Appendix A - Not for Publication

Table A1 reports the results from a probit regression that explains the individual choice to cooperate (1) or not (0) using two groups of regressors. First, we introduce several dummy variables that control for fixed effect (cycles, periods within the cycle, individuals), as well as for the duration of the previous cycle. Second, we include a set of regressors used to trace the response of the representative subject in the periods *following* an observed defection. For simplicity, we limit our focus to the five periods following an observed defection. This specification is more general than tracing behavior in periods 1-5 only, and it allows us to shed light on the type of strategy employed by the representative subject. Of course, there are several ways to choose regressors in order to trace strategies. Our specification has the advantage to detect whether subjects followed theoretically well-known strategies, such as grim trigger or tit-for-tat (Robert Axelrod, 1984). Indeed, we include a "grim trigger" regressor, which has a value of 1 in *all* periods following an observed defection and 0 otherwise. We also include five "lag *n*" regressors, which have a value of 1 only in *one* period following an observed defection and 0 otherwise. For example, the "lag 1" regressor takes value 1 exclusively in the period after the defection (0 otherwise). The "lag 2" regressor takes value 1 exclusively in the second period following a defection (0 otherwise). And so on.

If the representative subject switched from a cooperative to a punishment mode after seeing a defection, then the estimated coefficient of at least one of the six strategy regressors should be negative. For example, if subjects punished for just two periods following a defection, then the sum of the estimated coefficients of the grim trigger regressor and the "lag *n*" regressors should be negative for the first and second period following a defection, and zero afterwards.

Figure 1 in the text illustrates the marginal effect on the frequency of cooperation in the periods that followed an observed defection.[1] The focus on the five-period lags is for convenience in showing relevant patterns. The representation for "any more than five" period lags is based on the marginal effect of the grim trigger regressor only. The representation for period lags 1 though 5 is based on the sum of the marginal effects of the grim trigger regressor and the "lag *n*" regressor with the appropriate lag. The L-shaped pattern of response to an observed defection suggests a persistent downward shift in cooperation levels immediately after a defection. The grim trigger coefficient estimate is significantly different than zero at a 1 percent level.[2] While there is evidence that the representative subject employed a reactive strategy, not all observed actions fit this type of strategy.

[1] Figure 1 is based on Table A1 using the coefficient estimates coding for reactive strategies. Zero-period lag is exogenously set at 0 percent. Marginal effects for the tit-for-tat regressors are computed for grim trigger regressor set at 1 (i.e. defection)

[2] Table A1 reports that the actual length of the previous cycle influenced the propensity of participants to cooperate in period 1—the longer the previous cycle, the higher the cooperation level in the first period of the current cycle.

Table A1: Probit regression on individual choice to cooperate – marginal effects(*)

Dependent variable: *1= cooperation, 0=defection*	All Periods	Period 1
reactive strategies:		
grim trigger	-0.448***	
	(0.051)	
lag 1	0.068***	
	(0.016)	
lag 2	0.039	
	(0.028)	
lag 3	0.042	
	(0.026)	
lag 4	0.020	
	(0.028)	
lag 5	-0.002	
	(0.032)	
cycle dummies:		
Cycle 2	0.104**	-0.073*
	(0.043)	(0.039)
Cycle 3	0.044**	-0.064**
	(0.018)	(0.032)
Cycle 4	0.108***	-0.101*
	(0.042)	(0.058)
Cycle 5	0.038	-0.080*
	(0.046)	(0.048)
duration of previous cycle	0.000	0.005**
	(0.001)	(0.002)
Observations	7440	500

(*) Marginal effects are computed at the mean value of regressors. Robust standard errors for the marginal effects are in parentheses computed with a cluster on each session; * significant at 10%; ** significant at 5%; *** significant at 1%. For a continuous variable the marginal effect measures the change in the likelihood to cooperate for an infinitesimal change of the independent variable. For a dummy variable the marginal effect measures the change in the likelihood to cooperate for a discrete change of the dummy variable. First periods of each cycle are excluded (except in the last column). Individual fixed effects are included in columns "NP" and "PP", and period fixed effects are included in all but the last column. These fixed effects are not reported in the table (individual dummies; period dummies: 3, 4, 5, 6-10, 11-20, 21-30, >30). Duration of previous cycle was set to 20 for cycle 1.

