Sequential Bargaining

W. Güth, R. Schmittberger and B. Schwarze: "An experimental analysis of ultimatum bargaining", JEBO 1982.

Ultimatum game a simple representation of alternating offers bargaining, with costly delay (Rubinstein bargaining

- Pie of size M to divide between two players
- Player 1 offers $0 \leq x \leq M$ to Player 2
- Player 2 Accepts $(\pi 1, \pi 2) = (M-x, x)$ or rejects
- If Player 2 rejects the offer, the pie shrinks to $M' < M$
- Player 2 makes offer $0 \leq x' \leq M'$ to Player 1
- Repeat according to number of rounds of the game

Ultimatum game

- Alternating offer bargaining where pie vanishes after 1 round: $M'=0$
- The offer x is a take it or leave it offer (an ultimatum)

Ultimatum Game M=10
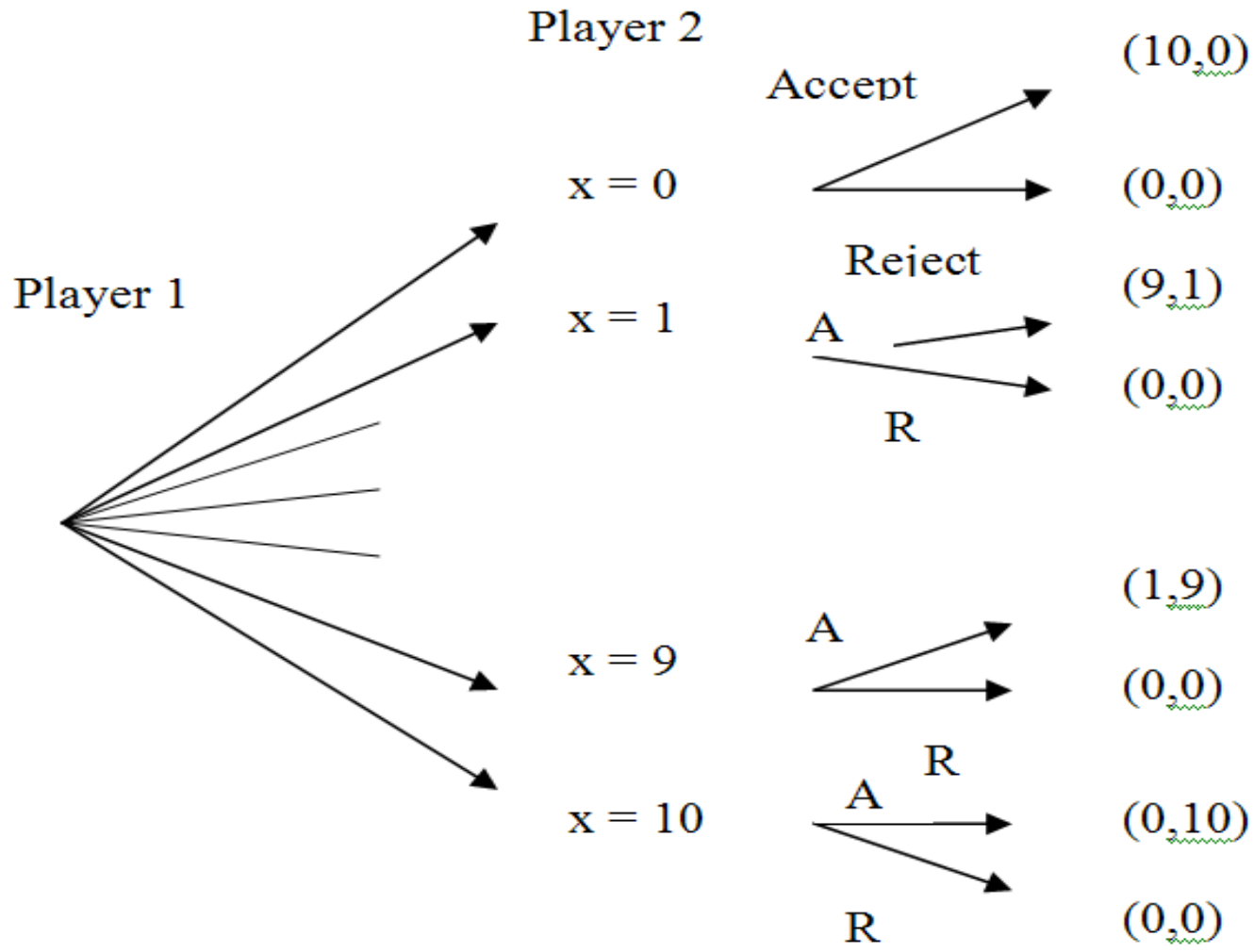
If individuals are rational, and aim to maximize their own monetary payoffs and there is common knowledge of that:

Subgame perfect equilibrium:

(0, 10), or (smallest positive amount, rest)

Results:

- SPE: offer = 0%
- Mean offer: 30%

Interpretation: fairness

- "subjects often rely on what they consider a fair or justified result"
- "the ultimatum can not be completely exploited since subjects do not hesitate to punish if their opponent asks too much"
- If player 1 does not leave a fair amount "and if I do not sacrifice too much I will punish him by choosing conflict"
- Player 1: "I have to leave at least an amount for player 2 so that he will consider the cost of conflict too high"

Economists were "skeptical" of GSS results

- Insufficient experience

- Payoffs too low

- UG specific parameters

- Series of experiments testing for robustness

Binnore et al. '85: 2-period games

- P.E. offer: 25%
- Modal observed offer: game 1 50%
- game 2 25% (role reversal)

Interpretation: 1. "experience" 2. "1-period special case"

Guth & Tietz '88: 2-period games

- A. P.E. offer: 10%
  - Mean observed offer: game 1 - 24%
  - game 2 - 33%
- P.E. offer: 90%
  - Mean observed offer: game 1 - 30%
  - game 2 - 41%

Interpretation: 1. "not experience" 2. "hierarchial decision making: if equilibrium are extreme they are ignored"

Although a lot of general conclusions have been offered at this point, you can't avoid the feeling that a large universe has been sampled at only a few, unsystematically chosen points.

So an obvious next step is to systematically vary some of the variables that have been looked at in isolation—discount factors (and hence perfect equilibrium predictions), and length of game.

