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Expectations and social decision-making: biasing effects of prior knowledge on Ultimatum responses

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Abstract Psychological studies have long demonstrated effects of expectations on judgment, whereby the provision of information, either implicitly or explicitly, prior to an experience or decision can exert a substantial influence on the observed behavior. This study extended these expectation effects to the domain of interactive economic decision-making. Prior to playing a commonly-used bargaining task, the Ultimatum Game, participants were primed to expect offers that would be either relatively fair (a roughly equal split of an endowed amount) or unfair (an unequal split, to the participant's disadvantage). A third group played the Game without receiving any prior information about expected offers. As predicted, these expectations had a large effect on decisions made by participants in the Ultimatum Game, with those with expectations of fairness rejecting significantly more unfair offers than those participants who expected low offers. Implications for models of fairness and equity are discussed.

Keywords Decision-making · Choice · Experimental Economics · Bargaining · Expectation

1 Introduction

An important recent development to emerge within the field of judgment and decision-making has been the integration of methods and results from several different disciplines, each of which has historically examined the decision-making process at different levels and with different methodologies. This interdisciplinary field, popularly known as Neuroeconomics (e.g. Sanfey et al. 2006), has begun to

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redress this lack of integration by seeking to better understand decision-making by taking into account the cognitive and neural constraints on this process, as investigated by Psychology and Neuroscience, while in addition utilizing the tasks and mathematical decision models that have emerged from Economics. By using these complementary strengths this approach offers a promising avenue to examine decision-making at different levels of analysis and, eventually, to perhaps arrive at a comprehensive account of how this process operates.

1.1 Social decision-making

One productive direction this emerging field has taken has been to investigate the processes underlying social decision-making. Typically, the experimental study of decision-making has examined choices in which the decision-maker selects between options that have direct consequences for only themselves. The canonical type of decision task investigated involves choices between monetary gambles—for example, participants might be asked whether they prefer a 50% chance of $100, or $50 for sure. Though the outcomes and likelihoods of these problems can be quite complex and uncertain, it is important to note that these decisions are typically made in 'social isolation', that is, the outcome rarely affects anyone other than ourselves.

The study of these choices has illuminated many important aspects of decision-making. For example, they have demonstrated that much of our decision behavior deviates from the predictions of standard economic theories such as Utility Theory, and have led in turn to revised versions of these models that better capture actual decision-making behavior. However, it is still unclear to what extent these processes may also be harnessed for decisions in a social context. Given that humans live in highly complex social environments, many of our most important decisions are often made in the context of direct or indirect social interactions. Indeed, our everyday choices are often dependent on the simultaneous decisions of others, for example when we are deciding to ask someone on a date, selecting a job candidate, or entering a business negotiation. The nature of decision-making may change fundamentally when the outcome of a decision is dependent on the decisions of others. For example, the standard expected utility computation that underlies many of the existing theories and models of decision-making is complicated by the fact that we must also attempt to infer the values and probabilities of our partner or opponent in attempting to reach the optimal decision. These social situations (e.g. Loewenstein et al. 1989; Blount 1995) have been comparatively understudied in the decision-making literature, at least as compared to individual decisions, and so the integration of psychological methods allied to the tasks developed in Experimental Economics may allow for more detailed examination of this important process.

1.2 Social decision tasks

One aspect of the Neuroeconomic approach, relevant to the present study, has been to utilize some of the tasks developed in Experimental Economics to address important questions regarding social decision-making. The set of methods used by

Experimental Economics are easy to understand for players and straightforward to utilize in the laboratory, and require that players employ sophisticated reasoning about the motivations of their partners in the game. An additional advantage of using these tasks is that behavior can be mathematically modeled by Game Theory (von Neumann and Morgenstern 1947). Game Theory is a collection of rigorous models attempting to understand and explain situations in which decision-makers must interact with one another, with these models applicable to such diverse scenarios as bidding in auctions, salary negotiations, and jury decisions. From an experimental standpoint, the mathematical framework of Game Theory provides a formal common language in which findings from different research approaches can be compared, and deviations from model predictions quantified, as opposed to the more ad-hoc models used by Psychology.

