

Data and Instructions Appendix
Asymmetric Inequality Aversion and Noisy Behavior
in Alternating-Offer Bargaining Games

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In two-stage bargaining games with alternating offers, the amount of the pie that remains after a rejection is what the first player should offer to the second player, since the second player can capture this remainder in the final (ultimatum) stage. Fairness considerations will reduce the correlation between first-stage offers and the size of the remaining pie, but randomness in behavior will have the same "flattening" effect. This paper reports an experiment designed to separate these considerations, by introducing asymmetric fixed money payments to each player. These endowments do not affect the perfect positive correlation between initial Nash offers and the remaining pie, but are selected to induce a perfectly *negative* relationship between the remaining pie size and the first-stage offer that would equalize final earnings of the two players. This negative relationship is apparent in the data, which suggests the importance of fairness considerations. A theoretical model of asymmetric inequality aversion and stochastic choice is used to provide maximum likelihood estimates of utility and logit error parameters. The parameters representing "envy," "guilt," and logit errors are all significant, and the resulting model produces the observed negative relationship between initial offers and residual pie size.

Data Appendix: Session 1

subject numbers (A, B)	2nd stage pie size	initial offer (π_A , π_B)	counter offer (π_A , π_B)	responses (initial, final)
S1, S5	0.00	0.10, 2.30	- , -	yes, -
S1, S5	0.40	0.40, 2.00	- , -	yes, -
S1, S7	0.80	0.80, 1.60	- , -	yes, -
S1, S8	1.20	1.20, 1.20	- , -	yes, -
S1, S5	1.60	1.50, 0.90	- , -	yes, -
S1, S6	2.00	2.00, 0.40	0.10, 1.90	no, no
S1, S7	2.40	2.25, 0.15	0.75, 1.65	no, yes
S2, S8	0.00	2.00, 0.40	- , -	yes, -
S2, S7	0.40	1.95, 0.45	- , -	yes, -
S2, S8	0.80	1.30, 1.10	- , -	yes, -
S2, S6	1.20	1.25, 1.15	- , -	yes, -
S2, S7	1.60	1.70, 0.70	0.60, 1.00	no, yes
S2, S8	2.00	1.50, 0.90	0.85, 1.15	no, yes
S2, S5	2.40	2.00, 0.40	- , -	yes, -
S3, S7	0.00	1.40, 1.00	- , -	yes, -
S3, S7	0.40	1.40, 1.00	- , -	yes, -
S3, S5	0.80	1.50, 0.90	0.45, 0.35	no, yes
S3, S6	1.20	1.20, 1.20	- , -	yes, -
S3, S6	1.60	1.60, 0.80	0.10, 1.50	no, no
S3, S8	2.00	1.30, 1.10	0.50, 1.50	no, yes
S3, S6	2.40	1.60, 1.80	0.10, 2.30	no, no
S4, S6	0.00	1.15, 1.25	- , -	yes, -
S4, S7	0.40	1.00, 1.40	- , -	yes, -
S4, S8	0.80	1.15, 1.25	- , -	yes, -
S4, S8	1.20	1.30, 1.10	- , -	yes, -
S4, S5	1.60	1.25, 1.15	- , -	yes, -
S4, S6	2.00	0.90, 1.50	0.25, 1.75	no, no
S4, S5	2.40	1.85, 1.55	- , -	yes, -

Data Appendix: Session 2

subject numbers (A, B)	2nd stage pie size	initial offer (π_A , π_B)	counter offer (π_A , π_B)	responses (initial, final)
S1, S6	0.00	0.15, 2.25	- , -	yes, -
S1, S5	0.40	0.40, 2.00	- , -	yes, -
S1, S7	0.80	0.50, 1.90	- , -	yes, -
S1, S8	1.20	1.20, 1.20	- , -	yes, -
S1, S7	1.60	1.60, 0.80	1.00, 0.60	no, yes
S1, S8	2.00	1.90, 0.50	1.00, 1.00	no, no
S1, S5	2.40	2.10, 0.30	- , -	yes, -
S2, S7	0.00	0.00, 2.40	- , -	yes, -
S2, S6	0.40	0.40, 2.00	- , -	yes, -
S2, S5	0.80	0.80, 1.60	- , -	yes, -
S2, S8	1.20	1.20, 1.20	- , -	yes, -
S2, S8	1.60	1.60, 0.80	- , -	yes, -
S2, S5	2.00	2.00, 0.40	- , -	yes, -
S2, S6	2.40	2.40, 0.00	- , -	yes, -
S3, S8	0.00	1.40, 1.00	0.00, 0.00	no, -
S3, S8	0.40	1.20, 1.20	- , -	yes, -
S3, S7	0.80	1.00, 1.40	- , -	yes, -
S3, S7	1.20	1.20, 1.20	- , -	yes, -
S3, S6	1.60	1.50, 0.90	- , -	yes, -
S3, S6	2.00	2.00, 0.40	- , -	yes, -
S3, S6	2.40	2.00, 0.40	- , -	yes, -
S4, S5	0.00	0.40, 2.00	- , -	yes, -
S4, S8	0.40	1.00, 1.40	- , -	yes, -
S4, S8	0.80	1.00, 1.40	- , -	yes, -
S4, S7	1.20	1.20, 1.20	- , -	yes, -
S4, S7	1.60	0.80, 1.60	- , -	yes, -
S4, S5	2.00	1.00, 1.40	- , -	yes, -
S4, S6	2.40	2.40, 0.00	- , -	yes, -

