cent and the Virtual Player will "earn" 1 cent (a total of 2 cents for both of you together). *Of course, because the Virtual Player is not real, it does not actually receive any earnings.*

For each token the Virtual Player in your group keeps, this Virtual Player will "earn" 6 cents. For each token the Virtual Player invests, the Virtual Player will "earn" 1 cent, and you will earn 1 cent (a total of 2 cents for the group).

To summarize, you will earn:

6 cents times the number of tokens you keep
+ 1 cent times the number of tokens you invest
+ 1 cent times the number of tokens the Virtual Player in your group has chosen to invest.

Keep _____ tokens Invest _____ tokens.
(These choices must sum to 50 tokens)

Choice 14. You are in a group of size 6 (you plus five Virtual Players). Each of you has 50 tokens to allocate. You will earn 6 cents for each token you keep. For each token you invest, you will earn 1 cent and each of the five Virtual Players in your group will each "earn" 1 cent (a total of 6 cents for all six of you together). *Of course, because the Virtual Players are not real, they do not actually receive any earnings.*

For each token a Virtual Player in your group keeps, this Virtual Player will "earn" 6 cents. For each token this Virtual Player invests, this Virtual Player will "earn" 1 cent, the other four Virtual Players will each "earn" 1 cent, and you will earn 1 cent (a total of 6 cents for the group).

To summarize, you will earn:

6 cents times the number of tokens you keep
+ 1 cent times the number of tokens you invest
+ 1 cent times the number of tokens the Virtual Players have chosen to invest.

Keep _____ tokens Invest _____ tokens.
(These choices must sum to 50 tokens)

Choice 15. You are in a group of size 6 (you plus five Virtual Players). Each of you has 50 tokens to allocate. You will earn 6 cents for each token you keep. For each token you invest, you will earn 2 cents and each of the five Virtual Players in your group will each "earn" 6 cents (a total of 32 cents for all six of

you together). *Of course, because the Virtual Players are not real, they do not actually receive any earnings.*

For each token a Virtual Player in your group keeps, this Virtual Player will "earn" 6 cents. For each token this Virtual Player invests, this Virtual Player will "earn" 2 cents, the other four Virtual Players will each "earn" 6 cents, and you will earn 6 cents (a total of 32 cents for the group).

To summarize, you will earn:

6 cents times the number of tokens you keep
+ 2 cents times the number of tokens you invest
+ 6 cents times the number of tokens the Virtual Players have chosen to invest.

Keep _____ tokens Invest _____ tokens.
(These choices must sum to 50 tokens)

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POST-EXPERIMENT QUESTIONNAIRE FOR EXPERIMENT 1 (UNFORMATTED)
{Demographic questions are not presented here to save space. For the following four "scale" questions, a number line was provided to visually illustrate the scale.}

- On a scale of 1 ("poorly understood") to 5 ("well understood"), please indicate how well you understood the experiment instructions.
- For the next three questions, indicate the number that best represents your opinion about the decisions you made in the experiment on a scale of 1 ("Not Very Important") to 5 ("Very Important").

  I wanted to make as much money as possible for myself.

  I wanted to make sure the researcher running the experiment did not lose a lot of money.

  I wanted to make as much money as possible for the Virtual Players in my group.
- When making your choices in the experiment, did you think about where the experimenter's money goes if you did not earn it through your decision? Yes or No. If yes, where did you believe this money would go?
- Did you make the same decision about how many tokens to keep and invest for each of the 15 choices? Yes or No. If no, why not?
- Carefully consider the following questions. You will be paid **$1 in cash** for answering (1) correctly and will paid an additional $1 if you answer both (2) and (3) correctly.

  1. Recall the last choice you faced in the experiment ***{note: we omit the question to save space}***. If all you cared about was making as much money as possible for *yourself*, how many tokens should you have invested? (you may not

have cared about making as much money as possible for yourself, but if you did, what is the correct answer?)

2. **True** or **False**? The Virtual Players in your group were human beings who received money from the tokens you invested.

3. **True** or **False**? In the experiment, you were able to affect how much the Virtual Players invested by changing your investment.

APPENDIX B

INSTRUCTIONS FOR EXPERIMENT 2 (UNFORMATTED)

Note: Instructions below are for the Virtual-Player Treatment. Instructions for the All-Human baseline (n=8), from which the Virtual-Player decisions were drawn, are identical except that they make clear that group members are humans in the experimental lab (i.e., the All-Human instructions are the same instructions as those used by Fischbacher, Gächter and Fehr, 2001).

- This is an experiment about decision-making.
- You will never be asked to reveal your identity during the experiment.
- Your name will never be associated with any of your choices.
- Keep your decisions private. Please do not reveal your choices to any other participant.
- These instructions will explain to you the choices that you will be making. They will also explain how you will enter your choices on paper decision sheets. There are seven pages you must read.
- If you have any questions at any point during these instructions or during the experiment itself, raise your hand and someone will come to your seat to answer it.
- You can write on these instructions if you wish. Feel free to refer back to them at any time during today's experiment.
- During the experiment do not speak or communicate with the other participants. If you have a question while we are going through these instructions or while the experiment is going on, please raise your hand and one of us will come to your seat to answer it. If you communicate with other participants, we will ask you to leave the experiment and you will forfeit your earnings.

This is an experiment about decision making. You will be paid for participating, and the amount of money you earn depends on the decisions that you make. At the end of today's sessions you will be paid privately and in cash for your decisions. A Georgia State University research grant has provided the funds for this experiment.

We will not speak of Dollars during the experiment, but rather of points. Your earnings will first be calculated in points. At the end of the experiment, the total amount of points you have earned will be converted to US Dollars at the following rate:

1 point = 28 cents

You will be in a group consisting of four players: you and three Virtual Players. The Virtual Players are **not** human and their decisions **have already been determined** (explained below). Your decisions will have **no effect** on how the Virtual Players behave. To assure you that the decisions of the Virtual Players have indeed been pre-determined and will not change during the experiment, we have envelopes in which the decisions of the Virtual Players in your group are printed on a piece of paper. We will place these envelopes on your desk. AFTER the experiment is over, you may open your envelope and confirm that it contains the decisions made by the Virtual Players in your group. PLEASE DO NOT OPEN THE ENVELOPE UNTIL THE EXPERIMENT IS COMPLETED AND YOU ARE TOLD TO OPEN IT.

The Basic Decision

You will learn later how exactly the experiment will be conducted. We first introduce you to the basic decision. At the end of the description of the decision, you will answer a series of questions designed to help you understand the decisions you will be making.

You will be a member of a group of four players: you and three non-human Virtual Players. The decisions of the other humans in the room today will have no effect on your earnings in this experiment.

Each member decides on the division of 20 tokens. You can put these 20 tokens in a private account or you can invest them fully or partially into a project. Each token you do not invest into the project will automatically be transferred to your private account.

Your Earnings from the Private Account

For each token you put in your private account, you will earn exactly one point. For example, if you put twenty tokens in your private account (which implies that you do not invest anything into the project), you will earn exactly twenty points from the private account. If you put 6 tokens into the private account, you will receive earnings of 6 points from the private account. Nobody except you earns points from your private account.

Your Earnings from the Project
From the tokens you invest into the project, you and each of the Virtual Players in your group will get the same payoff (of course, the Virtual Players are not human and thus do not really receive any payoff). You will also get a payoff from the tokens the Virtual Players invest into the project. For each group member, the earnings from the project will be determined as follows:

Earnings from the project = sum of contributions to the project × 0.4

For example, if the sum of all contributions to the project is 60 tokens, then you and each Virtual Player will get a payoff of 60 × 0.4 = 24 points from the project. If the four group members together contribute 10 tokens to the project, you and each Virtual Player will get a payoff of 10 × 0.4 = 4 points from the project. Please remember that the Virtual Players are not human, so they do not actually receive any earnings from your investment.

