Not for Publication
Vendettas – Online Appendices

Appendix A – Game 8 Analysis

Game 8: $\alpha = -1/6$ *and* $P^0 = (45\%, 45\%)$. Because of $\alpha < 0$ equilibrium behavior is not described by Proposition 1. Figure 2 describes the feasible states, the two endpoints in Ω which can be reached from P^0, namely $E_0 = \left(0\%, \frac{50}{6}\%\right)$ and $E_0' = \left(\frac{50}{6}\%, 0\%\right)$, and the potential endpoints E_2, E_3, and $E_4 = P^0$. The further reasoning depends on the exact structure of preferences. Here we discuss only two special cases: linear altruism and spite, as well as Fehr-Schmidt inequity aversion.

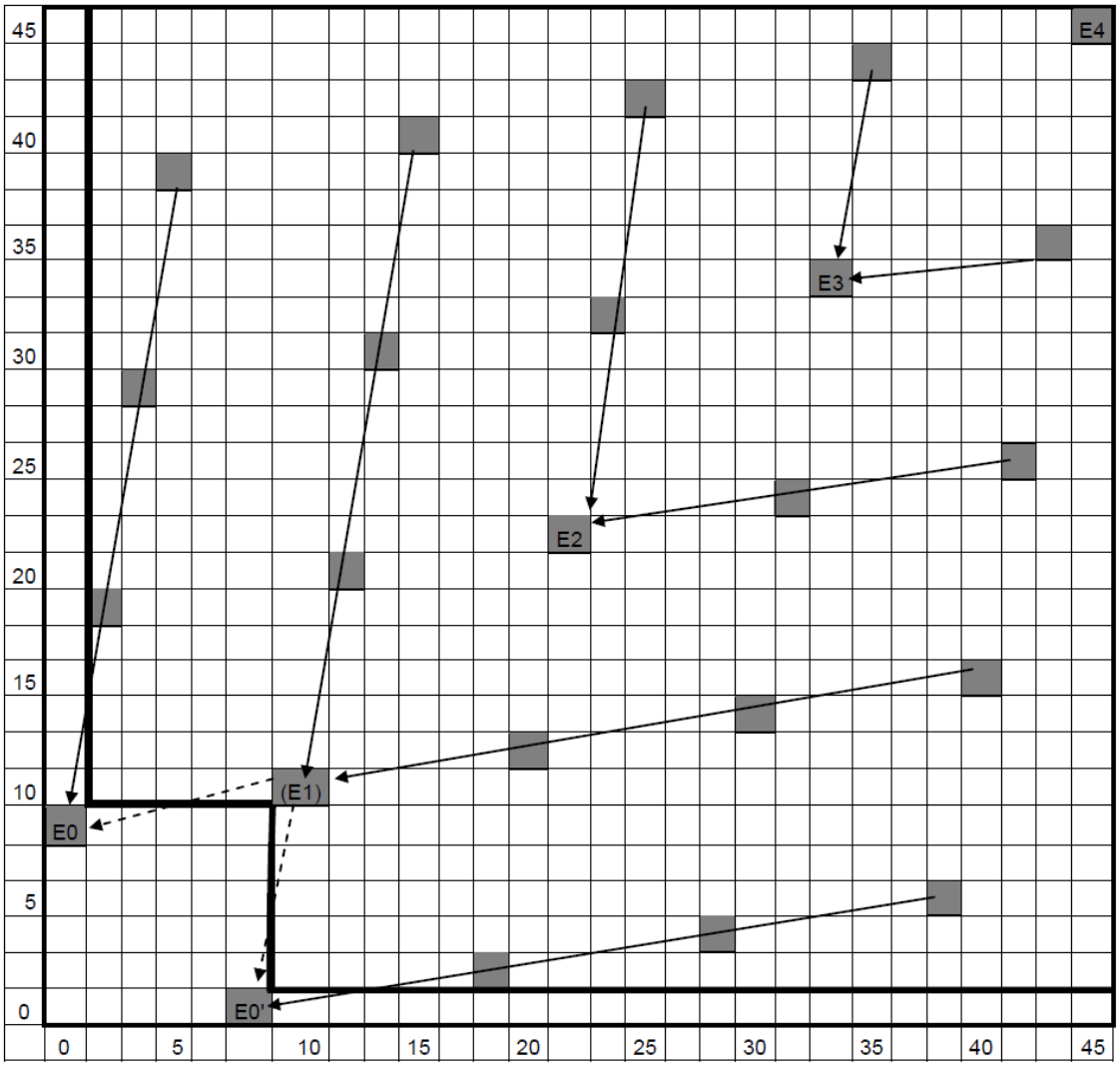
(Insert Figure 7 about here.)