This is straightforward to do. The only technical experimental design issue was how to vary the discount factors within members of a bargaining pair. The previous experiments had all used the shrinking pie method to induce the same discount factor for both bargainers.

Ochs and Roth'89

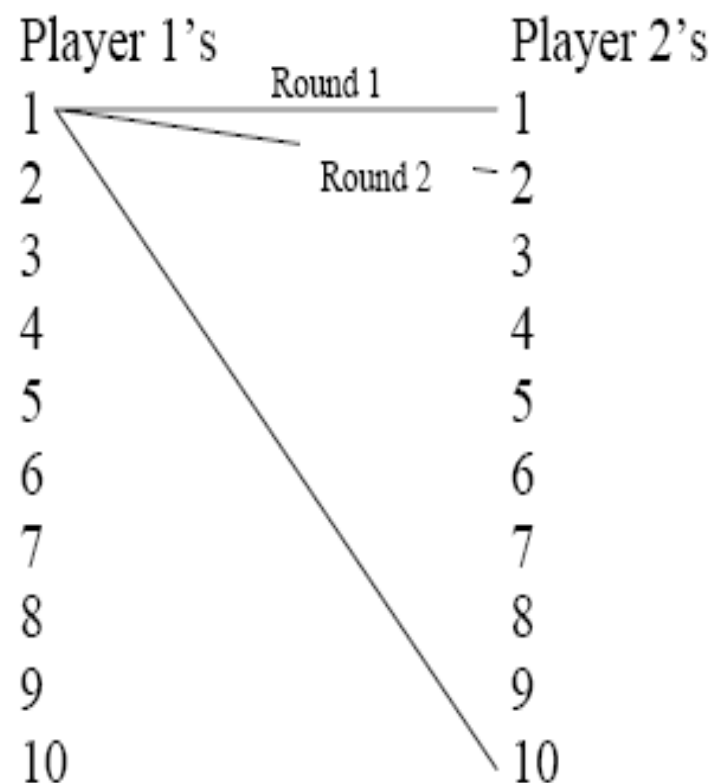TABLE 1—EXPERIMENTAL DESIGN, AND RANGE OF EQUILIBRIUM DIVISIONS

| | Two-Period | | Three-Period | |
	Chips	Money	Chips	Money
$\delta_1 = .4, \delta_2 = .4$	Cell 1: (59,41) to (61,39)	($17.70,$12.30) to ($18.30,$11.70)	Cell 5: (76,24)	 ($22.80,$7.20)
$\delta_1 = .6, \delta_2 = .4$	Cell 2: (59,41) to (61,39)	($17.70,$12.30) to ($18.30,$11.70)	Cell 6: (84,16)	 ($25.20,$4.80)
$\delta_1 = .6, \delta_2 = .6$	Cell 3: (39,61) to (41,59)	($11.70,$18.30) to ($12.30,$17.70)	Cell 7: (77,23) to (76,24)	($23.10,$6.90) to ($22.80,$7.20)
$\delta_1 = .4, \delta_2 = .6$	Cell 4: (39,61) to (41,59)	($11.70,$18.30) to ($12.30,$17.70)	Cell 8: (65,35)	 ($19.50,$10.50)

100 chips: 1 chip=$0.30 in period 1; 10 rounds – same game, different opponents

Note: In the 2 period games, the discount factor of player 1 has no impact in determining the SPE, only in the 3 period games…
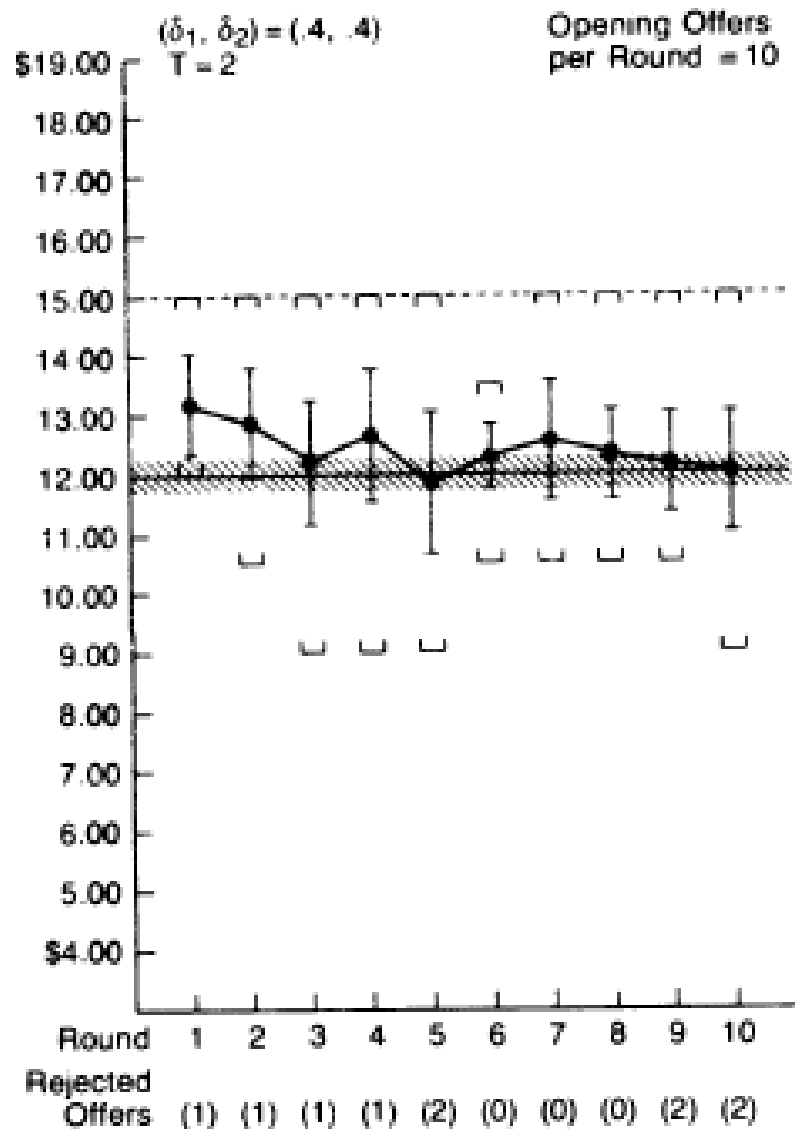
Design of the Experiment: 10-rounds (experience).