Data Appendix: Session 3

subject numbers (A, B)	2nd stage pie size	initial offer (π_A , π_B)	counter offer (π_A , π_B)	responses (initial, final)
S1, S5	0.00	1.20, 1.20	- , -	yes, -
S1, S6	0.40	2.00, 0.40	- , -	yes, -
S1, S7	0.80	2.40, 0.00	0.15, 0.65	no, yes
S1, S6	1.20	1.20, 1.20	- , -	yes, -
S1, S8	1.60	1.10, 1.30	- , -	yes, -
S1, S8	2.00	1.10, 1.30	- , -	yes, -
S1, S5	2.40	1.10, 1.30	1.40, 1.00	no, yes
S2, S6	0.00	2.00, 0.40	- , -	yes, -
S2, S8	0.40	2.00, 0.40	- , -	yes, -
S2, S5	0.80	1.20, 1.20	- , -	yes, -
S2, S6	1.20	1.60, 0.80	0.25, 0.95	no, no
S2, S7	1.60	1.40, 1.00	- , -	yes, -
S2, S5	2.00	1.20, 1.20	- , -	yes, -
S2, S7	2.40	1.60, 0.80	1.00, 1.40	no, yes
S3, S6	0.00	0.40, 2.00	- , -	yes, -
S3, S5	0.40	1.80, 0.60	- , -	yes, -
S3, S6	0.80	1.40, 1.00	- , -	yes, -
S3, S8	1.20	1.20, 1.20	- , -	yes, -
S3, S7	1.60	1.40, 1.00	0.40, 1.20	no, no
S3, S8	2.00	2.00, 0.40	0.50, 1.50	no, no
S3, S8	2.40	2.00, 0.40	1.00, 1.40	no, yes
S4, S7	0.00	2.35, 0.25	0.00, 0.00	no, -
S4, S5	0.40	2.40, 0.00	0.00, 0.40	no, no
S4, S6	0.80	1.55, 0.85	- , -	yes, -
S4, S5	1.20	1.40, 1.00	0.60, 0.60	no, yes
S4, S7	1.60	1.60, 0.80	0.60, 1.00	no, yes
S4, S7	2.00	2.00, 0.40	1.00, 1.00	no, yes
S4, S8	2.40	2.40, 0.00	1.20, 1.20	no, yes

Data Appendix: Session 4

subject numbers (A, B)	2nd stage pie size	initial offer (π_A, π_B)	counter offer (π_A, π_B)	responses (initial, final)
S1, S7	0.00	0.00, 2.40	- , -	yes, -
S1, S8	0.40	0.40, 2.00	- , -	yes, -
S1, S8	0.80	0.80, 1.60	- , -	yes, -
S1, S5	1.20	1.20, 1.20	- , -	yes, -
S1, S5	1.60	1.60, 0.80	- , -	yes, -
S1, S6	2.00	2.00, 0.40	- , -	yes, -
S1, S7	2.40	2.40, 0.00	- , -	yes, -
S2, S6	0.00	0.20, 2.20	- , -	yes, -
S2, S6	0.40	1.00, 1.40	- , -	yes, -
S2, S7	0.80	1.00, 1.40	- , -	yes, -
S2, S5	1.20	1.20, 1.20	- , -	yes, -
S2, S8	1.60	1.40, 1.00	- , -	yes, -
S2, S7	2.00	1.40, 1.00	- , -	yes, -
S2, S5	2.40	1.60, 1.80	- , -	yes, -
S3, S5	0.00	0.85, 1.55	- , -	yes, -
S3, S5	0.40	0.75, 1.65	- , -	yes, -
S3, S6	0.80	0.90, 1.50	- , -	yes, -
S3, S8	1.20	1.20, 1.20	- , -	yes, -
S3, S7	1.60	1.50, 0.90	- , -	yes, -
S3, S8	2.00	1.60, 0.80	- , -	yes, -
S3, S6	2.40	1.75, 0.65	- , -	yes, -
S4, S6	0.00	1.90, 0.50	0.00, 0.00	no, -
S4, S7	0.40	1.90, 0.50	0.15, 0.25	no, yes
S4, S8	0.80	1.55, 0.85	0.20, 0.60	no, yes
S4, S8	1.20	1.19, 1.21	- , -	yes, -
S4, S7	1.60	1.20, 1.20	- , -	yes, -
S4, S5	2.00	1.55, 0.85	- , -	yes, -
S4, S6	2.40	1.20, 1.20	- , -	yes, -

