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The Impact of Fairness on Decision Making - An Analysis of Different Video Experiments

by

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The Impact of Fairness on Decision Making – An Analysis of Different Video Experiments

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Abstract
Experimentally observed deviations of behavior from game theoretic predictions suggest that fairness does influence decision making. Fairness in the sense of *equality* has become an essential element of economic models aiming at explaining actual behavior (cf. Fehr/Schmidt 1999, Bolton/Ockenfels 2000). In this paper I will argue that equality is not the only fairness norm to be taken into account. Conditional on the game subjects are playing there may be more equity norms than equality, including inequality of payoffs. Since inequitable payoff allocations are advantageous for one player and disadvantageous for the other, opponents may suffer from a self-serving bias in fairness judgments making an agreement impossible. Subjects in the stronger position may exhibit *equality* aversion whereas players in the weaker position show *inequality* aversion.

Drawing on experimental results using the video method (Hennig-Schmidt 1999) I further show that in a bargaining experiment behavior is goal-oriented; fairness criteria based on equity norms are reference points that influence the decision process which finally leads to observed outcomes.

I analyze video experiments of the ultimatum game (Güth/Schmidtberger/Schwarze 1982; Sadrieh/Osterholt 1998), the tripled take game (Sadrieh/Hennig-Schmidt 1999), and an alternating offer bargaining game (Selten 1981; Hennig-Schmidt 1999).

Keywords: experimental economics, video experiments, fairness, equity principle, self-serving bias, aspiration levels, decision making

JEL Classification Number: C7, C90, C92

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1. Introduction

Fairness in the sense of equality is an essential element of economic models that aim at explaining observed behavior in experiments which deviates from game theoretic predictions. Two examples of recent models taking into account interpersonal motivations are Fehr/Schmidt (1999) and Bolton/Ockenfels (2000). Fehr/Schmidt's model rests on the postulate of inequality aversion. Utility is dependent on the player's own payoff and on the difference between players' payoffs; deviations from equality play a crucial role in this model. The premise in Bolton/Ockenfels' model is that together with the absolute payoff the relative payoff motivates people. The authors stress that equal division has collective significance; it is referred to as the social reference point.

In this paper I will argue that equality is not the only fairness norm to be taken into account. Conditional on the game subjects are playing there may be more equity norms than equality, including *inequality* of payoffs. Since inequitable payoff allocations are advantageous for one player and disadvantageous for the other, opponents may adhere to different fairness norms making an agreement impossible. Subjects in the stronger position may exhibit *equality* aversion whereas players in the weaker position show *inequality* aversion.

A second purpose of my paper is to describe how actual behavior is influenced by fairness norms. Drawing on experimental results using the strategy and the video method (cf. Selten/Mitzkewitz/Uhlig 1997, Hennig-Schmidt 1999) I will criticize the optimization approach dominant in modern economic modeling. Analyzing a bargaining experiment I will show that behavior is goal-oriented; fairness criteria based on equity norms are reference points that influence the decision process which finally leads to observed outcomes.

In this paper I analyze three experiments in which one or more fairness norms may prevail. Subjects' task is to agree on the allocation of a sum of money. The method I use to support my argumentation is the video method which gives valuable information in addition to what computer or paper and pencil experiments are able to yield and which can hardly be obtained by another method The paper is organized as follows: In section 2 experimental method and design are explained, in section 3 I describe the games played in the experiments. In section 4 results are stated with regard to the existence of different fairness norms and their influence on decision behavior. In the final section 5 I conclude.

2. Method and Experimental Design

Computer-, paper-and-pencil experiments and questionnaire studies usually document only decisions. The video method which was introduced by Hennig-Schmidt (1999) has the advantage that the *process* of decision making can be made visible by having subjects play together in a group. They have to solve a common task and the in-group discussions of their decisions are video taped. These are transcribed word for word into text protocols. The transcripts and the video tapes are the basis for evaluation.

