

Topic 1 and 2 – Bargaining games I and II

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Course in Behavioral and Experimental
Economics

Motivation

Bargaining is one of the central elements in economics.
Experimental economics provides a method to get deeper insights into what shapes humans' bargaining behavior.
Bargaining may be relevant, for instance, in

- markets, when suppliers and customers meet
- bilateral bargaining situations, for instance when two companies negotiate a merger,
- political negotiations (for instance, how to share land, how to reduce pollution, ...)
- ...

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Preview of topic 1

Bargaining games

- + Güth et al. (1982) – The ultimatum game (The "original")
- + Forsythe et al. (1994) – The dictator game
- + Bosman and van Winden (2002) – The power-to-take game
- + Güth et al. (2003) – A newspaper ultimatum game

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The ultimatum game Güth, Schmittberger and Schwarze (1982)

Two-person game with two stages.

The proposer receives an initial endowment of E .

Stage 1: Proposer offers $x \leq E$ to the responder.

Stage 2: Responder either accepts or rejects the offer.

Acceptance: Proposer earns $E - x$.
Responder earns x .

Rejection: Both earn nothing.

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The ultimatum game and “standard” theory

If subjects only care for money, the proposer can offer the smallest possible amount which is, then, accepted by the responder (subgame-perfect equilibrium).

Offering nothing (i.e., $x = 0$) can also be an equilibrium choice if one assumes the responder to accept the offer in case of indifference.

Let's see whether “standard” theory is a good predictor ...

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Güth et al. (1982)

They let subjects decide on the following decision forms (this is for the “easy” games in their design).

Table 1

The form given to subjects engaged in easy games.

The amount c to be distributed is $c = DM \dots$

Player 1 can demand every amount up to $c = DM \dots$

Sign of player 1: ... 1

Decision of player 1: I demand $DM \dots$

Sign of player 2: ... 2

I accept player 1's demand: ...

I refuse player 1's demand: ...

(indicate the decision you prefer by an 'X')

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Forsythe, Horowitz, Savin and Sefton (1994)

Our major objective in this paper is to determine whether nontrivial offers in ultimatum and dictator games can be explained by proposers' concerns with fairness. If nontrivial offers are due solely to proposers' concerns with fairness, the distributions of offers will be the same in the two games. Alternatively, if the distributions differ, other factors must influence offer distributions. The main focus of this paper is on testing the "fairness hypothesis" that the distributions of offers are the same in the ultimatum and dictator games.

Forsythe et al. compare offers in ultimatum games and dictator games.

If offers are identical, then fairness is the crucial explanation for ultimatum-game data. If offers are smaller in dictator games, then strategic motives (like the fear of rejection) play a role as well.

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Forsythe et al. (1994) – Methodological contributions

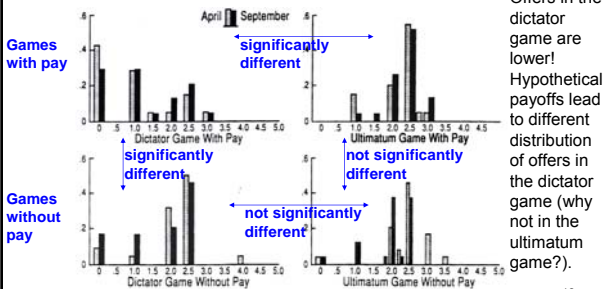
Besides comparing offers in dictator and ultimatum games, Forsythe et al. make two also important methodological contributions.

- 1) They check whether paying subjects makes a difference (payment yes/no as treatment)
- 2) They check whether stake sizes (in moderate variations) make a difference. They study both games with 5\$ or 10\$ as endowments.