Data Appendix: Session 5

subject numbers (A, B)	2nd stage pie size	initial offer (π_A , π_B)	counter offer (π_A , π_B)	responses (initial, final)
S1, S7	0.00	0.00, 2.40	- , -	yes, -
S1, S7	0.40	0.40, 2.00	- , -	yes, -
S1, S5	0.80	0.80, 1.60	- , -	yes, -
S1, S6	1.20	1.20, 1.20	- , -	yes, -
S1, S5	1.60	1.60, 1.80	0.45, 1.15	no ,no
S1, S5	2.00	2.00, 0.40	0.85, 1.15	no, no
S1, S7	2.40	2.40, 0.00	1.40, 1.00	no, yes
S2, S6	0.00	0.90, 1.50	- , -	yes, -
S2, S7	0.40	0.40, 2.00	- , -	yes, -
S2, S6	0.80	0.90, 1.30	- , -	yes, -
S2, S6	1.20	1.20, 1.20	- , -	yes, -
S2, S7	1.60	1.60, 0.80	- , -	yes, -
S2, S6	2.00	1.20, 1.20	- , -	yes, -
S2, S6	2.40	1.20, 1.20	- , -	yes, -
S3, S7	0.00	1.20, 1.20	0.00, 0.00	no, yes
S3, S5	0.40	1.20, 1.20	- , -	yes, -
S3, S7	0.80	1.20, 1.20	- , -	yes, -
S3, S5	1.20	1.20, 1.20	- , -	yes, -
S3, S5	1.60	1.20, 1.20	- , -	yes, -
S3, S5	2.00	1.20, 1.20	- , -	yes, -
S3, S6	2.40	1.20, 1.20	- , -	yes, -

Data Appendix: Session 6

subject numbers (A, B)	2nd stage pie size	initial offer (π_A , π_B)	counter offer (π_A , π_B)	responses (initial, final)
S1, S7	0.00	0.01, 2.39	- , -	yes, -
S1, S8	0.40	0.40, 2.00	- , -	yes, -
S1, S8	0.80	0.95, 1.45	- , -	yes, -
S1, S8	1.20	1.20, 1.20	- , -	yes, -
S1, S6	1.60	0.60, 1.80	- , -	yes, -
S1, S5	2.00	2.20, 0.20	1.00, 1.00	no, no
S1, S5	2.40	2.40, 0.00	1.25, 1.15	no, no
S2, S6	0.00	0.00, 2.40	- , -	yes, -
S2, S6	0.40	0.40, 2.00	- , -	yes, -
S2, S7	0.80	0.90, 1.60	- , -	yes, -
S2, S6	1.20	1.20, 1.20	- , -	yes, -
S2, S8	1.60	1.60, 0.80	- , -	yes, -
S2, S7	2.00	2.00, 0.40	0.75, 1.25	no, no
S2, S5	2.40	2.40, 0.00	- , -	yes, -
S3, S7	0.00	1.20, 1.20	- , -	yes, -
S3, S5	0.40	2.40, 0.00	0.15, 0.25	no, yes
S3, S6	0.80	2.20, 0.20	0.30, 0.50	no, yes
S3, S7	1.20	1.20, 1.20	- , -	yes, -
S3, S8	1.60	1.20, 1.20	- , -	yes, -
S3, S8	2.00	1.20, 1.20	- , -	yes, -
S3, S7	2.40	1.20, 1.20	- , -	yes, -
S4, S5	0.00	0.10, 2.30	- , -	yes, -
S4, S5	0.40	0.40, 2.00	- , -	yes, -
S4, S8	0.80	0.80, 1.60	- , -	yes, -
S4, S7	1.20	1.15, 1.25	- , -	yes, -
S4, S6	1.60	1.55, 0.85	- , -	yes, -
S4, S5	2.00	1.90, 0.50	1.10, 0.90	no, yes
S4, S5	2.40	2.30, 0.10	1.40, 1.00	no, yes

