

**“Gunning For Efficiency
with Third Party Enforcement
in Threshold Public Goods”**

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Online Appendix

Instructions

**The instructions used in period 1-10
for the all treatments**

Welcome to the Economics Study!

This experiment is a study of group and individual investment behavior. The instructions are simple. If you follow them carefully and make good investment decisions then you may earn a considerable amount of money. If you have any questions about the instructions please raise your hand and someone will come and speak with you privately about your question.

The experiment will last about an hour.

The Experiment

You have been organized into groups of 4 people. Each group will consist of 4 different randomly assigned persons in each period. There will be 20 **periods** in this session. In each period you will be required to make some decisions and what you earn from each decision will depend on what you and the other 3 people in your group decide.

Once all your decisions in the 20 periods have been made, we will randomly select **one of the 20** periods as the **period-that-counts**. We will use the period-that-counts to determine your actual earnings. Note, since all periods are equally likely to be chosen, you should make your decision in each period as if it will be the period-that-counts.

First, we will describe the instructions for the first 10 periods.

First 10 Periods: Investment Decision

At the beginning of each period you will be randomly assigned to a new group of 4 players.

In each period you will be choosing how to divide 8 tokens between two investment opportunities. The return from the **BLUE** investment depends on the actions of your fellow group members. While the return from **RED** investment depends only on your choices:

THE **RED** INVESTMENT

Each token you invest in the **RED** investment will earn you a return of **\$2.00**.

Example: Suppose you invest 4 tokens in the **RED** investment, then you would earn **\$8.00** from this investment.

Example: Suppose you invest 0 tokens in the **RED** investment, then you would earn **\$0.00** from this investment.

THE **BLUE** INVESTMENT

What you earn from the **BLUE** investment will depend on the total number of tokens that you and the other 3 members of your group invest in the **BLUE** investment.

In order to make any returns from the **BLUE** investment, the **total** amount that you and the other group members invest must meet a threshold of a total of **at least** 20 tokens. If your group invests a total of 20 **or more** tokens in the **BLUE** investment, so you meet the threshold, then you and all your group members will earn a return of **\$20.00** from the **BLUE** investment. **IMPORTANT:** Your group will earn exactly **\$20.00** from the **BLUE** investment even if you collectively invest *more than* a total of 20 tokens. If the total investment is 20 tokens, or 21 tokens, or 22 tokens, or ... all the way up to a collective investment of 32 tokens, your earnings from the **BLUE** investment will always be **\$20.00**. Notice, if each person in your group invests 5 tokens in the **BLUE** investment, this will be the most equal way to reach 20 tokens.

If your group invests 19 or less tokens in the **BLUE** investment you and all your group members will earn the amount you would have earned from investing all your tokens in the **RED** investment which is \$16.00.

The process is best explained by a number of examples.

Earnings: If **BLUE** investment threshold is met

Example: Suppose that you invest 8 tokens in the **RED** investment and 0 tokens in the **BLUE** investment and that the 3 other members in your group invest a total of 20 tokens in the **BLUE** investment (say, 4, 8, and 8 respectively). So the total investment in **BLUE** is $0+4+8+8=20$, which exactly meets the threshold of 20. Then your earnings from the **BLUE** investment would be **\$20.00**. Everyone else in your group would also earn **\$20.00** from the **BLUE** investment. Additionally you would earn **\$16.00** from the 8 tokens you put in the **RED** investment (which is 8 tokens multiplied by **\$2.00**). In total you would earn \$36.00 (which is **\$20.00** from the **BLUE** plus **\$16.00** from the **RED**).

Example: Suppose that you invest 3 tokens in the **RED** investment and 5 tokens in the **BLUE** investment and that the 3 other members in your group invest a total of 15 tokens in the **BLUE** investment (say 5, 5, and 5 respectively). So total investment in **BLUE** is $5+5+5+5=20$, which exactly meets the threshold of 20. Then your earnings from the **BLUE** investment would be **\$20.00** (because your group invested 20 or more tokens in the **BLUE** investment). Everyone else in your group would also earn **\$20.00** from the **BLUE** investment. Additionally you would earn **\$6.00** from the 3 tokens you put in the **RED** investment (which is 3 tokens multiplied by **\$2.00**). In total you would earn \$26.00 (which is **\$20.00** from the **BLUE** plus **\$6.00** from the **RED**).

Example: Suppose that you invest 0 tokens in the **RED** investment and 8 tokens in the **BLUE** investment and that the 3 other members in your group invest a total of 13 tokens in the **BLUE** investment (say, 3, 4, and 6 respectively). So total investment in **BLUE** is $8+3+4+6=21$, which exceeds the threshold of 20. Then your earnings from the **BLUE** investment would be **\$20.00**. Everyone else in your group would also earn **\$20.00** from the **BLUE** investment. You would earn **\$0.00** from the 0 tokens you put in the **RED** investment. In total you would earn \$20.00 (which is **\$20.00** from the **BLUE** plus **\$0.00** from the **RED**).