Your Total Earnings
Your total earnings are the sum of your earnings from the private account and your earnings from the project.

Total earnings = Earnings from the private account (= 20 – contributions to the project) + Earnings from the project (= 0.4 × Sum of contributions to the project)

Behavior of the Virtual Players in your Group
The Virtual Players in your group are <u>not</u> real students, but they have made decisions as if they were real students. Georgia State University students have gone through this same experiment, but in their experiment all the group members were human. The Virtual Players are simply the paper decision sheets filled out by the students in the past experiment. To select the choices of the three Virtual Players in your group, we simply chose at random the decision sheets filled out by three students in the past experiment and put them in the envelope on your desk. Thus, the Virtual Players are non-human, but they will behave as specific humans have behaved in the same experiment in the past. In other words, the Virtual Players in your group invest as if they were endowed with 20 tokens each round, can earn 1 point for every token invested in the private account, and can earn 0.4 point for every group member for every token invested in the project. The decisions of the Virtual Players in your group are printed on a piece of paper in the envelope at your desk PLEASE DO NOT OPEN THE ENVELOPE UNTIL THE EXPERIMENT IS COMPLETED AND YOU ARE TOLD TO DO SO. Remember, your group is you and three non-human Virtual Players. None of the other human students in the laboratory are in your group; they are working in

different groups with different Virtual Players. Your final earnings for the experiment will depend on your decisions and the decisions of your Virtual group members.

Practice Questions
Please answer the following four practice questions. Their purpose is to familiarize you with the calculation of earnings from different allocations of 20 tokens. Feel free to write on these instructions. When you are done, please raise your hand and someone will come by to check your answers.

1. Each group member has 20 tokens. Assume that none of the four group members (including you) contributes anything to the project.
What are your total earnings?
_____points
What are the total earnings of the Virtual Players?
_____points
(of course, the Virtual Players do not really earn anything because they are not human)

2. Each group member has 20 tokens. Assume that you invest 20 tokens into the project and each of the Virtual Players also invests 20 tokens.
What are your total earnings?
_____points
What are the total earnings of the Virtual Players?
_____points
(of course, the Virtual Players do not really earn anything because they are not human)

3. Each group member has 20 tokens. Assume that the three Virtual Players together contribute 30 tokens to the project.
What are *your* total earnings if you – in addition to the 30 tokens – contribute 0 tokens to the project?
_____points
What are *your* total earnings if you – in addition to the 30 tokens – contribute 8 tokens to the project?
_____points
What are *your* total earnings if you – in addition to the 30 tokens – contribute 15 tokens to the project?
_____points

4. Each group member has 20 tokens. Assume that you invest 8 tokens to the project.
What are *your* total earnings if the Virtual Players – in addition to your 8 tokens – contribute 7 tokens to the project?

_____points

What are *your* total earnings if the Virtual Players – in addition to your 8 tokens – contribute 12 tokens to the project?

_____points

What are *your* total earnings if the Virtual Players – in addition to your 8 tokens – contribute 22 tokens to the project?

_____points

If you finish these questions before the others, we advise you to think about additional examples to further familiarize yourself with the decision situation.

The Experiment

The experiment involves the decision situation that we have just described to you. At the end of the session today, you will get paid according to the decisions you make in this experiment. This experiment will be conducted only once.

As you know, you will have 20 tokens at your disposal. You can put them into a private account or you can invest them into a project. In this experiment, each participant has to make two types of decisions. We will call one the "unconditional contribution" and call the other the "contribution table."

- With the unconditional contribution to the project, you have to decide how many of the 20 tokens you want to invest into the project. You will enter this amount into a decision sheet that looks like the following:

Please write your unconditional contribution to the project on the line below.

Your Unconditional Contribution to the Project _____

After completing your sheet, you will hand it to a moderator.

- Your second task is to fill out a "contribution table." You have to indicate, for each possible average contribution of the Virtual Players (rounded to the

nearest whole number), how many tokens you wish to contribute to the project. You can condition your contribution on the contribution of the Virtual Players. This will be immediately clear to you if you take a look at the following decision sheet.

For each number representing the average number of tokens possibly contributed to the project by the Virtual Players, indicate how many tokens you wish to contribute

Your Conditional Contribution to the Project

0_____	7 _____	14_____
1_____	8 _____	15_____
2_____	9 _____	16_____
3_____	10_____	17_____
4_____	11_____	18_____
5_____	12_____	19_____
6_____	13_____	20_____

The numbers next to the lines are the possible (rounded) average contributions of the Virtual Players to the project. You simply have to write on each line how many tokens you will contribute to the project – conditional on the indicated average contribution. You have to make an entry for each number. For example, you will have to indicate how much you wish to contribute to the project if the Virtual Players contribute 0 tokens to the project, how much you contribute if the Virtual Players contribute 1, 2, or 3 tokens etc. On each line, you can write any whole number between 0 and 20.

Note that the Virtual Players in your group each have a completed unconditional contribution decision sheet and a completed contribution table. Recall the Virtual Players are <u>not</u> human, but their decision sheets were completed by humans in a previous experiment like this one. The only difference in the previous experiment compared to the one today is that there were no Virtual Players in the previous experiment – the groups were all made up of four humans.

After all participants have made an unconditional contribution and have filled out their contribution tables, we will roll a 20-sided die to select one participant whose ID number matches the roll of the die (your ID number is on the first page). This participant will roll the die another five times. For the five randomly selected participants whose ID numbers match the die roll, the relevant decision will be the contribution table. For the participants that are not selected, the

relevant decision will be the unconditional contribution. When you make your unconditional contribution and when you fill out the contribution table, you will not know whether you will be selected by the die. You will therefore have to think carefully about both types of decisions because either one can be the basis on which your earnings are calculated. Two examples should make this clear.

EXAMPLE 1: Assume that you have been selected by the random throw of the die. This implies that your relevant decision will be your contribution table. Assume that the unconditional contribution sheets of the Virtual Players indicate contributions of 0, 2 and 4 tokens. The average contribution of the Virtual Players is therefore 2 tokens. If you have indicated in your contribution table that you will contribute 1 token if the Virtual Players contributed 2 tokens on average, then the total contribution to the project is given by $0 + 2 + 4 + 1 = 7$ tokens. All group members therefore earn $0.4 \times 7 = 2.8$ points from the project plus their respective earnings from the private account (of course, the Virtual Players do not receive earnings because they are not human). If you have instead indicated in your contribution table that you will contribute 19 tokens if the Virtual Players contributed two tokens on average, then the total contribution of the group to the project is given by $0 + 2 + 4 + 19 = 25$. All group members therefore earn $0.4 \times 25 = 10$ points from the project plus their respective earnings from the private account.

EXAMPLE 2: Assume that you have not been selected by the random throw of the die, which implies that for you and two Virtual Players, the unconditional contribution is the relevant decision. Assume your unconditional contribution is 16 tokens and the decision sheets of the two Virtual Players indicate contributions of 18 and 20 tokens. The average unconditional contribution of you and the two other group member is therefore 18 tokens. The decision of the third Virtual Player will be based on a contribution table. If the Virtual Player's contribution table indicates a contribution of 1 token if the other three group members contributed on average 18 tokens, then the total contribution of the group to the project is given by $16 + 18 + 20 + 1 = 55$ tokens. All group members will therefore earn $0.4 \times 55 = 22$ points from the project plus their respective earnings from the private account. If instead the third Virtual Player's contribution table indicates a contribution of 19 if the others contributed on average 18 tokens, then the total contributions of that group to the project are $16 + 18 + 20 + 19 = 73$ tokens. All group members will therefore earn $0.4 \times 73 = 29.2$ points from the project plus their respective earnings from the private account.