1.3 The Ultimatum Game

One specific focus of these games has been bargaining behavior, with the Ultimatum Game often used to examine both how negotiations are struck and how people respond to conditions of both equality and inequality. In the Ultimatum Game (Guth et al. 1982) two players are given the opportunity to split a sum of money provided by the experimenter. One player is deemed the proposer and the other the responder. The proposer makes an offer as to how this money should be split between the two. This player is free to propose any split they want, from abjectly unfair ("I will keep all the money"), to fair ("We will split the money evenly"). The second player (the responder) then must make a decision, to either accept or reject this offer. If the offer is accepted the money is split as proposed, but if the responder rejects the offer then neither player receives anything. In either event, the game is over. Importantly, both players are fully aware of the rules of the game at all times.

The standard solution to the Ultimatum Game, assuming that people are motivated purely by financial self-interest, is for the proposer to offer the smallest sum of money possible to the responder. The responder, in turn, accepts this offer on the reasonable grounds that any monetary amount is preferable to none. However, hundreds of studies indicate that, at least in industrialized cultures, modal offers are typically around 50% of the total amount, demonstrating that proposers do not behave in accordance with standard models, and instead are willing to be more generous than predicted.

Responders are also quite consistent. Low offers (of 20% of the total or less) have about a 50% chance of being rejected. This very robust finding is intriguing, demonstrating that circumstances exist in which people are motivated to actively turn down monetary reward. In general, the probability of rejection increases substantially as offers decrease in magnitude. Thus, people's choices in the Ultimatum Game do not conform to a model in which decisions are driven purely by financial gain.

Since the Ultimatum Game was introduced, there have been many examinations of both proposer and responder behavior (for a useful summary of the principal findings, see Camerer 2003), often undertaken with the goal of finding the circumstances under

which players *would* act as the standard model predicts. However, the more obvious manipulations, such as higher stakes and anonymity of partners, have shown only modest effects on behavior. For example, List and Cherry (2000) examined Ultimatum behavior in games with both $20 and $400 stakes, and found little difference in either proposer or responder behavior across the different amounts. As with stake amounts, there is a weak effect of anonymity on Ultimatum behavior, namely that offers to anonymous (as compared to non-anonymous) partners are slightly lower, as are rejection rates (Bolton and Zwick 1995). Demographic variables have also been studied, though not as extensively, with again relatively weak effects found across many variables. For example, gender appears to have an effect on rejections, with males and females offering similar amounts but females rejecting less often (Eckel and Grossman 2001). The robust patterns of behavior in the Ultimatum Game have also led to revised formulations of Game theoretic models, with social preferences included as an important determinant of behavior.

However, the primary question of interest to decision-making researchers is *why* people reject offers, that is, what motivations underlie the decision to actively reject money. The game is so simple that it is improbable that these rejections are due either to a failure to understand the rules of the game or an inability to conceptualize a single-shot interaction with a partner. Based on participant reports, it appears that low offers are often rejected following an angry reaction to an offer perceived as unfair (Pillutla and Murnighan 1996; Xiao and Houser 2005). Objecting to unfairness has been proposed as a fundamental adaptive mechanism by which we assert and maintain a social reputation (Nowak et al. 2000), and the negative emotions provoked by unfair treatment in the Ultimatum Game can lead people to sacrifice sometimes considerable financial gain in order to punish their partner for the perceived slight.