- Players do not rotate the roles in order to distinguish fairness from equilibrium prediction
- (Players played with a different anonymous person from round to round by passing written proposal identified by coded ID numbers)
- This kind of design allows us to look at experience without strong repeated game effects. But it raises some econometric issues if you want to use all the data (and not just e.g. look at 10th period data).
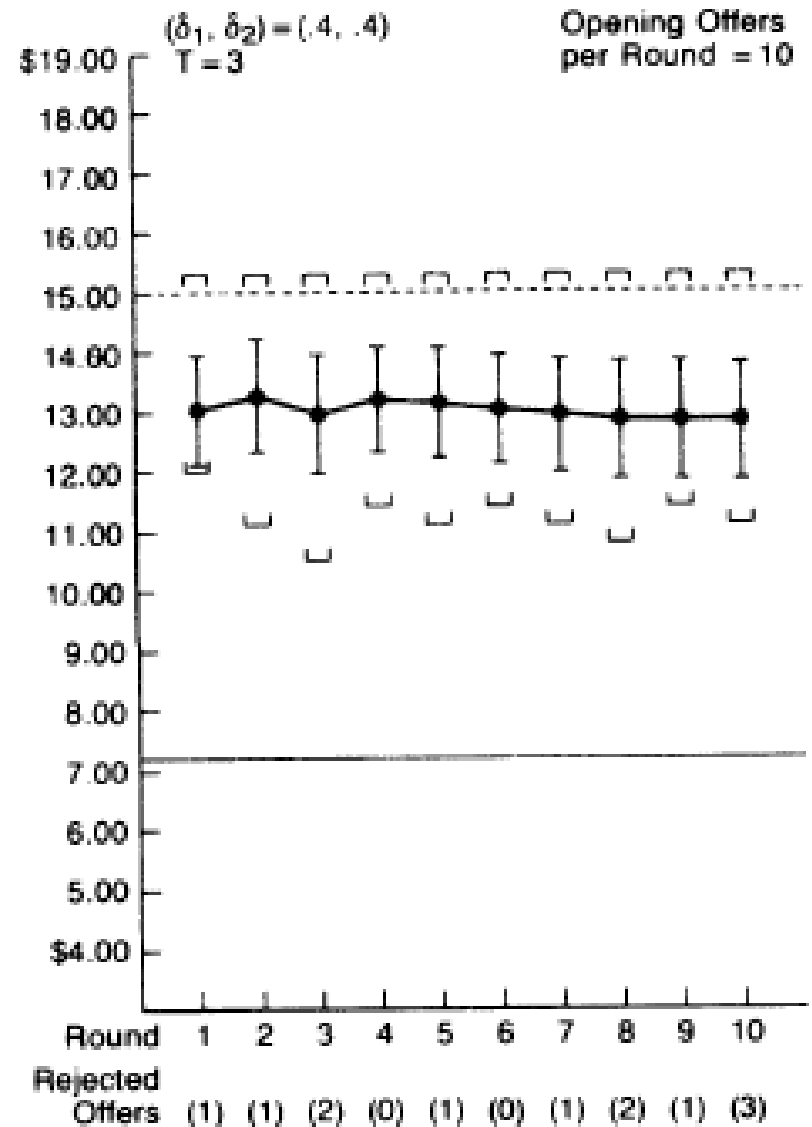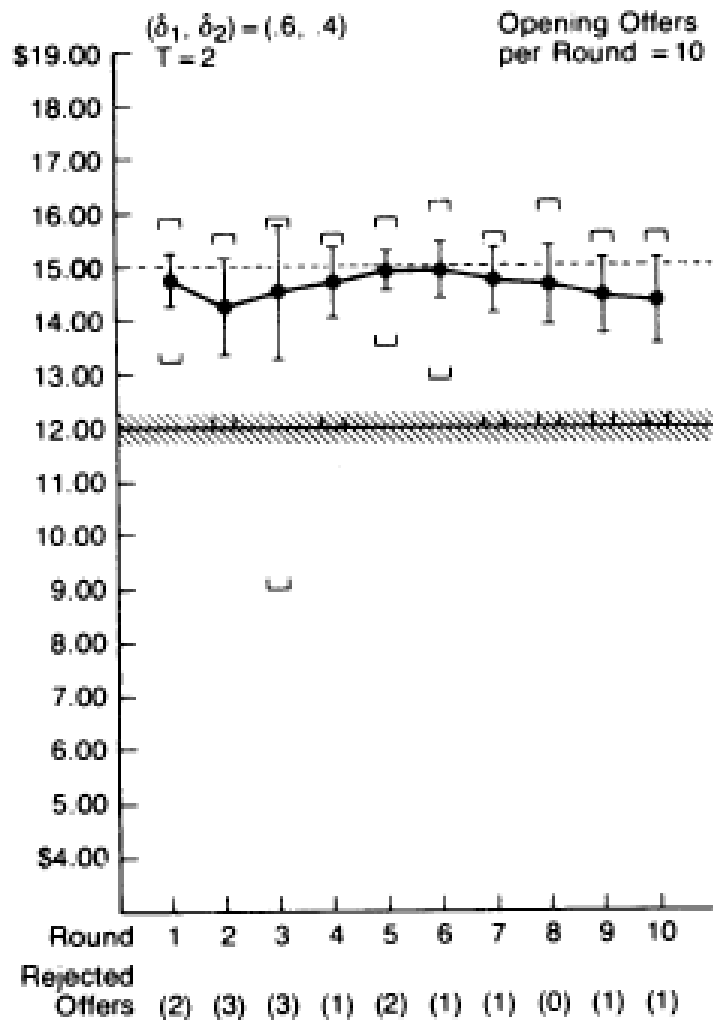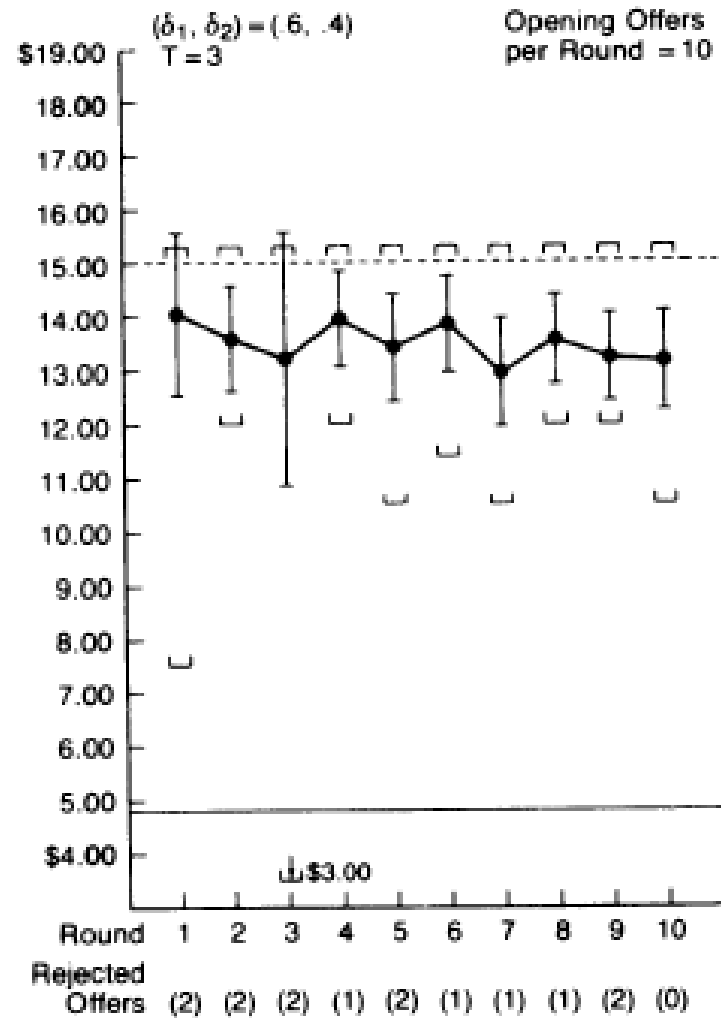
Player 1's   Player 2's
                Round 1
1 ———————————— 1
2   Round 2   ~2
3   3
4   4
5   5
6   6
7   7
8   8
9   9
10   10