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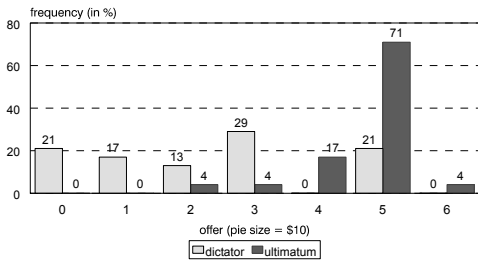
Forsythe et al. (1994) – Results



Offers in the dictator game are lower! Hypothetical payoffs lead to different distribution of offers in the dictator game (why not in the ultimatum game?).

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Forsythe et al. (1994) – Stake effects?

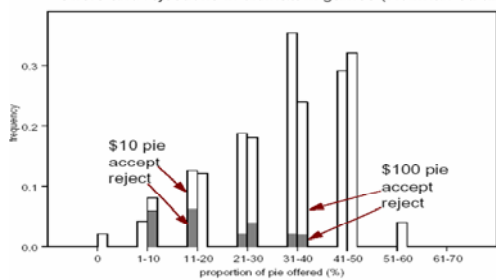


The distribution of offers with 10\$-endowment does not differ from the one with 5\$-endowment, both for dictator and ultimatum games. (c) M. Kocher and M. Sutter

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Hoffman et al. (1994) – Stake effects ...

Offers and rejections in ultimatum games (Hoffman et. al., 1994)



Hoffman et al. (1994) study ultimatum games with 10\$ and 100\$ endowments. Offers are pretty much the same (see also Slonim a. Roth, 1998). (c) M. Kocher and M. Sutter

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Subject pool effects – A newspaper experiment

- Most bargaining experiments are run with university students. Would other subjects behave differently?
- Güth, Schmidt and Sutter (2003) invited readers of *Berliner Zeitung* in May 2001 to participate in an ultimatum game.
- The framing was that an old aunt had left 1000DM to her niece (Charlotte) and nephew (Friedrich), subject to that they agree on the distribution of the money via ultimatum bargaining. Charlotte is proposer.

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Güth et al. (2003) – Method

- Use of strategy method (including expectations):
 - Each participant had to choose in the role of proposer (Charlotte) one out of 9 possible demands (ranging from 100DM to 900 DM).
 - In the role of responder (Friedrich), each participant had to indicate “accept” or “reject” for each of the 9 possible distributions of money.
- Participation via
 - Letter
 - Fax
 - Internet

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Güth et al. (2003) – Results proposers

Table 3: Actual and expected demands of proposer (Charlotte) – aggregate data

own demand in DM	actual demands (relative frequency in %)	expected demands (relative frequency in %)
100	0.6	0.1
200	0.0	0.1
300	0.5	0.5
400	2.7	1.8
500	50.0	49.1
600	22.4	22.1
700	9.1	15.9
800	3.8	3.8
900	10.9	6.6
average demand (N = 1035)	589.57	588.12

Proposers demand on average 59% of the pie. The modus is again the 50:50 split.

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Güth et al. (2003) – Results responders

Table 4: Actual and expected decisions as responder (Friedrich) - aggregate data

offer of	actual acceptance rates (relative frequency in %)	expected acceptance rates (relative frequency in %)
100	34.9	17.3
200	40.8	23.3
300	57.0	48.8
400	79.2	72.6
500	98.1	97.2
600	94.3	94.4
700	92.6	94.0
800	90.7	92.8
900	90.6	92.3

Note the high acceptance rate of a 10%-offer, and the non-monotonic increase in acceptance rates with increasing offers.

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The power-to-take game

- Two-person game between a “Take authority” and a “responder”.
- Both have an initial endowment (which may vary in real-effort experiments).
- Two stages:
 - Take authority decides how much of the responder’s endowment is to be transferred to the take authority (take rate in %).
 - Responder can react by destroying (part of) his endowment (destroy rate in %). The take rate applies to the remaining endowment.

