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The Impact of Previous Action on Bargaining—An Experiment on the Emergence of Preferences for Fairness Norms

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Abstract: The communication of participants to identify an acceptable bargaining outcome in the Nash bargaining game is all about fairness norms. Participants introduce fairness norms which yield a better outcome for themselves in order to convince the other participant of their bargaining proposal. Typically, these fairness norms are in line with theoretical predictions, which support a wide variety of different but fair outcomes the participants can choose from. In this experiment, we play two treatments of the Nash bargaining game: in one treatment, the participants play a dictator game prior to bargaining, and in the other treatment they do not. We find that participants who have not played the dictator game intensively discuss the outcome of the game and come to solutions closer to the equal split of the pie the longer they chat. This effect vanishes as soon as the participants have previous experience from a dictator game: instead of chatting, they establish the fairness norm introduced in the dictator game. Remarkably, if the dictator is unfair in the dictator game, he also gets a higher share of the pie in the Nash bargaining game.

Keywords: bargaining game; dictator game; norms; experimental economics

1. Introduction

Bargaining is not only central in everyday interaction, but also in computerized applications such as resource allocations in communication networks [1,2]. In recent years, experimental literature observed several different norms (e.g., [3,4]) to predict cooperative behavior. Although existing literature suggests that the establishment of norms can induce cooperation [5] (e.g., via reciprocity [6] or conditional cooperation [7]), norms are mainly added to economic research as post hoc interpretation [8]. Moreover, literature investigating how norms are formed and how one can use them to influence future behavior is scarce. In this paper, we investigate behavior in the Nash bargaining game [9], and show that by simply playing a dictator game prior to the bargaining game, the norms the participants agree upon can be manipulated. We argue that in order to understand individual outcomes in bargaining games (e.g., [10–12]), it is essential to know the history of a decision maker.

Formally, one can model bargaining using the Nash bargaining game [9]. Two participants who are Nash bargaining distribute a divisible good among each other. Each outcome in which the participants distribute the whole divisible good is Pareto efficient. Namely, no participant can increase their own payoff without away taking part of the share of the other participant. Consequently, every Pareto efficient allocation can be perceived as "fair": by deviating from an allocation in favor of one bargainer, the other bargainer will perceive the deviation as less fair.

Experimental results of the Nash bargaining game find support for different "fair" allocations (see, for example, experiments on gains [11,13] and experiments on losses [14]). In all experiments on Nash bargaining, some participants choose outcomes equally improving their payoffs relative to the

payoffs when not coming to an agreement. Some other participants compare their bargaining results to a situation in which both participants receive nothing. Aside from these allocations, a variety of other outcomes occur. That is, participants in behavioral experiments on bargaining establish different "fairness norms". While the set of norms is consistent for different types of experiments and occur for bargaining over both gains and losses, the frequency of these norms differs and it is not known which norm occurs when.

From a theoretical perspective, equal payoff splits—both relative to disagreement and to receiving nothing—are in line with theories on other regarding preferences (e.g., [15,16]). Aside other regarding preferences, efficienc[1] [17]—in terms of overall payoffs—is a norm influencing allocations. Efficiency reflects the desire of the participants to maximize the sum of the payoffs of all bargainers. Beside equal splits and efficiency, other fairness norms can occur.

In this paper, we investigate what norms the participants establish in the Nash bargaining game. To do so, we implement a bargaining game which disentangles the efficient from the equal split outcome to ensure that we can clearly differentiate the central experimental fairness norms established in existing literature on allocation decisions. To manipulate the established norms, in one treatment we let the participants play a dictator game prior to bargaining. The outcome of the dictator game is the realization of one fairness norm. That is, by implementing a dictator game prior to bargaining, participants experience one certain fairness norm. This approach helps us to understand how previously experienced fairness norms influence subsequent behavior.