OPENING OFFERS TO PLAYER 2

CELL ONE

$(\delta_1, \delta_2) = (.4, .4)$
$T = 2$

Opening Offers per Round = 10

Round	1	2	3	4	5	6	7	8	9	10
Rejected Offers	(1)	(1)	(1)	(1)	(2)	(0)	(0)	(0)	(2)	(2)

CELL FIVE

$(\delta_1, \delta_2) = (.4, .4)$
$T = 3$

Opening Offers per Round = 10

Round	1	2	3	4	5	6	7	8	9	10
Rejected Offers	(1)	(1)	(2)	(0)	(1)	(0)	(1)	(2)	(1)	(3)

CELL TWO

$(\delta_1, \delta_2) = (.6, .4)$
$T = 2$

Opening Offers
per Round = 10

CELL SIX

$(\delta_1, \delta_2) = (.6, .4)$
$T = 3$

Opening Offers
per Round = 10

CELL TWO

Round	1	2	3	4	5	6	7	8	9	10
Rejected Offers	(2)	(3)	(3)	(1)	(2)	(1)	(1)	(0)	(1)	(1)

CELL SIX

Round	1	2	3	4	5	6	7	8	9	10
Rejected Offers	(2)	(2)	(2)	(1)	(2)	(1)	(1)	(1)	(2)	(0)

⌐⌐ $3.00

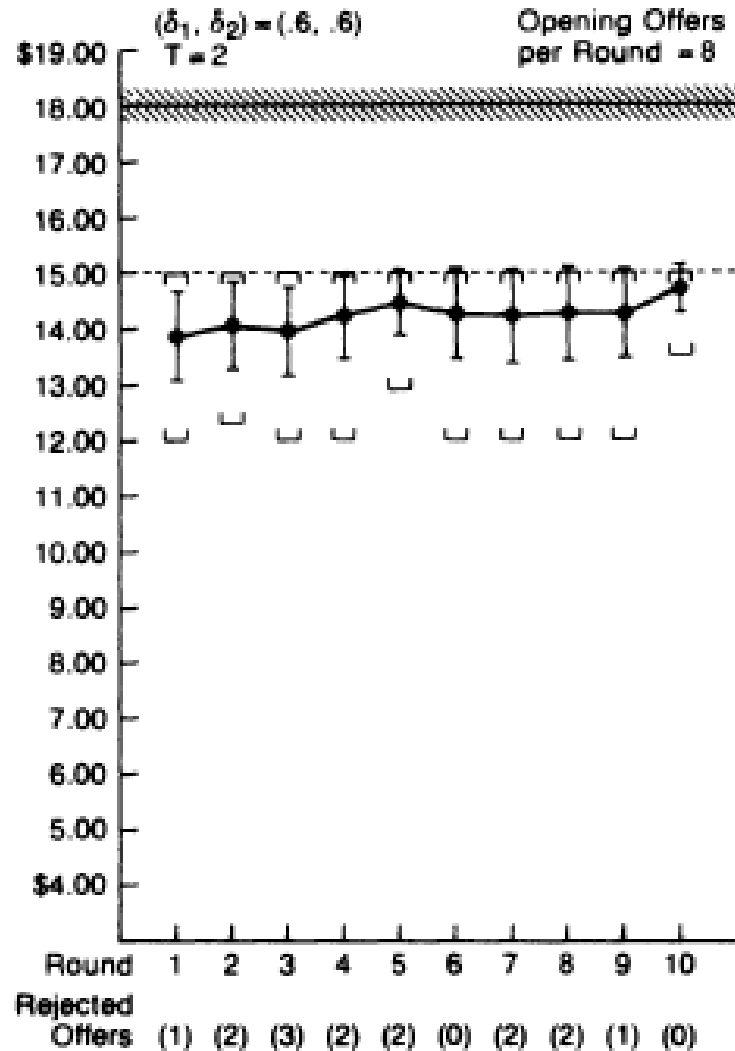**Legend:**

⌐⌐ maximum observed offer
mean plus 2 standard errors
● mean observed offer
mean minus 2 standard errors
⌐⌐ minimum observed offer