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Bosman and van Winden (2002)

- Subjects had to earn their endowment in a computer-task. Ultimate endowments ranged from 13.5 to 15 guilders.
- Take authorities indicate take rate on decision form.
- Responders receive decision form and decide on destroy rate.
- Both players are asked about their emotions (and also ex-post expectations).
- N = 78 participants (i.e., 39 pairs)

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Bosman and van Winden (2002) – Results

Table 1
Summary of Individual Data

Case no.	Y_{take}	Y_{resp}	t (%)	d (%)	Case no.	Y_{take}	Y_{resp}	t (%)	d (%)
1	15	15	0	0	21	15	15	70	0
2	15	15	0	0	22	15	15	20	0
3	15	12	0	0	23	15	15	70	0
4	15	13.5	25	0	24	15	13.5	70	90
5	15	15	30	0	25	15	15	70	0
6	15	15	30	0	26	15	15	70	0
7	15	15	30	0	27	15	15	70	0
8	15	15	35	0	28	15	15	70	100
9	15	15	40	0	29	15	15	70	100
10	15	15	50	0	30	15	15	70	0
11	15	15	50	0	31	15	15	70	0
12	15	15	50	0	32	15	15	75	100
13	15	15	50	0	33	15	15	75	0
14	15	13.5	60	0	34	15	15	80	0
15	15	15	65	0	35	15	9	80	99
16	15	15	65	0	36	15	13.5	80	100
17	15	15	65	0	37	15	15	90	100
18	15	15	65	0	38	15	15	90	0
19	15	15	66	0	39	15	15	100	100
20	15	15	66.7	0					

Note: Y_{take} denotes the effort/task income of the take authority, Y_{resp} the effort/task income of the responder, t the take rate and d the part of Y_{resp} destroyed by the responder. Cases are ordered by the take rate.

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The mean take rate is 58.5%, the median 66%, the mode 70%.

The robustness of bargaining results (Camerer, 2003)

- Robustness of results is an important issue in experimental economics (external validity).
- The ultimatum game is the perfect game to study robustness because it is probably game that has been studied most often.
- Several interesting dimensions: (i) methodological variables, (ii) demographic variables, (iii) culture, (iv) descriptive variables, (v) structural variables.

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The robustness of bargaining results (Camerer, 2003)

Table 2: Frequencies of ultimatum offers

References	no. of	Offer frequencies								Mean offer	Signif. note Comments	
		0	1-10	11-20	21-30	31-40	41-50	51-60	61-100			Other
Belton and Smith (1988)												
cardinal utilities	4	20	< 40							24	a	offer rejected from distribution (2%)
Indonesian rupiah	406	38								45	b	
Indonesian rupiah	2258	37								42	a	
Charness (1994)												
Indonesian rupiah	58	18	46	32	12	10	20	34	33	42	a	"spontaneous" excluded
Indonesian rupiah	406	38								45	b	
Indonesian rupiah	2258	37								42	a	
Charness (1994)												
Indonesian	10	30	40	34	34	33	33	37	37	36	a	data from working individual
Indonesian	10	28	40	32	33	33	33	37	37	36	b	
Charness and Rappoport (1991)												
Indonesian	5	46	41	31	31	34	34	21	31	31	a	students estimated
Indonesian	5	46	41	31	31	34	34	21	31	31	a	from 1990s
Charness, McClure and Smith (1994)												
PIIIII	10	24								34	a	
Control	10	24								31	b	
PIIIII	100	27	44							34	a	
Control	100	23								33	b	
Charness, Rappoport and Schmeidler (1992)												
Native	6-10	21	35							37	a	Payment in marks & not 12 games repeated
Expatriates	6-10	21	35							35	b	
Chen, Fehringer, Ockenfels and Rind (1991)												
Pittsburgh, Round 1	10	10								36	a	
Pittsburgh, Round 2	10	10								32	a	
Yugoslavia, Round 1	10	10								32	a	Payment in dollars
Japan, Round 1	2000	20								42	a	Payment in yen
India, Round 1	10	10								37	a	Payment in rupees
Pittsburgh, Round 10	10	10								45	a	
Pittsburgh, Round 20	10	10								45	a	
Yugoslavia, Round 10	4000	10								47	a	Payment in dollars
Japan, Round 10	2000	10								48	a	Payment in yen
India, Round 10	10	10								35	b	Payment in rupees

