A Expected punishment average marginal effects

Table A1: Estimated average marginal effects from Equation 4.

	Extensive margin			Intensive margin		
	(1) Equal	(2) Unequal	(3) High	(4) Equal	(5) Unequal	(6) High
Target Extraction	0.012***	0.008**	-0.003	0.013***	0.029	0.039
	(0.00)	(0.00)	(0.00)	(0.00)	(0.02)	(0.06)
Own Extraction	0.002	-0.000	-0.002	0.011*	0.013	0.068
	(0.00)	(0.00)	(0.01)	(0.01)	(0.06)	(0.16)
Average Extraction	0.001	-0.001	0.008	-0.045***	0.017	-0.014
	(0.00)	(0.00)	(0.01)	(0.02)	(0.04)	(0.22)
Lagged Sanctions Received	0.000	0.000	-0.000	0.001	0.002	0.014
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.02)
Period	-0.028***	-0.010**	0.003	-0.076***	0.004	0.051
	(0.01)	(0.00)	(0.01)	(0.02)	(0.08)	(0.13)
N	1344	1302	42	526	243	28

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

B Experiment instructions

Attached are the instructions for *Unequal* × *Punishment*. The instructions are the same in

the *Equal* treatment, except all subjects receive the same endowment.

Welcome to the experiment.

Please note that communication between participants is not permitted. If you have a question please raise your hand. This information packet will explain the decision you will make and how your decision affects your individual earnings. The experiment consists of 2 practice questions, 1 practice round and 15 paid rounds. You will be randomly grouped together with 3 other people into groups of 4. Your group will remain the same throughout the experiment. At no point during this experiment will the other members of your group be known to you. All decisions you make will remain anonymous to other participants and to the experiment moderator. You will be compensated, privately and in cash, at the end of the experiment.

You will find your unique identification number on an index card with this packet. Keep your ID confidential, it is used to facilitate all transactions and to maintain your anonymity. This ID will not be shared with any other member of your group.

Please enter this ID into the webpage which is loaded onto the computer and press *Submit*. Your screen should now confirm the ID you entered. If correct press *Continue*. Otherwise raise your hand. You should now see a screen which requires a password in order to continue. The moderator will announce this password once everyone has read these instructions and has successfully answered all practice questions.

When you are ready begin reading through the instructions. If at any time you have a question please raise your hand. You will find 2 examples and 2 practice questions toward the end of the packet. When these have been answered and everyone is comfortable with the instructions we will begin.

Thank You.

Instructions

Decision:

At the beginning of each round you will each receive an endowment of Experimental Dollars (EDs). Your group will consist of **two high endowment** members who will receive **60 ED** each round and **two low endowment** members who will receive **40 ED** each round. This initial allocation of EDs is random and will remain the same throughout the experiment. The decision you are asked to make consists of allocating your EDs between two accounts. Specifically, on each round you will be asked how many of your EDs you would like to invest in Account 1.

Account 1:

You can choose to invest any whole number of your EDs (less than or equal to your endowment) into Account 1. The payoffs you earn from Account 1 depend **not only** on the amount you invest but also on the investment decisions of the other 3 members of your group. The formula for Account 1 payoffs accompanies Table 1 below.

Account 2:

After choosing how many of your EDs to invest in Account 1 your remaining EDs will automatically be invested in Account 2. The payoffs you receive from Account 2 depend **only** on your investment. Each ED you invest in Account 2 gives you a payoff of 1 ED. For example, if a high endowment member invested 20 ED into Account 1 they would earn 40 ED from Account 2 (i.e. their initial endowment of 60 ED minus their Account 1 investment of 20 ED). If a low endowment member invested 20 ED into Account 1 they would earn 20 ED from Account 2 (i.e. 40 ED – 20 ED).

Total Individual Payoff:

Your total earnings *per round* are the sum of your payoffs in Account 1 and your payoffs in Account 2. You can accumulate additional earnings each round. At the conclusion of the experiment your accumulated ED will be converted into cash such that 100 ED is worth $1.00.

Table 1 describes your **total individual payoffs** where the row labeled **X** shows the different investment levels in Account 1 that **you** can choose (in steps of 5 for presentation). The column labeled **Y** shows the different **sums of investment** in Account 1 that the **other 3** members of your group may choose (in steps of 5 for presentation). Tables 1A and 1B show the total payoffs you earn if you choose to invest X and the sum of the investment of the others is Y depending on whether your initial endowment is 60 ED or 40 ED.