Neuroimaging studies have provided further evidence for emotion-based rejection of unfair offers. A functional magnetic resonance imaging (fMRI) study (Sanfey et al. 2003) examined unfair behavior in the Ultimatum Game, and found a brain area, namely the anterior insula, that exhibited greater activation as the unfairness (i.e. inequity) of the offer increased. Further, this area was more active when playing with another human than with a computer partner, and, importantly, the activation of this area reliably predicted the player's decision to either accept or reject the offer, with rejections of unfair offers being associated with significantly higher activation than acceptances of these offers. The presence of anterior insula activations in this study is notable, as this brain region is also responsive to physically painful and disgusting stimuli (Derbyshire et al. 1997; Calder et al. 2001). In addition, it is involved in mapping physiological states of the body, including touch and visceral sensations of autonomic arousal (Critchley et al. 2000), as well as in aversive conditioning. These results suggest that anterior insula and associated emotion processing areas may play a role in marking a social interaction as aversive. Further, in two recent studies, both patients with lesions to the ventromedial prefrontal cortex, a brain area associated with emotional processing (Koenigs and Tranel 2007), and normal players primed with a negative emotional state (Harle and Sanfey 2007) reject unfair offers more frequently than controls, further suggesting that dysregulation of affective processing has consequences for this type of social decision-making.

Therefore, initial investigations of responder behavior in Ultimatum Game have proposed an account whereby an affective-based neural system is activated by conditions deemed unfair by the player, with the resultant decision often being to reject the unfair offer, even at a financial cost to oneself. However, one question that has been unanswered is to what extent expectations of fairness may mediate this emotional reaction to inequality. That is, does expecting to be treated unfairly by a partner in the Ultimatum Game reduce this negative emotional response, and thereby increase the probability that these offers will be accepted? Or rather is our definition of, and reaction to, unfairness so ingrained that expecting good or bad outcomes will have no difference to our subjective feeling upon receiving an unfair offer? The present study sought to address this question.

1.4 Expectations

Expectation effects within Psychology have been detailed in many different forms and contexts over the years. For example, the well-known placebo effect demonstrates that inert pharmaceutical compounds such as sugar pills are shown to be as efficacious as actual medication, at least for a sizable minority (usually around 30%) of the population. This is one example of the impressive degree to which our expectations shape our interpretations of the world and our response to stimuli (Amanzio and Benedetti 1999). On a more prosaic level, expectations of quality or enjoyment can affect the judgment of many consumer products. For example, in a set of studies (Klaaren et al. 1994) participants' expectations about upcoming vacations were shown to influence their post-vacation evaluations, and expectations about a movie's quality influenced the enjoyment of the film. Additionally, several studies have examined the effect of expectations of a beer's brand identity (Allison and Uhl 1964) or constituent ingredients (Lee et al. 2006) on judgments of taste, both demonstrating the strong effect of expectations on these judgments. In a similar vein, expectations primed via pricing can play a powerful role in judgments. One study (Shiv et al. 2005) demonstrated that consumers who paid a discounted price for an energy drink appeared to yield a lesser benefit from this product than users who paid full price, a result the authors claim is mediated by the expectancies of efficacy that price provides.

More recently, functional neuroimaging has been used to examine the neural correlates of expectation in relation to judgment, with these studies corroborating the behavioral examinations of expectations. The retrieval of brand information in a cola-tasting study was associated with both increased judgments of quality and specific neural activations (McClure et al. 2004). Recently, an imaging study of wine-tasting (Plassman et al. 2008) reported that increasing the sales price of a specific wine increased behavioral reports of quality, as well as activating areas of the prefrontal cortex.

1.5 Social expectations: Psychology and Neuroscience

Social decision-making contexts such as negotiation have also been used to examine the effect of expectations, with emotional manipulations often employed to assess

how expectations can alter decision-making. Van Kleef et al. (2004) reported that participants in a negotiation task were more willing to concede ground to an opponent when the opponent demonstrated anger, with this anger used by the participant as a signal to the opponent's limits. Of more immediate relevance, Kopelman et al. (2006) found that negotiators who strategically displayed negative emotion prior to making a UG offer were more likely to elicit rejections than those displaying either neutral or positive emotions, independent of offer amount.