Since subjects act together in groups they argue spontaneously. By recording these discussions the video method allows to gain non-numerical behavioral data which are relevant in many experiments and which often are incompletely reflected in the final outcomes, if at all. For our analysis the discussions of different notions of fairness are important. Subjects are not explicitly asked for their fairness perception because we did not want to draw their attention to this point of our interest.

I analyze video experiments of a one-shot ultimatum game – UG – (Güth/Schmidtberger/-Schwarze 1982; Sadrieh/Osterholt 1998), a one-shot tripled take game – TTG – (Sadrieh/-Hennig-Schmidt 1999), and an alternating offer bargaining game – BG – (Selten 1981; Hennig-Schmidt 1999). All games are two-player games between players A and B. Except for the bargaining experiment the *strategy method* (Selten 1967) has been applied where players have to report a decision for every possible allocation. We wanted to force players to discuss *all* possible allocations in order to have a chance of detecting characterizations of different fairness notions. Players have been fully informed on all features of the experimental design. There was no face-to-face contact between the groups, only the decisions have been transmitted via the experimenter. Experiments have been run in the Bonn Laboratory of Experimental Economics.

3. Experiments

3.1 The Ultimatum Game

In the UG video experiment player A is endowed with 10 units of money which he can allocate between himself and player B who has an endowment of 0. A decides on the amount $x \in \{0,...,10\}$ to be sent to player B. Simultaneously and independently player B decides on an acceptance limit $y \in \{0,...,10\}$ for the amount x she is willing to accept. For $x \geq y$ A receives the payoff $10-x$, and B receives x. For $x<y$ both receive nothing.

The game theoretic solution of this game is that B accepts any amount A can send her since she is equally well or worse off when rejecting. Thus $x=0$ and $y=0$ is the only equilibrium point in strictly undominated strategies.

3.2 The Tripled Take Game

In the TTG video experiment player B is endowed with 12 monetary units, player A has an endowment of 0. B decides on an acceptance limit $y \in \{0,...,12\}$ for the amount x which A can take away from her. Simultaneously and independently player A is deciding on the amount $x \in \{0,...,12\}$ he is taking away from B. For $x \leq y$ B receives the payoff $12-x$, and A receives $3x$. For $x>y$ both receive nothing.

The game theoretic solution of this game is that A takes away all the money from B and B accepts this since she is equally well off when rejecting. Thus $y=12$ and $x=12$ is the only equilibrium point in strictly undominated strategies.

3.3 An Alternating Offer Bargaining Game

The game played in this video experiment is a two-person characteristic function game. It comprises a situation where two players A and B anonymously bargain on the distribution of a given amount of money, the coalition value $v(AB)$, by alternating offers without time limit and no bargaining costs. If they agree on an allocation they receive the amounts they agreed upon. If they do not reach an agreement they receive a conflict payoff $v(A)$ resp. $v(B)$, with $v(A)>v(B)$, and $v(A)+v(B)=v(AB)/2$. The values are $v(AB)=320$, $v(A)=128$ resp. 96, $v(B)=32$ resp. 64.

There is no unique game theoretic solution for this game. No disagreement should occur because players are equally well or worse off if they reject an offer equal or larger than the conflict payoff.

4. Results

A first result of the video experiments is that behavior does not correspond to the game theoretic solutions of section 3. From Table 1 we see that the average *x*'s of players A and the average *y*'s of players B are far from game theoretic predictions. Moreover, there is a considerable percentage of disagreements[1].

Table 1: Outcomes in different video experiments

Game	Number of groups	Average *x* of players A	Average *y* of players B	Average payoff of players A	Percentage of Equal Split offers	Percentage of Disagreements
Ultimatum	9	4,44	2,44		56	0.22
Tripled Take	12	6,50	7,92		8	0.33
Bargaining	20			175,89[1)]	8	0.20

[1)] including disagreement payoffs

Session outcomes are shown in Figures 1 – 3 (see Appendix).