Linear altruism/spite: $U_1 = x_1 - a_1 x_2$. Assumption A1 requires $a_1 < \alpha = -1/6 = -.17$. Then the feasible states which are connected with E_0 and E_0' by arrows in Figure 2 cannot be endpoints because either player 1 or player 2 can reach the preferred endpoint E_0 or E_0'. Also E_1 is not an endpoint. Assumption A2 has to be reformulated because two terminal points E_0 and E_0' can be reached: E_2 is an endpoint, if it is neither preferred to E_0 by player 2 nor to E_0' by player 1. (If Player 1 steals more than necessary to reach E_2 then Player 2 will steal back so that E_0 and E_0' is reached.) E_2 is preferred to E_0 and E_0' if a_i > -8/13 = -.62 [1]. The feasible states which are connected with E_2 by arrows in Figure 2 cannot be endpoints under -1/6 > a_i because Player 1 or Player 2 will move to the endpoint E_2. The same reasoning applies to E_3 which is an endpoint if $a_1 > -3/4$, and to E_4 which is an endpoint if $a_1 > -22/27$. Therefore, except in the case of extreme spite, equilibrium behavior requires players to stay in $P^0 = E_4$. 'Mistakes' should result in other endpoints, depending on a_1. Note that, under asymmetric preferences, acts of stealing may also be "expectation driven". A purely self-interested player *i* will start the game with maximum (preemptive) stealing if he or she expects that $a_2 < -22/27$. While this corresponds to an expectation of strong spite, the expectation of spite required would be less strong were α to be more negative.

Inequality aversion: $U_1 = x_{i1} - b_1 \cdot \max\{x_2 - x_1, 0\} - c_1 \cdot \max\{x_1 - x_2, 0\}$. (A1) requires $b_1 > 1/5$. Then, from states connected directly (not via E_1) with E_0 or E_0' by an arrow the respective players will always move to the endpoints E_0 and E_0'. E_1 is an endpoint, because it is preferred to E_0 and E_0' (own income decreases and inequality increases) and to the other states which are connected with E_1 by an arrow. E_2 is an endpoint, because it is preferred to E_0, E_0', E_1, and to the other feasible states which are connected with E_2 by an arrow. Because of the same reasoning, E_3 and E_4 are the only other endpoints.

[1] If a_i<-8/13 then they will prefer that the game ends in E_0 or E_0'. We do not discuss the limiting case a_i=-8/13 and similar cases where, because of indifference, there are many different equilibria.

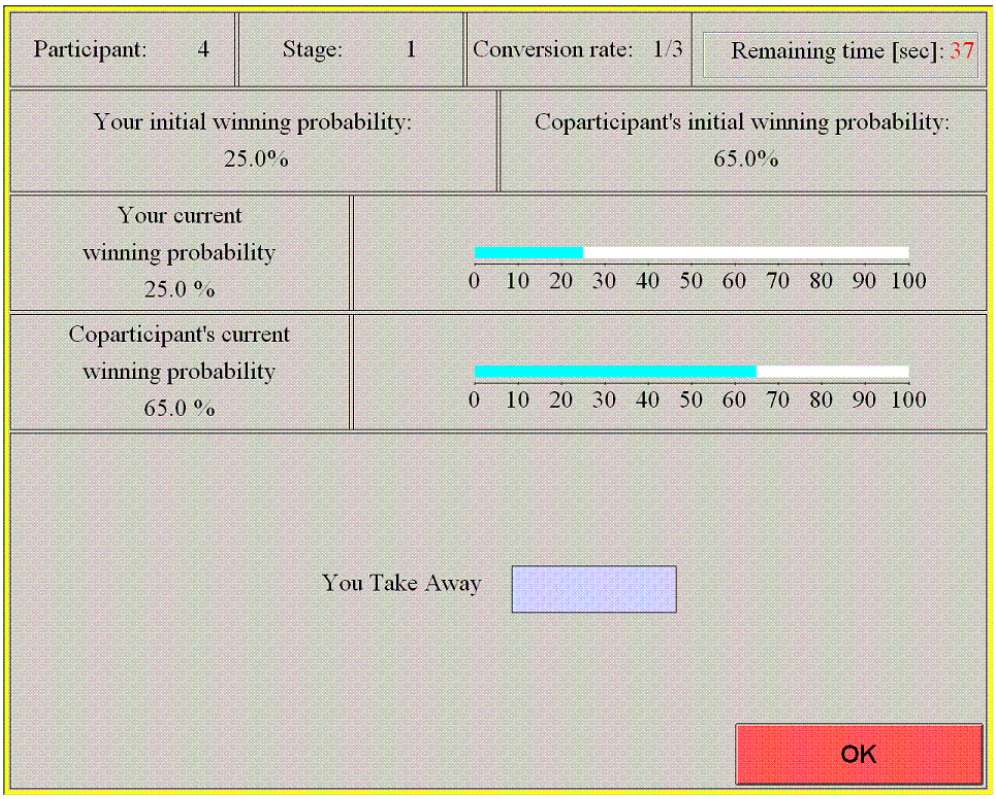
FIGURE 7: FEASIBLE STATES AND ENDPOINTS IN THE GAME WITH $\alpha = -1/6$