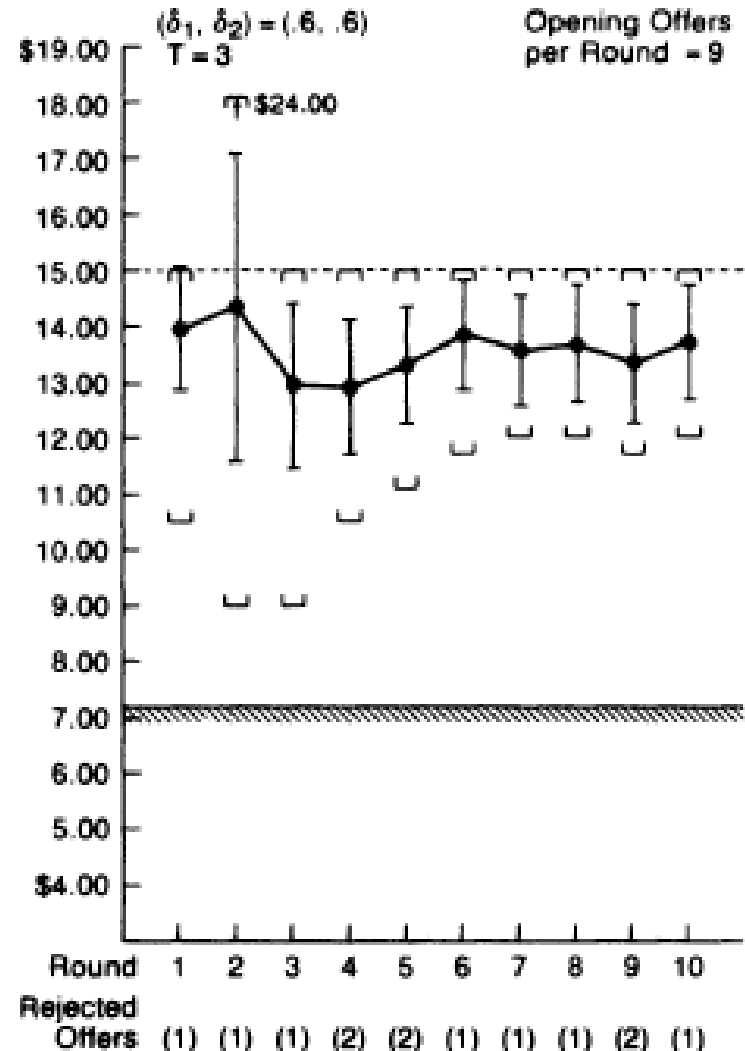---------- equal division

——— perfect equilibrium offer

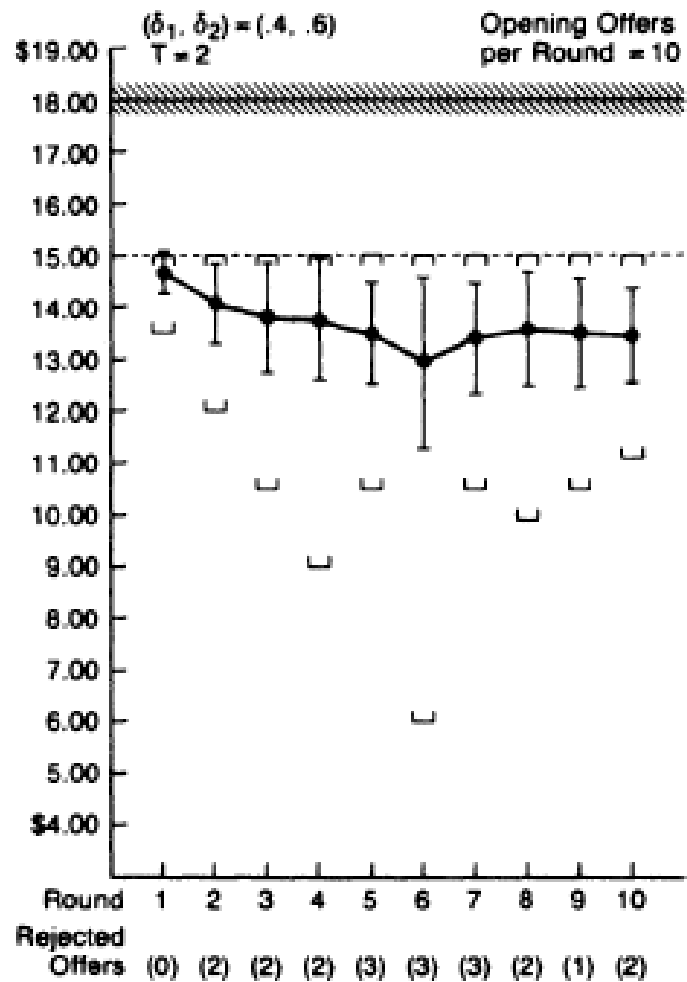▨▨▨ perfect equilibrium interval
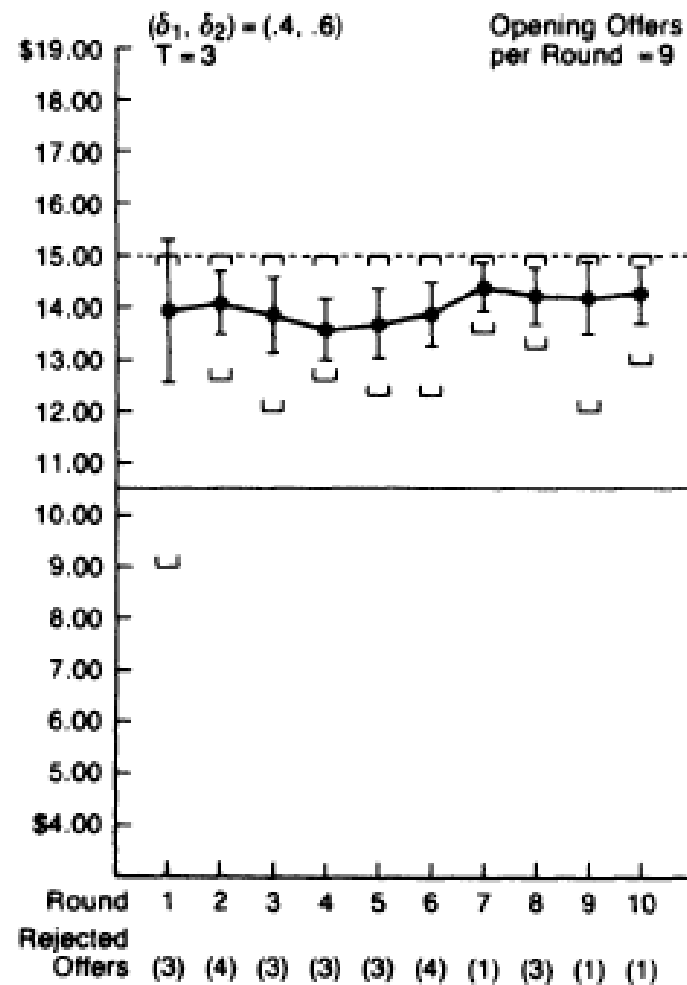
OPENING OFFERS TO PLAYER 2