After everyone has made their unconditional contribution and has filled out their contribution tables, one of you will be selected to roll the 20-sided die five times.

The numbers that are thrown will indicate which participants have been selected to have their contribution tables be relevant for their decision. For the other participants, their unconditional contribution is the relevant decision

You have now completed the instructions.

If you have any questions, raise your hand and someone will come to your desk to answer it. Please be sure that you have understood the instructions before continuing.

Please answer the following two questions that test your comprehension of the instructions. When you have answered them, please raise your hand and someone will come to check your answers.

(1) **True or False**? In this task, your group members are human beings who will receive money based on the decisions you and they make in the task. Circle your answer: TRUE FALSE

(2) **True of False**? In this task, your group members have already made their decisions before you make yours. Circle your answer: TRUE FALSE

APPENDIX C

INSTRUCTIONS FOR EXPERIMENT 3 (UNFORMATTED)

Note: Instructions below are for the Virtual-Player Treatment (VI). Instructions for the All-Human baseline (HI) are identical except that they make clear that group members are humans in the experimental lab (i.e., the All-Human instructions are the standard linear VCM game instructions). Note that all decision screens made explicit the nature of the subject's group members (Virtual or Human).

VIRTUAL-PLAYER-INEXPERIENCED (VI) INSTRUCTIONS (UNFORMATTED)

- This is an experiment about decision-making.
- You will never be asked to reveal your identity during the experiment.
- Your name will never be associated with any of your choices.
- Keep your decisions private. Please do not reveal your choices to any other participant.
- These instructions will explain to you the choices that you will be making. They will also explain how you will enter your choices on the computer. There are six pages you must read.
- If you have any questions at any point during these instructions or during the experiment itself, raise your hand and someone will come to your seat to answer it.

- You can write on these instructions if you wish. Feel free to refer back to them at any time during today's experiment.
- During the experiment do not speak or communicate with the other participants. If you have a question while we are going through these instructions or while the experiment is going on, please raise your hand and one of us will come to your seat to answer it.

This experiment is a study of group and individual investment behavior. If you follow the instructions carefully and make good investment decisions you may earn a considerable amount of money. The money you earn will be paid to you, in cash, at the end of the experiment. A research foundation has provided the funds for this study.

You will be in a group consisting of four players: you and three non-human Virtual Players. A computer has made the investment decisions for the Virtual Players in your group. These decisions have been pre-programmed. **Your decisions will have no effect on how the Virtual Players behave**. To assure you that the decisions of the Virtual Players have indeed been pre-determined and will not change during the experiment, we have envelopes in which the investment decisions of the Virtual Players in your group are printed on a piece of paper. We will place these envelopes on your desk. AFTER the experiment is over, you may open your envelope and confirm that it contains the decisions made by the Virtual Players in your group. PLEASE DO NOT OPEN THE ENVELOPE UNTIL THE EXPERIMENT IS COMPLETED.
Each member in your group will be given an investment account with a specific number of tokens in it. These tokens are then invested to turn into cash. You will be choosing how to divide your tokens between two investment opportunities: the **Individual Exchange** and the **Group Exchange**.

THE INDIVIDUAL EXCHANGE: Every token you invest in the Individual Exchange will earn you a return of one cent. Examples are given below:

Example: Suppose you invested 28 tokens in the Individual Exchange. Then you would earn $0.28 from this exchange.
Example: Suppose you invested 42 tokens in the Individual Exchange. Then you would earn $0.42 from this exchange.
Example: Suppose you invested 0 tokens in the Individual Exchange. Then you would earn nothing ($0.00) from this exchange.

THE GROUP EXCHANGE: The return you earn from the Group Exchange is a little more difficult to determine. What you earn from the Group Exchange will depend on the TOTAL NUMBER OF TOKENS that you and the three Virtual members of your group invest in the Group Exchange. The more the GROUP invests in the Group Exchange, the more EACH MEMBER OF THE GROUP earns. The process is best explained by a number of examples, given below:

Example: Suppose that you decided to invest no tokens in the Group Exchange, but that the three Virtual members invested **a total** of 50 tokens. Then **your** earnings from the Group Exchange would be $0.25 (one-half cent for each of the 50 tokens). Each Virtual member of your group also "earns" $0.25 from the Group Exchange (of course, because the Virtual Players are not real, they do not actually receive any of their earnings).

Example: Suppose that you decided to invest 20 tokens in the Group Exchange, and the three Virtual members invested a total of 40 tokens. This makes **a total** of 60 tokens invested in the Group Exchange. Then **your** earnings from the Group Exchange would be $0.30 (one-half cent for each of the 60 tokens). Each Virtual member of your group also "earns" $0.30 from the Group Exchange.
Example: Suppose that you decided to invest 30 tokens in the Group Exchange, but that the three Virtual members invested nothing. Then you, and everyone else in the group, would each earn $0.15 from the Group Exchange.

As you can see, every token invested in the Group Exchange will earn one half of a cent for EVERY member of the group, not just the member who invested it (of course, because the Virtual Players are not real, they do not actually receive any of their earnings). IT DOES NOT MATTER WHO INVESTS TOKENS IN THE GROUP EXCHANGE. EVERY MEMBER WILL GET A RETURN FROM EVERY TOKEN INVESTED — WHETHER THEY INVEST IN THE GROUP EXCHANGE OR NOT. The table on the last page (p.6) has been provided for your reference during the experiment. The table lists what your payoff would be from the Group Exchange given the number of tokens in the exchange in each round of the experiment.

THE INVESTMENT DECISION: Your task is to decide how many of your tokens to invest in each of the Exchanges. You are free to put some tokens into the Individual Exchange and some into the Group Exchange. Alternatively, you can put all of them into the Group Exchange or all of them into the Individual Exchange.

STAGES OF INVESTMENT: There will be twenty-five decision rounds in which you will be asked to make investment decisions. You will be paid the total of your payoffs from all twenty-five rounds. Any half-cent values will be rounded up to the nearest cent.

Remember that your earnings in a decision period are the sum of the returns from the tokens you placed in your Individual Exchange **plus** the return from the **total** number of tokens placed in the Group Exchange.

USING THE COMPUTER: Look at the example screen on the overhead at the front of the room. At the beginning of each round you will be given an Endowment of **50 tokens** and you will be reminded of the round number and the number of members in your group. You select the number of tokens you want to invest in the two investment exchanges by using the slide bar below the question "How many tokens do you want to invest in the Group Exchange?" You simply enter the number of tokens you want to place in the Group Exchange. Using your mouse, put the arrow cursor on the slide bar and hold down the left-hand click button. You can then slide the arrow to the amount that you want to invest in the Group Exchange. The number of tokens in the Individual Exchange will change automatically so that the sum of your investments equals your endowment, 50 tokens. The Virtual Players in your group also have 50 tokens to invest. You must make your investment decisions each round WITHOUT knowing what the other members of your group have decided.

When you are **certain** of your investment decision, click on the SUBMIT button located at the bottom of your screen. DO NOT CLICK THE "SUBMIT" BUTTON UNTIL YOU ARE SURE OF YOUR DECISION.