Instructions Appendix

This is an experiment in the economics of decision making. This experiment is funded by various foundations. In this part you will make a series of decisions. Each of your decisions will be communicated to some other person in the room. Your earnings will depend on your decision and on that of the other person, as explained below. You have already received \$5 for coming today and the earnings from this first part of the experiment will be added to your earnings from later parts. Your total earnings will be paid to you privately in cash at the end of the session today. All earnings will be yours to keep and you do not have to discuss them with anyone. There will be no general discussion of earnings, and all decisions will be anonymous.

Half of you have been designated as type A, and half as type B. Your type is: _____. The type A people will begin by making a series of 7 proposals on how to divide \$2.40. Each proposal will be recorded on a separate piece of paper and will be presented to a randomly selected type B person in the room. The type B person will either agree to the proposed division or not.

- If the type B person agrees, then the proposed division is implemented.
- If the type B person does not agree, the \$2.40 to be divided is reduced to a known amount, \$R. The type B person then has to propose how to divide the \$R that remains. If the type B person makes a counter proposal in this manner, it is returned to the original type A person who is matched with that type B person. The original type A can either agree to the proposed division of \$R or not, in which case both people earn nothing.

For each of the seven proposals the type A person will be told the amount \$R that remains if the original proposal is rejected. In addition, a fixed amount of money is given to the type A person and a (possibly different) amount of money is given to the type B person for each random matching. Both types receive this fixed amount irrespective of the proposed divisions and responses.

To make sure that you understand how the earnings are determined, please work through the examples below. *The numbers you choose in the examples will not affect your earnings for the experiment.* In these examples you should make (hypothetical) choices for both types; in the experiment you only make decisions for your own type.

Please make one example in which type A's proposal is accepted, one example in which type A's proposal is rejected and type B's counter proposal is accepted, and one example in which type A's proposal and type B's counter proposal are both rejected.

Example 1: There is \$2.40 to be divided. This amount will be reduced to \$1.75 if type A's proposal is rejected. In addition, the type A person will receive a fixed amount of \$1.00 and the type B person will receive a fixed amount of \$1.20, irrespective of the proposals and responses. Please fill in the blanks that follow and calculate the earnings that would result from the hypothetical choices that you use.

Type A's proposed division of \$2.40:

\$ _____ for A and \$ _____ for B (numbers should sum to \$2.40)

Type B's response: Agree _____ or Not Agree _____

If no agreement, type B's proposed division of \$1.75:

\$ _____ for A and \$ _____ for B (numbers should add up to \$1.75)

Type A's response: Agree _____ or Not Agree _____

Type A's earnings: _____ (don't forget to add the fixed payment of \$1.00)

Type B's earnings: _____ (don't forget to add the fixed payment of \$1.20)

Example 2: There is \$2.40 to be divided. This amount will be reduced to \$0.95 if type A's proposal is rejected. In addition, the type A person will receive a fixed amount of \$0.90 and the type B person will receive a fixed amount of \$1.60, irrespective of the proposals and responses. Please fill in the blanks that follow and calculate the earnings that would result from the hypothetical choices that you use.

Type A's proposed division of \$2.40:

\$ _____ for A and \$ _____ for B (numbers should sum to \$2.40)

Type B's response: Agree _____ or Not Agree _____

If no agreement, type B's proposed division of \$0.95:

\$ _____ for A and \$ _____ for B (numbers should add up to \$0.95)

Type A's response: Agree _____ or Not Agree _____

Type A's earnings: _____ (don't forget to add the fixed payment of \$0.90)

Type B's earnings: _____ (don't forget to add the fixed payment of \$1.60)

Example 3: There is \$2.40 to be divided. This amount will be reduced to \$2.10 if type A's proposal is rejected. In addition, the type A person will receive a fixed amount of \$1.55 and the type B person will receive a fixed amount of \$0.70, irrespective of the proposals and responses. Please fill in the blanks that follow and calculate the earnings that would result from the hypothetical choices that you use.