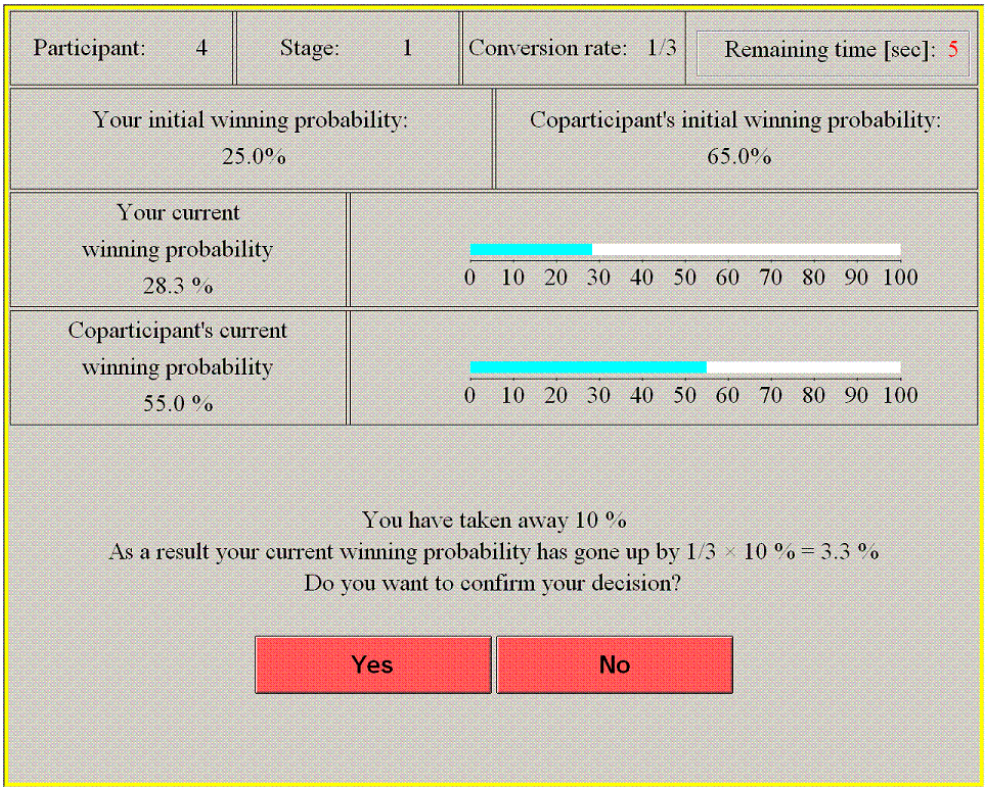


Notes: The arrows indicate stealing actions the conditions of which are specified in the text. Each horizontal or vertical step corresponds to a change of 1 2/3. For example, E_0' corresponds to an (8 1/3%, 0%) outcome.

Appendix B – Experimental Program Screenshots

SAMPLE COMPUTER DISPLAYS





Appendix C – Experimental Instructions

Instructions

You are participating in an experiment on decision making. Please raise your hand if you have any questions at any point in the experiment. The experiment is divided into 4 stages. At the end of the experiment you will be paid the sum of the earnings obtained in each stage, plus a participation fee of 5 pounds.

There are eight participants in the experiment, all of which have received the same set of instructions as you have. In each stage, you will be randomly matched with another participant (the **coparticipant**). Your coparticipant most likely changes from stage to stage.

Task: At the start of each stage you and your coparticipant are assigned an initial probability of winning a prize of 10 pounds. The probability of winning the prize is known as **winning probability**. You are assigned the same initial winning probability throughout the experiment, and your coparticipant is also assigned the same initial winning probability throughout the experiment. The computer display shows both your and your coparticipant's winning probabilities.

You and your coparticipant take turns in making choices. The computer determines which of you is first to choose. You are asked to choose how much winning probability to take away from your coparticipant. Amounts taken have to be multiples of 10% (so they can be 0%, 10%,20%, 340%, 40%, etc.), and up to as much as your coparticipant has at present.