Appendix B: Instructions (not for publication)

Overview

This is an experiment in decision-making. Purdue University has provided funds for this research. The instructions are simple. If you follow them carefully and make good decisions, you can earn an appreciable amount of money. These earnings will be paid to you in cash at the end of the experiment.

We ask that you not talk with one another for the duration of the experiment. Please turn off your cell-phones. Do not use e-mail.

During the course of this experiment, you will be called upon to make decisions in several periods. The experiment is divided into **five** sequences of periods and each sequence is referred to as a **cycle**.

At the beginning of a cycle, each participant in this room will be randomly assigned to a **set**.

In each set there will be **four** persons**.**

For the whole duration of a cycle, you will interact exclusively with the three other participants in that set and nobody else.

You will never meet again these participants in the following cycles.

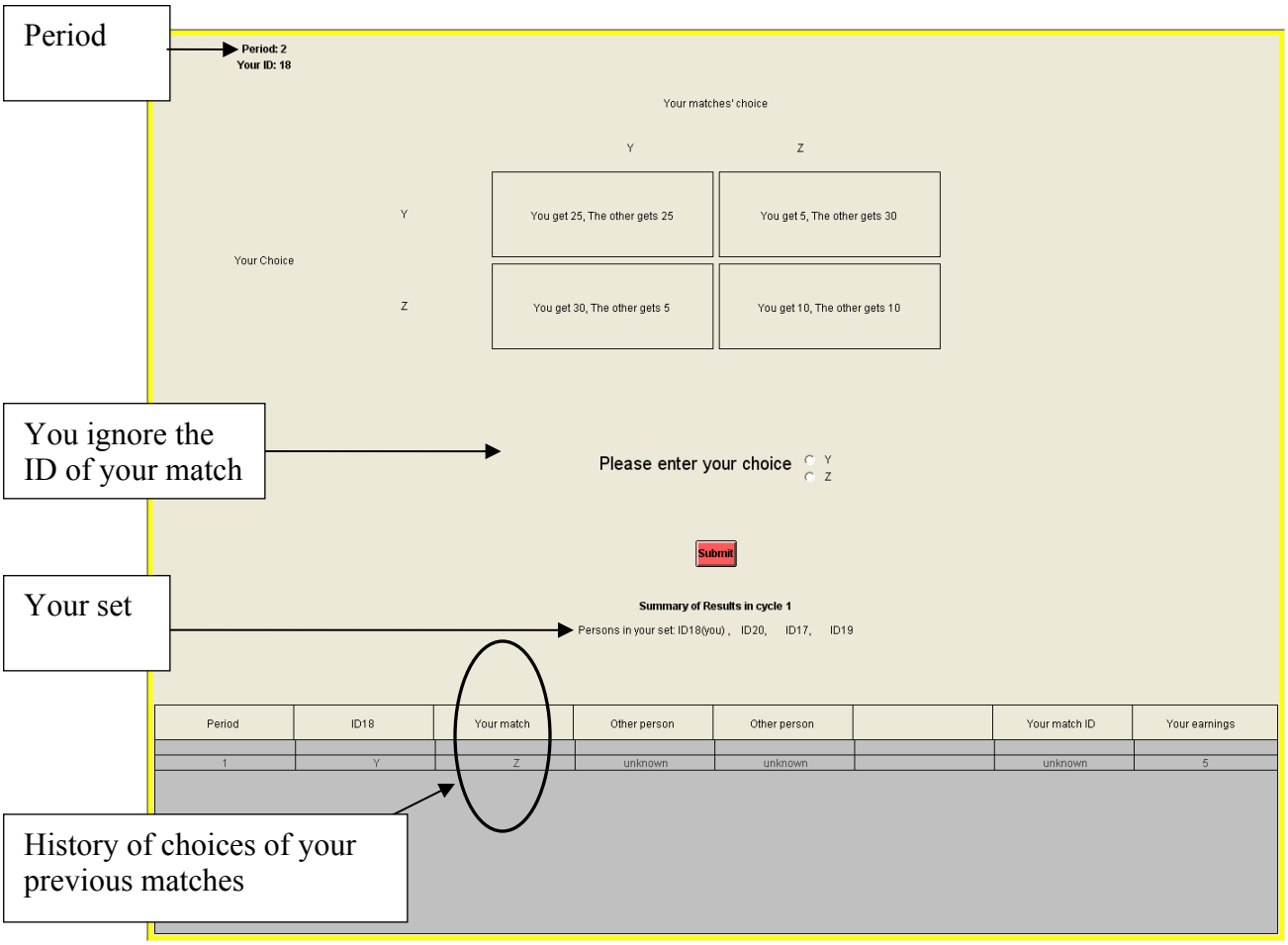
In each **period** of a cycle:

In each period you will be matched to one other participant selected at random from the set you are assigned to. We will refer to this person as "**your match**."

You will not be informed of the identity of your match. Hence, you do not know when you have already interacted with that person in previous periods of the same cycle.

You and your match will interact according to the rules described in the upper portion of your screen. The rules will be explained in a moment.

After each period you will be re-matched to a participant chosen at random from the set you are assigned to. There is one chance out of three that you will be matched with any given person in your set.



Interaction rules

In a period you and your match can make either of two choices, Y or Z. The points you earn in a period depend upon both the choice you make and the choice made by your match in that period. As the payoff table on your screen (above) indicates, there are four possible outcomes:

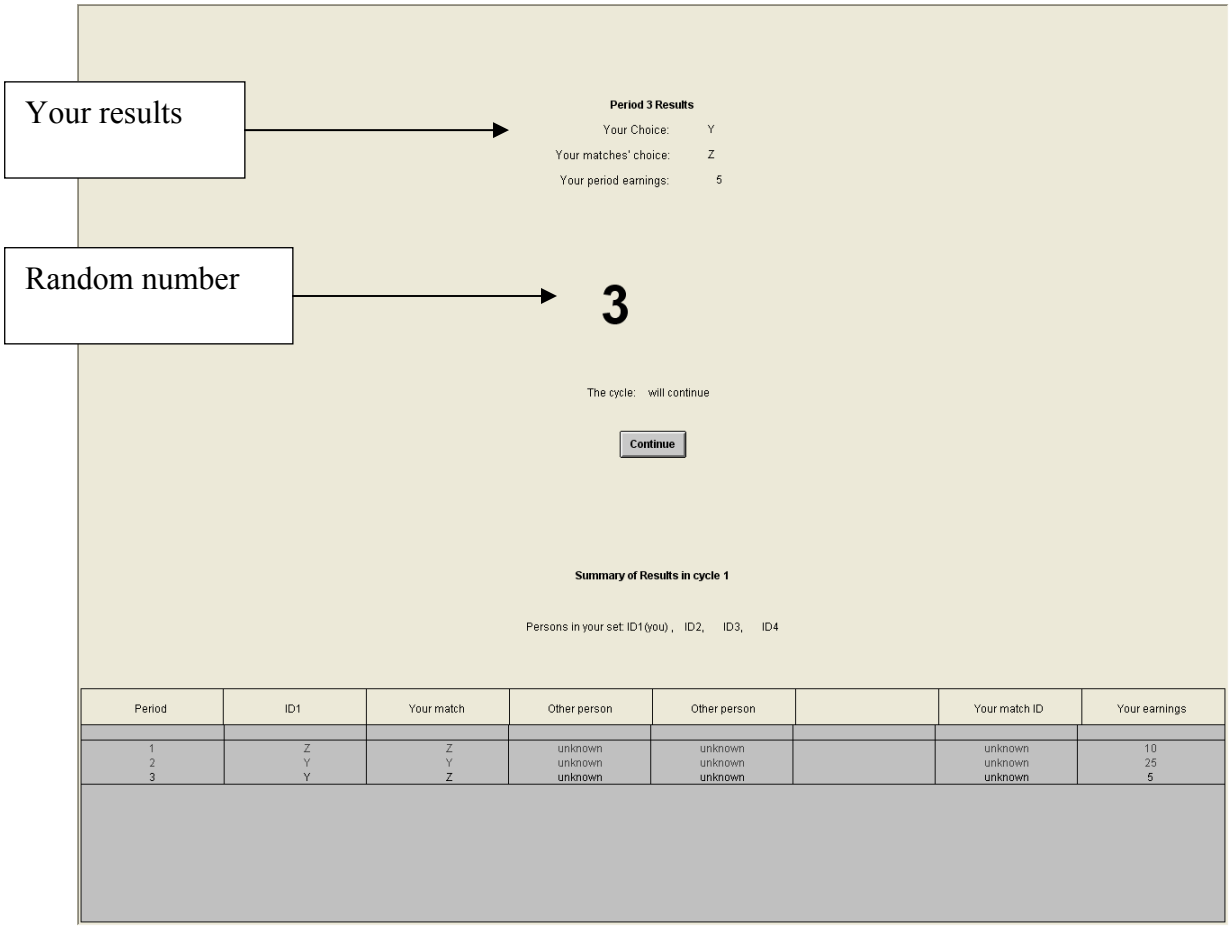
II. If both of you choose Y this period then: you both earn ***25*** points.