4.1 Fairness is synonymous to equity

The first goal of this paper is to uncover allocations that players characterized as fair. I hypothesize that subjects perceive also allocations as fair that are different from the equal split.

Table 2: Fairness norms, distribution masses, distribution keys, and payoffs of allocations characterized as fair in different video experiments

Game	Fairness norm	Distribution mass	Distribution key	Payoff Player A	Payoff Player B
Ultimatum	– Equal Split of endowment	– endowment	– egalitarian	5	5
Tripled Take	– Equality of payoffs	– joint payoff	– egalitarian	9	9
	– Equal Split of endowment player B	– endowment player B	– egalitarian	18	6
Bargaining	– Equal Split (ES)	– coalition value	– egalitarian	160	160
	– Proportional Split (P)	– coalition value	– proportional to conflict payoff	256 (192)	64 (128)
	– Split the Difference (SD)	– coalition value minus sum of conflict payoffs	– egalitarian	208 (176)	112 (144)
	– Equal Split of difference between SD and ES (ESSD)	– (SD-ES)	– egalitarian	184 (168)	136 (152)
	– Equal Split of difference between proposals of bargainers	– difference between proposals of bargainers	– egalitarian	depending on proposals	depending on proposals

[1]Roth (1995) reports on the same phenomenon in other experiments.

Irrespective of final agreements with very few exceptions fairness is attributed to equitable allocations the common property of which is the *equity principle* (Selten 1978, 1987), a concept of great importance in distributive negotiations: An amount of money (e.g. rewards or costs) is to be divided equally. Yet, what is meant by equal - the way to assign weights to each player, i.e. the *distribution key* - and the way to measure the amount to be distributed - i.e. the *distribution mass* - is not unambiguous.

Table 2 shows the allocations participants stated as fair at least once in a session. They differ with respect to the distribution mass and/or the distribution key. They are not only described as fair, but are also indicated by their equality characteristic[2]. Apart from UG *more than one* norm has been identified as fair. Depending on the norm rather unequal payoffs for both players result (cf. Table 2 and Figures 4 – 6 in the Appendix).

In addition to knowing which fairness norms were identified it is also important to know how frequently these norms were brought up. Table 3 shows two regularities: the existence of a self-serving bias with regard to fairness norms and a seeming preference for the equal split over other equity norms.

a) Self-serving bias

The existence of a self-serving bias with regard to fairness norms was already shown in early experiments. The perception of fairness seems to be role-specific. If multiple rules of fairness are available subjects do utilize them to their benefit (cf. Komorita/Kravitz 1979, McClintock/Kramer/Keil 1984). This view is confirmed in later research (Babcock et al. 1995, Babcock/Loewenstein 1997, Hennig-Schmidt 1999, Gächter/Riedl 2000)[3].

A clear pattern of self-serving bias in our experiments is displayed in Table 3[4]: the respective more profitable fairness norm is mentioned more often by the advantaged player than by the disadvantaged one. For instance in TTG 83% of players B term equality of payoffs fair against only 75 % of players A. For equitable payoffs that give *more* to players A than to players B the opposite is the case: in TTG only 17% of players B identify these allocations as fair against 50 % of players A; the same tendency holds for BG. And even in UG where there is just one fairness norm only 78% of players A call the equal split a fair division against 100% of players B.

This point was extensively discussed as the following quotes from BG show: One B-player group reasoned that "the proportional split might the 'equal split' for the A-group as the equal split is the 'equal split' for us". An A-group debated the different fairness norms in the following way: "Split the difference is one fairness definition, equal split is another. The proportional split is a third one which also has to be included. Our perception of fairness is split the difference, their idea of fairness is the equal split. This would also be ours if we were in a group B position".

[2] and as "appropriate, best, equilibrium allocations, ideal, logical, normal, optimal, rational, reasonable, social".

[3] See also Königstein (2000).