CELL THREE

$(\delta_1, \delta_2) = (.6, .6)$
T = 2

Opening Offers
per Round = 8

CELL SEVEN

$(\delta_1, \delta_2) = (.6, .6)$
T = 3

Opening Offers
per Round = 9

Round	1	2	3	4	5	6	7	8	9	10
Rejected Offers (Cell Three)	(1)	(2)	(3)	(2)	(2)	(0)	(2)	(2)	(1)	(0)

Round	1	2	3	4	5	6	7	8	9	10
Rejected Offers (Cell Seven)	(1)	(1)	(1)	(2)	(2)	(1)	(1)	(1)	(2)	(1)

CELL FOUR

$(\delta_1, \delta_2) = (.4, .6)$
$T = 2$

Opening Offers
per Round = 10

$19.00
18.00
17.00
16.00
15.00
14.00
13.00
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
$4.00

Round   1   2   3   4   5   6   7   8   9   10
Rejected
Offers   (0) (2) (2) (2) (3) (3) (3) (2) (1) (2)

CELL EIGHT

$(\delta_1, \delta_2) = (.4, .6)$
$T = 3$

Opening Offers
per Round = 9

$19.00
18.00
17.00
16.00
15.00
14.00
13.00
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
$4.00

Round   1   2   3   4   5   6   7   8   9   10
Rejected
Offers   (3) (4) (3) (3) (3) (4) (1) (3) (1) (1)

Legend:
⊓ maximum observed offer
   mean plus 2 standard errors
● mean observed offer
   mean minus 2 standard errors
⊔ minimum observed offer

--------- equal division

——— perfect equilibrium offer

▨▨▨ perfect equilibrium interval

FIGURE 1B. OPENING OFFERS TO PLAYER 2 FOR CELLS THREE, FOUR, SEVEN,
AND EIGHT

Ochs and Roth (1989) :.

- neither the point predictions nor the comparative static predictions made by game theory are supported by the data.

Let's have a look at counterproposals, once the first proposal was rejected.

Disadvantageous counterproposals

	Observations	First-Offer Rejections	Disadvantageous Counterproposals
Ochs & Roth	760	16%	81%
Binmore, Shaked & Sutton	81	15%	75%
Neelin, Sonnenschein & Spiegel	165	14%	65%
Guth, Schmittberger & Schwarz	42	19%	88%

Various Interpretations of Ochs & Roth '89 and Earlier Experiments

Ochs & Roth (1989):

1. Disadvantageous counteroffers show that players have (uncontrolled) non-monetary arguments in their utilities (preferences)
2. So this evidence isn't a test of PE per se.
3. Players appear to behave strategically (e.g. there was some subgame consistency) and they don't appear to "try to be fair" (e.g. means bounded away from 50-50).

Thaler (1988):

1. Non monetary arguments in utilities
2. Game-theory "unsatisfactory" (both as a descriptive and prescriptive tool – e.g. in Ochs & Roth '89 the players who offered nearest to P.E. didn't make the highest profits.)

Guth & Tietz (1990):

1. The uncontrolled elements can't be modeled in the utilities – decision making is hierarchical and doesn't involve tradeoffs between very different considerations. A theory of bargaining must be a theory of "distributive justice" – ie. Of fairness

Kennan & Wilson (1990):

1. The results show the limits of what can be controlled – game-theoretic models of incomplete information have the best chance of organizing the data.

What are potential questions

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- Do stakes matter?
- Does more repetition matter?
- What about different cultures?
- Who is "fair", i.e. why do proposers make fair offers?
- Is it intentions or outcomes that matter?

Stakes

Straub and Murnighan (1995, JEBO) $5 and $100

Hoffman, McCabe and Smith (1996, GEB) $10 UG to $100

- Find: same pattern of results – some subjects reject $30

Foreign countries:

Cameron (1999, EI):

- Indonesia
- Bargain over: pay equivalent to one day and one month
- One game
- No effect of stake

What are potential questions

- Do stakes matter?
- Does more repetition matter?
- What about different cultures?
- Who is "fair", i.e. why do proposers make fair offers?
- Is it intentions or outcomes that matter?

Who is fair?

The ultimatum game does not allow us to determine why we observe offers above 0:

- Does the proposer want to be fair?

- Can the responder use his power to destroy the pie to enforce fairness?

- Forsythe, Horowitz, Savin, and Sefton, 1994 (GEB): "Fairness in Simple Bargaining Experiments"

Dictator and Ultimatum Game

To separate motivations of proposers and responders: Game that is as similar to the ultimatum game as possible, but where the responder cannot express his preferences in any way.

Hence eliminating motivations of responders.