Earnings: If **BLUE** investment threshold is not met

Example: Suppose that you invest 8 tokens in the **RED** investment and 0 tokens in the **BLUE** investment and that the 3 other members in your group invest a total of 18 tokens in the **BLUE** investment (2, 8, and 8 respectively). So total investment in **BLUE** is $0+2+8+8=18$, which is below the threshold of 20. Then your earnings from the **BLUE** investment would be **\$0.00**. Everyone else in your group would also earn **\$0.00** from the **BLUE** investment. When the group invests less than 20 tokens in the **BLUE** investment everyone earns \$16.00.

Example: Suppose that you invest 6 tokens in the **RED** investment and 2 tokens in the **BLUE** investment but that the 3 other members in your group invest a total of 9 tokens in the **BLUE** investment (say 2, 3, and 4 respectively). So total investment in **BLUE** is $2+2+3+4=11$, which is below the threshold of 20. Then your earnings from the **BLUE** investment would be **\$0.00**. Everyone else in your group would also earn **\$0.00** from the **BLUE** investment. When the group invests less than 20 tokens in the **BLUE** investment everyone earns \$16.00.

Example: Suppose that you decided to invest 4 tokens in the **RED** investment and 4 tokens in the **BLUE** investment and that the 3 other members in your group invest a total of 12 tokens in the **BLUE** investment (4, 4, and 4 respectively). So total investment in **BLUE** is $4+4+4+4=16$, which is below the threshold of 20. Then your earnings from the **BLUE** investment would be **\$0.00**. Everyone else in your group would also earn **\$0.00** from the **BLUE** investment. When the group invests less than 20 tokens in the **BLUE** investment everyone earns \$16.00.

SUMMARY

As you can see, every token invested in the **BLUE** investment goes toward the threshold of 20 tokens. If your group invests 20 or more tokens together to the **BLUE** investment you will each earn **\$20.00**. *It does not matter who invests tokens in the **BLUE** investment. Everyone will get a return from the **BLUE** investment if there are 20 or more tokens in the **BLUE** investment—whether they invest tokens in the **BLUE** investment or not.*

YOUR TASK

Your task is to decide how many of your tokens to invest in the **RED** investment and how many to invest in the **BLUE** investment. You are free to invest some of your tokens in the **RED** investment and some in the **BLUE** investment. Alternatively, you can invest all of them in the **RED** investment or all of them in the **BLUE** investment.

Earnings

Once you and the other 3 members of your group have made your decisions, you will receive an **Earnings Statement** for that period. You will be given anonymous details of all your group's investments and earnings.

- If the group investments to the **BLUE** investment *meet or exceed* the threshold of 20 tokens, then...
Earnings = **(\$2.00)** × (Your investment to the **RED** investment) + **\$20.00**
- If the group investments to the **BLUE** investment are *less than* the threshold of 20 tokens, then...
Earnings = **\$16.00** = **(\$2.00)** × (8 tokens)

You must make your investment decisions without knowing what the others in your group are deciding. Do not discuss your decision with any other participant.

Your Group

For each decision period you will be in a group of 4 people in the room today. **After each decision period we will randomly re-match you with a new group of 4 people in the room.** As a result, each decision you make will be with a new group of 4 participants. The probability that you will ever be in the same group of 4 participants again is extremely remote.

After 10 periods of this investment decision, you will be given directions for another type of decision.

Things to remember

- You will be in a group of 4 people
- You will have 8 tokens to invest each period
- Each token you invest in the **RED** investment earns you **\$2.00**
- If your group investment in the **BLUE** investment meets or exceeds 20 tokens, then you and everyone in your group will earn **\$20.00** from the **BLUE** investment
- If your group investments in the **BLUE** investment are below 20 tokens, then you and everyone in your group will earn \$16.00, which is what you would have earned if you had invested all your tokens in the **RED** investment.
- There will be a total of 10 decision periods.
- The groups will be randomly re-matched every decision period.
- Please feel free to use the calculator, and scratch paper provided to help you with your calculations.

If you have any questions about the instructions please raise your hand and someone will come and speak with you privately about your question.

Thank you.

**Please wait to be told when you can begin making decisions
for the first 10 periods.**

**The instructions used in period 11-20
for the TPG Treatment**

Next 10 Periods

Next we will describe the instructions for the second set of 10 periods.

Recall, once all your decisions in the 20 periods have been made, we will randomly select **one of the 20** periods as the **period-that-counts**. We will use the period-that-counts to determine your actual earnings. Note, since all periods are equally likely to be chosen, you should make your decision in each period as if it will be the period-that-counts.

Next 10 Periods: Investment Decision

The next 10 periods are *identical* to the decision you made in the first 10 periods. Although you are already familiar with the investment decision we will go over the rules again briefly.

In each period you will be choosing how to divide 8 tokens between two investment opportunities:

THE RED INVESTMENT

Each token you invest in the RED investment will earn you a return of \$2.00.

THE BLUE INVESTMENT

In order to make any returns from the BLUE investment, the **total** amount that you and the other group members invest must meet a threshold of a total of **at least** 20 tokens. If your group invests a total of 20 **or more** tokens in the BLUE investment, so you meet the threshold, then you and all your group members will earn a return of \$20.00 from the BLUE investment. IMPORTANT: Your group will earn exactly \$20.00 from the BLUE investment even if you collectively invest *more than* a total of 20 tokens. If the total investment is 20 tokens, or 21 tokens, 22 tokens, or ... all the way up to a collective investment of 32 tokens, then your earnings from the BLUE investment will always be \$20.00. Notice, if each person in your group invests 5 tokens in the BLUE investment, this will be the most equal way to reach 20 tokens.