We find that the number of messages has a significant effect on the norm implemented: while groups exchanging only few messages often reach outcomes close to the equal split of payoffs, the bargaining results are closer to efficiency the longer the chats last. When looking at both treatments in isolation, this effect persists for the groups playing no dictator game. For the participants who first played the dictator game, the effect of the number of chat messages vanishes. The outcomes they choose in the bargaining game correlate with the outcomes of the previous dictator game.

In the remainder of this paper, we first describe the experiment in Section 1. We introduce the experimental results in Section 2, and discuss them in Section 3.

2. Material and Methods

In this section, we first discuss the treatment design before shedding light on the experimental procedure.

2.1. Treatment Design

The experiment consists of playing two games: a dictator game and a Nash bargaining game. In both games, two participants i with $i \in \{1, 2\}$ interact. In the dictator game, the strong player (the dictator) gets an endowment of 100 points. The strong player decides which amount, x_1, of the endowment to keep. The weak player (the recipient) receives the part of the endowment the strong player does not claim (i.e., $x_2 = 100 - x_1$). The game has one sub-game perfect equilibrium—namely $x_1 = 100$ and $x_2 = 0$: the weak player cannot make any decision, and the strong player maximizes their payoff by keeping all for themselves.

In the Nash bargaining game, the same participants interact. Now, their task is to distribute 100 tokens[2]. Before making their decisions, the strong and the weak player can communicate using a chat window. After the chat, both participants make their decisions; that is, each participant i indicates how many points φ_i to keep for themselves. Based on their decisions, the participants reach an agreement or not:

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[1] To clearly distinguish between Pareto efficiency and efficiency in terms of payoff sums, we will call the latter simply "efficiency" and the former "Pareto efficiency" throughout the paper.

[2] Using a pie of tokens give participants the opportunity to consider a different kind of equal split, namely, an equal token split.

(1) Agreement: If $\varphi_1 + \varphi_2 \leq 100$, only the available tokens are distributed. Each participant receives the number of tokens φ_i they wanted to keep.

(2) No agreement: If $\varphi_1 + \varphi_2 > 100$, the participants distributed more tokens than available. Hence, both participants receive a disagreement payoff of $\varphi_i = 0$ tokens.

To distinguish between the theoretical solution concepts, the payoff of the participants is $y_1 = f_1 \cdot \varphi_1$ and $y_2 = f_2 \cdot \varphi_2$ points, respectively, with $f_1 = 6$ and $f_2 = 1.2$. By using these parameters, the fairness norms equal split with respect to tokens and to overall payoffs, and efficiency all are characterized by different distributions of tokens (see Table 1).

Another property of the parameter set (namely, f_1 and f_2) is that as for the dictator game, the Nash bargaining game favors the strong player (i.e., the former dictator). For each token the strong player keeps, they get five times the payoff of the weak player.

Table 1. Numerical value of fairness norms.

Role	Factors (f_i)	Equal Token Split	Equal Payoff Split	Efficiency
Strong player	6.0	50	17	100
Weak player	1.2	50	83	0

We played two treatments—baseline and dictator—in the games. In treatment baseline, participants only played the Nash bargaining game, while they played the Nash bargaining game after the dictator game in treatment dictator.

2.2. Experimental Procedure

We recruited 78 participants from various fields of study to the experimental laboratory at the university of Magdeburg (MaXLab) using hroot [18]. None of the participants had previous experience in bargaining experiments, and we did not train the participants prior to playing the corresponding games. In the beginning, we assigned all participants to random seats in either of the two rooms of the laboratory. We assigned all participants in one room to the role of the strong player and all participants in the other room to the role of the weak player. In the end of each session, we asked the participants to leave the building using opposing directions. In this way, we ensured that interacting participants did not meet during or after the sessions.

