Self-Serving Bias and Ultimatum Bargaining

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Abstract

There is strong evidence that in bargaining situations with asymmetric outside options people exhibit self-serving biases concerning their fairness judgements. Moreover psychological literature suggests that this can be a driving force of bargaining impasse. This paper extends the notion of inequity aversion to incorporate self-serving biases due to asymmetric outside options and analyses whether this leads to bargaining breakdown. I distinguish between sophisticated and naive agents, that is, those agents who understand their bias and those who do not. I find that breakdown in ultimatum bargaining results from naiveté of the proposers.

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1 Introduction

There is a large body of empirical psychological literature (c.f. Babcock, Loewenstein, Issacharoff, and Camerer (1995), Babcock and Loewenstein (1997) and the literature cited there) as well as experimental economics literature (c.f. Dahl and Ransom (1999), Konow (2000) and Gaechter and Riedel (2002)) that finds self-serving biases in judgements of fairness. According to Dahl and Ransom (1999, p.703), agents that are self-servingly biased "...subconsciously alter their fundamental views about what is fair in a way that benefits their interests". The literature suggests that a self-serving bias impacts on behaviour. In

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particular, it has been identified as a driving force for bargaining impasse, see e.g. Babcock and Loewenstein (1997). A self-serving bias is characterised by two features: First, it settles itself in a notion of fairness which tends to favour the agent, i.e. which leaves the agent with a relatively big monetary payoff. Second, agents are not aware of their self-serving biases. They tend to consider their own fairness perception as impartial. It is intuitive that in a situation where agents have different notions of fairness and are not aware of these differences, bargaining might fail. The present paper extends the notion of inequity aversion to incorporate self-serving biases due to asymmetric outside options. It analyses how differences in fairness perceptions influence behaviour in ultimatum bargaining games, in particular with respect to bargaining breakdowns.

Bargaining is important on nearly all levels of social interaction from the small quarrels among friends and family to the big negotiations between states. Understanding why bargaining fails is thus one of the major concerns in social sciences. The consequences of impasse are evident in looking, for exemple, at the amounts spent privately and publicly on civial litigation or the costs of strike and lockout. Economists usually analyse bargaining games with the classical assumption of purely self-interested agents. However, experimental evidence suggests that a large fraction of agents do not behave as classical economic theory predicts. There exist various approaches to model the experimental evidence. All of these models embed social comparison processes in preferences and can be divided into two broad classes: equilibrium and distributional models. For an extensive overview of the literature see Fehr and Schmidt (2003). Equilibrium models capture the reciprocity motive, defined as an in-kind response to beneficial or harmfull action by others, in terms of beliefs concerning intentions. Rabin (1993), Levine (1998), Dufwenberg and Kirchsteiger (1999), Falk and Fischbacher (2000) and Cox and Friedman (2002) represent models of this type. Distribution models imply that agents like their own payoff and dislike income inequality. Models of this type are Fehr and Schmidt (1999), Bolton and Ockenfels (2000) and Charness and Rabin (2001). In what follows, I adopt the notion of inequity aversion of Fehr and Schmidt (1999).

When comparing monetary payoffs agents base their judgement as to whether an outcome is considered as equal/fair on a reference allocation. Fehr and Schmidt argue that in a symmetric setting a natural reference outcome is one which attributes the same monetary payoff to all agents (*Equal Split*). Also Bolton and Ockenfels (2000) postulate the *Equal Split* as reference allocation. With the introduction of asymmetric outside options this reasoning is no longer applicable. There are a variety of fairness perceptions in this situation: *Equal Split* or an equal split of the entire surplus minus the sum of outside options (*Split the Difference*). On which of the various reference allocations an agent is likely to base her fairness judgement is an empirical question. Psychological research suggests that people exhibit a self-serving bias, see Babcock and Loewenstein (1997): A self-serving bias implies that in a setting with asymmetric outside options agents tend to adopt a fairness perception that favours them in monetary terms. Moreover self-servingly biased agents do not recognise their bias.

Knez and Camerer (1995) run an ultimatum experiment with different outside options. They find that outside options significantly influence the behaviour of subjects. In particular, they find that rejection rates are around 45%-48%. This is much above the rejection rates in experiments with no outside options which are around 20%, see Camerer (2003). Falk, Fehr, and Fischbacher (2001) conduct a reduced ultimatum game with positive outside options for the responder as well as a control treatment with no outside option for either player. They too, find that the existence of outside options seems to influence on the behaviour of agents. The difference in behaviour might be explained by the mere introduction of outside options. However, some part of the changed behaviour might also be due to differing fairness perceptions and the existence of a self-serving bias in the perception of the fair allocation.

To incorporate differences in fairness perception, I render the reference allocation of the agents linearly dependent on the difference in outside options between two agents. The strength with which this difference influences the reference point can vary across agents. It serves as a measure of the extent to which the fairness perception favours the agent. I separate the two features of self-serving biases to analyse the influence of each component separately: An agent is *partial*, if she has a reference allocation that gives her a relatively bigger allotment. To illustrate partiality, consider the two specific fairness notions described above. Agents are partial if the agent with the relatively big outside option regards *Split the Difference* as a fair outcome while the agent with the relatively small outside option considers the *Equal Split* as fair. To capture the second feature of a self-serving bias, namely that people are ignorant about the partiality, I distinguish between *sophisticated* agents who understand that their fairness notion favours themselves, and *naive* agents who have no such understanding.