If your group invests 19 or less tokens in the BLUE investment you and all your group members will earn the amount you would have earned from investing all your tokens in the RED investment which is \$16.00.

We illustrate this with some examples.

Example: Suppose that you invest 8 tokens in the RED investment and 0 tokens in the BLUE investment and that the 3 other members in your group invest a total of 16 tokens in the BLUE investment (2, 6, and 8 respectively). So total investment in BLUE is $0+2+6+8=16$, which is below the threshold of 20. Then your earnings from the BLUE investment would be \$0.00. Everyone else in your group would also earn \$0.00 from the BLUE investment.

IF YOUR GROUP DOES MEETS THE THRESHOLD OF 20 IN BLUE

Example: Suppose that you invest 6 tokens in the RED investment and 2 tokens in the BLUE investment and that the 3 other members in your group invest a total of 19 tokens in the BLUE investment (say, 3, 8, and 8 respectively). So total investment in BLUE is $2+3+8+8=21$, which exceeds the threshold of 20. Then your earnings from the BLUE investment would be \$20.00. Everyone else in your group would also earn \$20.00 from the BLUE investment. Additionally you would earn \$12.00 from the 6 tokens you put in the RED investment (which is 6 tokens multiplied by \$2.00). In total you would earn \$32.00 (which is \$20.00 from the BLUE plus \$12.00 from the RED).

Example: Suppose that you invest 3 tokens in the RED investment and 5 tokens in the BLUE investment and that the 3 other members in your group invest a total of 15 tokens in the BLUE investment (5, 5, and 5 respectively). So total investment in BLUE is $5+5+5+5=20$, which exactly meets the threshold of 20. Then your earnings from the BLUE investment would be \$20.00 (because your group invested 20 or more tokens in the BLUE investment). Everyone else in your group would also earn \$20.00 from the BLUE investment. Additionally you would earn \$6.00 from the 3 tokens you put in the RED investment (which is 3 tokens multiplied by \$2.00). You would earn \$26.00 (which is \$20.00 from the BLUE plus \$6.00 from the RED).

SUMMARY

As you can see, every token invested in the BLUE investment goes toward the threshold of 20 tokens. If your group invests 20 or more tokens together to the BLUE investment you will each earn \$20.00. *It does not matter who invests tokens in the BLUE investment. Everyone will get a return from the BLUE investment if there are 20 or more tokens in the BLUE investment—whether they invest tokens in the BLUE investment or not.*

YOUR TASK

Your task is to decide how many of your tokens to invest in the **RED** investment and how many to invest in the **BLUE** investment. You are free to invest some of your tokens in the **RED** investment and some in the **BLUE** investment. Alternatively, you can invest all of them into the **RED** investment or all of them into the **BLUE** investment.

Earnings

Once you and the other 3 members of your group have made your decisions, you will receive an **Earnings Statement** for that period. You will be given anonymous details of all your group's investments and earnings.

- If the group investments to the **BLUE** investment *meet or exceed* the threshold of 20 tokens, then....
Earnings = **(\$2.00)**×(Your investment to the **RED** investment) + **\$20.00**
- If the group investments to the **BLUE** investment are *less than* the threshold of 20 tokens, then...
Earnings = **\$16.00** = **(\$2.00)**×(8 tokens)

You must make your investment decisions without knowing what the others in your group are deciding. Do not discuss your decision with any other participant.

Your Group

For each decision period you will be in a group of 4 people in the room today. **After each decision period we will randomly re-match you with a new group of 4 people in the room.** As a result, each decision you make will be with a new group of 4 participants. The probability that you will ever be in the same group of 4 participants again is extremely remote.

Things to remember

- You will be in a group of 4 people
- You will have 8 tokens to invest each period
- Each token you invest in the **RED** investment earns you **\$2.00**
- There will be a total of 10 decision periods.
- The groups will be randomly re-matched every decision period.
- Please feel free to use the calculator, and scratch paper provided to help you with your calculations.

If you have any questions about the instructions please raise your hand and someone will come and speak with you privately about your question.

Thank you.
**Please wait to be told when you can begin making decisions
for the next 10 periods.**

The instructions used in period 11-20 for the GunEff Treatment

Next 10 Periods

Next we will describe the instructions for the second set of 10 periods.

Recall, once all your decisions in the 20 periods have been made, we will randomly select **one of the 20** periods as the **period-that-counts**. We will use the period-that-counts to determine your actual earnings. Note, since all periods are equally likely to be chosen, you should make your decision in each period as if it will be the period-that-counts.

Next 10 Periods: Investment Decision with Deductions

Stage 1: Investment Decision

Stage 1 is *identical* to the decision you made in the first 10 periods.

In each period you will be choosing how to divide 8 tokens between two investment opportunities:

THE RED INVESTMENT

Each token you invest in the RED investment will earn you a return of \$2.00.