In other words, the entry corresponding to column **Y** and row **X** indicates your payoffs in case your investment into Account 1 is X and the sum of the investment of the others is Y.

Total Individual Payoff High Endowment (60 ED)

Notice that for **many** levels of group investment (**Y**) an increase in your individual investment (**X**) increases your individual payoff. To demonstrate, choose a couple values for **Y** and consider your payoffs as **X** increases. However, for **any** level of individual investment (**X > 0**) an increase in group investment (**Y**) decreases your individual payoff. To demonstrate, choose a couple values for **X** and consider your payoffs as **Y** increases. Spend a minute or two looking at Table 1A and ask any questions you have. **Bolded** values are referenced in the example problems.

Table 1A: High Endowment (60 ED)

	X												
Y	**0**	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60**
0	60.0	84.4	107.5	129.4	150.0	169.4	187.5	204.4	220.0	234.4	247.5	259.4	270.0
5	60.0	83.8	106.3	127.5	147.5	166.3	183.8	200.0	215.0	228.8	241.3	252.5	262.5
10	60.0	83.1	105.0	125.6	145.0	163.1	180.0	195.6	210.0	223.1	235.0	245.6	255.0
15	60.0	82.5	103.8	123.8	142.5	160.0	176.3	191.3	205.0	217.5	228.8	238.8	247.5
20	60.0	81.9	102.5	121.9	140.0	156.9	172.5	186.9	200.0	211.9	222.5	231.9	240.0
25	60.0	81.3	101.3	120.0	137.5	153.8	168.8	182.5	195.0	206.3	216.3	225.0	232.5
30	60.0	80.6	100.0	118.1	135.0	150.6	165.0	178.1	190.0	200.6	210.0	218.1	225.0
35	60.0	80.0	98.8	116.3	132.5	147.5	161.3	173.8	185.0	195.0	203.8	211.3	217.5
40	60.0	79.4	97.5	114.4	130.0	144.4	157.5	169.4	180.0	189.4	197.5	204.4	210.0
45	60.0	78.8	96.3	112.5	127.5	141.3	153.8	165.0	175.0	183.8	191.3	197.5	202.5
50	60.0	78.1	95.0	110.6	125.0	138.1	150.0	160.6	170.0	178.1	185.0	190.6	195.0
55	60.0	77.5	93.8	108.8	122.5	135.0	146.3	156.3	165.0	172.5	178.8	183.8	187.5
60	60.0	76.9	92.5	106.9	120.0	131.9	142.5	151.9	160.0	166.9	172.5	176.9	180.0
65	60.0	76.3	91.3	105.0	117.5	128.8	138.8	147.5	155.0	161.3	166.3	170.0	172.5
70	60.0	75.6	90.0	103.1	115.0	125.6	135.0	143.1	150.0	155.6	160.0	163.1	165.0
75	60.0	75.0	88.8	101.3	112.5	**122.5**	131.3	138.8	145.0	150.0	153.8	156.3	157.5
80	60.0	74.4	87.5	99.4	110.0	119.4	127.5	134.4	140.0	144.4	147.5	149.4	150.0
85	60.0	73.8	86.3	97.5	107.5	116.3	123.8	130.0	135.0	138.8	141.3	142.5	142.5
90	60.0	73.1	85.0	95.6	105.0	113.1	120.0	125.6	130.0	133.1	135.0	135.6	135.0
95	60.0	72.5	83.8	93.8	102.5	**110.0**	116.3	121.3	125.0	127.5	128.8	128.8	127.5
100	60.0	71.9	82.5	91.9	100.0	106.9	112.5	116.9	120.0	121.9	122.5	121.9	120.0
105	60.0	71.3	81.3	90.0	97.5	103.8	108.8	112.5	115.0	116.3	116.3	115.0	112.5
110	60.0	70.6	80.0	88.1	95.0	100.6	105.0	108.1	110.0	110.6	110.0	108.1	105.0
115	60.0	70.0	78.8	86.3	92.5	97.5	101.3	103.8	105.0	105.0	103.8	101.3	97.5
120	60.0	69.4	77.5	84.4	90.0	94.4	97.5	99.4	100.0	99.4	97.5	94.4	90.0
125	60.0	68.8	76.3	82.5	87.5	91.3	93.8	95.0	95.0	93.8	91.3	87.5	82.5
130	60.0	68.1	75.0	80.6	85.0	88.1	90.0	90.6	90.0	88.1	85.0	80.6	75.0
135	60.0	67.5	73.8	78.8	82.5	85.0	86.3	86.3	85.0	82.5	78.8	73.8	67.5
140	60.0	66.9	72.5	76.9	80.0	81.9	82.5	81.9	80.0	76.9	72.5	66.9	60.0