Within this extended framework of inequity aversion, I analyse the dictator as well as ultimatum bargaining game. In a dictator game an agent decides about how to split a fixed surplus. Heterogeneity in fairness perceptions introduces variation in the prediction of the game. Dictators, those reference allocation favours themselves more, tend to give less to the recipient. In an ultimatum game, a proposer and a responder bargain over the division of a fixed pie. The proposer announces a division which the responder can accept or reject. If he accepts, the pie is divided according to the proposed rule. If he rejects, each player gets an outside option, known to both agents. The analysis of this paper focuses on the propensity of bargaining breakdown. With purely-self interested agents, as well as with standard inequity averse agents, the bargain will take place. With the mere introduction of differing evaluations of what allocation is fair, this result does not change. As long as the proposer does know about the fairness perception of the other agent, she prefers to offer a share that the responder is willing to accept rather than get her outside option. Accordingly, as long as the partial agents are aware of their partiality, the ultimatum bargaining takes place. If instead the proposer is partial and naive, then there are circumstances where the bargain breaks down. The reasoning is straightforward: The respondent is willing to accept any offer that is above a certain threshold. The threshold level depends on the fairness perception of the respondent. A sophisticated and partial proposer will predict the threshold correctly while a naive and partial proposer underestimates it. Therefore, whenever the naive and partial proposer offers her predicted threshold level in equilibrium, the bargain fails.

In the next section I propose an extension of inequity aversion that incorporates heterogeneity in fairness perceptions and self-serving biases. The framework is first applied to dictator games in section 3 and then to ultimatum games with asymmetric outside options in section 4. Section 5 discusses experimental evidence. Section 6 concludes and suggests further paths of research.

2 An extension of inequity averse preferences

People compare themselves with others in many respects: cars, houses, income, work status etc. With whom they compare and what they compare is a question that receives a lot of interest in social sciences. In the last two decades experimental economists have conducted a vast variety of experimental studies to find out to what extent people in certain situations compare themselves with others and how this influences their behaviour. In particular, with simple set-ups such as dictator, ultimatum or trust games, researchers came to understand that the agents in their experiments do not solely base their behaviour on narrow self-interest as classical economics literature presumes. It seems that subjects compare their payoff with the other participants' payoffs. For an extensive summary on the experimental findings see Camerer (2003) and the literature cited there. Inequity aversion as proposed by Fehr and Schmidt (1999) captures this comparison: Inequity averse agents compare their monetary payoff with the payoff of members of a specific reference group. Within this reference group they dislike outcomes that they perceive as unequal or unfair, that is they derive negative utility of a deviation from their reference allocation. The reference allocation of an agent with respect to another agent is defined by the pair of payoffs that she considers to be equal or fair. It is the result of complicated social comparison processes.

The utility of an agent depends on the reference allocation as well as the reference group. Both these determinants are considered exogenous in the model of Fehr and Schmidt. They argue that in an experiment all participants form the reference group. Furthermore they postulate that in symmetric situations, a natural reference allocation is one in which each agent gets the same payoff, the *Equal Split*. A study by Hennig-Schmidt (2002) finds that in symmetric ultimatum games the only allocation that is perceived as fair by both agents is the allocation were each agent gets an equal amount. She conducted a video experiment where groups of individuals decided about a distributional task. During the group discussion preceding the decision, in the symmetric ultimatum game only the *Equal Split* was mentioned as a fair outcome.

Once asymmetry is introduced, there is no reason to believe that *Equal Split* is a natural reference allocation. The asymmetry may lead to various reference allocations. Psychological as well as experimental economic literature finds that in asymmetric situations there exist several notions of fairness. An experiment by Messick and Sentis (1979) divided subjects into two groups. One group was told that they should imagine they had worked 7 hours and were to receive a certain amount of money for that. Subjects of the other group were told to imagine they had worked for 10 hours on the same task. All subjects were asked to state the fair payment for the ones that had worked for 10 hours. Some people thought that it was fair to pay them the same total amount, while others thought it to be fair to pay them the same hourly wage. Among the group of subjects who was told to have worked 7 hours the fraction of subject regarding the same total payment as fair was significantly bigger than the fraction in the second group. Another experiment by Babcock, Loewenstein, Issacharoff, and Camerer (1995) allocated the roles of prosecutor and defendant in a juridical case to different individuals. They find that parties with the same information about the case come to different conclusions about what settlement is fair depending on their allocated roles. These are two examples of experiments finding a self-serving bias in the assessment of the fair outcome in asymmetric situations. Also other psychological literature suggests that "for the bias to occur, there needs to be some form of asymmetry in how the negotiation environment is viewed", Babcock and Loewenstein (1997,p. 119). The same study (p. 111) states that "self-serving assessments of fairness are likely to occur in morally ambiguous settings in which there are competing "focal points" - that is, settlements that could plausibly be viewed as fair."

In simple bargaining situations such as the ultimatum game, the mere allocation of roles introduces enough asymmetry to induce a self-serving bias: proposers view themselves in a relatively more powerful role and therefore believe that they deserve more than their opponents. The respondents in contrast think that the distribution of roles should not affect the division of the cake. More powerful sources of asymmetry in bargaining environments are asymmetric payoff possibilities or differing outside options for the agents.

The present paper models self-serving biases due to asymmetric outside options. Different outside options seem to be an important source of asymmetry. They are important in situations where an employer and a worker bargain over the worker's wage. But there are a lot of other day-to-day examples where people with different outside options have to decide about the distribution of a cake.[1] Apart from the apparent omnipresence of asymmetric outside options this form of asymmetry is relatively easy to capture. First, it is an easily observable characteristic of the bargaining situation. Second, it can be measured quantitatively. Last, outside options can be altered in experimental set-ups and thus the predictions of the theory should be testable.