Type A's proposed division of \$2.40:

\$ _____ for A and \$ _____ for B (numbers should sum to \$2.40)

Type B's response: Agree _____ or Not Agree _____

If no agreement, type B's proposed division of \$2.10:

\$ _____ for A and \$ _____ for B (numbers should add up to \$2.10)

Type A's response: Agree _____ or Not Agree _____

Type A's earnings: _____ (don't forget to add the fixed payment of \$1.55)

Type B's earnings: _____ (don't forget to add the fixed payment of \$0.70)

Summary: The type A people start by making a series of 7 proposals on how to divide \$2.40. Each proposal will be recorded on a separate piece of paper and will be presented to a randomly selected type B person in the room. Here we have a container with ping pong balls; each ball has the identification number of one of the type B people on it. There are seven balls for each type B person, and hence 28 balls in total. Each type A person makes 7 proposals and for each individual proposal we will draw a ping pong ball to determine which type B person receives that proposal. The matched type B person can either agree to the proposed division or not. If the type B person does not agree, the type B should propose how to divide the \$R that remains. This counter proposal will then be communicated to the type A person who made the original proposal.

During the experiment, you are not permitted to speak or communicate with the other participants. If you have a question while the experiment is going on, please raise your hand and one of us will come to your desk to answer it. At this time, do you have any questions about the instructions or procedures? If you have a question, please raise your hands and one of us will come to your seat to answer it.

Start of the experiment: At this time we will hand out the first proposal sheet to the type A people on which they should write their proposed division of \$2.40. After all type A's are finished we collect the first sheet and provide the type A's with their second decision sheet. This process will be repeated until the type A's have finished all their seven proposals. The type B people will have to wait until the type A's are done. Then the proposals will be assigned randomly to the type B people.

Your total earnings for this part of the experiment will consist of seven fixed payments and seven payments that are determined by the agreed on divisions. The fixed payments are independent of the proposals and responses, but these decisions do affect the division-based payments. In the end we will return copies of the proposals sheets so that you can add up your earnings for all seven proposals.

Note that every proposal sheet has different fixed payments and a different amount remaining to be divided if the original type A's proposal is rejected. So please take your time and consider this information carefully.

To be read after the first proposal sheet is distributed:

I have passed out the proposal sheets to the type A people. Please look at this sheet carefully. This sheet tells you the amount that will remain if the type A's proposal is not accepted. This sheet also tells you the additional fixed amount that the type A and type B people will receive irrespective of the proposals and responses. Thus each person's earnings will consist of 7 fixed payments and 7 amounts determined by the proposals and responses.

Proposal Sheet

There is **\$2.40** to be divided. If the initial proposal of the type A person is not accepted then the amount remaining will be: **\$2.00**. Irrespective of the proposals and the responses made, the type A person will receive an additional fixed amount of **\$0.65** and the type B person will receive an additional fixed amount of **\$2.25**.

To summarize:

\$2.40 to be divided

\$2.00 remaining if A's proposal is not accepted

\$0.65 additional fixed payment for type A

\$2.25 additional fixed payment for type B

Warning: Please be careful to distinguish between the blank for type A and the blank for type B; sometimes people get these confused and make a proposal they do not wish to make.

Type A's proposed division of **\$2.40**:

\$ _____ for type A and \$ _____ for type B (numbers should sum to \$2.40)

Type B's response: Agree _____ or Not Agree _____

If no agreement, the type B's proposed division of **\$2.00**:

\$ _____ for Type A and \$ _____ for type B (numbers should add up to \$2.00)

Type A's response: Agree _____ or Not Agree _____

Recall that earnings are determined by an agreement, and if there is no agreement to the counter-proposal, both types only receive the fixed payments specified above.

your payoff: _____

Table VII. Summary of Subject Characteristics

	Subject Role and Number							
	A1	A2	A3	A4	B5	B6	B7	B8
session 1	M, B psych.	W econ.	M econ.	W econ.	W, B econ.	M econ.	M econ.	M econ.
session 2	W, B econ.	M psych.	W psych.	M, B econ.*	W econ.	M, B econ.	M econ.	W econ.
session 3	W psych.*	W, B econ.	M econ.	M psych.	W econ.	M psych.	M econ.	M econ.
session 4	M chem.	M research	M NA	M psych	W engr.	M NA	M, B psych	M NA
session 5	M econ.	M econ	W ed.sch.	M NA	M comp.sci	W med.sc.	M, B econ.	M NA
session 6	M townie	W psych.	M NA	W ITC	M engr.	W engr.	M engr.	M ITC

* seemed confused or had trouble with examples