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The robustness of bargaining results (Camerer, 2003)

Table 3: Frequencies of ultimatum offers (continued)

References	no. of	Offer frequencies								Mean offer	Signif. note Comments	
		0	1-10	11-20	21-30	31-40	41-50	51-100	Other			
Fehringer, Henning, Rind and Rind (1991)												
with pen	10	24								47	a	
with map	1	41								41	a	
Control	10	28								31	a	from another date
Hoffman, McClure, Shachat and Smith (1994)												
PIIIII	10	24								34	a	
Control	10	24								31	b	
PIIIII	100	27	44							34	a	
Control	100	23								33	b	
Hoffman and McClure (1991)												
Uganda (Round 1)	20	16								44	a	MA/UC/1 report
Uganda (Round 10)	20	16								33	b	Round 10 only
Uganda (Round 1)	20	16								48	a	
Uganda (Round 10)	20	16								34	b	
Lavrich and Rind (in press)												
Uganda (Round 1)	1	81	12							38	a	1/1 panel; see R. Lavrich language
Uganda (Round 1)	1	86	8							43	a	Figure (table 1)
Margolis, Rind, and Rind (1994)												
Uganda (Round 1)	10	10								31	a	make 8 offers
Uganda (Round 10)	10	10								34	b	2 repeated offers
Uganda (Round 1)	10	10								37	a	offer was rejected
Uganda (Round 10)	10	10								37	a	offer was rejected
Margolis, Rind, and Rind (1991)												
Uganda (Round 1)	10	10								38	a	from 1991
Uganda (Round 10)	10	10								38	b	from 1991
Shachat, Witt and Rappoport (1994)												
one stage	10	17								45	a	
two stage	10	18								45	a	
Smith and Roth (1994)												
low stakes	4000	24								41	a	
medium stakes	2000	24								42	a	
high stakes	2000	24								42	a	
Lee and Ochs (2000)												
low stakes	400	100								34	a	offer 20% to high stake
high stakes	400	79								32	a	(11,20) interval

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Methodological variables

- **Repetition** (e.g., Roth et al., 1991; Bolton and Zwick, 1995; Slonim and Roth, 1998; List and Cherry, 2000): usually small and insignificant tendency of offers and rejection rates to fall; Harrison and McCabe (1996) show that information about all offers and MAOs in the population drives down offers and MAOs.
- **Stakes** (e.g., Roth et al., 1991; Cameron, 1999): weak effects, for instance, in Cameron (5K, 40K and 2000K rupiah in Indonesia) on both players.
- **Anonymity and experimenter 'blindness'** (e.g., Hoffmann et al., 1994): 'double-blind' has a significant effect.