[1] Imagine a school that has got one grand piano. Pupils are allowed to play it for one hour a day. Two girls want to practice and have to distribute the available time among the two. The fact that one girl has got a piano at home might lead the other girl to believe that she should be allowed more time at the grand piano than the girl with the piano at home. But the girl with the piano might believe that she deserves the same time to practice with the grand piano.

An easy and straightforward way of incorporating outside options into fairness considerations is to render the reference allocation linearly dependent on the difference of the outside options. The reference allocation can then be expressed as follows

$$x_i = x_j + \gamma_i (\omega_i - \omega_j) \quad \forall i \neq j \tag{1}$$

where x_i represents the monetary payoff of agent i, ω_i her outside option and γ_i measures the extent to which the fairness perception favours the agent.[2] The value of γ_i determines the perception of fairness of the agent i.[3] This representation has the property that whenever we consider agents in a symmetric environment the reference allocation is the *Equal Split*, independent of γ_i. Moreover, it is adapted to the inequity approach of Fehr and Schmidt as the outside option comes in linearly. Note that the fairness parameter γ_i can vary across agents.

When two agents i, j can jointly generate a surplus of $\overline{x}_{i,j} \geq 0$, the reference allocation of agent i is uniquely determined by equation (1) and the restriction that $x_j = \overline{x}_{i,j} - x_i$. Denote the pair of payoffs that solves these equations by $x^f(\gamma_i) = \left(x_i^f(\gamma_i), x_j^f(\gamma_i)\right)$ where the superscipt f stands for fair. This notation emphasises that the reference allocation of agent i depends on her fairness parameter γ_i. There are several outstanding fairness considerations. The most prominent being the notion that equal monetary payoffs of the agents are fair (*Equal Split*). This would imply a fairness parameter γ_i of zero. A notion of fairness that would split the difference between the surplus both agents can jointly generate $\overline{x}_{i,j}$ and the sum of the outside options $\omega_i + \omega_j$ (*Split the Difference*) implies a parameter γ_i of one. Whereas a parameter of $\gamma_i = \frac{\overline{x}_{i,j}}{\omega_i + \omega_j}$ represents a fairness perception that attributes a proportion of the outside options to each agent (*Proportional Split*). Still, one could think of any other value of γ_i constituting a fairness notion.[4]

I normalise the surplus that can be generated jointly by the agents to $\overline{x}_{i,j} = 1$. Furthermore, I assume that the entire pie exceeds the sum of the outside options. In two-player cases only the difference of the outside options matters, I therefore set one of the two outside options equal to zero, $1 > \omega_i \geq \omega_j = 0$ for $j \neq i$. The parameter range of γ_i can be reduced to $\left[-\frac{1}{\omega_i - \omega_j}, \frac{1}{\omega_i - \omega_j}\right]$ whenever $\omega_i > \omega_j$. The upper value signifies a reference point where agents find it fair that agent i gets the entire pie and the lower value where agent j gets everything. In the following I exclude negative fairness parameters. Remember that a parameter of zero signifies the *Equal Split.* In the case where agent i has got the bigger outside option, a negative fairness parameter for either agent would translate into a reference allocation attributing an absolute bigger allotment to agent j. This does not seem to be an intuitive distributional goal. Limiting the parameter range to positive

[2] The terms fairness perception, fairness notion and reference allocation are used synonymously.

[3] Melanie Lührmann pointed out that the fairness parameter γ could also be interpreted as a preference parameter for redistribution. For example in the context of pensions, the γ parameter could indicate the preference for redistribution of an accummalated stock of contribution.

[4] In the experiments by Hennig-Schmidt (2002) during the group discussions, *Equal Split*, *Split the Difference* and *Proportional Split* as well as a few other divisions of the cake have been characterised as fair allocations.

values is thus not overly restrictive and simplifies the analysis.

Incorporating this approach in the representation of inequity aversion yields preferences of the form

$$\begin{aligned} u_i(x) &= x_i - \alpha_i \frac{1}{n-1} \sum_{j \neq i} \max\{x_j - \gamma_i \omega_j - (x_i - \gamma_i \omega_i), 0\} \\ &\quad -\beta_i \frac{1}{n-1} \sum_{j \neq i} \max\{x_i - \gamma_i \omega_i - (x_j - \gamma_i \omega_j), 0\} \end{aligned}$$

with $\alpha_i \geq \beta_i$ and $\beta_i < 1$. The utility parameters α_i/β_i measure the loss for agent i resulting from a deviation to her disadvantage/advantage from her reference point.

The reference allocation of a self-servingly biased person attributes a relatively big monetary allotment to herself. Moreover, the person believes her reference allocation to be impartial. I split up the notion of self-serving biasedness into its two components: (i) the bias and (ii) the belief about the bias.

Definition 1 *An agent i is* ***partial*** *with respect to another agent j if a higher monetary payoff is attributed to herself by her own reference allocation than by the reference allocation of agent j, i.e. $x_i^f(\gamma_i) > x_i^f(\gamma_j)$.*

This implies that the agent with the relatively high outside option is partial if she has a relatively high fairness parameter γ_i. On the other hand, an agent with the relatively small outside option is partial if she has a relatively low γ_i. Two agents that have the same fairness parameter γ are unpartial. The opposite of partiality is when an agent allocates less to herself than the opponent does. The agent with the relatively big outside option would then have a smaller fairness parameter than her opponent. To rule out these cases, I restrict the parameter range such that

$$\gamma_j \in [0, \gamma_i] \text{ for } \omega_i \geq \omega_j.$$

I distinguish between those agents that are aware of differing fairness notions among individuals and those that are not. In analogy to O'Donoghue and Rabin (1999), I call an agent naive who thinks her reference allocation is impartial. A naive agent assumes therefore that the other agent has the same fairness parameter as herself. In contrast, a sophisticated agent knows that her notion of fairness differs from the one of her opponents. Moreover, she knows the exact fairness parameter of the other agents.[5] Denote the belief of agent i about the fairness parameter of another agent j by $\widehat{\gamma}_i$.