When all players have submitted their investment decisions, you will be told the total number of tokens invested in the Group Exchange that round as well as your earnings from that round. At any time during the experiment, you can click on the **Transaction History** button and see the history for each round, including a record of (1) the number of tokens you invested in the Individual and Group Exchanges, (2) the number of tokens invested in the Group Exchange by the Virtual Players, (3) the total number of tokens invested in the Group Exchange, and (4) your earnings for that round. To return to the Investment screen, just click Close.

BEHAVIOR OF THE VIRTUAL PLAYERS IN YOUR GROUP:

The Virtual Players in your group are **not real students**, but they behave as if they were real students. Georgia State University students have gone

through this same experiment, but in their experiment all the group members were human. To program the behavior of the three non-human Virtual Players in your group, the computer selected the investment decisions of three humans in a previous experiment, which are stored in a database. The computer programmed each Virtual Player to behave in the same way that one of the humans behaved in the previous experiments. Thus, the Virtual Players are non-human, but they will behave as specific humans have behaved in the same experiment in the past. In other words, the Virtual Players in your group are investing as if they were endowed with 50 tokens each round, can earn 1 cent for every token invested in the Individual Exchange, and can earn one-half cent for every group member for every token invested in the Group Exchange.

Remember, your group is you and three non-human Virtual Players. None of the other human students in the laboratory are in your group; they are working in different groups with different Virtual Players. Your final earnings for the experiment will depend on your decisions and the decisions of your Virtual group members.

You have now completed the instructions. On the next page is a question that will allow you to practice before the actual experiment begins.

If you have any questions, raise your hand and someone will come to your desk to answer it. Please be sure that you have understood the instructions before continuing.

Practice Question: Please answer the following question to ensure that you understand how your cash earnings in this experiment are calculated. When you are done, please raise your hand and someone will come by to check your answers.

Pretend you are given 50 tokens. Decide how many of these tokens you want invest in the Individual Exchange and how many you want to invest in the Group Exchange and write these numbers below (your answers here are only hypothetical – it does not matter how many tokens you allocate to each exchange):

(1) Individual Exchange: _____ tokens
(2) Group Exchange: _____ tokens
(make sure the two numbers above sum to 50)

Now pretend that the three Virtual members of your group invested **100 tokens** in the Group Exchange. The Total Number of Tokens in the Group Exchange is thus equal to 100 plus whatever you invested in the Group Exchange.

(3) Total Number of Tokens in Group Exchange: _____ tokens

Please calculate your earnings in the spaces below:

(4) Your earnings from your investment in the Individual Exchange = _____ cents

(one cent times the number of tokens you invested in the Individual Exchange)

(5) Your earnings from <u>your</u> investment in the Group Exchange: _____ cents

(one-half cent times the number of tokens you invested in the Group Exchange)

(6) Your earnings from <u>others'</u> investment in the Group Exchange: _____ cents

(one-half cent times the number of tokens the Virtual members invested in the Group Exchange):

(7) Your Total Earnings: _____ cents

After you have completed this practice question, raise your hand and wait for someone to come to your seat. After everyone's answer has been checked, there will be a brief oral summary of the main features of this experiment and then we will begin the experiment.

Oral Summary

{*The oral summary was a series of bullet points that covered the main features of the game and the payoff calculations, as well as emphasizing confidentiality of decisions, anonymity within the room, absence of deception, and that this experiment would be followed by another one. The Virtual-Player Treatment instructions also included the following bullet point:*

- In this experiment, you are in a group of four members: you and three non-human Virtual Players. The decisions of the Virtual Players have been pre-programmed. Your decisions will have no effect on how the Virtual Players behave. Why are we using Virtual Players? To ensure that your behavior is not affected by whom you know in this experiment: you are not playing with peers in this experiment, you are playing with robots. To assure you that the decisions of the Virtual Players have indeed been pre-determined and will not change during the experiment (in other words, to assure you that we are not deceiving you), we have envelopes in which the investment decisions of the Virtual Players in your group are

printed on a piece of paper. We will place these envelopes on your desk. AFTER the experiment is over, you may open your envelope and confirm that it contains the decisions made by the Virtual Players in your group. PLEASE DO NOT OPEN THE ENVELOPE UNTIL THE EXPERIMENT IS COMPLETED.

Experienced Subjects Instructions (HE and VE)

Instructions for HE and VE were identical to HI and VI except they began with "This is an experiment about decision-making that is almost exactly the same as the previous experiment." When describing the attributes of the experiment, the instructions also included the introductory clause "As in the previous experiment," whenever appropriate. "In contrast to the previous experiment," or "however" were used to highlight what had changed about the experiment (i.e., the nature of the group members).
Below, we list relevant post-experiment questionnaire questions. We do not reproduce questions related to demographic information and relevant academic experience.

Please answer the following questions. If you answer them all correctly, you can win another $10 in addition to the earnings you have already earned. If more than one person answers the questions correctly, one winner will be picked at random to receive the $10 prize.
(1) If all you cared about was making as much money as possible for yourself in each round of the experiment in which the groups were all human students, how many tokens should you have invested in the Group Exchange each round? (you may not have cared about making as much money as possible for yourself, but if you did, what is the correct answer?)
(2) If all you cared about was making as much money as possible for yourself in each round of the experiment in which the groups included Virtual Players, how many tokens should you should have invested in the Group Exchange each round? (you may not have cared about making as much money as possible for yourself, but if you did, what is the correct answer?)
(3) **True** or **False**? The Virtual Players in your group were human beings who received money from your investment in the Group Exchange.
(4) **True** or **False**? In the experiment with the Virtual Players, you were able to affect how much the Virtual Players invested in the Group Exchange by changing your investment.

On the next page of this appendix is the payoff table given to every subject (on paper).