Total Individual Payoff: $\frac{X}{X+Y}\left[6*(X+Y) - .025*(X+Y)^2\right] + (60 - X)$

                           (Account 1 Payoff)   + (Account 2 Payoff)

Total Individual Payoff Low Endowment (40 ED)

Notice that for **many** levels of group investment (**Y**) an increase in your individual investment (**X**) increases your individual payoff. To demonstrate, choose a couple values for **Y** and consider your payoffs as **X** increases. However, for **any** level of individual investment (**X > 0**) an increase in group investment (**Y**) decreases your individual payoff. To demonstrate, choose a couple values for **X** and consider your payoffs as **Y** increases. Spend a minute or two looking at Table 1B and ask any questions you have. **Bolded** values are referenced in the example problems.

Table 1B: Low Endowment (40 ED)

Y	X								
	0	5	10	15	20	25	30	35	40
0	40.0	64.4	87.5	109.4	130.0	149.4	167.5	184.4	200.0
5	40.0	63.8	86.3	107.5	127.5	146.3	163.8	180.0	195.0
10	40.0	63.1	85.0	105.6	125.0	143.1	160.0	175.6	190.0
15	40.0	62.5	83.8	103.8	122.5	140.0	156.3	171.3	185.0
20	40.0	61.9	82.5	101.9	120.0	136.9	152.5	166.9	180.0
25	40.0	61.3	81.3	100.0	117.5	133.8	148.8	162.5	175.0
30	40.0	60.6	80.0	98.1	115.0	130.6	145.0	158.1	170.0
35	40.0	60.0	78.8	96.3	112.5	127.5	141.3	153.8	165.0
40	40.0	59.4	77.5	94.4	110.0	124.4	137.5	149.4	160.0
45	40.0	58.8	76.3	92.5	107.5	121.3	133.8	145.0	155.0
50	40.0	58.1	75.0	90.6	105.0	118.1	130.0	140.6	150.0
55	40.0	57.5	73.8	88.8	102.5	115.0	126.3	136.3	145.0
60	40.0	56.9	72.5	86.9	100.0	111.9	122.5	131.9	140.0
65	40.0	56.3	71.3	85.0	97.5	108.8	118.8	127.5	135.0
70	40.0	55.6	70.0	83.1	95.0	105.6	115.0	123.1	130.0
75	40.0	55.0	68.8	81.3	92.5	**102.5**	111.3	118.8	125.0
80	40.0	54.4	67.5	79.4	90.0	99.4	107.5	114.4	120.0
85	40.0	53.8	66.3	77.5	87.5	96.3	103.8	**110.0**	115.0
90	40.0	53.1	65.0	75.6	85.0	93.1	100.0	105.6	110.0
95	40.0	52.5	63.8	73.8	82.5	90.0	96.3	101.3	105.0
100	40.0	51.9	62.5	71.9	80.0	86.9	92.5	96.9	100.0
105	40.0	51.3	61.3	70.0	77.5	83.8	88.8	92.5	95.0
110	40.0	50.6	60.0	68.1	75.0	80.6	85.0	88.1	90.0
115	40.0	50.0	58.8	66.3	72.5	77.5	81.3	83.8	85.0
120	40.0	49.4	57.5	64.4	70.0	74.4	77.5	79.4	80.0
125	40.0	48.8	56.3	62.5	67.5	71.3	73.8	75.0	75.0
130	40.0	48.1	55.0	60.6	65.0	68.1	70.0	70.6	70.0
135	40.0	47.5	53.8	58.8	62.5	65.0	66.3	66.3	65.0
140	40.0	46.9	52.5	56.9	60.0	61.9	62.5	61.9	60.0
145	40.0	46.3	51.3	55.0	57.5	58.8	58.8	57.5	55.0
150	40.0	45.6	50.0	53.1	55.0	55.6	55.0	53.1	50.0
155	40.0	45.0	48.8	51.3	52.5	52.5	51.3	48.8	45.0
160	40.0	44.4	47.5	49.4	50.0	49.4	47.5	44.4	40.0