Definition 2 *Agent i is* ***naive*** *if she believes that agent j's fairness parameter is the same as hers, that is $\widehat{\gamma}_i = \gamma_i$. Agent i is* ***sophisticated*** *if her belief about agent j's fairness parameter is correct, that is $\widehat{\gamma}_i = \gamma_j$.*

[5] If we allow sophisticated agents to be uncertain about the exact value of the fairness parameter of the other agent, we get partial sophistication. The case with perfect sophisticates and perfect naives can be regarded as a benchmark.

Only an agent which is partial and naive has got a self-serving bias. The behaviour of self-servingly biased agents is going to be the central focus of the analysis.

Definition 3 *A partial and naive agent is* ***self-servingly biased****.*

In the presence of self-servingly biased agents the solution concepts of subgame perfectness and Bayesian perfectness become problematic as believes might not be correct in equilibrium. I therefore employ the concept of "perception perfect strategies" introduced by O'Donoghue and Rabin (2001) in the context of hyperbolic discounting. This concept requires that at any time the agents have reasonable beliefs about the fairness parameters of the other agents and that they choose an action that maximises their payoff according to these beliefs. But it does not require, as the concept of subgame perfectness or Bayesian perfectness, that agents' beliefs are correct in equilibrium. Denote with $U_i(s_i(\gamma_i, \widehat{\gamma}_i))$ the (expected) utility of agent i resulting from the strategy $s_i \in A_i$ where A_i signifies the strategy space for agent i. I restrict the strategy space to incorporate pure strategies only.

Definition 4 *The strategy $s_i^{pp}(\gamma_i, \widehat{\gamma}_i)$ is perception-perfect for a $(\gamma_i, \widehat{\gamma}_i)$-agent if and only if it is such that $s_i^{pp}(\gamma_i, \widehat{\gamma}_i) \in \arg\max_{s_i} U_i(s_i(\gamma_i, \widehat{\gamma}_i))$.*

The belief of sophisticated agents is correct. Therefore the perception perfect equilibrium coincides with the subgame perfect equilibrium resp. the Bayesian perfect equilibrium.

There are other models of social preferences available. Most closely related to Fehr and Schmidt is the theory of equity, reciprocity, and competition by Bolton and Ockenfels (2000). They postulate a motivation function driving the behaviour that depends on the monetary payoff of an agent as well as on her relative share of the payoff. One example of such a motivation function is an additively separable function that is linear in the monetary payoff and quardratic in the deviation of the relative share from the *Equal Split*. Agents compare themselves with the average of all other players, while in Fehr and Schmidt comparison processes are between pairs of agents. It is possible to apply the same logic used here to extend inequity aversion to the reference allocation in the motivation function. Qualitatively, most of the results presented later carry over to the representation of Bolton and Ockenfels.

In the next sections I analyse the behaviour of self-servingly biased inequity averse agents in simple dictator and ultimatum bargaining games.

3 Dictator game

In a dictator game the dictator (D) decides how to split a fixed surplus between herself and a recipient (R).[6] A purely self-interested dictator allocates the entire surplus to herself.

[6] In what follows, I denote the first player as female and the second player as male.

Instead, an inequity averse dictator as in Fehr and Schmidt (1999) either gives half of the surplus to the recipient, if she is sufficiently inequity averse (i.e. $\beta_D > \frac{1}{2}$), or keeps the entire surplus to herself.

In this setting, outside options as conflict payments are of no relevance. There is no possibility of conflict and the outside option is therefore never paid out. However, suppose both agents have the opportunity to decide whether to participate in the dictator game. If at least one of the agents decides not to participate, they both receive an outside option, denoted by $\omega_i \geq 0$ for $i = D, R$. These outside options could also be interpreted as the opportunity costs of participating in the dictator game. Intuitively, the size of the outside options might influence the decision of how to split the surplus. The introduction of outside options does not influence the behaviour of dictators, whether purely self-interested or inequity averse. In particular, the constellation of outside options is irrelevant to the inequity averse dictator. However, recipients might not participate in the dictator game.

This implies that the distribution of surplus in the dictator game stage is not affected by the constellation of outside options. Yet, this changes when allowing the fairness perception to be different from the *Equal Split* norm: Analogously to the case with an *Equal Split* norm, the dictator gives the share she perceives as fair to the recipient if she is sufficiently inequity averse. The fair share now depends on the fairness norm. Let s denote the share allocated by the dictator to the recipient.

Lemma 1 *Given both agents participate, a optimal strategy of the dictator is:*

$$s = \begin{cases} \frac{1-\gamma_D(\omega_D - \omega_R)}{2} & if\ \beta_D \geq \frac{1}{2} \\ 0 & if\ \beta_D < \frac{1}{2} \end{cases} .$$

Proof. The utility function of the dictator is given by $u_D(s) = 1 - s - \alpha_D \max\{2s - 1 + \gamma_D(\omega_D - \omega_R), 0\} - \beta_D \max\{1 - 2s - \gamma_D(\omega_D - \omega_R), 0\}$. It is obvious that it is never optimal for the dictator to keep less than half of the surplus. If $\beta_D < \frac{1}{2}$, then the utility is decreasing in the share s. It is hence maximal for $s = 0$. If instead $\beta_D \geq \frac{1}{2}$, the utility is (weakly) increasing in the share s.It is optimal to allocate the fair share $s_D^f = \frac{1-\gamma_D(\omega_D - \omega_R)}{2}$ to the recipient. ■

The fair share depends on the fairness perception of the dictator γ_D. As soon as the perception deviates from the *Equal Split*, $\gamma_D = 0$, the outside option constellation matters. Hence, only then is the behaviour of the dictator influenced by the outside options. This shows that the mere introduction of heterogeneity in fairness perceptions changes the predictions of the dictator game significantly. We will see in the next section that the mere introduction of several fairness norms does not change the results qualitatively, but only quantitatively. However, with ultimatum bargaining the occurance of self-serving bias becomes crucial.