[4] We did not find significant differences between A- and B-players. Yet, we have to be careful when running statistical analyses on fairness characterizations since the independence postulate is not met in 2 respects: Fairness characterizations are not independent observations because many groups stated more than one fairness norm which might be interrelated. In the bargaining game experienced and inexperienced groups are included in our analysis.

Table 3: Frequency of fairness characterizations

Game	Fairness norm	Players A % of groups	Players B % of groups
Ultimatum	– Equal Split of endowment	78	100
Tripled Take	– Equality of payoffs	75	83
	– Equal Split of endowment player B	50	17
Bargaining	– Equal Split (ES)	65	75
	– Proportional Split (P)	15	5
	– Split the Difference (SD)	25	15
	– Equal Split of difference between SD and ES (ESSD)	10	5
	– Equal Split of difference between proposals of bargainers	35	30

b) Preference for the equal split over other equity norms?

The Equal split is the allocation being characterized as fair most frequently by players B *and A.* This result seems to support the models quoted above claiming that equal division *is* the social reference point and inequality aversion has significance for *both* players. From the knowledge of the video transcript I argue that there are two kinds of aversion: most players A exhibit *equality* aversion, whereas players B exhibit *inequality* aversion.

All players, A and B, are aware of the fact that equal division is a very strong fairness norm, yet, possibly one among others. Players A know that the equal split might be *the* fairness norm for players B and they discuss this frequently (see the above quotation). These discussions are included in the figures of Table 3. The transcripts clearly reveal that most players A want *more* than the equal split. This is also confirmed by Table 1 and Figures 1 – 3. The percentage of players A finally offering less than the equal split is substantial: in TTG 92%, (11 out of 12), in BG 92% (18 out of 20) and even in UG - where only one fairness norm exists - 44% (4 out of 9). In BG players could make more than one offer and here the tendency to equality aversion is even more obvious: less than 1 % of all player A proposals have been the equal split. In fact only in 2 sessions players agreed on equality of payoffs, and here the same A-group was involved playing as an inexperienced and an experienced group.

B-players are the ones that show inequality aversion from a fairness point of view. Even though with one exception *acceptance levels* in UG and TTG involve payoffs less than the equal split (Figures 1a, 2a in the Appendix) *fairness statements* are clearly in favor of payoff equality (cf. Table 3). Moreover, in BG 49% of all player B proposals have been the equal split or even less showing that players B negotiated hard to avoid unequal payoffs.

The impact of the multiplicity of fairness norms on decision making is important in two respects: First, in games where only one fairness norm exists players A offer the equal split significantly more often than in games with several fairness norms ($p < 0.05$). This result suggests that when analyzing distributive tasks one has to account for multiplicity of fairness norms. Second, even if the percentage of players perceiving non-equal payoffs as fair is rather small (cf. Table 3) this might nevertheless be important with respect to bargaining impasse. If players adhere to different fairness norms consent between them might become difficult, the self-serving bias in fairness judgments may prevent agreement. And indeed, the transcripts suggest that disagreements occur because opponents' aspirations are incompatible. They are anchored at different fairness norms and players are not willing to make sufficient conces-

sions. Babcock and Loewenstein in their survey article (1997) report on investigations showing the same phenomenon. I will discuss this point further in section 4.2.

I conclude the discussion in this section by formulating the following results:

Result 1: Fair allocations are equitable allocations.

Result 2: A multiplicity of fairness norms exist. Even in one game different fairness concepts may prevail.

Result 3: Because of the self-serving bias in fairness judgments inequality and equality aversion exists.

4.2 The influence of fairness on decision making

In the remainder of the paper I will analyze how actual behavior is influenced by fairness norms. The example I take is the alternating offer bargaining game (cf. Hennig-Schmidt 1999).