In the domain of social decision-making, one study has used Game Theory and functional neuroimaging to examine a related question, showing that declarative information previously learned about a partner can greatly modulate decision behavior when paired with that person. In this study (Delgado et al. 2005), participants saw general personality information about partners prior to playing a Trust Game with these people. This consisted of vignettes regarding the moral character of the partner, with each described as either a morally positive or a morally negative person. This prior knowledge led to biases in participants' trust behavior, with a consequent reduced activity in reward-related brain areas in response to partners' game behavior. The authors' interpretation of these data is that responses to the direct actions of another can be reduced when we have been led to expect a certain pattern of behavior. This suggests that prior social knowledge about a particular partner can reduce the degree to which we directly learn from actual behavior, and demonstrates what has been called a "top-down" influence on social decision-making. Though this study is suggestive, to date there have been no studies that have explicitly manipulated the general expectations of players in Game Theoretic tasks (that is, what most other people will do, as opposed to what a particular partner might do), and then directly observed the consequences on their behavior.

1.6 Social expectations: Experimental Economics

Additionally, several studies within Experimental Economics have addressed related questions to the one of interest here. For example, a number of experiments have examined the effect of comparing the to-be-decided-on offer to one from a different proposer (e.g. Knez and Camerer 1995; Cason and Mui 1998). These studies report rather modest effects of this so-called 'outside option'; with rejection rates increasing slightly when information is provided that other responders are receiving more. This suggests that additional information about the proposer's offer is sometimes used by responders in deciding what they are willing to accept. In a more recent study, Bohnet and Zeckhauser (2004) provided responders with the average amount offered by the group of proposers who participated in the experiment, prior to the responder decision to accept or reject. The presence of this information indeed had an effect on rejection rates, with higher rejection rates observed when participants knew the average amount on offer. Though these results are intriguing, questions remain. In this study, expectations were not directly manipulated, and the average amount revealed to responders was reasonably high (approximately 35% of the pot). It is therefore still an open question whether 'low' expectations, that is, information that the average offer is quite unfair, would still

have an effect on behavior. Additionally in this study, proposers were told, before submitting their own offers, whether or not the average amount would be revealed to responders. This had the effect of actually increasing offers in the expectation condition, making direct comparisons between the 'expectation' and 'non-expectation' group more challenging. Nonetheless, these results do suggest that providing responders with information concerning typical proposer behavior could have important effects on decision behavior in an Ultimatum Game.

1.7 The present study

Taken in total, the above results suggest that expectations of fairness and unfairness may well have a significant impact on social decision-making, although to date this question has not been directly addressed by explicitly manipulating the fairness expectations of participants. To answer this question, the present study provided different groups of players with information concerning 'typical' patterns of proposer play in the Ultimatum Game, informing participants that proposers are usually quite fair or unfair in the offers they make (though to avoid potential demand characteristics, the words *fair* and *unfair* were not used in these instructions). Then, participants played the Ultimatum Game as responder, and we observed the effects of these expectations on decision behavior in the game. If, as expected, these expectations had noticeable effects on the patterns of responses, for example if higher expectations of fairness led to higher rejection rates, this would have important implications for models of fairness and equality, and would further contribute to the literature on how expectations and norms can drive behavior in a novel context.

2 Methods

2.1 Subjects

A total of 102 participants (61% female) were recruited from the pool of psychology undergraduate students at the University of Arizona (age 18–26 years, $M = 19.07$, SD $\pm$ 1.36). Each was randomly assigned to one of the three experimental conditions (high expectation, low expectation, no expectation), with 34 participants in each condition. To ensure that participants were sufficiently motivated to make real decisions, they were paid 10% of their actual earnings in the Ultimatum Game task, so that most participants received between \$4 and \$7 in cash. Additionally, participants received course credit for completing the experiment.

2.2 Expectation induction

To induce expectation, we included a one-sentence description of "typical" Ultimatum Game behavior in the experimental packet that participants were required to read before beginning the task. This packet consisted of a two-page description of the Ultimatum Game, as well as some demographic questions.

In the *high expectation* condition, participants read the following text: "Just to give you some information about how the game is typically played by college students, in general the most common offers made are quite equal, that is, an offer of $4 or $5 to you when dividing a $10 pot."

In the *low expectation* condition, participants read the following text: "Just to give you some information about how the game is typically played by college students, in general the most common offers made are quite unequal, that is, an offer of $1 or $2 to you when dividing a $10 pot."