All participants played one out of the two treatments (baseline and dictator), computerized with z-Tree [19]. Thirty-eight participants took part in treatment baseline, and 40 participants took part in treatment dictator. For both games, we handed out written instructions (see supplementary data). The participants in treatment dictator did not know what type of game they would play after the dictator game. In the bargaining game, the participants saw the conversion rates $(1.2, 6.0)$, the payoff for not coming to an agreement (0 for both participants), and the payoff for receiving all tokens (120, 600). In the beginning of the bargaining game, the participants could chat using a chat window. To exclude any reciprocity effects, we asked all participants to neither disclose their identity nor reference to the prior game when chatting. After both participants had left the chat, a window asked them to specify the number of tokens they wanted to keep for themselves. Although the participants in treatment dictator played in the same groups throughout the experiment, we did not inform the participants accordingly, but only stated that two participants would interact in the second game.

To ensure that all participants could receive identical payoffs independent of the treatment, the participants in treatment baseline received a show-up fee of 5.00 € for participating in the experiment. To prevent obfuscation of the result of the bargaining game, we mentioned the show-up fee only seconds before beginning to pay off. Each point the participants earned corresponds to 0.10 €. On average, the participants received 13.51 € (min: 0.00 €; max: 65.00 €) for the experiment lasting approximately 45 min. Notice that both treatments lasted equally long. The time the participants in

treatment dictator lost by playing the dictator game was spent by the participants in treatment baseline for additional chat messages when bargaining (also see Section 2.1).

3. Results

Of the 39 groups in our experiment, five did not come to an agreement (three in treatment dictator, two in treatment baseline; see Table A1 for detailed data). In each treatment, one of these groups did not come to an agreement due to one of the participants leaving the chat without making an offer. In the three remaining groups, the participants entered the wrong offer after having come to an agreement in the chat. However, we assume that the participants did not intend the new offer: they always entered the offer of their interaction partner. Hence, if we do not explicitly state otherwise, we neglect the groups having made no offer and report results based on the final offer entered in the chat instead of the offers specified when entering the bargaining result[3].

3.1. Comparison of Payoffs and Tokens

We first compare the payoffs of the strong player relative to the overall payoff for both treatments. In the dictator game, the strong players kept an average of 75% of the pie for themselves. The relative payoffs for the bargaining game are similar. Here, the strong players earned about 70% of the overall payoff. This result clearly indicates that the participants did not show any form of (indirect) reciprocity [20]. If the strong players wanted to reciprocate, we would have expected shares closer to equal payoff splits or in favor of the weak player in the Nash bargaining game.

When we investigate the tokens kept by the strong player in the Nash bargaining game (see Table 2), we again find no significant differences between the treatments—neither when looking at the bargaining result entered after the chat (i.e., the offers finally made; Mann Whitney U test, two-sided, $p = 0.701$) nor when comparing the last chat messages (i.e., the offers promised to make at the end of the chat; Mann Whitney U test, two-sided, $p = 0.665$). The strong players on average received less than 50% of all tokens. This is clearly the result of the different factors f_i we implemented to derive points from tokens and which favor the strong players over the weak players by a factor of 5 (f_1 / f_2). However, the standard deviations between both treatments differ. The individual bargaining outcomes vary less around the average in the baseline treatment (standard deviation: 14%) than in the dictator treatment (standard deviation: 30%).

Table 2. Bargaining game results in share of tokens kept by the strong player.

Treatment	Bargaining (Result)		Bargaining (Chat)	
	Avg.	**SD**	**Avg.**	**SD**
Dictator	41%	32%	37%	30%
Baseline	38%	20%	32%	14%

3.2. Frequency of Experimental Benchmarks

To better understand the variance between both treatments, we compare the frequency of the experimental norms between both treatments (see Figure 1). That is, we classify each observation as equal payoff/token split if the strong player keeps exactly the number of tokens predicted by the equal payoff/token split or up to five more or less, while we classify an observation as efficient if the strong player keeps everything for themselves. All other outcomes are classified as "other outcomes".