The analysis of the transcripts shows that subjects' decision behavior is clearly *goal-oriented*. In contrast to the main tendency in economic model building no attempt of subjects to optimize could be found in the transcripts.[5] Instead, they very early in the bargaining process formulate aspirations on the final payoff they want to achieve; these *aspiration levels* are adapted during the bargaining process.

Do fairness norms have an influence on the formation and adaptation of aspiration levels? This question can usually not be answered by computer experiments since aspiration levels are not directly observable from decisions. The video taped discussions, however, show a surprising fact: the *equity principle* and the *prominence principle* can explain formations and adaptations of aspiration levels in all groups except in 6 cases (cf. Table 4). It was shown before that fairness is attributed to equitable allocations. Therefore in the following I will neglect prominence[6] and concentrate on the influence of the equity principle on the decision-making process.

How do subjects form the first aspiration level in the negotiation? Table 4 shows that the majority of groups are oriented towards social norms. In 36 groups one of the fairness norms is a guideline for constructing the first aspiration level, in 4 out of the 36 in combination with the prominence principle. We also see the divergence between A- and B-groups: 12 of the 16 B-groups that are solely oriented towards the equity principle take the Equal Split as their focal point in comparison to only 3 A-groups. But also aspiration adaptation is guided by the equity principle (cf. Table 4). Aspiration levels are adapted to another social norm, or they are adjusted in a way that evenly splits the bargaining area determined by aspiration levels or demands of both groups.

I now return to the multiplicity of fairness norms and the impact of the self-serving bias on disagreements. In 4 sessions no agreement is reached (sessions where payoffs < 160 in Figure 3). All A-players' aspiration levels are guided by a fairness norm giving highly unequal payoffs to the groups – proportional split and split the difference (cf. Table 5). B-players start the

[5] This finding is in accordance with the results of Selten/Mitzkewitz/Uhlig (1997) who in a strategy experiment also found no optimizing behavior.
[6] See Hennig-Schmidt (1999) for a detailed analysis.

Table 4: Principles of formation and adaptation of aspiration levels

Aspiration Levels	**Number of A-groups (Total = 20)**	**Number of B-groups (Total = 20)**
Formation of aspiration levels		
Equity Principle	**16**	**16**
Equal Split	3	12
> Equal Split[7]	8	2
Split the Difference	2	1
Proportional Split (P); <P	1	1
Middle between demands/ingroup-proposals	2	
Prominence Principle	**2**	**1**
Equity *and* Prominence Principle	**2**	**2**
Other		**1**
Adaptation of aspiration levels		
Equity Principle	**12**	**15**
Prominence Principle	**15**	**16**
Equity *and* Prominence Principle	**8**	**5**
Other	**4**	**1**

negotiation with an initial aspiration level being anchored at the equal split or split the difference. In the final stage of the negotiation they favor allocations much lower than A-players equity anchored aspirations. Although two B-groups offer a fair distribution opponents' fairness notions do not concur. There is no inclination to further concessions on both sides. The result is a break-down of the negotiation.

Table 5: Diverging aspirations of players A and B in disagreement sessions

Disagreement session	Player A		Player B	
	Fairness norm guiding final aspiration level	Payoff	Fairness norm guiding lowest (initial) aspiration level	Highest(intended) offer
1	*Split the Difference*	208	(*Equal Split*)	(190)
2	*Proportional Split* and prominence principle	240	(> *Equal Split*)	200
3	*Proportional Split* and prominence principle	200	> *Equal Split*	160
4	*Proportional Split* and prominence principle	259	*Split the Difference*	(208)

[7] If a group does not want to accept an upper or lower offer this is treated as a separate aspiration level, even though it does not correspond to the notion of a level. However, the formulations in the transcripts were unambiguous that the value taken as a reference point should not be accepted even though a specific amount was not yet mentioned.