THE BLUE INVESTMENT

In order to make any returns from the BLUE investment, the **total** amount that you and the other group members invest must meet a threshold of a total of **at least** 20 tokens. If your group invests a total of 20 or more tokens in the BLUE investment, so you meet the threshold, then you and all your group members will earn a return of \$20.00 from the BLUE investment. IMPORTANT: Your group will earn exactly \$20.00 from the BLUE investment even if you collectively invest *more than* a total of 20 tokens. If the total investment is 20 tokens, or 21 tokens, 22 tokens, or ... all the way up to a collective investment of 32 tokens, then your earnings from the BLUE investment will always be \$20.00. Notice, if each person in your group invests 5 tokens in the BLUE investment, this will be the most equal way to reach 20 tokens.

If your group invests 19 or less tokens in the BLUE investment you and all your group members will earn the amount you would have earned from investing all your tokens in the RED investment which is \$16.00.

Stage 2: Payoff Deductions

In Stage 2 it is possible that some of the group members will have deductions taken from their Stage 1 earnings. Or it is possible that no one will have deductions taken. Whether or not you have a payoff deduction depends on what you and the others in your group choose.

IF YOUR GROUP DOES NOT MEET THE THRESHOLD OF 20 IN BLUE

If your group invests 19 or less tokens in the BLUE investment then the **lowest** investor to the BLUE investment will have a payoff deduction.

1. Only the lowest investor to the BLUE investment will have a payoff deduction.
2. We will deduct \$2.25 from the earnings of the lowest investor to the BLUE investment.
3. If there is a tie for the lowest investor, all those who tied will have the \$2.25 deduction taken from their payoff.
4. If all 4 members of your group tie for the lowest investor, then everyone have \$2.25 taken from your payoffs.

Thus, when your group invests 19 or less tokens in the BLUE investment the only way you can avoid having a deduction is to avoid being the lowest investor to the BLUE investment.

The only way everyone in the group can avoid a deduction is if your group invests a total of 20 or more tokens in the BLUE investment.

We illustrate this with some examples.

Example: Suppose that you invest 8 tokens in the **RED** investment and 0 tokens in the **BLUE** investment and that the 3 other members in your group invest a total of 16 tokens in the **BLUE** investment (2, 6, and 8 respectively). So total investment in **BLUE** is $0+2+6+8=16$, which is below the threshold of 20. Then your earnings from the **BLUE** investment would be **\$0.00**. Everyone else in your group would also earn **\$0.00** from the **BLUE** investment. Since you were the lowest investor to the **BLUE** investment, you will have a deduction of \$2.25. So the other three group members will earn \$16.00, because the threshold was not met, but because of the payoff deduction, you will earn $\$16.00-\$2.25=\$13.75$.

Example: Suppose that you invest 6 tokens in the **RED** investment and 2 tokens in the **BLUE** investment but that the 3 other members in your group invest a total of 9 tokens in the **BLUE** investment (say 2, 3, and 4 respectively). So total investment in **BLUE** is $2+2+3+4=11$, which is below the threshold of 20. Then your earnings from the **BLUE** investment would be **\$0.00**. Everyone else in your group would also earn **\$0.00** from the **BLUE** investment. Since you are one of the two people who tied for being the lowest investor in **BLUE**, you both will receive a payoff deduction, earning \$13.75 each, while the two group members investing more than 2 will both earn \$16.00.

Example: Suppose that you decided to invest 4 tokens in the **RED** investment and 4 tokens in the **BLUE** investment and that the 3 other members in your group invest a total of 12 tokens in the **BLUE** investment (4, 4, and 4 respectively). So total investment in **BLUE** is $4+4+4+4=16$, which is below the threshold of 20. Then your earnings from the **BLUE** investment would be **\$0.00**. Everyone else in your group would also earn **\$0.00** from the **BLUE** investment. Since all 4 group members tied for the lowest investor, each will face a \$2.25 deduction and each will earn \$13.75 rather than \$16.00.

IF YOUR GROUP DOES MEETS THE THRESHOLD OF 20 IN **BLUE**

If your group invests 20 or more tokens in the **BLUE** investment then there will be no deductions for any group member. It does not matter how much a group member invests in the **BLUE** investment if the total investment are above 20 tokens there will be no deductions.

Notice: The only way for everyone in the group to avoid deductions is if the group as a whole invests 20 or more in the **BLUE** investment. For example, if each person in your group invested 5 tokens in the **BLUE** investment, then no one would receive a deduction

The process is best explained by a number of examples.

Example: Suppose that you invest 8 tokens in the **RED** investment and 0 tokens in the **BLUE** investment and that the 3 other members in your group invest a total of 20 tokens in the **BLUE** investment (say, 4, 8, and 8 respectively). So total investment in **BLUE** is $0+4+8+8=20$, which exactly meets the threshold of 20. Then your earnings from the **BLUE** investment would be **\$20.00**. Everyone else in your group would also earn **\$20.00** from the **BLUE** investment. Additionally you would earn **\$16.00** from the 8 tokens you put in the **RED** investment (which is 8 tokens multiplied by **\$2.00**). Because the group invested 20 or more in **BLUE** there are no deductions, so in total you would earn \$36.00 (which is **\$20.00** from the **BLUE** plus **\$16.00** from the **RED**).