Finally, in the *no expectation* control condition, participants were not given any information about typical play in the game, with the above sentence omitted entirely.

2.3 Expectation induction check

Following the administration of the instruction packet, but prior to playing the game, participants were asked to estimate what range of offers they would expect proposers to make in the Ultimatum Game. This was done to assess the degree to which the expectation induction had primed the participants. Participants were asked how many offers of $1, $2, $3, $4, $5, $6, and $7 they would expect to receive from a set of 100 proposers, where $10 was the pot amount to be split in each case. For example, if they thought that half of the offers would be an even split and the other half the minimum $1, they would answer '50' to the $5 amount and '50' to the $1 amount. Based on the answers provided, an average expected offer was computed for each participants. Finally, participants were asked what they would offer if they were the proposer in an Ultimatum Game.

2.4 Decision task (Ultimatum Game)

Participants were first given detailed instructions about the Ultimatum Game. It was emphasized that each displayed offer would be independent, that is, other proposers would not have the opportunity to view either the offer or the participant's response. Further, they were reminded that they would be compensated based on their pattern of acceptances and rejections.

Participants played the game in the role of responder, receiving one-time monetary offers from 23 different proposers, 15 of which were from human proposers and a further eight from a computer partner. It was explained that the human partners were free to make any offer they deemed appropriate, while the computer partner would make a random offer of between $0 and $5 on each trial. The entire experimental task therefore consisted of a single block of these 23 offers, each involving a $10 split.

A computerized version of the Ultimatum Game was used, presented via the E-Prime software package. Participants were told that they would be playing the game over a computer network with partners located at other universities. On each trial, participants first saw a picture of their partner for that trial (i.e. the proposer) on the computer screen for 4 s. For the human trials, these pictures were selected from a pool of actual Ultimatum Game players' photographs from previous studies (Sanfey

et al. 2003). For the computer trials, a picture of a standard desktop PC was used. Following the presentation of the picture, participants then saw the proposer's offer and had a maximum of 12 s to decide to either accept or reject this offer. Upon deciding by way of a key press, the outcome of the offer was presented for 4 s, and the next offer sequence followed. All participants saw the same set of offers that varied in unfairness level, with the trials presented in a randomized order for each.

Participants saw a varied set of offers. From human partners, participants saw 3 offers of \$5, 3 of \$4, 3 of \$3, 3 of \$2, and 3 of \$1. From the computer partner, they saw 2 of \$5, 3 of \$2 and 3 of \$1, for an overall total of 23 offers.

3 Results

3.1 Expectation induction

Participants' expectations regarding the Ultimatum Game offer amounts were computed by averaging the set of offers each participant reported that they would expect to see if they received 100 separate offers. For example, if a participant reported that they would expect 50 offers of \$5, 25 offers of \$4, and 25 offers of \$3, their calculated expectation amount per offer would be \$4.25 [(50 × \$5) + (25 × \$4) + (25 × \$3)/100]. Based on these calculated amounts, an analysis of variance (ANOVA) was conducted on this variable to determine if there were differences in expectation as a result of the simple instructional manipulation. This ANOVA confirmed that there was a difference amongst the means, $F(2,99) = 11.09$, $p < 0.001$, partial eta$^2 = 0.183$. Post-hoc comparison test showed that the high expectation condition ($M = \$4.32$) produced significantly higher predictions than the control condition ($M = \$3.67$, $p < 0.01$), and the control condition was in turn significantly higher than the low expectation condition ($M = \$3.14$, $p < 0.04$) (see Fig. 1).

The expectation induction had no significant effect on what participants reported their offers would be if they found themselves as proposers in the game. Although these amounts were in the predicted direction, there were no significant differences in offer amount between those in the high expectation group ($M = \$4.76$ out of \$10), low expectation group ($M = \$4.35$) and the control group ($M = \$4.64$), $F(2,99) = 2.38$, $p > 0.05$).