Total Number of Tokens Invested in Group Exchange and Your Payoff

Total Tokens	Your Payoff	Total Tokens	Your Payoff	Total Tokens	Your Payoff	Total Tokens	Your Payoff
0	$0.00	*51*	$0.255	*101*	$0.505	*152*	$0.76
1	$0.005	*52*	$0.26	*102*	$0.51	*153*	$0.765
2	$0.01	*53*	$0.265	*103*	$0.515	*154*	$0.77
3	$0.015	*54*	$0.27	*104*	$0.52	*155*	$0.775
4	$0.02	*55*	$0.275	*105*	$0.525	*156*	$0.78
5	$0.025	*56*	$0.28	*106*	$0.53	*157*	$0.785
6	$0.03	*57*	$0.285	*107*	$0.535	*158*	$0.79
7	$0.035	*58*	$0.29	*108*	$0.54	*159*	$0.795
8	$0.04	*59*	$0.295	*109*	$0.545	*160*	$0.8
9	$0.045	*60*	$0.3	*110*	$0.55	*161*	$0.805
10	$0.05	*61*	$0.305	*111*	$0.555	*162*	$0.81
11	$0.055	*62*	$0.31	*112*	$0.56	*163*	$0.815
12	$0.06	*63*	$0.315	*113*	$0.565	*164*	$0.82
13	$0.065	*64*	$0.32	*114*	$0.57	*165*	$0.825
14	$0.07	*65*	$0.325	*115*	$0.575	*166*	$0.83
15	$0.075	*66*	$0.33	*116*	$0.58	*167*	$0.835
16	$0.08	*67*	$0.335	*117*	$0.585	*168*	$0.84
17	$0.085	*68*	$0.34	*118*	$0.59	*169*	$0.845
18	$0.09	*69*	$0.345	*119*	$0.595	*170*	$0.85
19	$0.095	*70*	$0.35	*120*	$0.6	*171*	$0.855
20	$0.1	*71*	$0.355	*121*	$0.605	*172*	$0.86
21	$0.105	*72*	$0.36	*122*	$0.61	*173*	$0.865
22	$0.11	*73*	$0.365	*123*	$0.615	*174*	$0.87
23	$0.115	*74*	$0.37	*124*	$0.62	*175*	$0.875
24	$0.12	*75*	$0.375	*125*	$0.625	*176*	$0.88
25	$0.125	*76*	$0.38	*126*	$0.63	*177*	$0.885
26	$0.13	*77*	$0.385	*127*	$0.635	*178*	$0.89
27	$0.135	*78*	$0.39	*128*	$0.64	*179*	$0.895
28	$0.14	*79*	$0.395	*129*	$0.645	*180*	$0.9
29	$0.145	*80*	$0.4	*130*	$0.65	*181*	$0.905
30	$0.15	*81*	$0.405	*131*	$0.655	*182*	$0.91
31	$0.155	*82*	$0.41	*132*	$0.66	*183*	$0.915
32	$0.16	*83*	$0.415	*133*	$0.665	*184*	$0.92
33	$0.165	*84*	$0.42	*134*	$0.67	*185*	$0.925
34	$0.17	*85*	$0.425	*135*	$0.675	*186*	$0.93
35	$0.175	*86*	$0.43	*136*	$0.68	*187*	$0.935
36	$0.18	*87*	$0.435	*137*	$0.685	*188*	$0.94
37	$0.185	*88*	$0.44	*138*	$0.69	*189*	$0.945
38	$0.19	*89*	$0.445	*139*	$0.695	*190*	$0.95
39	$0.195	*90*	$0.45	*140*	$0.7	*191*	$0.955
40	$0.2	*91*	$0.455	*141*	$0.705	*192*	$0.96
41	$0.205	*92*	$0.46	*142*	$0.71	*193*	$0.965
42	$0.21	*93*	$0.465	*143*	$0.715	*194*	$0.97
43	$0.215	*94*	$0.47	*144*	$0.72	*195*	$0.975
44	$0.22	*95*	$0.475	*145*	$0.725	*196*	$0.98
45	$0.225	*96*	$0.48	*146*	$0.73	*197*	$0.985
46	$0.23	*97*	$0.485	*147*	$0.735	*198*	$0.99
47	$0.235	*98*	$0.49	*148*	$0.74	*199*	$0.995
48	$0.24	*99*	$0.495	*149*	$0.745	*200*	$1.00
49	$0.245	*100*	$0.5	*150*	$0.75		
50	$0.25	*101*	$0.505	*151*	$0.755		

APPENDIX D
ADDITIONAL STATISTICAL TESTS FOR EXPERIMENT 3

Table D1 presents nonparametric test statistics for selected pair-wise differences. For these between-subject tests we employ the Kolmogorov-Smirnov test for two independent samples. Statistical tests of equal contributions for selected pairs of experiment conditions are presented on a round-by-round basis as well as for the average subject-specific contributions across all rounds.

Table D1. Nonparametric, Kolmogorov-Smirnov Difference Tests

Round	H*I* v. V*I*	H*E* v. V*E*	H*I* v. H*E*	V*I* v. V*E*
1	0.3125**	0.3000**	0.2625**	0.2500**
2	0.3250**	0.2000*	0.3750**	0.2125*
3	0.2750**	0.1250	0.3250**	0.2000*
4	0.2750**	0.1000	0.3750**	0.1625
5	0.2750**	0.1250	0.3250**	0.1625
6	0.3375**	0.2000*	0.2375*	0.1250
7	0.3500**	0.2500**	0.3000**	0.1625
8	0.3250**	0.0625	0.3375**	0.1125
9	0.3875**	0.1125	0.3875**	0.1125
10	0.3625**	0.2000*	0.3250**	0.1500
11	0.3500**	0.2250*	0.2125*	0.1250
12	0.3875**	0.2875**	0.2125*	0.1375
13	0.2500**	0.2000*	0.2125*	0.1375
14	0.3250**	0.2000*	0.1875	0.1125
15	0.3250**	0.1750	0.1875	0.0625
16	0.3125**	0.2000*	0.2125*	0.1750
17	0.3250**	0.2750**	0.2250*	0.1500
18	0.2750**	0.2125*	0.1375	0.1125
19	0.3250**	0.2000*	0.2125*	0.0625
20	0.1875	0.2375*	0.1250	0.1625
21	0.3125**	0.1375	0.2875**	0.1125
22	0.2750**	0.1250	0.2875**	0.2000*
23	0.3500**	0.1000	0.3375**	0.1375
24	0.2000*	0.1000	0.1500	0.0500
25	0.2000*	0.0500	0.2625**	0.1250
Average	0.4125**	0.2500**	0.3375**	0.1750

Notes: * and ** correspond respectively to 5%, and 1% significance levels (one-sided tests). "H" and "V" refer to the All-Human and Virtual-Player treatments, respectively. "*I* " and "*E* " refer to inexperienced and experienced subjects, respectively. Critical values for one-tailed Kolmogorov-Smirnov *D*-statistics are: 5% = 0.1929; 1% = 0.2403.

APPENDIX E
FOCUS GROUP POST-EXPERIMENT 3

We paid subjects in our last session (n=20) an additional $10 to remain in the laboratory and serve as a focus group to provide feedback to the experimenters. These subjects had just completed playing 50 rounds with virtual players. Two-thirds (67.5%) of the subjects correctly answered "0" to the post-experiment question about the payoff-maximizing Group Exchange contribution. As noted below, however, many of them guessed at this answer based on the final-round behaviors of virtual players or interpreted the question as asking for the "risk-free" contribution level (i.e., they erroneously believed they were playing a risky investment game, where zero contributions are seen as a risk-dominant strategy but not as free-riding).

Subjects first provided written answers to five questions that probed their thoughts about the experiment (they were instructed to write "NA" if it was not applicable to them):

(1) In your opinion, what is the point of this experiment?

(2) If you invested positive numbers (>0) of tokens in the Group Exchange in the early rounds (1-5) of the first Experiment (Part A), why did you?

(3) In the post-experiment test of your understanding of the experiment, many of you answered the first question (How many tokens should you invest in the Group Exchange if you wanted to make the most money for yourself) with: "0 tokens." However, most of you did not choose to invest 0 tokens in every round of the experiment. Why didn't you?

(4) In some rounds, some of you invested 49 tokens in the Individual Exchange and 1 token in the Group Exchange. If you are one of these people, why did you choose this investment pattern?

(5) Some of you answered that ensuring that the professor did not lose a lot of money was important to you. If you answered that it was important to you, how did such a preference affect your choices in the experiment (what did you do to help the professor)?

(6) [*This question was seen after other five questions were answered*] How did you determine how many tokens to invest in the Group Exchange in the early rounds of the experiment (first 10 rounds)." (A) The choice was clear from the instructions; (B) I invested different amounts and watched how my payoff changed; (C) I observed how many tokens the Virtual Players invested and altered my decision accordingly; (D) Other (please specify) [*Subjects were instructed they could choose more than one response*]

As noted in the main text, in response to Question 1, almost all subjects wrote something about observing how people make investments (e.g., "to see if

one will be attentive and look back at the transaction chart to help them make more efficient moves or better predict how the computer will gamble next time."). Given that almost all public goods experiments use the neutral language of "investment decisions," such responses are not surprising. The main text also describes the answers to Question 6.