Example: Suppose that you invest 6 tokens in the **RED** investment and 2 tokens in the **BLUE** investment and that the 3 other members in your group invest a total of 19 tokens in the **BLUE** investment (say, 3, 8, and 8 respectively). So total investment in **BLUE** is $2+3+8+8=21$, which exceeds the threshold of 20. Then your earnings from the **BLUE** investment would be **\$20.00**. Everyone else in your group would also earn **\$20.00** from the **BLUE** investment. Additionally you would earn **\$12.00** from the 6 tokens you put in the **RED** investment (which is 6 tokens multiplied by **\$2.00**). Because the group invested 20 or more in **BLUE** there are no deductions, so in total you would earn \$32.00 (which is **\$20.00** from the **BLUE** plus **\$12.00** from the **RED**).

Example: Suppose that you invest 3 tokens in the **RED** investment and 5 tokens in the **BLUE** investment and that the 3 other members in your group invest a total of 15 tokens in the **BLUE** investment (5, 5, and 5 respectively). So total investment in **BLUE** is $5+5+5+5=20$, which exactly meets the threshold of 20. Then your earnings from the **BLUE** investment would be **\$20.00** (because your group invested 20 or more tokens in the **BLUE** investment). Everyone else in your group would also earn **\$20.00** from the **BLUE** investment. Additionally you would earn **\$6.00** from the 3 tokens you put in the **RED** investment (which is 3 tokens multiplied by **\$2.00**). Because the group invested 20 or more in **BLUE** there are no deductions, so in total you would earn \$26.00 (which is **\$20.00** from the **BLUE** plus **\$6.00** from the **RED**).

SUMMARY

As you can see, every token invested in the **BLUE** investment goes toward the threshold of 20 tokens. If your group invests 20 or more tokens together to the **BLUE** investment you will each earn **\$20.00**. *It does not matter who invests tokens in the **BLUE** investment. Everyone will get a return from the **BLUE** investment if there are 20 or more tokens in the **BLUE** investment—whether they invest tokens in the **BLUE** investment or not.*

Also if your group invests 20 or more tokens in the **BLUE** investment there will be no deductions.

YOUR TASK

Your task is to decide how many of your tokens to invest in the **RED** investment and how many to invest in the **BLUE** investment. You are free to invest some of your tokens in the **RED** investment and some in the **BLUE** investment. Alternatively, you can invest all of them into the **RED** investment or all of them into the **BLUE** investment.

Earnings

Once you and the other 3 members of your group have made your decisions, you will receive an **Earnings Statement** for that period. You will be given anonymous details of all your group's investments and earnings.

If the group investments to the **BLUE** investment *meet or exceed* the threshold of 20 tokens:

Earnings = **(\$2.00)***(Your investment to the **RED** investment) + **\$20.00**

If the group investments to the **BLUE** investment are *less than* the threshold of 20 tokens:

Earnings = **\$16.00** – (Payoff Deduction if you are the lowest investor to the **BLUE** investment)

You must make your investment decisions without knowing what the others in your group are deciding. Do not discuss your decision with any other participant.

Your Group

For each decision period you will be in a group of 4 people in the room today. **After each decision period we will randomly re-match you with a new group of 4 people in the room.** As a result, each decision you make will be with a new group of 4 participants. The probability that you will ever be in the same group of 4 participants again is extremely remote.

Things to remember

- You will be in a group of 4 people
- You will have 8 tokens to invest each period
- Each token you invest in the **RED** investment earns you **\$2.00**
- If your group investment in the **BLUE** investment meets or exceeds 20 tokens, then you and everyone in your group will earn **\$20.00** from the **BLUE** investment. *And there will be no deductions*
- If your group investments in the **BLUE** investment are below 20 tokens, then you and everyone in your group will initially earn \$16.00, which is what you would have earned if you had invested all your tokens in the **RED** investment. *And the lowest investor(s) to the **BLUE** investment will have a payoff deduction.*
 - The deduction will be \$2.25.
 - If there is a tie for the lowest investor, all those who tied will have the deduction taken from their payoff.
 - If all 4 members of your group tie for the lowest investor, then all of you will have \$2.25 taken from your payoffs.
- There will be a total of 10 decision periods.
- The groups will be randomly re-matched every decision period.
- Please feel free to use the calculator, and scratch paper provided to help you with your calculations.

If you have any questions about the instructions please raise your hand and someone will come and speak with you privately about your question.

Thank you.

Please wait to be told when you can begin making decisions for the next 10 periods.

**The instructions used in period 11-20
for the GunSelect Treatment**

Next 10 Periods

Next we will describe the instructions for the second set of 10 periods.

Recall, once all your decisions in the 20 periods have been made, we will randomly select **one of the 20** periods as the **period-that-counts**. We will use the period-that-counts to determine your actual earnings. Note, since all periods are equally likely to be chosen, you should make your decision in each period as if it will be the period-that-counts.

Next 10 Periods: Investment Decision with Deductions

Stage 1: Investment Decision

Stage 1 is *identical* to the decision you made in the first 10 periods.

In each period you will be choosing how to divide 8 tokens between two investment opportunities:

THE RED INVESTMENT

Each token you invest in the RED investment will earn you a return of \$2.00.