[*All treatments except PEN*: A **conversion rate** is specified on the computer display. For every 10% winning probability that you take away from the coparticipant, your winning probability increases by the winning probability taken away multiplied by the conversion rate (and rounded to the nearest percentage point), up to a maximum of 100%. For example, if the conversion rate were 0.5 and you took away 40% from the coparticipant, then your winning probability would go up by 20%. The conversion rate may change from stage to stage.]

[*PEN treatment only*: A **conversion rate** is specified on the computer display. For every 10% winning probability that you take away from the coparticipant, your winning probability decreases by the winning probability taken away multiplied by the conversion rate (and rounded to the nearest percentage point), down to a minimum of 0%. For example, if the conversion rate were 0.5 and you took away 40% from the coparticipant, then your winning probability would go down by 20%. The conversion rate may change from stage to stage.]

On the computer display you will find two bars; one shows your winning probability and the other shows your coparticipant's winning probability. After your coparticipant has chosen, and it is your turn, the bars will be updated to show you the winning probabilities as a result of your coparticipant's choice. During your round, the bars will show you winning probabilities for any given amount you take away from your coparticipant.

If neither you nor the coparticipant takes away (or can take away) winning probabilities for two consecutive turns, then the stage is over and the resulting winning probabilities are used to determine who wins the prize. A random draw takes place to determine if you or your coparticipant is the winner, or if neither of you is the winner (i.e. there is no winner).

Please fill in the questionnaire and call for the experimenter before you begin. Feel free to raise your hand for assistance at any point of the experiment.

Appendix D – Experimental Outcomes

The numbers on each grid represent the number of times a final pair of winning probabilities was obtained in the experiment for each treatment and transfer rate. The cells enclosed in bold denote game predictions. Games are defined as in Table 1. The player on the horizontal axis is the player with 65% in the unequal initial winning probability treatments (IN and IB); it is the more successful player in the other treatments.

GAME 1: INITIAL ENDOWMENT (45,45), TRANSFER RATE = 2/3

(a, b) *Treatments EN, EB*: see Figure 4 in main text.

(c) *Treatment EI*

61.7																			
58.3																			
55																			
51.7																			
48.3																			
45														**8**					
41.7													**1**						
38.3																			
35																**2**			
31.7															**2**				
28.3																			
25													**1**					**1**	
21.7							**1**												
18.3											**1**								
15																			
11.7																			
8.3			**24**					**1**					**1**						
5							**1**												
1.7																			
	1.7	**5**	**8.3**	**11.7**	**15**	**18.3**	**21.7**	**25**	**28.3**	**31.7**	**35**	**38.3**	**41.7**	**45**	**48.3**	**51.7**	**55**	**58.3**	**61.7**

(d) *Treatment EW*

1.7																			
58.3																			
55																			
51.7																			
48.3																			
45														**5**					
41.7													**1**						
38.3												**1**							
35											**1**					**1**			
31.7																			
28.3																			
25																			
21.7																			
18.3						**1**													
15					**3**														**1**
11.7									**1**					**1**					
8.3			**32**																
5																			
1.7																			
	1.7	**5**	**8.3**	**11.7**	**15**	**18.3**	**21.7**	**25**	**28.3**	**31.7**	**35**	**38.3**	**41.7**	**45**	**48.3**	**51.7**	**55**	**58.3**	**61.7**	**65**

GAME 4: INITIAL ENDOWMENT (45,45), TRANSFER RATE = 1/3

(a, b) *Treatments EN, EB*: see Figure 4 in main text.

(c) *Treatment EI*

61.7																			
58.3																			
55																			
51.7																			
48.3																			
45														**10**					
41.7																			
38.3												**4**							
35																			
31.7										**1**									
28.3																			
25																			
21.7																			
18.3						**1**													
15																			
11.7				**3**															
8.3							**4**												
5		**22**								**1**									
1.7					**2**														
	1.7	**5**	**8.3**	**11.7**	**15**	**18.3**	**21.7**	**25**	**28.3**	**31.7**	**35**	**38.3**	**41.7**	**45**	**48.3**	**51.7**	**55**	**58.3**	**61.7**

(d) *Treatment EW*

61.7																			
58.3																			
55																			
51.7																			
48.3																			
45														**8**					
41.7																			
38.3												**1**							
35															**3**				
31.7																			
28.3																			
25																			
21.7																			
18.3						**1**													
15																			
11.7				**1**															
8.3							**1**												
5		**29**								**1**								**3**	
1.7																			
	1.7	**5**	**8.3**	**11.7**	**15**	**18.3**	**21.7**	**25**	**28.3**	**31.7**	**35**	**38.3**	**41.7**	**45**	**48.3**	**51.7**	**55**	**58.3**	**61.7**