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Methodological variables

Table 7: Ultimatum offers at different stakes

Reference	no. of Experimental condition Amount paid to D	Offer frequencies							Mean Offer	sigif. code	Comments	
		1-10	11-20	21-30	31-40	41-50	51-60	61-100				
Cameron (1999)												
Indonesian rupiah	5K 101	.08	.02	.12	.06	.20	.28	.03	.11	.42	a	"problems" excluded
Indonesian rupiah	40K 35			.17	.17	.43			.03	.43	b	
Indonesian rupiah	200K 37	.03	.03	.03	.08	.24	.17	.03		.42	a	
Hoffman, McCabe and Smith (1994)												
FHSS Replication	10 24				.11	.25	.32			.44	a	
FHSS Replication	100 27	.04			.08	.25	.32	.07		.44	a	
Control	10 24		.08	.25	.40	.33	.08			.31	b	
Control	100 23		.17	.26	.48	.22	.11			.32	b	
Roth, Praschker, Okuno-Fujiwara and Zamir (1991)												
Pittsburgh, Round 1	10 27		.04	.11	.22	.38	.04		.04	.47		
Pittsburgh, Round 1	30 10						.40	.20		.52		
Forsythe, Horowitz, Savin and Sefton (1994)												
with pay	5 43		.09	.02	.23	.42	.11			.45	a	
with pay	10 24		.06	.04	.17	.12	.04			.47	a	
without pay	5 48		.04	.06	.21	.14	.08		.02	.44	a	two sessions different
Slonim and Roth (1998)												
low stakes	600K 240		.01	.03	.10	.29	.06			.43	a	
medium stakes	3000K 130		.04	.07	.20	.46	.07			.42	a	
high stakes	15000K 250		.01	.06	.04	.12	.49	.07		.43	a	
List and Cherry (2000)												
low stakes	820 290		.28	.10	.17	.36	.09		.34	a	offers<25% in	
high stakes	480 270		.27	.17	.17	.34	.04		.32	a	(11/20) interval	

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Methodological variables

Table 8: Rejection frequencies at different stakes

Reference	no. of Experimental condition Amount paid to D	Conditional rejection frequencies							Rejection rate	sigif. code	Comments
		1-10	11-20	21-30	31-40	41-50	51-60	61-100			
Cameron (1999)											
Indonesian rupiah	5K 101	1.00	1.00	0.75	1.00	.58	.03	0	0	.17	
Indonesian rupiah	40K 35				.40	.17	0	0	0	.09	
Indonesian rupiah	200K 37	1.00	1.00	1.00	0	0	.05	.00	.00	.12	
Hoffman, McCabe and Smith (1994)											
FHSS Replication	10 24				.33	.11	.00			.08	
FHSS Replication	100 27				.00	.14	.00	.00		.04	
Control	10 24		.00	.50	.00	.00	.00	.00		.13	
Control	100 23		.75	.00	.33	.00	.00	.00		.21	
Roth, Praschker, Okuno-Fujiwara and Zamir (1991)											
Pittsburgh, Round 1	10 27		.00	.07	.17	.07	.00	1.00	.19		
Pittsburgh, Round 1	30 10						.25	.00		.20	
Forsythe, Horowitz, Savin and Sefton (1994)											
with pay	5 43		.50	.00	.10	.00	.00	.00	.07	a	
with pay	10 24		.00	.00	.25	.00	.00	.04	a		
Hoffman, McCabe and Smith (1994)											
FHSS Replication	10 24				.33	.11	.00			.08	
Control	10 24		.00	.50	.00	.00	.00	.00		.13	
FHSS Replication	100 27				.00	.14	.00	.00		.04	
Control	100 23		.75	.00	.33	.00	.00	.00		.21	
Slonim and Roth (1998)											
low stakes	600K 240		1.00	.67	.42	.11	.07		.18	a	
medium stakes	3000K 130		.85	.33	.17	.07	.05		.10	b	
high stakes	15000K 250		.50	.54	.07	.03	0		.14	b	
List and Cherry (2000)											
low stakes	20 290		.72	.43	.30	.13	.12		.35	a	
high stakes	480 270		.55	.28	.17	.08	0		.25	b	

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Demographic variables

- **Gender** (lots of studies): Women are not 'nicer' but there might be more subtle effects (Andreoni and Vesterlund, 2001: interaction with price of altruism; Sutter et al., 2006: gender pairing matters). One important issue is how/whether gender is made public among participants.
- **Race**: Stereotypes seem to play a role; see Fershtman and Gneezy (2001) later.
- **Academic major**: mixed effects even for 'optimal' differences such as nurses vs. MBA students; differences are probably self-selection effects into education.
- **Age**: Younger children are closer to the self-interest prediction of game theory than virtually any adult group – see later (Sutter and Kocher, 2007).