Ultimatum Game: Proposer proposes a division of M (10), responder accepts and division is implemented, or rejects, and M is destroyed, both agents get 0.
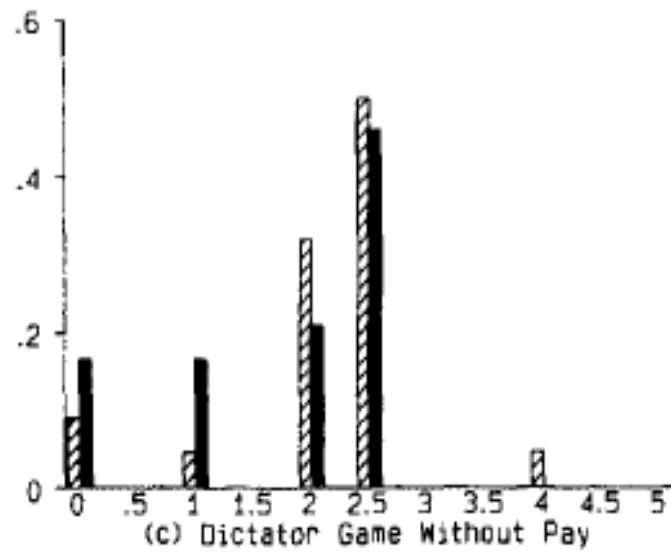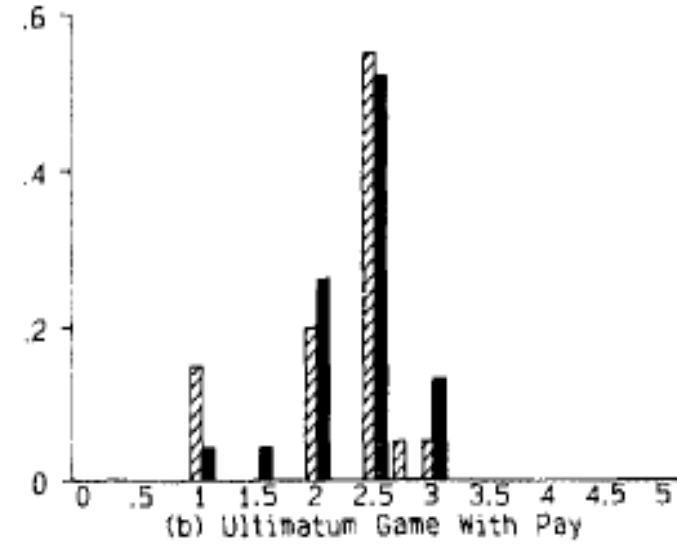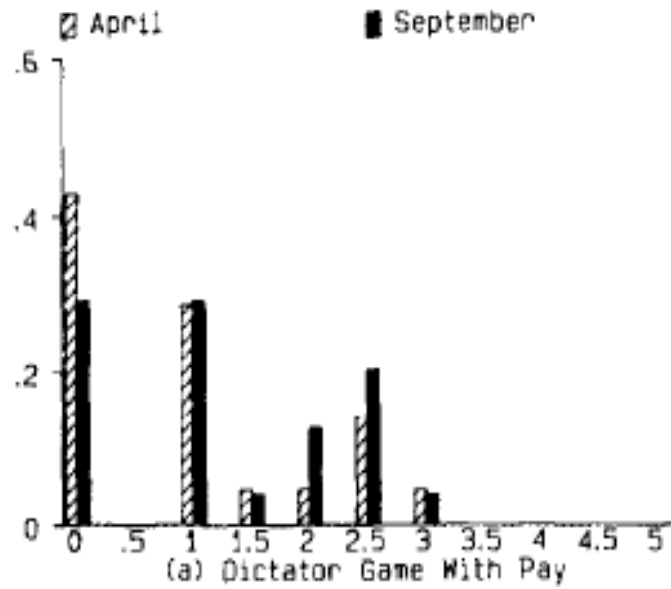
The Dictator Game: Proposer proposes a division of M (10), responder has to accept.

Dictator and Ultimatum Game
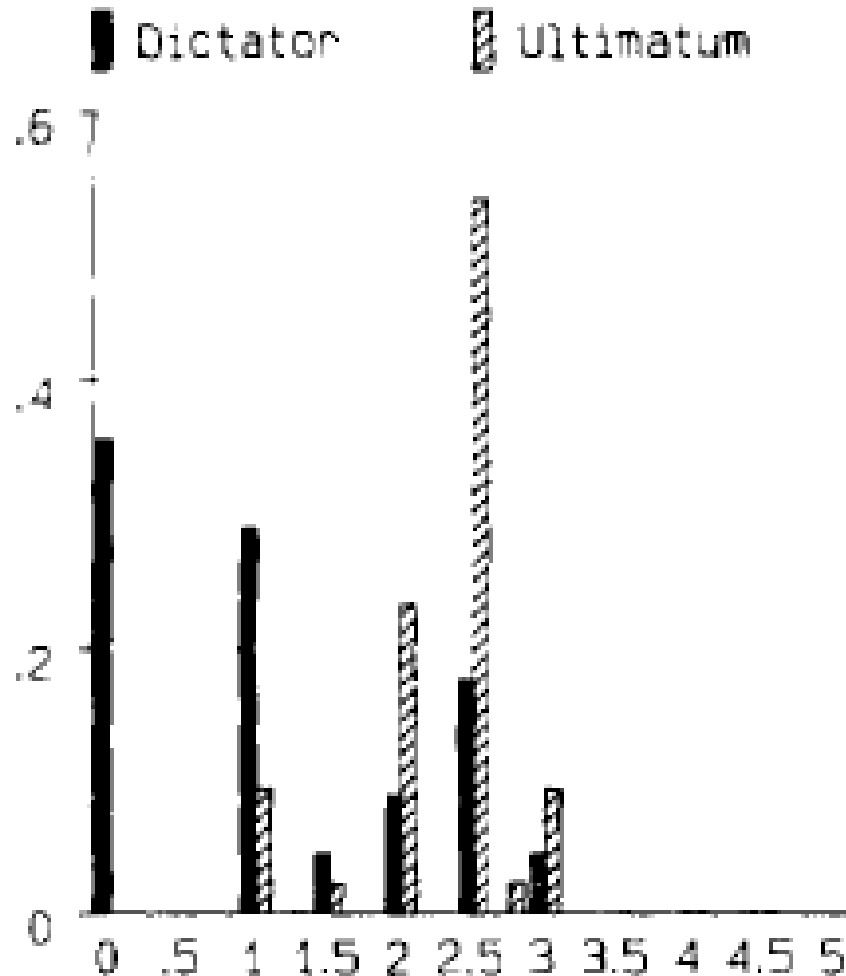
t seems that both motivations of proposers, and responders are contributing to fair outcomes, but responders definitely have a significant role.