GAME 2: INITIAL ENDOWMENT (65,25), TRANSFER RATE = 2/3

(a) *Treatment IB*

1.7																				
58.3																				
55																				
51.7																				
48.3		**1**																		
45																				
41.7																				
38.3														**2**						
35																				
31.7												**1**					**1**			
28.3																**1**				
25																				**3**
21.7																				
18.3			**2**					**1**										**1**		
15		**1**					**1**													
11.7																				
8.3					**5**															
5				**2**					**1**											
1.7			**25**																	
	1.7	**5**	**8.3**	**11.7**	**15**	**18.3**	**21.7**	**25**	**28.3**	**31.7**	**35**	**38.3**	**41.7**	**45**	**48.3**	**51.7**	**55**	**58.3**	**61.7**	**65**

(b) *Treatment IN*

1.7																				
58.3																				
55																				
51.7																				
48.3		**1**																		
45																				
41.7																				
38.3														**1**						
35																				
31.7																				
28.3											**1**									
25																				**2**
21.7														**1**						
18.3								**1**												
15		**1**																		
11.7																				
8.3					**1**															
5				**3**					**1**											
1.7			**35**																	
	1.7	**5**	**8.3**	**11.7**	**15**	**18.3**	**21.7**	**25**	**28.3**	**31.7**	**35**	**38.3**	**41.7**	**45**	**48.3**	**51.7**	**55**	**58.3**	**61.7**	**65**

GAME 5: INITIAL ENDOWMENT (65,25), TRANSFER RATE = 1/3

(a) *Treatment IB*

45																						
41.7																						
38.3																						
35			**2**								**2**											
31.7																						
28.3																						
25																				**3**		
21.7																						
18.3																						
15					**1**																	
11.7																**1**						
8.3			**36**								**1**											
5						**1**																**1**
1.7																						
	1.7	**5**	**8.3**	**11.7**	**15**	**18.3**	**21.7**	**25**	**28.3**	**31.7**	**35**	**38.3**	**41.7**	**45**	**48.3**	**51.7**	**55**	**58.3**	**61.7**	**65**	**68.3**	**71.7**

(b) *Treatment IN*

45																						
41.7																						
38.3																						
35											**2**											
31.7																						
28.3																						
25				**1**																		
21.7							**1**															
18.3																						
15					**2**																	
11.7																						
8.3			**39**																			
5						**1**																**1**
1.7									**1**													
	1.7	**5**	**8.3**	**11.7**	**15**	**18.3**	**21.7**	**25**	**28.3**	**31.7**	**35**	**38.3**	**41.7**	**45**	**48.3**	**51.7**	**55**	**58.3**	**61.7**	**65**	**68.3**	**71.7**

GAME 3: INITIAL ENDOWMENT (18 1/3, 18 1/3), TRANSFER RATE = 2/3

Treatment LEN

18.3						**7**	
15							
11.7							
8.3			**41**				
5							
1.7							
	1.7	5	8.3	11.7	15	18.3	21.7

GAME 6: INITIAL ENDOWMENT (18 1/3, 18 1/3), TRANSFER RATE = 1/3

Treatment LEN

18.3						**8**	
15							
11.7				**1**			
8.3							**1**
5		**38**					
1.7							
	1.7	5	8.3	11.7	15	18.3	21.7

