A Online Appendix for "Enforcement and Compliance in an Uncertain World"

Table A.1: Comparison of Group-Level Punishment and Contribution Rates in False Positives and False Negatives Treatments

Punishment Rate Given Accusatory Signal	Punishment Rate Given Exculpatory Signal	Difference in Punishment Rates	Contribution Rate
False Positives Treatment			
0.880	0.033	0.847	0.538
0.785	0.000	0.785	0.425
0.627	0.000	0.627	0.675
0.595	0.000	0.595	0.838
0.507	0.000	0.507	0.175
0.484	0.063	0.421	0.463
0.493	0.077	0.416	0.238
0.424	0.071	0.353	0.338
0.302	0.000	0.302	0.713
0.258	0.000	0.258	0.350
0.317	0.118	0.199	0.338
False Negatives Treatment			
1.000	0.000	1.000	0.763
1.000	0.000	1.000	0.613
1.000	0.016	0.984	0.650
1.000	0.043	0.957	0.775
1.000	0.063	0.937	0.700
1.000	0.067	0.933	0.625
0.950	0.017	0.933	0.563
1.000	0.092	0.908	0.900
0.714	0.000	0.714	0.863
0.606	0.000	0.606	0.400
0.548	0.429	0.119	0.413
Accurate Signals Treatment			
0.89	0.00	0.89	0.89
1.00	0.00	1.00	0.89
0.73	0.01	0.71	0.86
0.88	0.00	0.88	0.90
–	0.00	–	1.00
1.00	0.00	1.00	0.88
–	0.00	–	1.00
0.76	0.00	0.76	0.79
Technology Choice False Positives Condition			
1.000	0.000	1.000	0.825
0.939	0.000	0.939	0.738
0.730	0.000	0.730	0.775
0.652	0.000	0.652	0.238
0.635	0.000	0.635	0.363
0.619	0.059	0.560	0.400
0.419	0.000	0.419	0.688
0.435	0.091	0.344	0.275
0.526	0.250	0.276	0.138
0.538	0.500	0.038	0.025
Technology Choice Accurate Signals Condition			
1.00	0.00	1.00	0.99
1.00	0.00	1.00	0.93
1.00	0.00	1.00	0.75
0.93	0.03	0.90	0.81
1.00	0.00	1.00	0.89
1.00	0.14	0.86	0.95

Notes: Each entry is a single group observed over twenty periods. Sorted within treatment by difference in punishment rates.

Table A.2: Predicting the decision to contribute with historical average contributions

	(1)	(2)	(3)
	False Positives	False Negatives	Tech. Choice False Positives
Wrongly punished$_{i,t-1}$	-0.625	-0.694	-0.754
	[0.271]*	[0.412]	[0.291]**
Wrongly unpunished$_{i,t-1}$	-0.548	-0.933	-1.047
	[0.231]*	[0.269]**	[0.308]**
Contribute$_{i,t-1}$	0.814	0.667	1.182
	[0.221]**	[0.230]**	[0.248]**
Average total contributions	0.616	0.558	0.911
in group$_{i,t-1}$	[0.144]**	[0.163]**	[0.175]**
One other contributor$_{i,t-1}$	0.514	-0.148	0.702
	[0.256]*	[0.359]	[0.307]*
Two other contributors$_{i,t-1}$	0.574	0.031	0.442
	[0.289]*	[0.353]	[0.385]
Three other contributors$_{i,t-1}$	0.815	0.214	0.7
	[0.391]*	[0.382]	[0.465]
Observations	836	836	760

Standard errors in brackets. * indicates significant at 5%; ** significant at 1%. Two-tailed tests. Coefficients for constant and period indicators suppressed in all columns to save space.

Instructions

This is an experiment on decision making. In the following experiment you will make a series of choices. At the end of the experiment, you will be paid depending on the specific choices that you made during the experiment and the choices made by other people. If you follow the instructions and make appropriate decisions, you may make an appreciable amount of money. Please listen carefully to the instructions.

During the course of the experiment, you will have the opportunity to earn "tokens" that will be converted into dollars at the end of the experiment. The conversion rate is:

30 tokens = 1 dollar

You will be assigned, at random, into a group of five people. Within that group, you will also be randomly assigned to one of two roles in the experiment: Role A, or Role B. Within a given group, one person is randomly assigned to Role A; the other four people are assigned to Role B. The assignments will remain fixed for the duration of the experiment: that is, you will interact with the same group of other people, and remain in the same role, for the duration of the experiment. In addition, every person assigned to Role B will also receive an ID number: 1, 2, 3, or 4. This ID number, unlike groups and roles, will be randomly re-assigned from one period to the next. All of your interactions will be through the computer terminals at which you are sitting, and your true identity will never be revealed to any other person in the laboratory.

The experiment consists of **20** *periods*, all of which have the same structure. In each period, there are two separate *stages*. In the first stage of each period, each person in Role B will be given a supply of tokens, and must choose whether to allocate these tokens to a common pot or to keep these tokens for him- or herself. In the second stage of each period, the person in Role A will receive some information, which may or may not be accurate, about the individual choices made in the first stage by each of the people in Role B (listed by their ID number for the period). The person in Role A will then have an opportunity to decide whether, and by how much, to reduce the payoffs of each of the people in Role B (again, listed by their ID number for the period).

This same process will be repeated in all **20** periods. A more complete description of this process now follows.

First Stage

At the beginning of each period, each person in Role B receives **20** tokens. Each person in Role B must then decide whether to allocate these **20** tokens to a common pot, or to keep them for him- or herself. Each person in Role B must choose either to allocate *all* **20** of the tokens or keep *all* **20** of the tokens.