3.2 Decision-making

Aggregate acceptance rates for different types of offers (i.e. fairness level) were computed for each participant and compared across the three expectation conditions. These sets of offers, namely 'fair' (\$4, \$5 offers) and 'unfair' (\$1–\$3 offers), were constructed based on both participant debriefings as well as the observed acceptance rates of the offers. Analyses of variance (ANOVAs) were conducted to test the primary hypotheses regarding the respective effects of high and low expectation induction on decision-making, namely the acceptance rates of offers in the Ultimatum Game.

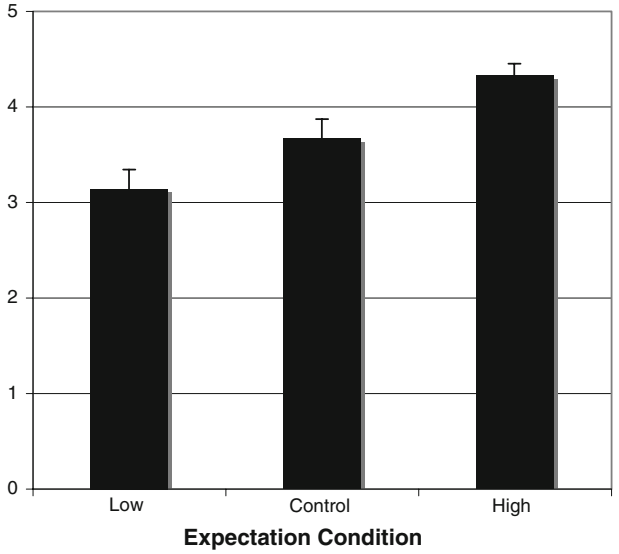

Fig. 1 Results of manipulation check, indicating the average offer (in $, from a pot of $10) expected by each of the three expectation groups

In terms of acceptance rates of unfair offers from human partners (i.e. $1–$3 offered to the Responder), there was a significant main effect between the three groups, $F(2,99) = 5.86$, $p = 0.004$, partial eta$^2 = 0.106$ (see Fig. 2). Specifically, using LSD post-hoc comparison tests, the high expectation group accepted significantly less offers than both the control group (mean difference = 0.206, $p = 0.004$) and the low expectation group (mean difference = 0.235, $p = 0.002$). The low expectation and control group did not differ significantly from each other (mean difference = 0.029, $p > 0.05$).

This pattern was further reflected in participant' total earnings, as the high expectation group earned on average $7.97 less across the game than the control group, $F(2,99) = 7.506$, $p = 0.001$, partial eta$^2 = 0.132$ for ANOVA, with post-hoc group comparison significant for high versus control groups (mean difference = −7.97, $p = 0.001$).

In contrast to unfair offers, and as expected, participants' responses to *fair* (i.e. $5) offers did not reveal any significant effect of expectation, showing almost perfect acceptance rates across conditions (average acceptance rate = 99.89%). A similar pattern emerged for $4 offers (average acceptance rate = 93.14%), which, based on debriefing interviews, were considered fair by most participants.

Interestingly, the main effect outlined above also extended to unfair offers from computer partners. For unfair computer offers (i.e. $1–$2), there was also a significant main effect amongst the three groups, $F(2,99) = 5.958$, $p = 0.004$, partial eta$^2 =$ 0.107. Post-hoc comparisons revealed that the high expectation group again accepted significantly less offers than both the control (mean difference = 0.304, $p = 0.001$)

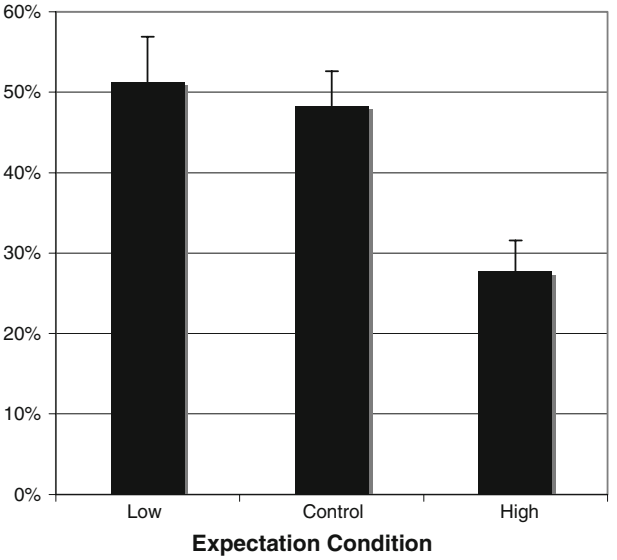

Fig. 2 Average acceptance rates of unfair offers from human partners ($1, $2 and $3 offers) for each of the three expectation condition groups