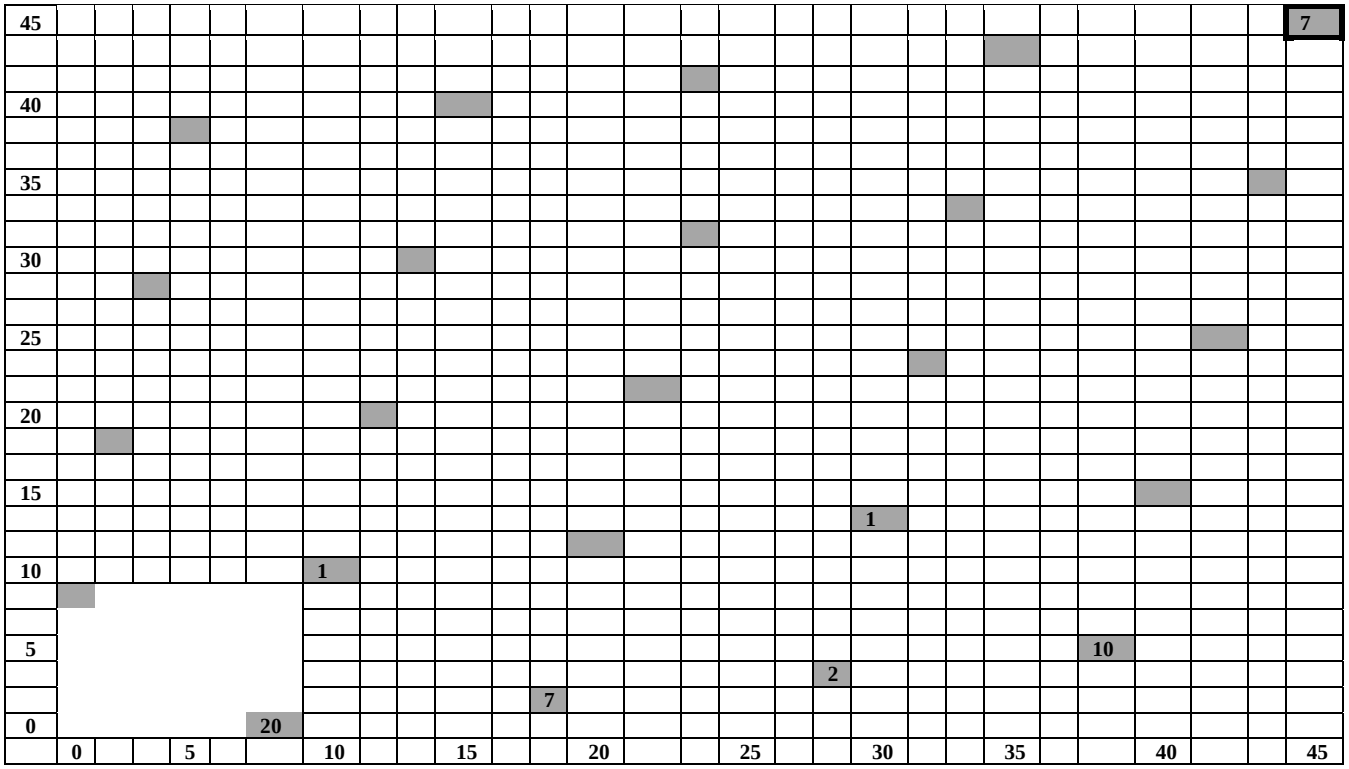
GAME 7: INITIAL ENDOWMENT (45,45), TRANSFER RATE = 0

Treatment PEN

45					**10**
35					**1**
25			**1**	**1**	
15					
5	**31**	**6**	**1**	**1**	**2**
	5	15	25	35	45

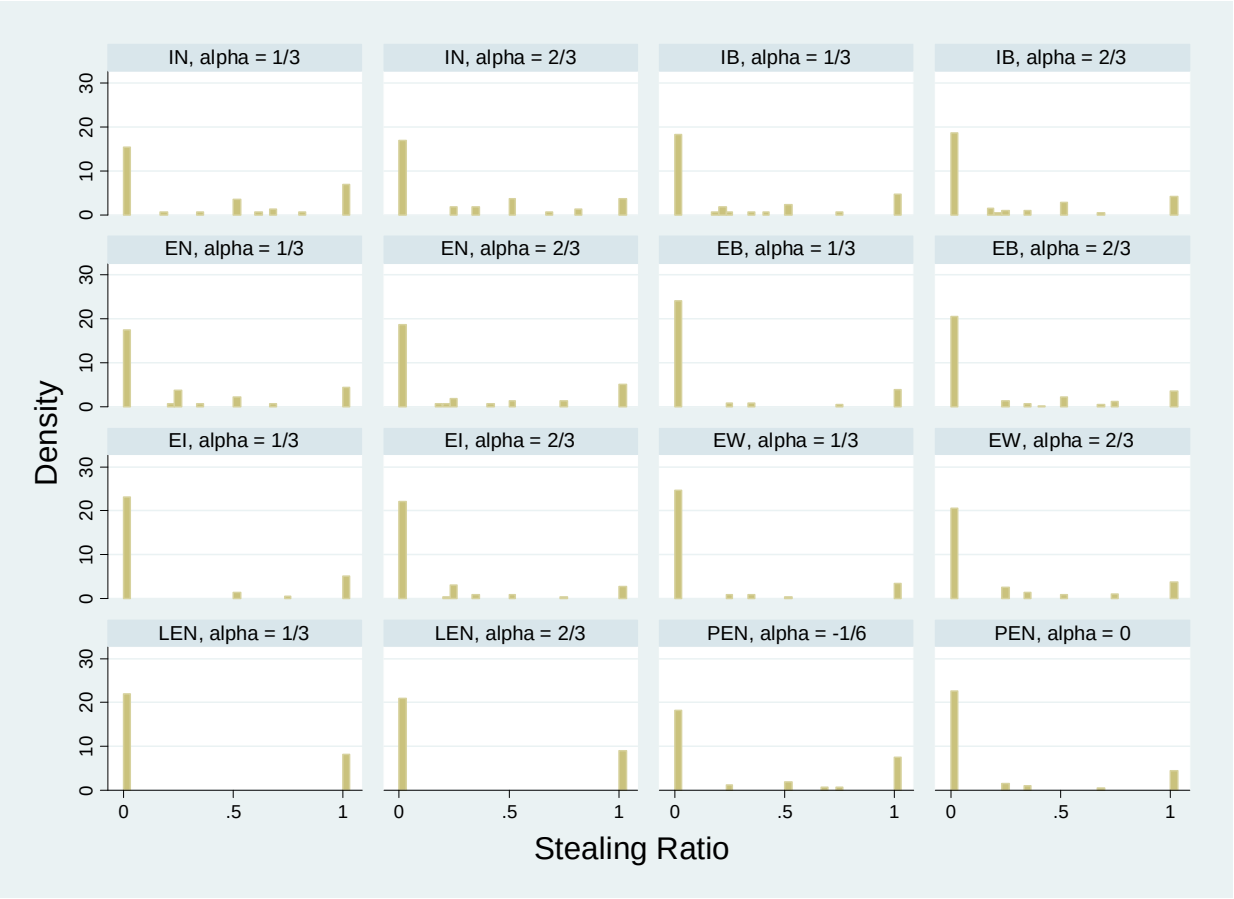
GAME 8: INITIAL ENDOWMENT (45,45), TRANSFER RATE = -1/6