Total Individual Payoff (40 ED): $\frac{X}{X+Y}\left[6*(X+Y) - .025*(X+Y)^2\right] + (40 - X)$

(Acct. 1 Payoff)   + (Acct. 2 Payoff)

Total Group Payoff

Table 2 describes the **total group payoff**. That is, the sum of the total individual earnings for each member of the group. Where **X + Y** represents the sum of Account 1 investment by the group. Notice that total group payoff increases until a total of **100 ED** are invested into Account 1 and decreases thereafter. **Bolded** values are referenced in the example problems.

Table 2

X + Y	Group Earnings
0	200.0
5	224.4
10	247.5
15	269.4
20	290.0
25	309.4
30	327.5
35	344.4
40	360.0
45	374.4
50	387.5
55	399.4
60	410.0
65	419.4
70	427.5
75	434.4
80	440.0
85	444.4
90	447.5
95	449.4
100	**450.0**
105	449.4
110	447.5
115	444.4
120	**440.0**
125	434.4
130	427.5
135	419.4
140	410.0
145	399.4
150	387.5
155	374.4
160	360.0
165	344.4
170	327.5
175	309.4
180	290.0
185	269.4
190	247.5
195	224.4
200	200.0

Example Questions

Answers to all example questions are **bolded** in the corresponding table for your convenience.

1. Realizing that total group payoff is maximized when 100 ED are invested into Account 1 suppose that **each** member of your group invests **25 ED** in Account 1.

   a. What is the total individual payoff for each **high** and **low** endowment member of the group?

   Use Table 1A and 1B. Because each member of the group invested 25 ED into Account 1 we can find your total individual payoff using X = 25 and Y = 25 + 25 + 25 = 75. Recall that Y is simply the summation of the ED invested into Account 1 by the other 3 members of the group. So we simply need to determine the number at the intersection of X = 25 and Y = 75 in the Table.

   Each high endowment group member would earn 122.5 ED on this round (Table 1A)
   Each low endowment group member would earn 102.5 ED on this round (Table 1B)

   b. What is the total group payoff?

   Use Table 2. To determine total group payoff we need to determine the total number of EDs invested into Account 1. That is we need to find X + Y which in this case is 25 + 75 = 100.

   The group would earn 450 ED on this round

2. Suppose that in order to increase their individual earnings the **two low endowment** members of your group increase their Account 1 investment to **35 ED each**. Recall that for many levels of group investment (Y) an increase in individual investment (X) increases individual payoff. Assume that the **two high endowment** members maintain **25 ED** in Account 1.

   a. What is the total individual payoff for each of the **two low endowment** group members who invested **35 ED** in Account 1?

   *Use Table 1B. In this case we want to set X = 35 and **Y = 25 + 25 + 35 = 85**. Note that Y reflects the investment choices of two members at 25 ED and 1 member at 35 ED.*

   Each low endowment group member would earn 110 ED on this round

   b. What is the total individual payoff for each of the **two high endowment** group members who invested **25 ED** into Account 1?

   *Use Table 1A. In this case we want to set X = 25 and **Y = 25 + 35 + 35 = 95**. Again Note that Y reflects the investment choices of two members at 35 and 1 member at 25*

   Each high endowment group member would earn 110 ED on this round

   c. What is the total group payoff?

   Use Table 2 and simply determine X + Y. In each case, either using 35 + 85 or 25 + 95 the total group investment is 120 ED into Account 1.

   The group would earn 440 ED on this round

Practice Questions

1. In response to the additional Account 1 investment suppose that both high endowment group members choose to invest 35 ED into Account 1. Therefore, now all members of the group are investing 35 ED into Account 1.

   a. What is the total individual payoff for each **high endowment** member?
      For high endowment earnings use Table 1A with X = 35 and Y = 35 + 35 + 35 = 105.

   b. What is your total individual payoff for each **low endowment** member?
      For low endowment earnings use Table 1B with X = 35 and Y = 35 + 35 + 35 = 105.

   b. What is the total group payoff?
      Use Table 2 with X + Y = 140.