III. If you choose Y this period and your match chooses Z then: you earn ***5*** points and your match earns ***30*** points.

IV. If you choose Z this period and your match chooses Y then: you earn ***30*** points and your match earns ***5*** points.

V. If you both choose Z then: you both earn ***10*** points.

To make your choice in each period, click the button next to either Y or Z. You may change your mind at any time prior to clicking the "Submit" button by simply clicking on the button next to Y or Z. You are free to choose Y or Z in every period. When you are satisfied with your choice, click the "Submit" button. After all persons have made their choices, the results of the period will appear on your screen.



The result screen (above) will display the number of points you have earned for the period along with **your choice and the choice of your match.** The first column of the 'Summary of Results' table contains your past choices. The second column concerns the choices of your previous matches. Notice that **choices in the second column were most likely made by different persons in different periods. You are not given information on the choices made by the other two persons in your set**. Please record your results for the period on your RECORD SHEET under the appropriate headings.

At this stage a ball will be drawn from an urn containing one hundred balls numbered from 1 to 100. Each ball is equally likely to be selected. The computer program will randomly

draw a ball and show the number on the result screen (above). If this random number is less than or equal to 95, then the cycle will continue into the next period. If this number is greater than 95, then the cycle ends. Therefore, **after each period there is a 95% chance that there will be another period of interactions in the cycle and a 5% chance that the cycle will end**.

Suppose that a number less than or equal to 95 has been drawn. Then you press the "Continue" button to proceed. You will face the same decisional situation as in the previous period, but **with a person selected at random from the set of participants you were assigned to**. Remember that there are four participants in each set.

Before making your choice, you may review all the outcomes in previous periods of the cycle by scrolling down the "Summary of Results" table. The table shows your history and the past choices of the persons who happened to be your match in the period. You then choose either Y or Z. Your choice and the choice of your match this period are recorded and added to the Summary of Results table in the lower portion of your screen. You record the outcome and your point earnings for the period.

If the number drawn is greater than 95 then the cycle ends. When a cycle ends, you will be notified in a new screen. There will be a total of five cycles. The rules in the following cycles are the same as in the first, but you will interact with different persons. More precisely, after each cycle, new sets of persons will be formed. This assignment does not depend on actual choices. **A participant will never interact with a person for more than one cycle.**

Earnings

The points you earned in each period are added up. For every 10 points that you earn you will receive 13 cents ($.13). Therefore, the more points you earn the more money you earn. In addition, you will receive a $10 show-up fee. You will be paid your earnings in cash and in private at the end of today's session.