After the questionnaire was completed, the moderator asked each subject orally for more detail on how he or she made decisions in the "early" rounds (first 10 rounds) of the experiment. The order in which subjects were questioned was determined by the monitor's observations of the data from rounds 6 – 20. The order was based loosely on how confused the subjects appeared to the moderator, which was determined by their contribution patterns. Subjects who persisted in making positive contributions or frequently changed their contribution levels were considered more confused and subjects who generally contributed zero were labeled least confused. We ordered subjects in this way to mitigate the risk that confused subject responses would be affected by the responses of subjects who understood the incentives. A summary of the responses is in the main text, Recall that 35% of the subjects reported a mix of beginning with a split of their endowment, followed by watching what the virtual players were doing and by attempting to infer if there was any pattern to earnings, followed quickly by abandoning any attempt to infer a pattern and instead herding along with the virtual players. Thus, as implied by our econometric results, some subjects attempted to infer the best response strategy from play of the game, but found it too difficult, gave up and simply imitated what they saw other players doing. In retrospect, this result is not surprising. If a subject was unable to see from the instructions that every token invested in the Group Exchange yielded him only one-half token, the same subject is unlikely to make the inference from observing changes in earnings when his contributions and those of his group members were changing simultaneously.

As noted in the main text, two-thirds of the subjects answered on the post-experiment questionnaire that contributing zero tokens to the Group Exchange would maximize their payoffs, but most did not contribute zero tokens for most rounds. When asked why they wrote down zero, but did not invest zero, two general responses were heard: (1) one had to come up with an answer and given the virtual players were contributing at zero or near zero in the final rounds, an answer of "0" seemed like the best answer; and (2) the question was asking about the "risk-free" investment decision. This latter response was common, orally and in writing, among self-reported herders. When probed, many subjects spoke of a perceived "risk" associated with investing in the Group Exchange. As the following two written answers imply, many subjects understood that higher group payoffs were engendered when all members contributed, but they mistakenly thought that this outcome maximized their own earnings.

"If I wanted to play it safe, I would invest nothing at all. But in order to maximize my earnings, every member (including virtual players) would need to invest."
"Put 50 in Individual and 0 in Group. This would mean your money is guaranteed. The other option is risky."

The oral discussion suggests there are two types of herders: (1) herders who are confused and just follow average contributions of group; and (2) others who have a more sophisticated, but incomplete, understanding of the game in which they are playing. They incorrectly believe that it is privately optimal to contribute more when others are contributing more, and contribute less when others are contributing less. They have a sense of being "suckers" if they contribute and their group members do not, but they do not understand, even after 50 rounds of play with virtual players, that they would be better off by free-riding on the other group members' contributions. Importantly, their view of the game has nothing to do with other-regarding preferences, but rather stems from a misunderstanding of the structure of the game.

The oral response of one subject captures the sentiment of this sub-group: "The way to maximize your earnings was to invest when the Virtual Players invested and don't invest when they didn't invest. I would have made a lot more money if I had been with other Virtual Players. The ones I had in the second 25 periods were jerks. In the first 25, the virtuals invested a lot more in the Group Exchange than the ones I had in the last 25 rounds. I hardly invested anything in the Group Exchange with the last group." The moderator asked her, "So if your Virtual Players had invested 50 tokens every period, you would also have invested 50 tokens?" She said, "Yes, that would have ensured I made the most money." She then pointed to her payoff table and stated that more money was made when more tokens were invested. Note that this woman (1) understood she was playing with robots whose behavior she could not change, (2) correctly answered the post-experiment question on the payoff-maximizing contribution and (3) had just listened to another subject articulate the dominant strategy in precise terms.

Also in Experiment 3, we posed two questions after the sessions in which subjects (n=80) played 50 rounds of the VCM game with virtual players: "Circle the number on the rating scale that best represents your opinion about the decisions you made in the experiment. (C) I wanted to make as much money as I could for myself; (D) I wanted to make sure the professor running the experiment did not lose a lot of money." For each statement, subjects circled a number ranging from 1 (Not Important) to 7 (Very Important). The mean response to C was 6.0 and to D was 1.2 (only 11 subjects circled a number greater than "1"; 8 of them circled "2").

Thus the empirical results and the *ex post* subject narratives suggest that subjects understood clearly the nonhuman nature and exogeneity of the virtual-player contributions and were interested in payoff-maximization when playing with virtual players. However, a substantial proportion of subjects begin and end the experiment without recognizing the tension between the privately-optimal strategy of free-riding and the socially-optimal strategy of contributing to the public good.

APPENDIX F

INSTRUCTIONS FOR EXPERIMENT 4 (UNFORMATTED)

Note: Instructions below are for the Human-Player with Modified Instructions Treatment. The Virtual-Player Treatment uses the virtual-player language of Experiment 3 and asks the two True-False comprehension questions before subjects make their decisions (as in Experiment 2).

- This is an experiment about decision-making.
- You will never be asked to reveal your identity during the experiment.
- Your name will never be associated with any of your choices.
- Keep your decisions private. Please do not reveal your choices to any other participant.
- These instructions will explain to you the choices that you will be making. They will also explain how you will enter your choices on the computer.
- You can write on these instructions if you wish. Feel free to refer back to them at any time during today's experiment.
- During the experiment do not speak or communicate with the other participants. If you have a question while we are going through these instructions or while the experiment is going on, please raise your hand and one of us will come to your seat to answer it.

THIS EXPERIMENT

This experiment is a study of group and individual decision making. The amount of money you earn depends on the decisions that you and the other participants make and thus you should read the instructions carefully. The money you earn will be paid privately to you, in cash, at the end of the experiment. A research foundation has provided the funds for this study.

You will be in a group consisting of four players: you and three others. The other players in your group are people sitting in this room, but you will not be told who is in your group.

Each member in your group will be given tokens. You may choose to keep all of your tokens. Alternatively, you may choose to donate some or all of your tokens to the other three members of your group.

KEEPING TOKENS: For every token you keep you (and only you) will earn 6 cents. Examples are given below:

Example: Suppose you keep 3 tokens. Then you would earn $0.18 (18 cents) from doing so.
Example: Suppose you keep 5 tokens. Then you would earn $0.30 from doing so.
Example: Suppose you keep 0 tokens. Then you would earn nothing ($0.00) from doing so.

DONATING TOKENS: Every token you donate will earn your group 12 cents. This amount will be shared equally between all members of your group (including yourself). Said another way, every token you donate earns you and the three other people in your group 3 cents each. Tokens donated by any of the other three people in your group also earn you 3 cents. Thus your earnings from donations will depend on the TOTAL NUMBER OF TOKENS that you and the other three members of your group donate. The process is best explained through a number of examples, given below:

Example: Suppose that you decided not to donate any tokens to the group, but that the three other members donate **a total** of 10 tokens. Then **your** earnings from donations would be $0.30 (3 cents for each of the 10 tokens). Everyone else in your group would also earn $0.30 from donations.

Example: Suppose that you decided to donate 4 tokens to the group, and the three other members donate **a total** of 9 tokens. This makes **a total** of 13 tokens donated to the group. Then **your** earnings from donations would be $0.39 (3 cents for each of the 13 tokens). Everyone else in your group would also earn $0.39 from donations.

Example: Suppose that you decided to donate 6 tokens to the group, but that the three other members donate nothing. Then you, and everyone else in the group, would each earn $0.18 from the donations (3 cents for each of the six tokens).

As you can see, every token donated to the group will earn 3 cents for EVERY member of the group, not just the person who donated it. IT DOES NOT MATTER WHO DONATES TOKENS TO THE GROUP. EVERYONE WILL GET A RETURN FROM EVERY TOKEN DONATED — WHETHER THEY

DONATE TO THE GROUP OR NOT. A table has been provided for your reference during the experiment. The table lists what your payoff would be from group donations given the number of tokens donated in each round of the experiment.