and the low expectation group (mean difference $= 0.230$, $p = 0.014$). The latter two groups did not differ from each other (mean difference $= 0.074$, $p > 0.05$).

Comparing directly between acceptance rates for $1 and $2 offers from human versus computer partners overall, participants accepted a higher number of unfair offers from computer partners ($M = 37.42\%$) than from human partners ($M = 28.27\%$), $t(101) = 3.053$, $p = 0.003$.

Therefore, as predicted, we found that raising participants' expectations of fair offers resulted in lower acceptance rates of unfair offers in comparison to both the neutral condition and the group who had been primed with low expectations of fairness. However, no differences in acceptance patterns were observed between low expectation and control groups.

Finally, it is noteworthy that acceptance rates in the control (no expectation) condition were comparable to those from a wide variety of previous Ultimatum Game studies, providing an important behavioral response check. Specifically, the control group accepted all fair offers, and accepted about half (48.37%) of unfair offers.

4 Discussion

The primary question of interest in this study was whether providing players with information about typical patterns of play in the Ultimatum Game could in turn influence the decisions made by these players in the game itself. More specifically, would informing different groups of participants that offers in general are usually

either relatively high (i.e. fair) or relatively low (i.e. unfair) lead to differential acceptance rates of unfair offers in the game.

The manipulation check, whereby participants were explicitly asked what range of offers they would expect to see from proposers, demonstrated that the information provided about typical play did influence their expectations as to the set of offers they would subsequently see. Despite the rather subtle nature of this information, which was merely a one-sentence description provided as part of a printed two-page experimental packet, results indicated that judgments of the participants in the three groups (those primed with high offers, those primed with low offers, and those who received no information about typical play) differed in the predicted fashion. That is, the high expectation group anticipated quite fair offers ($M = \$4.32$ from a \$10 pot), significantly higher than the no expectation group ($M = \$3.67$), which was in turn significantly higher than the low expectation group ($M = \$3.14$).

This result is in itself quite interesting, as it demonstrates that our judgment of social decisions, in this case our predictions of proposer behavior, can be rather easily affected by simply providing some 'average' information. This is perhaps surprising, as it shows that descriptive information such as this can apparently take precedence over our own perceptions of how we, and others, would play the game. Interestingly, there were no differences between groups with regard to what participants reported that they would offer were they to play the game as proposer, suggesting that expectations may play a role in the prediction of other's behavior in particular.

With regard to the main research question, results demonstrated that these expectations did indeed have an effect on decision behavior in terms of participants' play as responder in the Ultimatum Game. Specifically, players who had been informed that the typical set of offers are generally rather high (i.e. quite fair) had significantly lower acceptance rates for unfair offers than either of the other two groups. The magnitude of this difference was substantial, with acceptance rates in this high expectation condition almost half of those in the low expectation group. This is notable, as across many experiments in different cultures and with varying methodologies, responder acceptance rates of unfair offers are generally quite consistent (around 50%—see Camerer 2003).

A primary contribution of this study is to experimentally demonstrate a further context in which expectations can play an important role in shaping decision-making behavior. Of particular interest is that in this situation, participants were not asked about relatively labile and inconsequential judgments such as one's enjoyment of a movie or the subjective taste of wine or beer, but rather were asked to make decisions about their own personal values regarding fairness and equity. While it has long been known that our values and preferences are often constructed when elicited, as opposed to the notion that values are inherent and simply must be 'read-off' when needed (Slovic 1995), the data presented here provide important additional evidence that this process extends to what could be considered quite fundamental values. Further, these results demonstrate the strong effect of social norms, whereby what is advertised as typical or average behavior can exert a substantial influence on behavior.