THE BLUE INVESTMENT

In order to make any returns from the BLUE investment, the **total** amount that you and the other group members invest must meet a threshold of a total of **at least** 20 tokens. If your group invests a total of 20 or more tokens in the BLUE investment, so you meet the threshold, then you and all your group members will earn a return of \$20.00 from the BLUE investment. IMPORTANT: Your group will earn exactly \$20.00 from the BLUE investment even if you collectively invest *more than* a total of 20 tokens. If the total investment is 20 tokens, or 21 tokens, 22 tokens, or ... all the way up to a collective investment of 32 tokens, then your earnings from the BLUE investment will always be \$20.00. Notice, if each person in your group invests 5 tokens in the BLUE investment, this will be the most equal way to reach 20 tokens.

If your group invests 19 or less tokens in the BLUE investment you and all your group members will earn the amount you would have earned from investing all your tokens in the RED investment which is \$16.00.

Stage 2: Payoff Deductions

In Stage 2 it is possible that some of the group members will have deductions taken from their Stage 1 earnings. Or it is possible that no one will have deductions taken. Whether or not you have a payoff deduction depends on what you and the others in your group choose.

IF YOUR GROUP DOES NOT MEET THE THRESHOLD OF 20 IN BLUE

If your group invests 19 or less tokens in the BLUE investment then the **lowest** investor to the BLUE investment will have a payoff deduction.

5. Only the lowest investor to the BLUE investment will have a payoff deduction.
6. We will deduct \$2.25 from the earnings of the lowest investor to the BLUE investment.
7. If there is a tie for the lowest investor, all those who tied will have the \$2.25 deduction taken from their payoff.
8. If all 4 members of your group tie for the lowest investor, then everyone have \$2.25 taken from your payoffs.

Thus, when your group invests 19 or less tokens in the BLUE investment the only way you can avoid having a deduction is to avoid being the lowest investor to the BLUE investment.

The only way everyone in the group can avoid a deduction is if your group invests a total of 20 or more tokens in the BLUE investment.

We illustrate this with some examples.

Example: Suppose that you invest 8 tokens in the **RED** investment and 0 tokens in the **BLUE** investment and that the 3 other members in your group invest a total of 16 tokens in the **BLUE** investment (2, 6, and 8 respectively). So total investment in **BLUE** is $0+2+6+8=16$, which is below the threshold of 20. Then your earnings from the **BLUE** investment would be **\$0.00**. Everyone else in your group would also earn **\$0.00** from the **BLUE** investment. Since you were the lowest investor to the **BLUE** investment, you will have a deduction of \$2.25. So the other three group members will earn \$16.00, because the threshold was not met, but because of the payoff deduction, you will earn $\$16.00-\$2.25=\$13.75$.

Example: Suppose that you invest 6 tokens in the **RED** investment and 2 tokens in the **BLUE** investment but that the 3 other members in your group invest a total of 9 tokens in the **BLUE** investment (say 2, 3, and 4 respectively). So total investment in **BLUE** is $2+2+3+4=11$, which is below the threshold of 20. Then your earnings from the **BLUE** investment would be **\$0.00**. Everyone else in your group would also earn **\$0.00** from the **BLUE** investment. Since you are one of the two people who tied for being the lowest investor in **BLUE**, you both will receive a payoff deduction, earning \$13.75 each, while the two group members investing more than 2 will both earn \$16.00.

Example: Suppose that you decided to invest 4 tokens in the **RED** investment and 4 tokens in the **BLUE** investment and that the 3 other members in your group invest a total of 12 tokens in the **BLUE** investment (4, 4, and 4 respectively). So total investment in **BLUE** is $4+4+4+4=16$, which is below the threshold of 20. Then your earnings from the **BLUE** investment would be **\$0.00**. Everyone else in your group would also earn **\$0.00** from the **BLUE** investment. Since all 4 group members tied for the lowest investor, each will face a \$2.25 deduction and each will earn \$13.75 rather than \$16.00.

IF YOUR GROUP DOES MEETS THE THRESHOLD OF 20 IN **BLUE**

Even if your group meets the threshold of 20 in the **BLUE** investment, some group members may receive a deduction *if* (a) the person was the lowest investor in **BLUE**, **and** (b) the person invested less than 5 in **BLUE**. In this case the deduction depends on the amount invested in **BLUE** by the second lowest investor in **BLUE**. In particular, if the lowest investment in **BLUE** was x while the second lowest was y , then the lowest investor will face a deduction of $(y-x)\times\$2.00 + \2.25 . If several people are tied for the lowest investor, and all invested less than 5 in **BLUE**, then all of them will face a payoff deduction.

Notice: The only way for everyone in the group to avoid deductions is if every group member invests 5 or more in the **BLUE** investment. For example, if each person in your group invested 5 tokens in the **BLUE** investment, then no one would receive a deduction.

The process is best explained by a number of examples.

Example: Suppose that you invest 8 tokens in the **RED** investment and 0 tokens in the **BLUE** investment and that the 3 other members in your group invest a total of 20 tokens in the **BLUE** investment (say, 4, 8, and 8 respectively). So total investment in **BLUE** is $0+4+8+8=20$, which exactly meets the threshold of 20. Then your earnings from the **BLUE** investment would be **\$20.00**. Everyone else in your group would also earn **\$20.00** from the **BLUE** investment. Additionally you would earn **\$16.00** from the 8 tokens you put in the **RED** investment (which is 8 tokens multiplied by **\$2.00**). However, since you invested the lowest amount in **BLUE**, and that amount was less than 5, then you will have a payoff deduction. Because you invested 0 and the second lowest investment was 4, your deduction will be $(4-0)\times\$2.00+\$2.25=\$10.25$. So your final earnings will be \$25.75 (which is **\$20.00** from the **BLUE** plus **\$16.00** from the **RED** minus the \$10.25 deduction).