Ultimatum and dictator game: with and without payments:
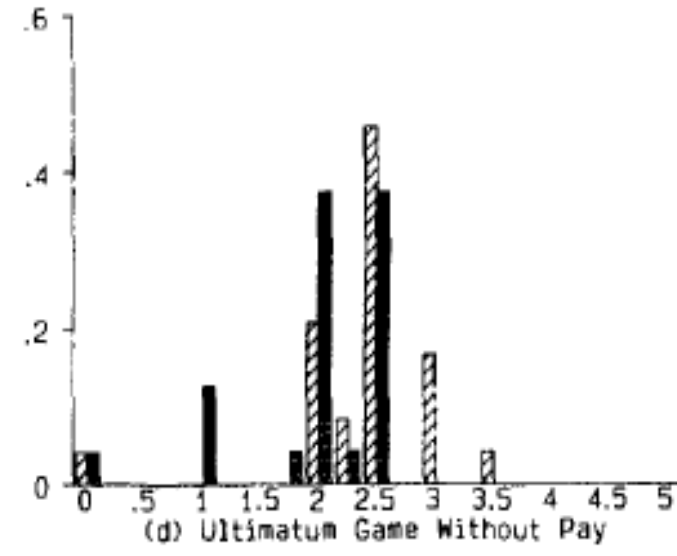
How far does "fairness" extend?

Kagel, John and Katherine Wolfe, "Tests of Fairness Models Based on Equity Considerations in a Three-Person Ultimatum Game," Experimental Economics, vol 4, 2001, pp 203-220.

They have 3 player ultimatum games: Player X allocates $15 between Y and Z. After that, one of the players Y and Z is chosen randomly to decide whether to accept the allocation of X or reject it. In case of rejection, the other (non-chosen) player receives a consolation prize: $0, $1, $3 and $12, and also -$10.

What happens when we have a third player, who gets $12 pie when the responder rejects: No effect.

Suppose a third person receives $-10 when the responder rejects: No effect.

(There are many more variants, many to try out the various fairness models…)

Figure 3
Rejection rates by amount offered to responder
Negative $10 Case
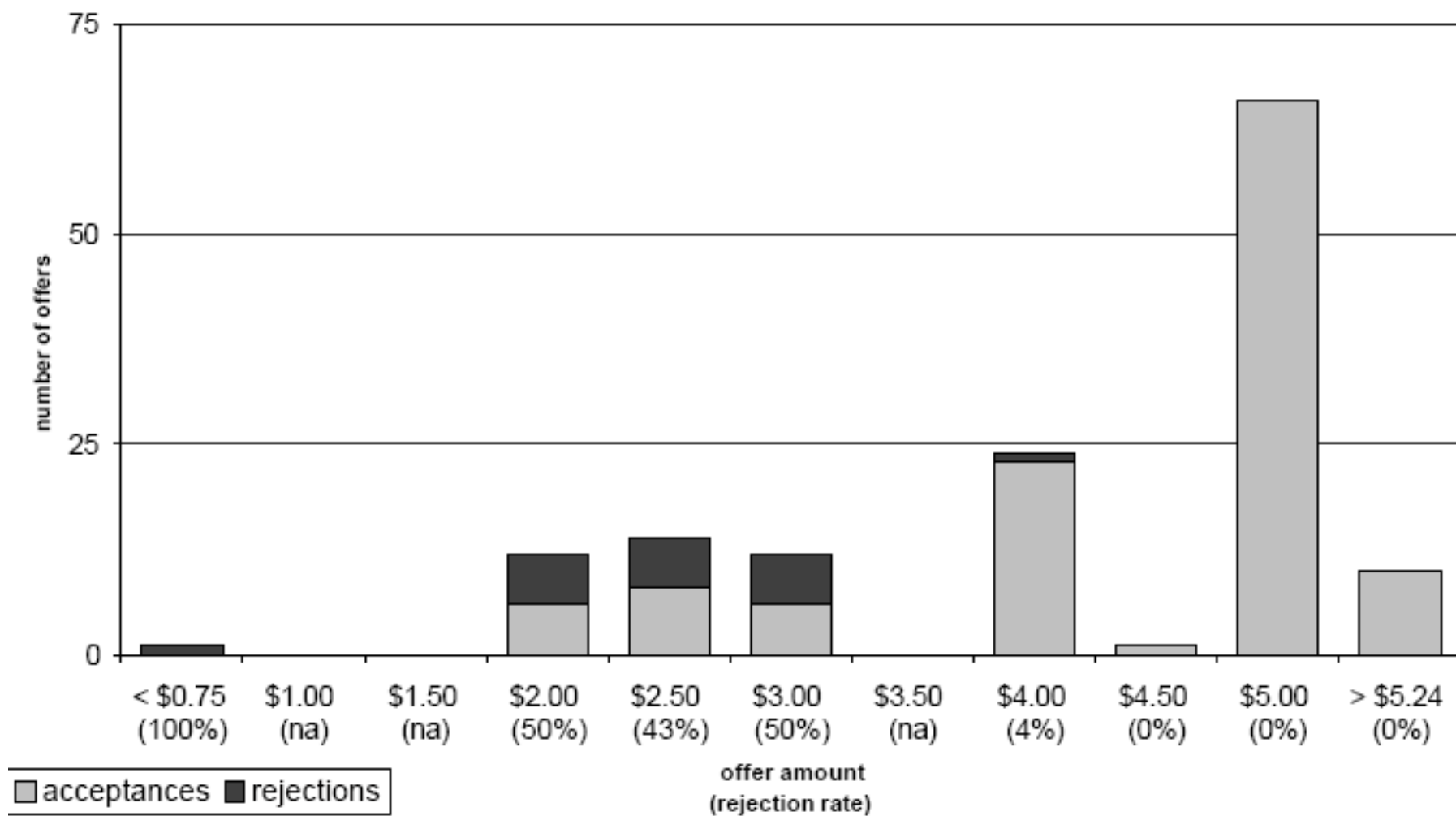
- What happens when the proposer can only make "unfair" offers?
- Falk, Fehr and Fischbacher (1999) look whether "intentions" matter.

unchosen offer (10-x,x)	interpretation of (8,2) offer	how often the (8,2) offer is...	
		rejected	proposed
(5,5)	relatively unfair	.44	.31
(2,8)	not sacrificial	.27	.73
(8,2)	neutral	.18	—
(10,0)	relatively fair	.09	1.00