In addition, these results have the potential to inform economic models of fairness and equity, by illustrating that notions about what constitutes an acceptable division of a sum of money can be affected by altering the perceptions of participants about what is typical in this situation. Adherence to norms regarding equity (e.g. Fehr and Schmidt 1999; Bolton and Ockenfels 2000) and fairness (e.g. Falk and Fischbacher 2006; Charness and Rabin 2002) have been proposed as strong mechanisms by which unfair offers are rejected in Ultimatum Games, and therefore evidence of expectation effects which directly change the way people play these games could usefully be used to further constrain these sets of models.

The results of this study are largely in agreement with those of Bohnet and Zeckhauser (2004), who demonstrated that when responders are made aware of average offers at the group level, this information can have an effect on acceptance rates of unfair offers. In their study, the authors adhered to the tenets of Experimental Economics, which prohibits deception such as informing participants about 'average' offers which are not derived from an actual distribution of real offers. The present study extends this work by specifically manipulating the information provided about average offers, and also by ensuring that all groups of participants saw the very same set of Ultimatum offers.

Of course, there are still some open questions with regard to the current data. Although there were significant differences between all three groups in terms of the set of offers they predicted receiving (after the expectation manipulation), there were no significant differences in acceptance rates between the low expectation group and the control group, although the groups were ordered in the predicted direction (low expectation group accepted more than the control group). It is possible that this was due to a form of ceiling effect, whereby it is difficult to move acceptance rates for unfair offers much beyond 50% no matter what the circumstances, as evinced by much experimental work. If so, this would suggest that expectations may have an effect up to a point, but no matter how low's ones expectations are, certain levels of unfairness are unacceptable. Future studies could help assess the validity of this hypothesis.

Another interesting future question might be to examine how providing people with average offer amounts might affect proposer behavior itself. If I believe that the typical UG offer is a low one, will that increase the likelihood that I in turn will offer a small amount? In this study, participants were asked what they would offer were they to play in this role. Though there were no significant differences between the groups, it may be the case that actual behavior could deviate from non-binding predictions, such as were obtained here. The fact that participants were not placed in the role of proposer may mean that responses were made with a degree of social desirability—that they may not have wanted to state they would behave unfairly. Further, although there were no significant differences, the proposed offers did at least match with what would be predicted, with the high expectation group offering the most, and the low expectation group the least.

The results outlined here also have the potential to help inform neural models of responder behavior in the Ultimatum Game. Several studies (e.g. McCabe et al. 2001, Rilling et al. 2002) have begun to explore the brain processes that might underlie processing of social decisions, and have utilized neuroimaging technology

and some of the many Game Theoretic tasks to examine these questions. One study (Sanfey et al. 2003) has proposed a model of processing in the Ultimatum Game, with affective brain areas responsive to the negative emotion of receiving an unfair offer, and thus biasing to reject, while more deliberative areas respond to other motivations such as the economically sensible decision to take the money, and therefore bias the decision-maker to accept. The present paradigm could usefully be employed in a neuroscience context to further inform this model, and also to shed light on the mechanisms by which expectations alter decision-making. For example, awareness of typically high average offers could reduce unfair acceptance rates by either causing an enhanced negative emotional reaction to the unfair offer, or similarly could lead to this effect by having the same degree of emotional reaction, but with reduced ability to 'override' this prepotent response (e.g. Delgado et al. 2005). Scanning participants as they play the game with knowledge of average play could help address this question.

In conclusion, this study showed the strong effect of expectations in novel context, that of economic interactive decisions. As expectations about the size of the offer increased, actual acceptance rates of unfair offers decreased. The interactions that are currently emerging between Psychology, Economics and Neuroscience offer a strong future basis for the investigation of human judgment and decision-making, and the integration of economic tasks with psychological manipulations and assessments, as shown in this study, provide a useful avenue for further research into this important topic.

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