[3] When reporting our results, we focus on the share of the strong player as in both games, dictator game and Nash bargaining game, the shares add up to 100, the share of the weak player can easily be derived by subtracting the share of the strong player from 100. Participants also come to an agreement, if they distribute less than the 100 available tokens. In our experiment this happened once in each treatment (see "Underbid." in column "Agreement" of Appendix A). However, given the chat protocols in both cases player 2 most likely entered the share of player 1 instead of his share.

This classification is motivated by the chat protocols. The participants allocating between 11 and 21 to the strong player discussed with the aim of establishing an equal payoff/token split, while only the participants assigning everything to the strong player discussed efficiency. All other participants discussed other fairness norms. In the baseline treatment, the central experimental fairness norms occurred. Namely, eleven participants chose the equal payoff split, while two participants chose the equal token split and three participants the efficient (i.e., maximal overall payoff) outcome. In the dictator game, we observed less equal payoff splits (8), more equal token splits (4), and no efficient allocations. The distribution of the different experimental fairness norms differs significantly between both treatments (Chi squared test, two-sided, $p = 0.032$).

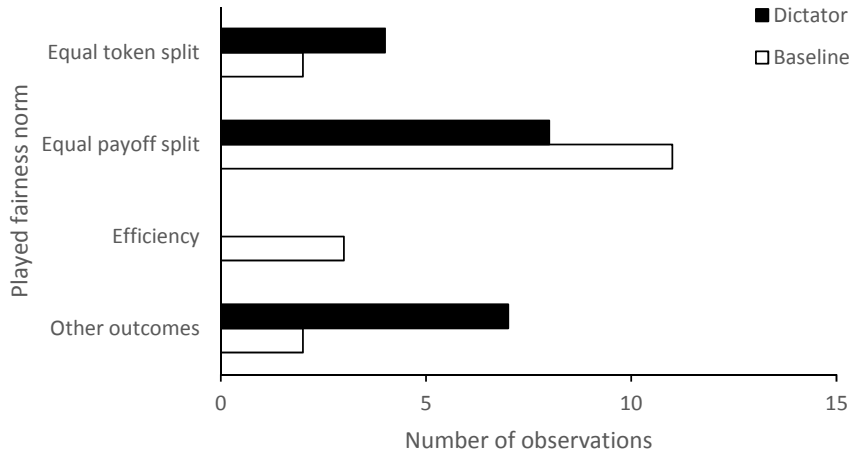

Figure 1. Observed frequency of experimental fairness norms.

3.3. Influencing Factors

We observed that the participants in our experiment on average showed identical behavior in both treatments. However, the results differ if we relate the results to the experimental benchmarks. Now, the variance between the outcomes in the dictator treatment are higher than in the baseline treatment and we observe differences in the frequencies of the outcomes. In the remainder, we investigate what drives the observed differences.

We first calculate the number of messages exchanged before coming to an agreement (Table 3). While the participants in the dictator treatment only exchanged about nine messages, participants in the baseline treatment exchanged on average about twice as much (about 20 messages). The number of messages exchanged in the baseline treatment was significantly higher than in the dictator treatment (Mann Whitney U test, two-sided, $p = 0.004$).

Table 3. Number of messages in chat protocol per treatment.

Treatment	# Messages	
	Avg.	**SD**
Dictator	9.11	6.34
Baseline	21.94	15.07

Given the differences in the messages exchanged, we conduct a regression analysis to investigate what drives the outcomes in the bargaining game. In a first regression, we investigate the impact of the number of messages exchanged on the number of tokens received by the strong player (see first column of Table 4). If we look at all the data (i.e., the data of treatments baseline and dictator), the number of messages has a significant positive effect on the outcome. That is, the longer the participants chat, the more the strong player receives. This effect vanishes if we look at the dictator treatment in

isolation (see second column of Table 4). In the dictator treatment, it is the outcome of the dictator game which drives the outcomes in the bargaining game (see last column of Table 4). However, this relationship is not (indirect) reciprocal. The more the strong player keeps in the dictator game, the more they get in the subsequent Nash bargaining game. That is, the participants of the dictator game play the fairness norm in the bargaining game, which the strong player established in the previous dictator game.