The payoff to a person in Role B in the first stage is composed of two parts:

- The number of tokens that person keeps for him- or herself,
  PLUS
- 0.4 times the number of tokens that *all* people in Role B allocate to the common pot (including tokens that person allocates him- or herself).

That is, the payoff to a person in Role B in the first stage can be written as

first-stage payoff to person in Role B = (tokens kept) + 0.4 × (total tokens allocated to common pot by people in Role B).

Although the person in Role A does not make a choice in the first stage, he or she also receives first-stage payoffs that depend on the choices made by people in Role B. These payoffs are composed of two parts:

- An automatic supply of **10** tokens
  PLUS
- 0.4 times the number of tokens that *all* people in Role B allocate to the common pot.

first stage payoff to person in Role A = **10** + 0.4 *× (total tokens allocated to common pot by people in Role B).*

Therefore, every token kept by a given person in Role B increases that person's first-stage payoffs by one token (and does not contribute to the payoffs of other group members). Every token allocated to the common pot increases the first-stage payoffs of *every* person in Role B by 0.4 tokens, and also increases the first-stage payoffs of the person in Role A by 0.4 tokens.

Consider the following examples:

(1) Suppose that every person in Role B keeps all of his or her 20 tokens for him- or herself. Then the first-stage payoffs of each person in Role B will be equal to 20 + (0.4 × 0) = 20 tokens. The first-stage payoffs of the person in Role A will be equal to 10 + (0.4 × 0) = 10 tokens.

(2) Suppose that every person in Role B allocates all of his or her 20 tokens to the common pot. Then the first-stage payoffs of each person in Role B will be equal to 0 + (0.4 × 80) = 32 tokens. The first stage payoffs of the person in Role A will be equal to 10 + (0.4 × 80) = 10 + 32 = 42 tokens.

(3) Suppose that two people in Role B each allocate 20 tokens to the common pot, and two people in Role B each keep 20 tokens for themselves. In total, 40 tokens are allocated to the common pot by the people in Role B as a whole. Then each person in Role B receives 0.4 × 40 = 16 tokens from the common pot. The two people in Role B who each allocated 20 tokens to the common pot (keeping none for themselves) would therefore have first-stage payoffs equal to 0 + (0.4 × 40) = 16 tokens. The two people in Role B who each allocated no tokens to the common pot (keeping 20 for themselves) would therefore have first stage payoffs

equal to $20 + (0.4 \times 40) = 36$ tokens. The person in Role A would receive first stage payoffs equal to $10 + (0.4 \times 40) = 26$ tokens because a total of 40 tokens were placed in the common pot.

Second Stage

At the beginning of the second stage, everyone receives some information about what happened in the first stage.

- A person in Role B is told:
  - How many tokens in total were allocated to the common pot by all the people in Role B
  - His or her total first-stage payoffs
- The person in Role A receives some information, which may or may not be accurate, about the decision of each person in Role B, listed by his or her ID number for the period (1, 2, 3, or 4). Specifically:
  - The person in Role A receives a message that a given person in Role B "allocated" his or her tokens to the common pot or "kept" his or her tokens.
  - If a given person in Role B (say, the person with ID number 2 for the period) in fact *allocated* his or her tokens, there is a **60%** likelihood that the person in Role A will receive a message that this person "allocated" his or her tokens, but a **40%** likelihood that the person in Role A will receive a message that this person "kept" his or her tokens.
  - If a given person in Role B (say, the person with ID number 2 for the period) in fact *kept* his or her tokens, there is a **100%** likelihood that the person in Role A will receive a message that this person "kept" his or her tokens.
  - Therefore, a person in Role A could receive a message that a given person in Role B "allocated" his or her tokens *only* if that person in fact allocated his or her tokens to the common pot. However, a person in Role A could receive a message that a given person in Role B "kept" his or her tokens *either* if that person in fact (1) kept or (2) allocated his or her tokens.

Once this information has been received, the person in Role A must decide whether he or she wishes to reduce the first-period payoff to each of the people in Role B, as identified by each person's ID number for the period. The person in Role A may choose either to leave the payoffs of any specific person in Role B untouched, or to reduce that person's payoffs by **20** tokens. These are the only two possibilities; the person in Role A does not have the ability to reduce the payoffs of any person in Role B by any other amount. Note that the person in Role A does not get to keep any tokens he or she deducts from the payoffs of the person in Role B.

After the person in Role A has made his or her decisions, each person in Role B will learn whether or not the person in Role A reduced his or her payoffs.

Summary of Net Payoffs for a Period

For a person in Role B, the following is calculated:

- First-stage payoffs (from common pot and from tokens kept)….
- ….MINUS the number of tokens, if any, reduced by the person in Role A in the second stage.

The result is the net payoffs for the period for a person in Role B.

For the person in Role A, the following is calculated:

- First-stage payoffs (from common pot and from automatic token supply)

The result is the net payoffs for the period for the person in Role A.

Regardless of your Role, you will see your net payoffs for the period on your screen once that period is complete.

Conclusion

This concludes the description of the choices that are made and the payoffs that are earned in one period. This process will be repeated until all of the **20** identical periods are completed. Remember that you will interact with the same group of other people, and remain in the same role, throughout this process. Also remember that the ID numbers of people in Role B are randomly reassigned from one period to the next.

We ask everyone to remain silent until the end of the last period and then to await further instructions. If you have any questions, please ask them at this time.