Example: Suppose that you invest 6 tokens in the **RED** investment and 2 tokens in the **BLUE** investment and that the 3 other members in your group invest a total of 19 tokens in the **BLUE** investment (say, 3, 8, and 8 respectively). So total investment in **BLUE** is $2+3+8+8=21$, which exceeds the threshold of 20. Then your earnings from the **BLUE** investment would be **\$20.00**. Everyone else in your group would also earn **\$20.00** from the **BLUE** investment. Additionally you would earn **\$12.00** from the 6 tokens you put in the **RED** investment (which is 6 tokens multiplied by **\$2.00**). However, since you invested the lowest amount in **BLUE**, and that amount was less than 5, then you will have a payoff deduction. Because you invested 2 and the second lowest investment was 3, your deduction will be $(3-2)\times\$2.00+\$2.25=\$4.25$. So your final earnings will be \$27.75 (which is **\$20.00** from the **BLUE** plus **\$12.00** from the **RED** minus the \$4.25 deduction).

Example: Suppose that you invest 3 tokens in the **RED** investment and 5 tokens in the **BLUE** investment and that the 3 other members in your group invest a total of 15 tokens in the **BLUE** investment (5, 5, and 5 respectively). So total investment in **BLUE** is $5+5+5+5=20$, which exactly meets the threshold of 20. Then your earnings from the **BLUE** investment would be **\$20.00** (because your group invested 20 or more tokens in the **BLUE** investment). Everyone else in your group would also earn **\$20.00** from the **BLUE** investment. Additionally you would earn **\$6.00** from the 3 tokens you put in the **RED** investment (which is 3 tokens multiplied by **\$2.00**). Since everyone in the group invested 5 or more in **BLUE**, then there will be no deductions for anyone. So your final earnings will be \$26.00 (which is **\$20.00** from the **BLUE** plus **\$6.00** from the **RED**).

SUMMARY

As you can see, every token invested in the **BLUE** investment goes toward the threshold of 20 tokens. If your group invests 20 or more tokens together to the **BLUE** investment you will each earn **\$20.00**. *It does not matter who invests tokens in the **BLUE** investment. Everyone will get a return from the **BLUE** investment if there are 20 or more tokens in the **BLUE** investment—whether they invest tokens in the **BLUE** investment or not.*

Also if each person in your group invests 5 or more tokens in the **BLUE** investment there will be no deductions.

YOUR TASK

Your task is to decide how many of your tokens to invest in the **RED** investment and how many to invest in the **BLUE** investment. You are free to invest some of your tokens in the **RED** investment and some in the **BLUE** investment. Alternatively, you can invest all of them into the **RED** investment or all of them into the **BLUE** investment.

Earnings

Once you and the other 3 members of your group have made your decisions, you will receive an **Earnings Statement** for that period. You will be given anonymous details of all your group's investments and earnings.

If the group investments to the **BLUE** investment *meet or exceed* the threshold of 20 tokens, and each person in your group invests at least 5 tokens in the **BLUE** investment:

$$\text{Earnings} = (\$2.00) * (\text{Your investment to the } \text{RED} \text{ investment}) + \$20.00$$

If the group investments to the **BLUE** investment *meet or exceed* the threshold of 20 tokens, and at least one person in your group invests less than 5 tokens in the **BLUE** investment:

$$\text{Earnings} = (\$2.00) * (\text{Your investment to the } \text{RED} \text{ investment}) + \$20.00 - (\text{Payoff Deduction if you are the lowest investor to the } \text{BLUE} \text{ investment})$$

If the group investments to the **BLUE** investment *are less than* the threshold of 20 tokens:

$$\text{Earnings} = \$16.00 - (\text{Payoff Deduction if you are the lowest investor to the } \text{BLUE} \text{ investment})$$

You must make your investment decisions without knowing what the others in your group are deciding. Do not discuss your decision with any other participant.

Your Group

For each decision period you will be in a group of 4 people in the room today. **After each decision period we will randomly re-match you with a new group of 4 people in the room.** As a result, each decision you make will be with a new group of 4 participants. The probability that you will ever be in the same group of 4 participants again is extremely remote.