Treatment PEN



Notes: Each horizontal or vertical step corresponds to a change of 1 2/3. For example, the 20 in correspondence to 0% for the column player corresponds to an outcome with 8 1/3% for the row player.

Appendix E – Distribution of Responses to Zero Steals



Notes: Each cell plots the density of stealing ratios in response to coplayers stealing nothing in the previous period for the respective treatment and conversion rate alpha.

Appendix F - Tobit Regression Analysis

TOBIT REGRESSIONS ON STEALING RATIO, ALL TREATMENTS

	Model 1'								
	Coefficients			E[y|0<y<1]			E[y]		
	β	t	p	dy/dx	t	p	dy/dx	t	p
Inequality	0.43	2.46	0.014	0.033	2.45	0.014	0.16	2.52	0.012
TransferRate	-0.022	-0.1	0.923	-0.002	-0.1	0.923	-0.008	-0.1	0.923
Disadvantaged	-0.059	-0.29	0.77	-0.005	-0.29	0.77	-0.022	-0.29	0.77
Stage	-0.429	-2.49	0.013	-0.033	-2.45	0.014	-0.161	-2.49	0.013
StageSquared	0.048	1.41	0.157	0.004	1.41	0.159	0.018	1.41	0.157
Order	-0.073	-0.72	0.472	-0.006	-0.72	0.473	-0.027	-0.72	0.472
Wait	-0.209	-1.1	0.271	-0.016	-1.1	0.271	-0.078	-1.11	0.269
BREE	-0.074	-0.39	0.697	-0.006	-0.39	0.697	-0.028	-0.39	0.697
BREECB	0.239	1.28	0.199	0.018	1.28	0.2	0.09	1.29	0.196
LEN	0.396	2.04	0.041	0.031	2.04	0.042	0.147	2.1	0.036
PEN	-0.012	-0.05	0.96	-0.001	-0.05	0.96	-0.005	-0.05	0.96
PEN × TransferRate	0.568	0.48	0.634	0.044	0.48	0.633	0.212	0.48	0.633
Constant	1.15	4.56	0						
Log likelihood	-770.2								
n/ss/sn	768/360								
l/u/r	260/271/237								
	Model 1"								
	Coefficients			E[y|0<y<1]			E[y]		
	β	t	p	dy/dx	t	p	dy/dx	t	p
Inequality	0.381	2.19	0.028	0.03	2.19	0.029	0.143	2.23	0.025
TransferRate	-0.226	-0.89	0.374	-0.018	-0.89	0.374	-0.086	-0.89	0.373
Disadvantaged	-0.05	-0.31	0.755	-0.004	-0.31	0.755	-0.019	-0.31	0.755
Stage	-0.47	-2.35	0.019	-0.037	-2.33	0.02	-0.178	-2.36	0.018
StageSquared	0.055	1.4	0.161	0.004	1.4	0.162	0.021	1.4	0.161
Order	-0.095	-0.86	0.39	-0.007	-0.86	0.391	-0.036	-0.86	0.39
Wait	-0.166	-0.81	0.418	-0.013	-0.81	0.419	-0.063	-0.81	0.417
BREE	-0.09	-0.44	0.66	-0.007	-0.44	0.66	-0.034	-0.44	0.66
BREECB	0.221	1.08	0.28	0.017	1.08	0.28	0.083	1.09	0.277
LEN	0.37	1.75	0.08	0.029	1.75	0.08	0.139	1.79	0.073
PEN	-0.153	-0.57	0.567	-0.012	-0.57	0.567	-0.057	-0.58	0.564
PEN × TransferRate	0.147	0.11	0.914	0.012	0.11	0.914	0.056	0.11	0.914
Constant	1.325	4.62	0						
Log likelihood	-802.38								
n/ss/sn	768/48								
l/u/r	260/271/237								