For completeness, recipients participate as long as the value of the outside option is less than the value of the devision of the surplus. If the dictator keeps the entire surplus to herself, the difference in payoffs can only increase when participating. Recipients thus always refrain from particiaption. If instead the dictator is sufficiently inequity averse, most recipients participate in the game, see the appendix A for further detail.

4 Ultimatum game

In an ultimatum game, a proposer and a responder bargain over the division of a fixed surplus of 1. The proposer (P) announces a division of the surplus $(1-s, s)$ where s denotes the share offered to the responder. The responder (R) in turn accepts or rejects the proposal. If he accepts, then the surplus is divided according to the proposed rule. If he rejects, each player gets her or his outside option denoted by $\omega_i \geq 0$ for $i = P, R$.

In the subgame perfect equilibrium under the assumption of purely self-interested agents the proposer offers a division of the surplus of $(1-\omega_R, \omega_R)$ which is accepted by the respondent. With complete information concerning the utility parameters α_R, β_R, the equilibrium offer of inequity averse proposers depends on the extent to which she suffers from advantageous inequity, that is situations in which she gets more than the responder. Proposers that suffer relatively heavily from inequity to their advantage offer a relatively high share to the responder. However, they never go as far as to offer him more than half the pie. Conversely, proposers that do not suffer much from advantageous inequity find it profitable to offer a share as small as possible such that the responder is just willing to accept. In equilibrium, proposers offer

$$s \begin{cases} = 0.5 & if\ \beta_P > \frac{1}{2} \\ \in \left[\frac{\alpha_R - \alpha_R\omega_P + (1-\beta_R)\omega_R}{1+2\alpha_R}, 0.5\right] & if\ \beta_P = \frac{1}{2} \\ = \frac{\alpha_R - \alpha_R\omega_P + (1-\beta_R)\omega_R}{1+2\alpha_R} & if\ \beta_P < \frac{1}{2} \end{cases}.$$

The responder accepts the offer. In comparison to the pure self interest model, the model with inequity aversion predicts that the proposed shares for the responder will be positive irrespective of the outside options of the agents. Furthermore, a positive outside option for the responder increases the minimum share he is willing to accept $\underline{s} = \frac{(1-\beta_R)\omega_R + \alpha_R}{1+2\alpha_R}$ compared to no outside option for both players where he accepts everything above $\underline{s} = \frac{\alpha_R}{1+2\alpha_R}$ or to the case where the proposer has a positive outside option, $\underline{s} = \frac{(1-\omega_P)\alpha_R}{1+2\alpha_R}$.

Before analysing the general case, in the next section, I explain the workings of a self-serving bias with the help of a simple example.

4.1 An example

Suppose the responder has got a bigger outside option than the proposer, $\omega_R > \omega_P = 0$. Consider the two conflicting fairness perceptions of *Equal Split* and *Split the Difference*. A partial proposer believes that the *Equal Split* $s_P^f = \frac{1}{2}$ is fair while a partial responder adopts *Split the Difference* as reference allocation $s_R^f = \frac{1+\omega_R}{2}$. In this case the fairness parameter of the proposer resp. the responder is $\gamma_P = 0$ resp. $\gamma_R = 1$. The mere introduction of partiality in fairness perceptions does not result in a breakdown of the bargaining. A sophisticated partial proposer is always willing to divide the pie such that the respondent is at least as well off as with his outside option. The efficiency gain resulting from the bargain is always large enough to compensate for possible further deviations from the reference allocation. In the next section I will show that this holds in general: The maximum share the proposer is willing to offer (MOS - *Maximally Offered Share,* denoted by $\overline{s}$) exceeds the minimum share the responder is willing to accept (MAS - *Minimally Accepted Share,* denoted by $\underline{s}$). These shares render the proposer resp. the responder indifferent between their outside option and the division of the pie.

In the above example, the value of the outside option to the responder is $u_R(0, \omega_R) = \omega_R$ and a division $(1-s, s)$ of the cake which is disadvantageous to him, i.e. $s \leq \frac{1+\omega_R}{2}$, results in a value of $u_R(1-s, s) = s - \alpha_R(1 - 2s + \omega_R)$. The responder's MAS is thus

$$\underline{s}_{\gamma_R=1} = \frac{(1+\alpha_R)\,\omega_R + \alpha_R}{1+2\alpha_R}.$$

The proposer on the other hand values the outside option with $u_P(0, \omega_R) = -\alpha_P \omega_R$. She derives a utility of $u_P(1-s, s) = 1 - s - \alpha_P(2s-1)$ of a disadvantageous division $(1-s, s)$ of the pie, with $s \geq \frac{1}{2}$. Hence she is better off with a division of the pie as long as the share for the respondent does not exceed the MOS of

$$\overline{s}_{\gamma_P=0} = \frac{1 + \alpha_P(1+\omega_R)}{1+2\alpha_P}.$$

The MOS $\overline{s}_{\gamma_P=0}$ is strictly bigger than the MOS $\underline{s}_{\gamma_R=1}$. The bargain will therefore never fail to take place.