Our result concerning the influence of the self-serving bias of fairness norms is not as clear-cut as those by Loewenstein/Thompson/Bazerman (1989) where negotiators are strongly adverse to settling even slightly below the point they view as fair. One reason for the difference in results might be that we did not ask subjects beforehand on their fairness notion and therefore did not attract their attention to this point. Therefore they cannot stick to a previously declared fairness statement This may result in some groups being willing to make concessions far below their initial aspiration level. Nevertheless, in the disagreement groups we see considerable divergence between fairness norms resp. demands and offers

Result 4: Aspiration formation and adaptation are determined by fairness norms. Self-serving bias in fairness perceptions may cause conflict.

5. Conclusion

In this paper I showed that different fairness norms exist even in one game, and that fairness norms differ across games. Fairness perceptions coincide with the different appearances of the equity principle. Depending on their role in the game players show equality and inequality aversion. Therefore, it seems to be problematic to design general models that are based on one specific fairness concept only as an explaining factor for behavior. This is the more the case since the self-serving bias in fairness perceptions induces players to be guided by opposed fairness norms and thus may impede agreement.

The impact of fairness on decision making was demonstrated in the case of the bargaining game. No attempt of subjects to optimize could be found in the transcripts. Instead, subjects' exhibit goal-directed behavior. Fairness in the sense of equity is the guiding principle in aspiration formation and plays an important role in aspiration adaptation. There is evidence that in UG and TTG fairness norm(s) being perceived as valid in the respective situation functions as a focal point which serves as a point of orientation for estimating the opponent's acceptance limit. Further analyses of the transcripts are necessary to clarify this phenomenon.