Final Comments

First, do not discuss your choices or your results with anyone at any time during the experiment.

Second, your ID# is private. Do not reveal it to anyone.

Third, since there is a 95% chance that at the end of a period the cycle will continue, you can expect, on average, to interact for 20 periods in a given cycle. However, since the stopping decision is made randomly, some cycles may be much longer than 20 periods and some others may be much shorter.

Fourth, remember that after each period you will be matched randomly to someone in the set you were assigned to. As there are four people in the set, the probability of you being matched with the same person in two consecutive periods of a cycle is 1/3. You are not told the identity of your match.

Fifth, the rules are the same in all five cycles. After a cycle, you will never meet again the same participants.

Questions?

Now is the time for questions. Does anyone have any questions before we begin?

Appendix C: Quiz and Questionnaire

QUIZ

1. The total number of **cycles** is _____

2. You are at the beginning of the cycle. How many **periods** do you expect the cycle will last, on average? _____

3. You are in period 15 of the cycle. How many additional **periods** do you expect, on average? _____

4. The number of **participants** in the experiment (total in the room) is_____

5. In a given **cycle** with how many participants could you interact with (i.e. number of people in a set)? _____

6. In a given **period** with how many participants do you interact with? _____

7. Other than your match, will you know at the end of the period the actions taken by people **in your set**? _____

8. Will you know at the end of the period the actions taken by participants **outside your set**? _____

9. Before choosing an action, will you know the **ID** of your match? _____

10. If ID 5 is in your set this cycle, is there any chance that ID 5 will be your match in future cycles? _____

11. How many points do you earn if both you and your match choose **Y**? _____

12. If the experiment lasts 100 periods and everybody always chooses **Y**, how many dollars are you going to earn? _____

13. How many points do you earn if you and your match choose **Z**? _____

14. If the experiment lasts 100 periods and everybody always chooses **Z**, how many dollars are you going to earn? _____

Date_____ Experimental Identification Number _____

QUESTIONNAIRE

This questionnaire is anonymous. The answers will help us in our research. Your name will not be associated with the answers you are about to give.

Sex □ M □ F

Age _____

Are you married? □ Yes □ No

Do you have children? □ Yes □ No

Highest degree attained
- □ Less than high school
- □ High school
- □ Some college
- □ B.A. or B.S.
- □ M.S., M.A., or M.B.A.
- □ Ph.D.

Place of birth State/Country _____

Where did you live while in high school? State/Country _____

Have you ever been in the military? □ Yes □ No

Do you personally own a house? □ Yes □ No

Working experience
- □ Blue collar, full time years _____
- □ White collar, full time years _____
- □ Independent activity, full time years _____
- □ Part time activity years _____

At work do you supervise other workers? □ Yes □ No

Do you have a credit card? □ Yes □ No

What is your family gross yearly income?
- □ I prefer not to answer
- □ Less than $10,000
- □ More than $10,000, less than $20,000
- □ More than $20,000, less than $30,000
- □ More than $30,000, less than $40,000
- □ More than $40,000, less than $50,000
- □ More than $50,000, less than $60,000
- □ More than $60,000, less than $80,000
- □ More than $80,000

Do you have health insurance? □ Yes □ No

Are you engaged in any volunteer activities?
- □ No
- □ Yes, with a political organization
- □ Yes, with a religious organization

□ Yes, with a social organization

Have you ever been involved in a legal dispute, directly or indirectly?

□ Yes □ No

Do you have "uninsured motorist" coverage with your car insurance?

□ I do not own a car
□ I do own a car but don't know what it is
□ Yes
□ No

What is your denomination?

□ I prefer not to answer
□ Evangelist
□ Methodist
□ Catholic
□ Presbiterian
□ Other Christians
□ Hinduist
□ Muslim
□ Buddhist
□ Jewish
□ Atheist
□ Agnostic

□ Other (specify if you wish) _____