Table 4. Factors influencing decisions in bargaining game.

	All Data		**Dictator Treatment**			
	# Messages		**# Messages**		**Dictator Game**	
# Messages	0.571	(0.288) *	−0.737	(0.507)	−0.486	(0.467)
Dictator game					0.226	(0.099) **
Intercept	25.696	(5.756) ***	38.340	(5.579) ***	19.048	(9.796) *
R^2	0.076		0.058		0.246	
N	37		19		19	

*** Significant at the 1 percent level; ** Significant at the 5 percent level; * Significant at the 10 percent level.

4. Discussion

Existing literature on the establishment of norms is rather scarce. Although we know that we learn norms throughout our lives and adapt to the norms of others (e.g., [21]), it is still unknown how and at which speed we learn norms. This experimental study is one step towards understanding norm adaption. In the remainder, we first discuss whether existing norms can justify the observed behavior, before we argue the importance and volatility of norms.

Other-regarding preferences: One might get the impression that the strong players have stable other-regarding preferences. In the dictator treatment, their share of payoffs is similar in both the bargaining and the dictator game. However, if any of the weak players was motivated by other-regarding preferences [15,16], they should have tried to get more or at least half of the payoff—which they did not. When looking at the distribution of tokens, four groups in the baseline treatment and one group in the dictator treatment assigned exactly half of the tokens to each player. Nevertheless, the number equal distributions of tokens was rather low. Hence, we conclude that other-regarding preferences cannot justify the behavior we observe.

Reciprocity: It is not reciprocity which justifies the observed behavior either. If either of the participants would behave reciprocally, payoffs of the weak players in the bargaining game should be higher than the payoffs of the strong players after unequal distributions in the dictator game. However, this is not the case in terms of payoffs. Opposite to the expectation of reciprocity, dictators who kept more for themselves, also received higher payoffs when bargaining. When looking at the distribution of tokens in the baseline treatment, participants at first sight seem to equally distribute the added number of tokens from both bargaining and dictator games. However, the number of tokens assigned to the strong player in the dictator treatment is on average higher than in the baseline treatment (although this difference is not significant). Hence, we argue that reciprocity is not a driving factor.

Efficiency: The desire to reach efficient outcomes—in terms of payoff sums—could explain the observed behavior. This is especially true, as the payoff structure of the Nash bargaining game is highly skewed: A token assigned to the strong player is valued five times higher than when assigned to the weak player. In the baseline treatment, three weak players assigned all 100 tokens to the strong player. They clearly chose to play the efficient allocation. However, this allocation does not occur in the dictator treatment. In sum, the efficiency norm is not played very often: on average, the strong player gets less than half the tokens distributable in both treatments. However, if the groups wanted to achieve efficiency, they could have. Nevertheless, as part of future work, we suggest—as one of the anonymous reviewers suggested—playing an additional treatment in which the dictator game follows

the Nash bargaining game. In this way, one could disentangle the impact of efficiency more clearly from other-regarding preferences.

In sum, we found a variety of different bargaining outcomes. Neither of them in isolation can justify behavior. What we see, however, is how preferences for fairness norms emerge. After both strong and weak players experienced unfair behavior in favor of the strong player, they both accepted this fairness norm and establish similar distributions in the subsequent bargaining game. In treatment baseline, the situation was different. Now, no fairness norm is ex ante imposed for both of the participants. Hence, the participants discuss how to allocate the money. That is, they establish their preferences over different fairness norms. Consequently, the bargaining partners bargained for significantly longer than in the dictator treatment. The length of bargaining also drove the later result. The more the participants chat, the more they deviate from the equal split of payoffs to an efficient outcome.