If, however, the proposer is partial and naive about it, then the bargain is likely to fail. The naive and partial proposer thinks that the responder shares the same fairness perception of $\gamma_P = 0$. She employs that value of the fairness parameter to compute the MAS. Hence she believes the MAS to be the same as in the standard case with simple inequity aversion

$$\underline{s}_{\widehat{\gamma}_P=0} = \frac{(1-\beta_R)\,\omega_R + \alpha_R}{1+2\alpha_R}.$$

This level is strictly smaller than the actual minimal level, i.e. $\underline{s}_{\gamma_R=1} > \underline{s}_{\widehat{\gamma}_P=0}$. If the proposer's sufferance from advantageous inequality is sufficiently small, i.e. $\beta_P < \frac{1}{2}$, then in equilibrium the proposer is going to propose the smallest share to the responder. Therefore she will propose a share that is actually below the minimal share the responder is willing to accept and the bargain will fail.

The next section extends this result to more general notions of fairness and derives the equilibrium for the case of incomplete information concerning the utility parameters α_R, β_R.

4.2 General case

The outcome of the ultimatum bargaining with inequity averse agents is characterised by Fehr and Schmidt (1999): In equilibrium the responder accepts any offer above his MAS while the proposer offers either a share that equals the fair share if she is sufficiently inequity averse, or else the MAS. This result carries over to the more general case where we allow for heterogeneity in fairness perceptions. However, in the presence of partial agents it might occur that the MAS of the responder exceeds the fair share the proposer attributes to the responder. In this case the sophisticated proposer offers the MAS irrespective of her inequity aversion. In contrast to the case with symmetric fairness perceptions, partiality can therefore induce that the equilibrium outcome no longer depends on the inequity aversion of the proposer.

If the agents have a strong tendency to favour themselves, then it is likely that in equilibrium the MAS will be offered irrespective of the inequity aversion of the proposer. Strong partiality indicates whether the partiality is sufficiently big, so that the MAS of the responder exceeds the fair share the proposer attributes to the responder. Define the fair allocation depending on the fairness parameter γ by

$$\begin{aligned} & \left(1 - s^f(\gamma), s^f(\gamma)\right) \\ = & \left(\frac{1 + \gamma(\omega_P - \omega_R)}{2}, \frac{1 - \gamma(\omega_P - \omega_R)}{2}\right) \end{aligned}$$

and let $\underline{s}(\gamma)$ denote the MAS depending on the fairness parameter γ.

Definition 5 *Agents are* ***strongly partial*** *if the MAS of the responder is bigger than the fair share of the proposer,* $\underline{s}(\gamma_R) > s^f(\gamma_P)$.

In case of strong partiality, we have to make sure that the proposer wants to offer more than her fair share to the responder. The efficiency gain from a bargain has to be sufficiently large as to compensate the proposer for the loss resulting from the deviation from her reference allocation. Lemma 2 establishes that the proposer is better off if she offers the MAS to the responder than if she is left with her outside option. In case the MAS exceeds the fair share, the proposer therefore prefers to offer the MAS, than to be left with her outside option.

Lemma 2 *The MAS* $\underline{s}(\gamma_R)$ *of the responder is always smaller than the MOS* $\overline{s}(\gamma_P)$ *of the proposer.*

The proof is redirected to the appendix B as it consists of simple algebra only. The following two propositions characterise the equilibrium of the ultimatum bargaining with sophisticated proposers, that is proposers who understand that they are partial.

Proposition 1 *A sophisticated* ***and not*** *strongly-partial proposer offers a share*

$$s^* \begin{cases} = s^f(\gamma_P) & \beta_P > \frac{1}{2} \\ \in \left[\underline{s}(\gamma_R), s^f(\gamma_P)\right] & \beta_P = \frac{1}{2} \\ = \underline{s}(\gamma_R) & \beta_P < \frac{1}{2} \end{cases}$$

in perception perfect equilibrium which the responder accepts.

Proof. If the agents are not strongly partial, the MAS $\underline{s}(\gamma_R)$ is smaller than the fair share $s^f(\gamma_P)$. The rest of the proof is analogous to the proof of proposition 1 in Fehr and Schmidt (1999). ■

Proposition 2 *A sophisticated* ***and*** *strongly-partial proposer offers the MAS $s^* = \underline{s}(\gamma_R)$ in perception perfect equilibrium which the responder accepts.*

Proof. A strong partiality implies that the MAS $\underline{s}(\gamma_R)$ exceeds the fair share $s^f(\gamma_P)$. The proposer's utility of an offer above the fair share $s \geq s^f(\gamma_P)$ is given by $u_P(s) = 1 - s - \alpha_P(2s - 1 - \gamma_P(\omega_R - \omega_P))$ which is strictly decreasing in s. The proposer therefore never offers a share bigger than the MAS. By definition, the responder only accepts offers above the MAS. Lemma 2 shows that the proposer always prefers to offer the MAS than to get her outside option. Therefore in equilibrium the proposer offers exactly the MAS. ■

Propositions 1 and 2 imply that partiality does not generate a bargaining breakdown. The proposer is always willing to render the responder at least indifferent between his outside option and the proposed share. Note that the beliefs of sophisticated agents are correct and the perception perfect equilibrium coincides with the subgame perfect equilibrium.