THE DECISION TASK: In each decision round, you will be given an Endowment of **10 tokens**. Your task is to decide how many of the **10 tokens** to keep and how many to donate. You are free to keep some tokens and donate some tokens. Alternatively, you can keep all of them or donate all of them. Your earnings in a decision round are the sum of the earnings from the tokens you keep **plus** the earnings from the **total** number of tokens donated by your group.

Your earnings = 6 cents*(The Number of Tokens You Keep)
+ 3 cents*(Total Number of Tokens Donated)

NUMBER OF DECISIONS: You will have the same decision task in each of 25 rounds. You will be grouped with the same three people each round, but as noted above, you will not know the identities of the people with whom you are paired (you will all remain anonymous to each other).

You will be paid the total of your earnings from all 25 rounds.

The Earnings Table

It is very important for our research that you understand how earnings are determined in the experiment. We hope that it is important to you as well, as a better understanding of the experiment will likely lead to higher earnings for you. To help you understand these calculations, we provide you with a table that describes your earnings and the average earnings of your group members for all possible decisions that you might make. We encourage you to refer to the table, as well as the instructions, throughout the experiment.

Each row corresponds to one of your possible donations. The first row corresponds to a decision where you donate 0 tokens (and this implies you keep 10 tokens). The fifth row corresponds to a decision where you donate 5 tokens (and so 5 tokens are kept).

Each column corresponds to the average amount that your three group members may donate, rounded to whole numbers. Since your group members also have 10 tokens to allocate, these values range from 0 to 10 tokens. So the first column (with *0* at the top) corresponds to a case where the other three group members donate 0 tokens. The 8th column (with *8* at the top) corresponds to the situation in which the other three group members donate, on average, 8 tokens (a total of 24 tokens: 8 tokens x 3 people).

So each row represents your possible decisions and each column represents the possible decisions of your group members. Each cell that is formed by the intersection of a row and a column represents one possible outcome in the experiment.

Thus the first cell in the upper left-hand corner (first row, first column) corresponds to the outcome in which you donate 0 tokens, and your group members donate 0 tokens. You earnings are listed first and are in bold font. You earn $0.60 (six cents per token kept and $0.00 from donations because there are no tokens donated). The other group members also earn $0.60 each.

The cell below the upper left-hand cell (second row, first column) corresponds to the outcome in which you donate 1 token, and your group members donate 0 tokens. You earn $0.57 (6 cents for each of 9 tokens kept and 3 cents for the one token donated). The other group members earn $0.63 each (6 cents for each of 10 tokens each kept and 3 cents for the one token you donated).

The cell to the right of the upper left-hand cell (first row, second column) corresponds to the outcome in which you donate 0 tokens, and your group member donate, on average, 1 token (a total of 3 tokens donated from the group because there are three other people in your group). You earn $0.69 (6 cents for each of 10 tokens kept and 3 cents for each of the 3 tokens donated). On average, the other group members earn $0.63 each (on average, each kept 9 tokens, earning 54 cents, and received an additional 9 cents from the three tokens donated).

A few points that you should notice about the earnings calculations:
(1) By looking across a row, you should notice that your earnings increase with increases in the average donations of your group members. This relationship holds no matter how many tokens you donate. Please confirm this by looking across the rows.
(2) By looking down a column, you should notice that your earnings decrease with increases in your donations. This relationship holds no matter how many tokens others in your group donate. Please confirm this by looking down columns.
(3) An individual makes the least amount of money ($0.30) when he or she donates all 10 tokens and the other group members donate 0 (bottom left-hand corner of table). Please confirm this by looking at the table.
(4) An individual makes the most amount of money ($1.50) when he or she donates 0 tokens and the other group members donate 10 tokens (top right-hand corner of table). Please confirm this by looking at the table.
(5) A group makes the least amount of money when all four members donate 0 tokens (upper left-hand corner): $0.60/person x 4 people = $2.40 total. Please confirm this by looking at the table.

(6) A group makes the most amount of money when all four members donate 10 tokens (lower right-hand corner): $1.20/person x 4 people = $4.80 total. Please confirm this by looking at the table.

If any of these points is not clear, please raise your hand and someone will come by to answer it. It is in your best interest to ensure that you understand the way in which earnings are calculated.

Questions of understanding, part 1. To make sure you understand how to read this table, please answer the following three questions. You will be paid $1 if you answer all questions correctly.

(1) You donate 0 tokens to the group (thus keeping 10 tokens) and the other group members donate 0 tokens,

(a) What are your earnings?_____

(b) What are the average earnings of each of your group members?_____

(2) You donate 10 tokens to the group (thus keep 0 tokens) and the other group members donate 0 tokens,

(a) What are your earnings?_____

(b) What are the average earnings of each of your group members?_____

(3) You donate 0 tokens to the group and the other group members each donate 10 tokens, on average, to the group,

(a) What are your earnings?_____

(b) What are the average earnings of each of your group members?_____

Raise your hand when you are finished so that the moderator may check your answers. If you finish these questions before the others, we advise you to think about additional examples to further familiarize yourself with the table.

Questions of understanding, part 2. To make sure you understand how to read this table, please answer the following four questions. You will be paid $1 if you answer all questions correctly.

(4) You donate 10 tokens to the group and the other group members donate 10 tokens, on average, to the group,

(a) What are your earnings?_____

(b) What are the average earnings of each of your group members?_____

(5) You donate 5 tokens to the group and the other group members donate 6 tokens, on average, to the group,

(a) What are your earnings?_____

(b) What are the average earnings of each of your group members?_____

(6) You donate 6 tokens to the group and the other group members donate 5 tokens, on average, to the group,

(a) What are your earnings?_____

(b) What are the average earnings of each of your group members?_____

(7) Now make up an example on your own.

(a) You donate _____ tokens to the group (thus you keep _____ tokens).

(b) Your group members donate, on average, _____ tokens to the group.

(c) What are your earnings? _____

(d) What are the average earnings of each of your group members?_____

Raise your hand when you are finished so that the moderator may check your answers. If you finish these questions before the others, we advise you to think about additional examples to further familiarize yourself with the table.

USING THE COMPUTER: Please look at your computer screen. At the beginning of each round you will be given an Endowment of **10 tokens**. You will also be reminded of the round number and the number of members in your group. You select the number of tokens you want to keep and donate by using the slide bar below the question "How many tokens do you want to donate to the group?" You simply enter the number of tokens you want to donate to the group. Using your mouse, put the arrow cursor on the slide bar and hold down the left-hand click button. You can then slide the arrow to the amount that you want to donate. The number of tokens you keep will change automatically so that the sum of the tokens you keep and donate is equal to your endowment, 10 tokens. The other players in your group will also have 10 tokens to allocate. You must make your decisions each round WITHOUT knowing the decisions of your group members.

When you are **certain** of your decision, click on the SUBMIT button located at the top of your screen. DO NOT CLICK THE "SUBMIT" BUTTON UNTIL YOU ARE SURE OF YOUR DECISION.

When all players have submitted their decisions, you will be told the total number of tokens donated that round as well as your earnings from that round. At any time during the experiment, you can click on the **Transaction History** button and see the history for each round, including a record of (1) the number of tokens you kept and donated, (2) the number of tokens donated by all group members other than you, (3) the total number of tokens donated, and (4) your earnings for that round. To return to the decision screen, just click Close.

You have now completed the instructions.

Please remember to remain quiet during the experiment.