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Appendix

Figure 1a: Amounts sent and acceptance levels in the Ultimatum Game

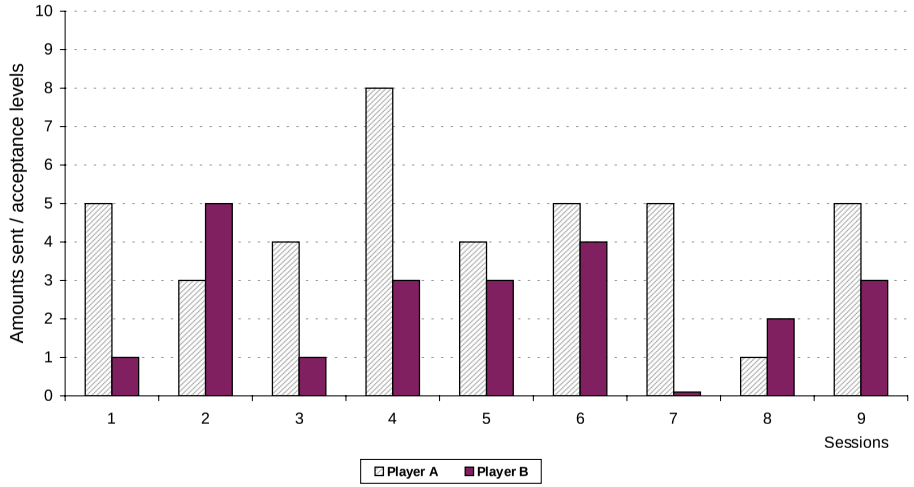

Figure 1b: Payoffs in the Ultimatum Game

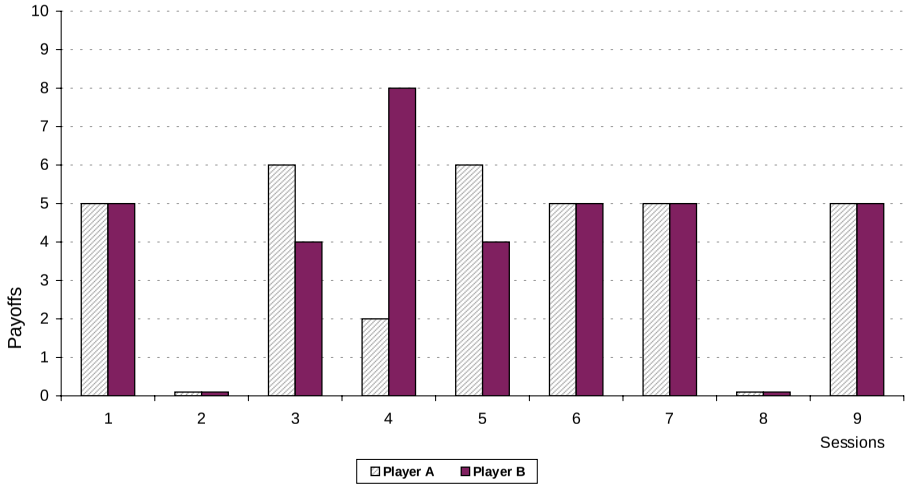

Figure 2a: Amounts taken and acceptance levels in the Tripled Take Game

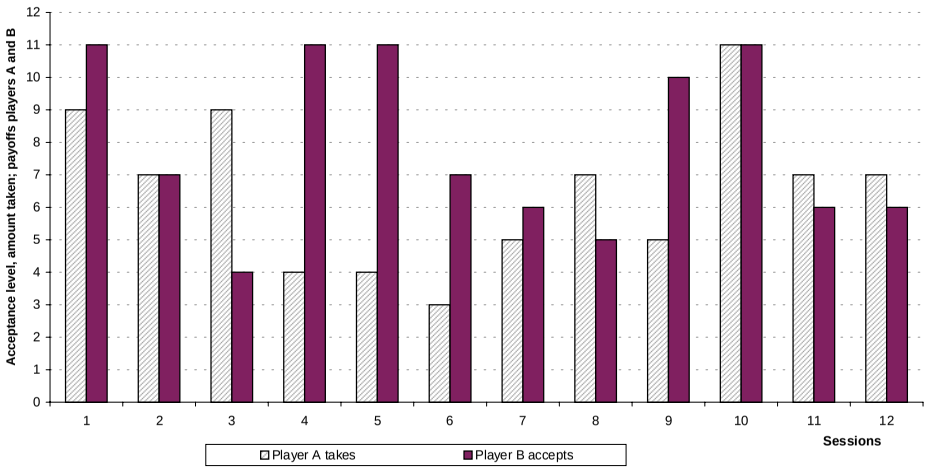

Figure 2b: Payoffs in the Tripled Take Game