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Some more exotic influences

- **High testosterone** players are more likely to reject offers but also more likely to make generous offers (Burnham, 1999).
- A **'beauty premium'** has been established for bargaining games (important for labor markets): Men in the study of Schweitzer and Solnick (1999) were not especially generous towards attractive (though unknown) women, but women offered about 5% more to attractive men than to unattractive men (actually, the average offer is 50.7% - the only study that found an average offer above the equal split for one experimental group).

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Culture

- Difficulties with cross-cultural experiment: stakes, language, experimenter effects, confounds with culture
- **Roth et al. (1991)**: Japanese and Israeli closer to standard equilibria.
- **Henrich et al. (2001, 2002)**: Started with Machiguenga in Peru (close to game theoretic equilibria) and grew to a large endeavor of economists and anthropologists. Two important explanatory variables for behavior: (i) the amount of cooperative activity in production (for instance, in hunting), (ii) market integration (national language, labor market for cash wages, farming crops for cash): both positive related with more equal-split offers.

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Culture



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Culture

Table 9: Summary of Ultimatum Bargaining Games

Group	Country	N	Stake Size	Mean	Mode (%sample)	Std. Dev.	% Rej. of $\le 20\%$
Machiguenga	Peru	21	2.3	.26	.15 (25/72%)	.14	.048
Hadza (small)	Tanzania	79	1	.27	.20 (38%)	.15	.28
Tsimane'	Bolivia	70	1.2	.37	.50/.30/.25 (65%)	.19	0
Qachana	Ecuador	13	1	.27	.25 (47%)	.16	.15
Torguud	Mongolia	10	8	.35	.25 (30%)	.09	.05
Khazax	Mongolia	10	8	.36	.25	.09	
Mapuche	Chile	30	1	.34	.50/.33 (46%)	.18	.67
Au	PNG	30	1.4	.43	.30 (33%)	.14	.27
Gnao	PNG	25	1.4	.38	.40 (32%)	.19	.40
Hadza (big)	Tanzania	26	1	.40	.50 (28%)	.17	.19
Sangu (small)	Tanzania	20	1	.41	.50 (35%)	.12	.23
Unsettled	Zimbabwe	31	1	.41	.50 (50%)	.14	.10
Achuar	Ecuador	16	1	.42	.50 (36%)	.2	0
Sangu (large)	Tanzania	20	1	.42	.50 (40%)	.09	.05
Orma	Kenya	56	1	.44	.50 (54%)	.092	.04
Pittsburgh	U.S.	27	.28	.45	.50 (52%)	.096	.22
Resettled	Zimbabwe	86	1	.45	.50 (70%)	.10	.07
Los Angeles	U.S.	15	2.3	.48	.50 (66%)	.065	0
Ache	Paraguay	51	1	.51	.50/.40 (75%)	.15	0
Lamalera	Indonesia	19	10	.58	.50 (63%)	.14	.20

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Descriptive variables

- Different forms of labeling and framing usually have modest but significant effects.
- Loaded terms like 'seller' and 'buyer' promotes self-interested decision, whereas emphasizing the joint result by words like 'partner' promotes more generous behavior.

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Structural variables I

- Identification and communication promote more generous offers, whereas entitlements on the endowment generates lower offers but not rejections (potential self-serving bias of judgments regarding the legitimacy of entitlements).
- Competitive pressure as an excuse to offer low amounts and outside options making create more difficulties regarding focal points.
- Information asymmetries (which make the assignment of intentions impossible) are usually exploited.

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Structural variables II

- Multi-person games: e.g. Güth and van Damme (1998) combine an ultimatum game with a dictator game; in Roth et al. (1991) nine proposers make offers to a single responder who can choose.
- Intentions: Low offers made by computers are less often rejected than low offers from human players (Blount, 1995). Mini-ultimatum games (Falk et al., 2004).

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Structural variables III

Table 10: Ultimatum games with varying unchosen paths, Falk et al (1999)

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

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