2. In order to reduce group investment into Account 1 suppose both **high endowment** members choose to invest **20 ED** into Account 1 and that both **low endowment** members choose to invest **30 ED** into Account 1.

   a. What is the total individual payoff for each **high endowment** member who invested **20 ED** in Account 1?
      *Use Table 1A with X = 20 and **Y = 20 + 30 + 30 = 80**. Note that Y reflects the investment choices of two members at 30 ED and 1 member at 20 ED.*

   b. What is the total individual payoff for each **low endowment** member who invested 3**0 ED** into Account 1?
      *Use Table 1B with X = 30 and **Y = 20 + 20 + 30 = 70**. Again Note that Y reflects the investment choices of two members at 20 ED and 1 member at 30 ED.*

   c. What is the total group payoff?
      Use Table 2 with X + Y = 100 [30 + 70 or 20 + 80].

Reductions

There is another decision that affects your earnings. After each round you will be shown the individual Account 1 investment decisions of each member of your group by random ID. These random IDs will change each round.

With this information you will have the opportunity to pay a Fee of 1 ED in order to Fine another player 3 ED. Each Fine of 3 ED you impose will cost you 1 ED. You can choose to impose any number of Fines on any number of other players but you must be able to pay the total Fee from the **current** rounds' earnings. The Fees and Fines are the same for each of you and will remain the same throughout the experiment. All **Fees paid** and **Fines received** will be subtracted from your earnings

For example, suppose that after a particular round you decide to impose 3 Fines on ID 10, 2 Fines on ID 20 and 0 Fines on ID 30. For simplicity assume that no other player decides to impose any Fines. You have therefore decided to impose 5 Fines (3+2) each of which will cost you 1 ED. Your earnings will be reduced by 5 ED in **Fees paid**. Further, ID 10, who received 3 Fines will have their earnings reduced by 9 ED (3*3) in **Fines received** and ID 20 will have their earnings reduced by 6 ED (2*3) in **Fines received**.

Now, suppose that ID 20 decided to impose 4 Fines on you. Having paid to impose 4 Fines ID 20's earnings will be reduced by an additional 4 ED in **Fees paid** for a total reduction of 10 ED and your earnings will be reduced by an additional 12 ED (4*3) in **Fines received** for a total reduction of 17 ED.

Each of you will learn that your earnings have been reduced by **Fees paid** and **Fines received** but you will not know who has reduced your earnings or how many members of the group have chosen to reduce your earnings.

> 3. Suppose that after a particular round you decide to place a total of 6 Fines on other players and that the members of your group place a total of 5 Fines on you. What are your total Fees paid and Fines received?

Password

Once all participants are comfortable with the instructions and have successfully completed the practice questions the password will be announced and we can continue with the experiment. Please remember that communication between participants is not permitted. Thank you for your patience, we will begin shortly.

Demonstration Rounds

Before we begin we will play 1 practice round to demonstrate the game. The result of this round is not included in your accumulated earnings.

Round by round information: After each round and after each participant has made their decision you will be provided with the following information:

1. Your individual Account 1 investment **X**
2. The sum of all Account 1 investment (including yours) by the group **X+Y**
3. Your Account 1 payoffs
4. Your Account 2 payoffs
5. Your total individual payoffs for the current round and
6. Your accumulated earnings up to this point in the game.

All information from previous rounds is always available by clicking the link labeled **History**.

Round 1:
To demonstrate that it is possible to equalize earnings across all players while maximizing group payoffs let's have **each high endowment member invest 21 ED** into Account 1 and **each low endowment member invest 29 ED** into Account 1. Press *submit*.

You should see your Account 1 investment and the group investment into Account 1 (Which should be 100 ED). You should also see that your total individual earnings are 112.5 on this round.

*Please be patient, your screen will update only when each member of your group has submitted their choice. **Do not hit the back button**. Please raise your hand if you think something is not working properly.*

Now, press *continue* and you should see a page depicting the individual investment choices of each member of your group by random ID (which should be either 21 or 29). To demonstrate how the reductions appear during the game let's have each of you impose 3 fines on **each** member of your group and press *submit*. You should now see that your earnings have been reduced by **9 ED in Fees Paid** and **27 in Fines Received** for a total earnings of 76.5 (i.e. 112.5 – 36).

Note that while you do not need to impose any fines after a particular round you will need to input an integer into this field to proceed (i.e. enter a 0 (zero) to impose no fines).

If there are no further questions we will begin the experiment. When you are ready click continue.