	Model 2'								
	Coefficients			E[y|0<y<1]			E[y]		
	β	t	p	dy/dx	t	p	dy/dx	t	p
Inequality	0.102	0.91	0.361	0.007	0.91	0.361	0.035	0.92	0.357
TransferRate	0.133	1.19	0.235	0.01	1.19	0.235	0.046	1.19	0.235
Firstmover	0.028	0.72	0.472	0.002	0.72	0.472	0.01	0.72	0.472
Disadvantaged	-0.134	-1.05	0.294	-0.01	-1.05	0.294	-0.047	-1.04	0.299
Stage	-0.275	-3.1	0.002	-0.02	-3.09	0.002	-0.095	-3.1	0.002
StageSquared	0.04	2.28	0.023	0.003	2.28	0.023	0.014	2.28	0.022
Order	-0.094	-1.41	0.159	-0.007	-1.41	0.16	-0.032	-1.41	0.159
Wait	-0.422	-3.51	0	-0.031	-3.51	0	-0.144	-3.6	0
BREE	0.12	1	0.315	0.009	1	0.315	0.041	1.01	0.313
BREECB	0.035	0.3	0.767	0.003	0.3	0.767	0.012	0.3	0.766
LEN	-0.074	-0.57	0.566	-0.005	-0.57	0.566	-0.026	-0.57	0.569
PEN	-0.447	-2.76	0.006	-0.033	-2.75	0.006	-0.161	-2.72	0.007
PEN × TransferRate	0.115	0.13	0.893	0.008	0.13	0.893	0.04	0.13	0.893
LStolen	1.578	28.95	0	0.116	21.04	0	0.546	30.28	0
Constant	0.494	3.34	0.001						
Log likelihood	-3608.2								
n/ss/sn	4392/384								
l/u/r	1110/1175/2107								
	Model 2"								
	Coefficients			E[y|0<y<1]			E[y]		
	β	t	p	dy/dx	t	p	dy/dx	t	p
Inequality	0.109	1.42	0.155	0.008	1.42	0.155	0.038	1.44	0.151
TransferRate	0.214	1.76	0.079	0.016	1.76	0.079	0.075	1.76	0.079
Firstmover	0.05	1.33	0.182	0.004	1.33	0.182	0.018	1.34	0.182
Disadvantaged	-0.109	-1.56	0.118	-0.008	-1.56	0.119	-0.038	-1.55	0.122
Stage	-0.253	-2.65	0.008	-0.019	-2.65	0.008	-0.088	-2.65	0.008
StageSquared	0.037	1.98	0.047	0.003	1.98	0.048	0.013	1.98	0.047
Order	-0.113	-2.19	0.028	-0.008	-2.19	0.028	-0.039	-2.2	0.028
Wait	-0.374	-4.15	0	-0.028	-4.15	0	-0.129	-4.24	0
BREE	0.116	1.31	0.191	0.009	1.31	0.191	0.04	1.31	0.189
BREECB	0.036	0.4	0.688	0.003	0.4	0.688	0.013	0.4	0.687
LEN	-0.028	-0.27	0.785	-0.002	-0.27	0.785	-0.01	-0.27	0.786
PEN	-0.341	-2.32	0.02	-0.026	-2.31	0.021	-0.123	-2.28	0.023
PEN × TransferRate	0.194	0.21	0.831	0.015	0.21	0.831	0.068	0.21	0.831
LStolen	1.693	28.84	0	0.127	23.78	0	0.592	32.86	0
Constant	0.305	2.09	0.036						
Log likelihood	-3779.7								
n/ss/sn	4392/48								
l/u/r	1110/1175/2107								

Notes: In each model, l/u/r denote the number of observations censored at 0, uncensored, and censored at 1, respectively. Models 1' and 2' control for subject level non independence, and models 1" and 2" for session level non independence of observations. Marginal effects are provided for the expected value of y conditional on being censored, E[y|0<y<1] and the unconditional expected value of y, E[y].