Things to remember

- You will be in a group of 4 people
- You will have 8 tokens to invest each period
- Each token you invest in the **RED** investment earns you **\$2.00**
- If your group investment in the **BLUE** investment meets or exceeds 20 tokens, and everyone in your group invests at least 5 tokens to the **BLUE** investment, then you and everyone in your group will earn **\$20.00** from then **BLUE** investment. *And there will be no deductions*
- If your group investment in the **BLUE** investment meets or exceeds 20 tokens, and someone in your group invests less than 5 tokens to the **BLUE** investment, then you and everyone in your group will earn **\$20.00** from the **BLUE** investment. *And the lowest investor to the **BLUE** investment will have a payoff deduction.*
 - The deduction will be the difference between the investment of the lowest investor and the investment of the second lowest investor to the **BLUE** investment multiplied by \$2 plus an additional \$2.25.
- If your group investments in the **BLUE** investment are below 20 tokens, then you and everyone in your group will initially earn \$16.00, which is what you would have earned if you had invested all your tokens in the **RED** investment. *And the lowest investor(s) to the **BLUE** investment will have a payoff deduction.*
 - The deduction will be \$2.25.
 - If there is a tie for the lowest investor, all those who tied will have the deduction taken from their payoff.
 - If all 4 members of your group tie for the lowest investor, then all of you will have \$2.25 taken from your payoffs.
- There will be a total of 10 decision periods.
- The groups will be randomly re-matched every decision period.
- Please feel free to use the calculator, and scratch paper provided to help you with your calculations.

If you have any questions about the instructions please raise your hand and someone will come and speak with you privately about your question.

Thank you.
Please wait to be told when you can begin making decisions
for the next 10 periods.

Screenshots

TPG (1)

Period 1 out of 1

You have 8 tokens for this stage of the study.

Tokens in the **RED** investment earn \$2.00 for you, and \$0.00 for all your other group members.

If your group invests 20 or more tokens in the **BLUE** investment **you and all your group members** will earn \$20.00 from the **BLUE** investment .

Use the box to indicate how many of your tokens will be invested in the **RED** investment.

Use the box to indicate how many of your tokens will be invested in the **BLUE** investment.

TPG (2)

Period

1 out of 1

Player	RED investment:	BLUE investment:	Earnings
Player 1	2	6	24.00
Player 2	0	8	20.00
Player 3	4	4	28.00
You	3	5	26.00
Total		23	

OK

TPG (3)

Period 1 out of 1

RESULTS:

RED investment: 3

BLUE investment: 5

Total Tokens in BLUE investment: 23

Your Earnings This Period: 26.00

Period	RED Investment	BLUE Investment	Total Tokens In BLUE Investment	Earnings
1	3	5	23	26.00

OK

GunEff (1)

Period

1 out of 1

You have 8 tokens for this stage of the study.

Recall, if your group invests 20 or more tokens in the BLUE investment there will be no deductions.
If there is a deduction it will be taken from the lowest investor to the BLUE investment in your group

Tokens in the RED investment earn \$2.00 for you, and \$0.00 for all your other group members.

If your group invests 20 or more tokens in the BLUE investment **you and all your group members** will earn \$20.00 from the BLUE investment.

Use the box to indicate how many of your tokens will be invested in the RED investment.

Use the box to indicate how many of your tokens will be invested in the BLUE investment.

OK

GunEff (2)

Period

1 out of 1

Player	RED investment:	BLUE investment:	Initial Earnings	Deduction	Initial Earnings - Deduction
You	4	4	16.00	2.25	13.75
Player 2	3	5	16.00	0.00	16.00
Player 3	3	5	16.00	0.00	16.00
Player 4	3	5	16.00	0.00	16.00
Total		19			

OK

GunEff (3)

Period 1 out of 1

You were the lowest BLUE investor this period, and so a deduction of \$2.25 has been taken from your Stage 2 earnings.

RESULTS:

RED investment:	4
BLUE investment:	4
Total Tokens in BLUE investment:	19
Initial Earnings:	16.00
Deduction:	2.25
Net Earnings:	13.75
Your Earnings This Period:	13.75

Period	RED Investment	BLUE Investment	Total Tokens In BLUE Investment	Initial Earnings	Amount of Deduction	Net Earnings	Your Earnings This Period
1	4	4	19	16.00	2.25	13.75	13.75

OK

GunSelect (1)

Period

1 out of 1

You have 8 tokens for this stage of the study.

Recall, if everyone in your group invests 5 or more tokens in the BLUE investment there will be no deductions.
If there is a deduction it will be taken from the lowest investor to the BLUE investment in your group

Tokens in the RED investment earn \$2.00 for you, and \$0.00 for all your other group members.

If your group invests 20 or more tokens in the BLUE investment **you and all your group members** will earn \$20.00 from the BLUE investment.

Use the box to indicate how many of your tokens will be invested in the RED investment.

Use the box to indicate how many of your tokens will be invested in the BLUE investment.

GunSelect (2)

Period: 1 out of 1

Player	RED investment:	BLUE investment:	Initial Earnings	Deduction	Initial Earnings - Deduction
Player 1	0	8	20.00	0.00	20.00
You	4	4	28.00	10.25	17.75
Player 3	0	8	20.00	0.00	20.00
Player 4	0	8	20.00	0.00	20.00
Total		28			

OK

GunSelect (3)

Period 1 out of 1

You were the lowest BLUE investor this period, and so a deduction of \$10.25 has been taken from your Stage 2 earnings.

RESULTS:

RED investment:	4
BLUE investment:	4
Total Tokens in BLUE investment:	28
Initial Earnings:	28.00
Deduction:	10.25
Net Earnings:	17.75
Your Earnings This Period:	17.75

Period	RED Investment	BLUE Investment	Total Tokens In BLUE Investment	Initial Earnings	Amount of Deduction	Net Earnings	Your Earnings This Period
1	4	4	28	28.00	10.25	17.75	17.75

OK