To what extent do the results change if the proposer is partial and naive, and therefore does not understand her partiality? Naive agents suppose that other agents share the same fairness notion as they do. In the example we have already seen that naiveté about partiality can lead to an offer that is not acceptable for the responder. The naive proposer underestimates the MAS. If she comes to propose the underestimated MAS in perception perfect equilibrium, the responder rejects the offer and the bargain breaks down. Lemma 3 states the conditions under which naive proposers predict the MAS to be strictly smaller than the actual MAS.

Lemma 3 *A naive and partial proposer underestimates the MAS if*

1) *she is endowed with the relatively small outside option and her fairness parameter is smaller than 1, i.e. $\gamma_P \leq 1$, or*
2) *she is endowed with the relatively big outside option and her fairness parameter is bigger than 1, i.e. $\gamma_P > 1$.*

Proof. 1) Suppose the naive and partial proposer has a fairness parameter smaller than 1. Then she predicts the MAS to be $\underline{s}(\widehat{\gamma}_P) = \frac{\alpha_R - \alpha_R\omega_P + \omega_R(1-\beta_R+\widehat{\gamma}_P(\alpha_R+\beta_R))}{1+2\alpha_R}$. If she is endowed with the smaller outside option, the partiality manifests itself in a relatively small fairness parameter $\gamma_P < \gamma_R$. Given the true fairness parameter of the responder is $\gamma_R \leq 1$, the actual minimal share depends positively on the fairness parameter. The naive proposer therefore predicts a too small MAS. Given the true parameter of the responder is $\gamma_R > 1$, the actual MAS is $\underline{s}(\gamma_R) = \frac{\alpha_R+(1+\alpha_R)\omega_R}{1+2\alpha_R} > \frac{\alpha_R+\omega_R(1-\beta_R+\widehat{\gamma}_P(\alpha_R+\beta_R))}{1+2\alpha_R} = \underline{s}(\widehat{\gamma}_P)$. Hence if the outside option is smaller for the proposer, the predicted MAS is smaller than the actual MAS.
If instead the outside option is bigger for the proposer, partiality implies that $1 \geq \gamma_P > \gamma_R$, the actual MAS is independent of the fairness parameter as predicted by the proposer $\underline{s}(\widehat{\gamma}_P) = \frac{\alpha_R-\alpha_R\omega_P}{1+2\alpha_R} = \underline{s}(\gamma_R)$.

2) Suppose the naive and partial proposer has a fairness parameter bigger than 1. Then she predicts the MAS to be $\underline{s}(\widehat{\gamma}_P) = \frac{\alpha_R-((\alpha_R+\beta_R)\widehat{\gamma}_P-\beta_R)\omega_P+(1+\alpha_R)\omega_R}{1+2\alpha_R}$. A relatively big outside option for the proposer implies that $\gamma_P > \gamma_R$. If the true fairness parameter is also bigger than 1, the actual MAS depends negatively on the parameter and the proposer therefore underestimates the MAS. But if the true parameter is smaller than 1, $\gamma_R \leq 1$, then the true MAS is independent of the fairness parameter $\underline{s}(\gamma_R) = \frac{\alpha_R-\alpha_R\omega_P}{1+2\alpha_R} > \frac{\alpha_R-((\alpha_R+\beta_R)\widehat{\gamma}_P-\beta_R)\omega_P}{1+2\alpha_R} = \underline{s}(\widehat{\gamma}_P)$.Hence if the outside option is bigger for the proposer, the predicted MAS is smaller than the actual MAS.
On the other hand if the outside option is bigger for the responder, then the partiality means that $1 < \gamma_P < \gamma_R$. The actual as well as the predicted MAS is independent of the fairness parameter $\underline{s}(\widehat{\gamma}_P) = \frac{\alpha_R+(1+\alpha_R)\omega_R}{1+2\alpha_R} = \underline{s}(\gamma_R)$. ■

Given the conditions of lemma 3, the naive and partial proposer underestimates the MAS, i.e. $\underline{s}(\widehat{\gamma}_P) < \underline{s}(\gamma_R)$. Therefore, if she offers the predicted MAS in perception perfect equilibrium and theses conditions are satisfied, her offer is too low and is rejected by the responder. The following two propositions state when this happens and the bargain breaks down. If the proposer is not only naive, but also strongly partial, then given the conditions of lemma 3 the bargain breaks down with certainty. However if the agents are not strongly partial, the conditions of lemma 3 are not sufficient for bargaining breakdown. Additionally, the parameter of advantageous inequity aversion of the proposer has to be sufficiently small.

Proposition 3 *Under the conditions of lemma 3, a naive, but* ***not*** *strongly partial proposer causes a breakdown (with positive probability) of the ultimatum bargain if the proposer's parameter of advantageous inequity aversion is small enough, i.e.* $\beta_P < \frac{1}{2}$ *(*$\beta_P = \frac{1}{2}$*).*

Proof. In equilibrium, the respondent accepts any offer above the true MAS $\underline{s}(\gamma_R)$. Under the conditions of lemma 3, a naive and partial proposer predicts the MAS to be too small, that is $\underline{s}(\widehat{\gamma}_P) < \underline{s}(\gamma_R)$. Given the agents have no strong partiality, the MAS is smaller than the fair share the proposer attributes to the responder, $\underline{s}(\gamma_R) \leq s^f(\gamma_P)$. Therefore the proposer offers a share $s^* \begin{cases} = s^f(\gamma_P) & if\ \beta_P > \frac{1}{2} \\ \in \left[\underline{s}(\widehat{\gamma}_P), s^f(\gamma_P)\right] & if\ \beta_P = \frac{1}{2} \\ = \underline{s}(\widehat{\gamma}_P) & if\ \beta_P < \frac{1}{2} \end{cases}$ in perception perfect equilibrium. Therefore, if the parameter of advantageous inequity is smaller than (or equal to) $\frac{1}{2}$, the equilibrium share is smaller than the minimal share (with positive probability), hence the bargain breaks down (with positive probability). ■