We argue that this is also the consequence of norms: in our everyday lives, the equal split and efficiency norms are omnipresent. If we find no intuitive benchmark, we typically try to establish the simplest norm to think of—just cut the cake in two equal halves or maximize the overall benefit of a decision. Only if we take more time to think about possible distributions do we find other plausible allocations. Convincing the bargaining partner to accept a distribution differing from these obvious fairness norms (e.g., equal split or efficiency) is difficult and takes time. Notice that it is not always the finally benefiting participant who proposes to choose a certain fairness norm. In one of our groups having a strong player receiving all tokens, it was the weak player who had to convince the strong player of taking everything—in a chat consisting of more messages than most others.

Based on these results, we argue that norms—in contrast to our expectation—are volatile. Just one experience—a simple, short dictator game—can let you choose a certain norm differing from the norm you would have chosen otherwise. This result casts serious doubts on the way we understand other regarding preferences today: what is the benefit of deriving αs and βs for calculating the utility function of a decision maker with other regarding preferences à la Fehr & Schmidt [16], if an experience lasting for 5 min can render these preferences obsolete.

Supplementary Materials: Supplementary Materials: The Supplementary Material are available online at http://www.mdpi.com/2073-4336/8/3/34/s1.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix Experimental Data

Table A1. Chat proposals (in brackets) and decisions per group.

Group	Dictator Treatment							Baseline Treatment				
	Dictator Game		Bargaining Game					Bargaining Game				
			Offer				Agreement	Offer				Agreement
	P. 1	P. 2	P. 1		P. 2			P. 1		P. 2		
1	65	35	40	(40)	60	(60)	Exact	20	(20)	80	(80)	Exact
2	90	10	30	(30)	70	(70)	Exact	22	(22)	78	(78)	Exact
3	50	50	16	(16)	84	(84)	Exact	20	(20)	80	(80)	Exact
4	90	10	50	(50)	50	(50)	Exact	50	(50)	50	(50)	Exact
5	100	0	50	(50)	50	(50)	Exact	17	(17)	83	(83)	Exact
6	90	10	60	(60)	60	(40)	No	100	(-)	100	(-)	No
7	70	30	30	(30)	70	(70)	Exact	40	(40)	60	(60)	Exact
8	90	10	80	(20)	80	(80)	No	100	(100)	0	(0)	Exact
9	80	20	80	(-)	60	(-)	No	20	(20)	80	(80)	Exact

Table A1. *Cont.*

Group	Dictator Treatment							Baseline Treatment				
	Dictator Game		Bargaining Game					Bargaining Game				
			Offer				Agreement	Offer				Agreement
	P. 1	P. 2	P. 1		P. 2			P. 1		P. 2		
10	100	0	50	(50)	50	(50)	Exact	20	(20)	80	(80)	Exact
11	100	0	20	(20)	80	(80)	Exact	45	(45)	55	(55)	Exact
12	50	50	20	(20)	20	(80)	Underbid.	17	(17)	83	(83)	Exact
13	6	94	18	(18)	82	(82)	Exact	16	(16)	20	(80)	Underbid.
14	100	0	50	(50)	50	(50)	Exact	100	(100)	0	(0)	Exact
15	100	0	30	(30)	70	(70)	Exact	30	(30)	70	(70)	Exact
16	80	20	30	(30)	70	(70)	Exact	20	(20)	80	(80)	Exact
17	8	92	17	(17)	83	(30)	Exact	20	(20)	80	(80)	Exact
18	50	50	20	(20)	80	(80)	Exact	83	(17)	83	(83)	No
19	100	0	80	(20)	80	(80)	Exact	100	(100)	0	(0)	Exact
20	90	10	30	(30)	70	(70)	Exact					

Table A1 shows the results of the dictator game and the distributions in the Nash bargaining game agreed upon during the chat (values in brackets) and the actual decisions (values without brackets). The strong player is represented by "P. 1", while the weak player is "P. 2". In the agreement column, we state whether the found distribution distributed all 100 points exactly ("Exact") or more points were distributed ("No"). No group distributed less than the available 100 points.

Remarks on groups coming to no agreement: in Group 9, no group member entered a message in the chat window.

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