If you have any questions, raise your hand and someone will come to your desk to answer it.

Please be sure that you have understood the instructions before continuing.

Complete payoff table given to every subject (on paper) is Figure 4 in main text.

REFERENCES

Andreoni, J. 1990. Impure Altruism and Donations to Public Goods: A Theory of Warm-Glow Giving. *The Economic Journal* **100**(401): 464-477.

Andreoni, J. 1995. Cooperation in Public-Goods Experiments: Kindness or Confusion? *American Economic Review* **85**(4): 891-904.

Ashley, R., S. Ball, and C. Eckel. 2003. Analysis of Public Goods Experiments Using Dynamic Panel Regression Models. Working Paper, Department of Economics, Virginia Tech.

Burlando, R.M. and F. Guala. 2005. Heterogeneous Agents in Public Goods Experiments. *Experimental Economics* **8**: 35-54.

Carpenter, J. 2004. When in Rome: Conformity and the Provision of Public Goods. *Journal of Socio-Economics* **33**(4): 395-408.

Cason, T.N. and D. Friedman. 1999. Learning in Laboratory Markets with Random Supply and Demand. *Experimental Economics* **2**(1): 77-98.

Charness, G., G.R. Frechette and J.H. Kagel. 2004. How Robust is Laboratory Gift Exchange? *Experimental Economics* **7**: 189-205.

Chaudhuri, A., S. Graziano and S. Maitra. 2006 Social Learning and Norms in a Public Goods Experiment with Inter-generational Advice. *Review of Economic Studies* **73**(2): 357-380.

Chaudhuri, A. and T. Paichayontvijit. 2006. Conditional cooperation and voluntary contributions to a public good. *Economics Bulletin* **3**(8): 1−14.

Chou, E., M. McConnell, R. Nagel, and C.R. Plott. 2009. The control of game form recognition in experiments: understanding dominant strategy failures in a simple two person 'guessing' game. *Experimental Economics* **12**(2): 159-179.

Cookson, R. 2000. Framing Effects in Public Goods Experiments. *Experimental Economics* **3**(1): 55-79.

Cotten, S., P.J. Ferraro and C.A. Vossler. 2007. Can Public Goods Experiments Inform Policy? Intepreting results in the presence of confused subjects. In *Environmental Economics, Experimental Methods,* edited by T. Cherry, S. Kroll and J. Shogren. Routledge, pp.194-211.

Cox, J.C. and V. Sadiraj. 2007. Social Preferences and Voluntary Contributions to Public Goods. *Public Finance Review* 35(2): 311-322.

Croson, R., E. Fatas, and T. Neugebauer. 2005. Reciprocity, Matching and Conditional Cooperation in Two Public Goods Games. *Economic Letters* 87(1): 95-101.

Davis, D.D. and C.A. Holt. 1993. *Experimental Economics*. Princeton, N.J.: Princeton University Press.

Erev, I. and A.E. Roth. 1998. Predicting how people play games: Reinforcement learning in experimental games with unique, mixed strategy equilibria. *American Economic Review* **88**(4): 848-881.

Ferraro, P.J., D. Rondeau, and G.L. Poe. 2003. Detecting Other-regarding Behavior with Virtual Players. *Journal of Economic Behavior and Organization* **51**: 99-109.

Fischbacher, U., Gächter S., Fehr E., 2001. Are people conditionally cooperative? Evidence from a Public Goods Experiment. *Economics Letters* **71**: 397-404.

Fischbacher, U. and S. Gächter. 2004. Heterogeneous Motivations and the Dynamics of Free Riding in Public Goods. Working Paper, Institute for Empirical Research in Economics, University of Zurich.

Goeree, J., C. Holt, and S. Laury. 2002. Private Costs and Public Benefits: Unraveling the Effects of Altruism and Noisy Behavior. *Journal of Public Economics* **83**: 255-276.

Greene, W.H. 2003. *Econometric Analysis*, fifth edition. Upper Saddle River, N.J.: Prentice Hall.

Hey, J.D. 2005. Why We Should Not be Silent about Noise. *Experimental Economics* **8**: 325-345.

Holt, C.A. and S.K. Laury. 2008. Theoretical Explanations of Treatment Effects in Voluntary Contributions Games. In C.R. Plott and V.L. Smith (eds.), *Handbook of Results in Experimental Economics*. Amsterdam: North Holland, pp 846-855.

Houser, D. and R. Kurzban. 2002. Revisiting Kindness and Confusion in Public Goods Experiments. *American Economic Review* **92**(4): 1062-1069.

Houser, D. and R. Kurzban. 2005. An experimental investigation of cooperative types in human groups: A complement to evolutionary theory and simulations. *Proceedings of the National Academy of Sciences* **102**(5): 1803-1807

Isaac, R.M., J. Walker, and S. Thomas. 1984. Divergent Evidence on Free Riding: An Experimental Examination of Possible Explanations. *Public Choice* **43**: 113-149.

Johnson, E. J., C. Camerer, S. Sen and T. Rymon. 2002. Detecting Failures of Backward Induction: monitoring information search in sequential bargaining. *Journal of Economic Theory* **104**: 16-47.

Keser, C., and F. van Winden. 2000. Conditional Cooperation and Voluntary Contributions to Public Goods. *Scandinavian Journal of Economics* **102**(1): 23-39.

Laury, S.K. and L.O. Taylor. 2008. Altruism Spillovers: Are Behaviors in Context-free Experiments Predictive of Altruism Toward a Naturally Occurring Public Good? *Journal of Economic Behavior and Organization* **65**(1): 9-29.

Ledyard, J. 1995. Public Goods: A Survey of Experimental Research. In J.H. Kagel and A.E. Roth eds, *Handbook of Experimental Economics*. Princeton: Princeton University Press, pp. 111-194.

Levitt, S.D. and J.A. List. 2007. What Do Laboratory Experiments Measuring Social Preferences Reveal About the Real World? *Journal of Economic Perspectives* **21**(2): 153-174.

Loewenstein, G. 1999. Experimental Economics from the Vatange-Point of Behavioural Economics. *Economic Journal* **109**: F25-F34.

Mason, C.F. and O.R. Phillips. 1997. Mitigating the Tragedy of the Commons through Cooperation: An Experimental Evaluation. *Journal of Environmental Economics and Management* **34**: 148-172.

Oxoby, R.J. and J. Spraggon. Forthcoming. Ambient-Based Policy Instruments: The Role of Recommendations and Presentation. *Agricultural and Resource Economics Review*.

Palfrey, T.P. and J.E. Prisbrey. 1997. Anomalous Behavior in Public Goods Experiments: How Much and Why? *American Economic Review* **87**: 829-846.

Plott, C. and K. Zeiler. 2005. The Willingness to Pay–Willingness to Accept Gap, the 'Endowment Effect,' Subject Misconceptions, and Experimental Procedures for Eliciting Valuations. *American Economic Review* **95**: 530-545.

Rege, M. and K. Telle. 2004. The Impact of Social Approval and Framing on Cooperation in Public Good Situations. *Journal of Public Economics* **88**(7-8): 1625-1644.

Saijo, T. and H. Nakamura. 1995. The Spite Dilemma in Voluntary Contribution Mechanism Experiments. *Journal of Conflict Resolution* **39**(3): 535-560.

Roth, A.E. and I. Erev. 1995. Learning in Extensive-Form Games: Experimental Data and Simple Dynamic Models in the Intermediate Term. *Games and Economic Behavior* **8**: 164-212.

White, H. 1982. Maximum Likelihood Estimation of Misspecified Models. *Econometrica* **50**(1): 1-25.