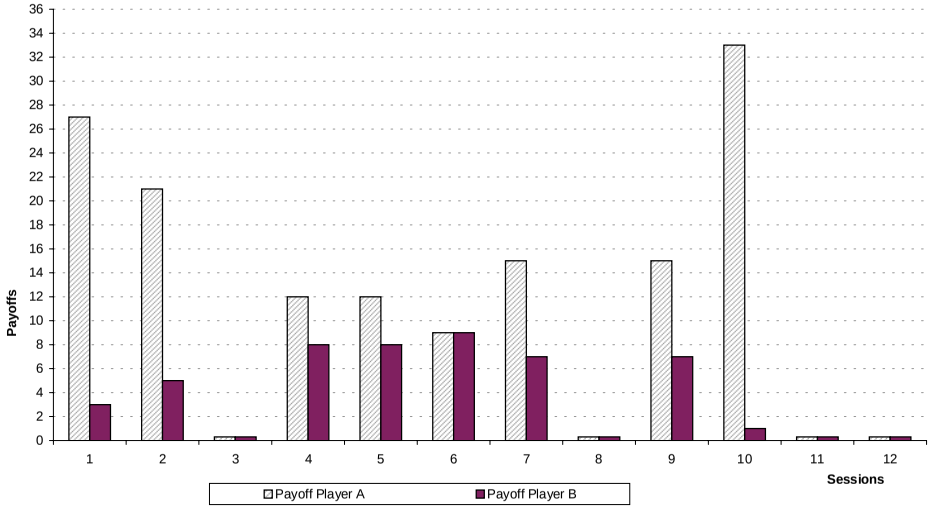

Figure 3: Final payoffs in the Alternating Offer Bargaining Game

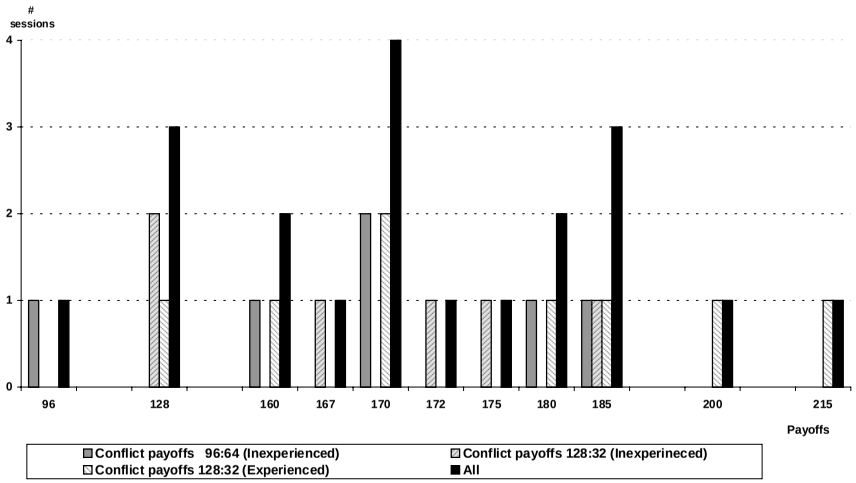

Figure 4: *One* fair allocation in the Ultimatum Game

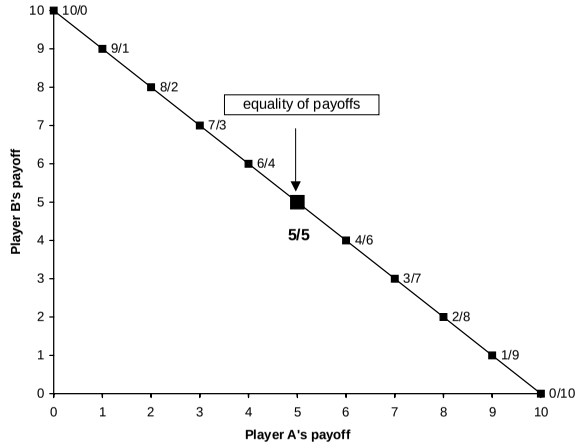

Figure 5: Two fair allocations in the Tripled Take Game

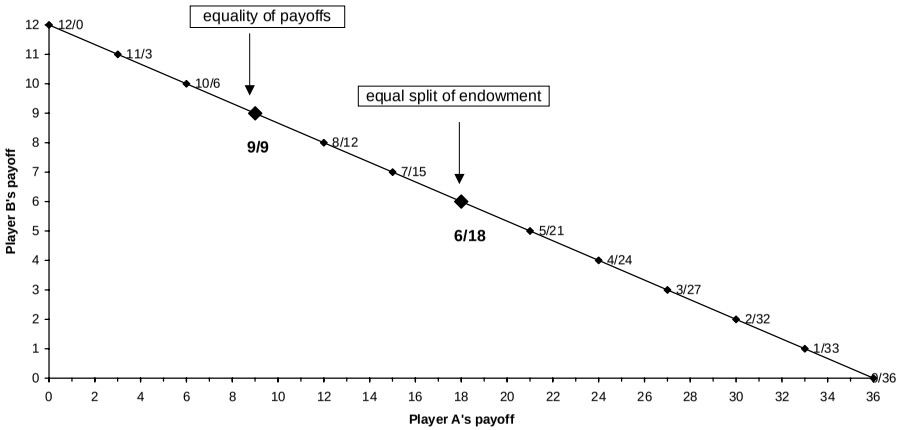

Figure 6: Three and more fair allocations in the Alternating Offer