Proposition 4 *Under the conditions of lemma 3, a naive* ***and*** *strongly partial proposer causes a breakdown of the ultimatum bargain.*

Proof. In equilibrium the respondent accepts any offer above the true MAS $\underline{s}(\gamma_R)$. Under the conditions of lemma 3, a naive and partial proposer predicts the MAS to be too small, that is $\underline{s}(\widehat{\gamma}_P) < \underline{s}(\gamma_R)$. With a strong partiality the MAS is bigger than the fair share $s^f(\gamma_P)$ the proposer attributes to the responder, $\underline{s}(\gamma_R) > s^f(\gamma_P)$. In perception perfect equilibrium, the maximally offered share is given by $\max\left\{s^f(\gamma_P), \underline{s}(\widehat{\gamma}_P)\right\}$, see proposition 1 and 2. This is smaller than the actual MAS $\underline{s}(\gamma_R)$ and the bargain breaks down. ■

Propositions 3 and 4 characterise the circumstances under which there is bargaining breakdown even with complete information concerning the parameters of the responder's utility function α_R and β_R. This reflects the psychological findings that self-serving biases are a driving force of bargaining breakdown. The analysis stresses that both characteristics of a self-serving bias are crucial for breakdown, namely the partiality as well as the ignorance of it.

So far I analysed the perception perfect equilibrium given that the proposer knows the willingness of the responder to deviate from his reference allocation. Now suppose the proposer does not know the parameters of the responder's utility, but believes that the parameter of disadvantageous α_R and advantageous β_R inequity are distributed according to the joint cumulative distribution functions $F_{\alpha,\beta}(\alpha_R, \beta_R)$ on the support $[\underline{\alpha}, \overline{\alpha}] \times [\underline{\beta}, \overline{\beta}]$.[7]

Proposition 5 *With $(\alpha_R, \beta_R) \sim F_{\alpha,\beta}[\underline{\alpha}, \overline{\alpha}] \times [\underline{\beta}, \overline{\beta}]$, the equilibrium strategy of a partial proposer is given by*

1) *if* $\max_{\alpha_R,\beta_R} \underline{s}(\alpha_R, \beta_R|\widehat{\gamma}_P) \leq s^f(\gamma_P)$

$$s^*(\beta_P) \begin{cases} = s^f(\gamma_P) & if\ \beta_P > \frac{1}{2} \\ \in \left[\max_{\alpha_R,\beta_R} \underline{s}(\alpha_R, \beta_R|\widehat{\gamma}_P), s^f(\gamma_P)\right] & if\ \beta_P = \frac{1}{2} \\ \in \left[\min \underline{s}(\alpha_R, \beta_R|\widehat{\gamma}_P), \max_{\alpha_R,\beta_R} \underline{s}(\alpha_R, \beta_R|\widehat{\gamma}_P)\right] & if\ \beta_P < \frac{1}{2} \end{cases}$$

2) *else*

$$s^* \in \left[\min_{\alpha_R,\beta_R} \underline{s}(\alpha_R, \beta_R|\widehat{\gamma}_P), \max_{\alpha_R,\beta_R} \underline{s}(\alpha_R, \beta_R|\widehat{\gamma}_P)\right].$$

[7] Note that the lower limits on the supports are bigger or equal to zero, $\underline{\alpha}, \underline{\beta} \geq 0$, and that the upper limit on the support of advantageous inequity is smaller or equal to one, i.e. $\overline{\beta} \leq 1$.

Proof. This follows from proposition 1-4 and the proof of proposition 1 in Fehr and Schmidt (1999). ■

The perception perfect equilibrium differs for sophisticated and naive proposers in essentially two features: First, the offered shares and second, the resulting propensity of bargaining breakdown. The share sophisticated proposers offer is weakly bigger than the share offered by a naive agent. Proposers face a trade off between the probability of acceptance and higher costs as share increases. Naive proposers assess the reference allocation of the responder wrongly. They believe the responder shares the reference allocation with themselves. We have seen that under the conditions of lemma 3 this leads to a wrong prediction of the MAS in the complete information case. For a given parameter pair (α_R, β_R) their prediction of the MAS is smaller than the true MAS. This implies that their assessment of the probability of acceptance of a share s is bigger than the actual probability. Thus, naive proposers offer less than sophisticated proposers in perception perfect equilibrium.

Given that the share a sophisticated proposer offers exceeds the share of a naive proposer, the probability of bargaining breakdown increases for a naive proposer. The following proposition summarises these two characteristics of the perception perfect equilibrium with incomplete information.

Proposition 6 *With incomplete information, a naive proposer offers (weakly) less and the probability of bargaining breakdown is (weakly) higher than with a sophisticated.*

Proof. The maximisation problem of the proposer is characterised by

$$\begin{aligned} U_P(s) &= \left(u_P(1-s,s) - u_P(\omega_P,\omega_R)\right) prob\left(s \geq \underline{s}(\widehat{\gamma}_P)\right) + u_P(\omega_P,\omega_R) \\ &\rightarrow \max_s \end{aligned}$$

Note that the probability is the estimated probability of acceptance of the share s. Lemma 2 tells us that the proposer is always better off proposing the MAS than with her outside option. The difference between the utility of the bargain with share s and the outside option is thus always positive, $u_P(1-s,s) - u_P(\omega_P,\omega_R) \geq 0$.

In case the proposer is sufficiently inequity averse, $\beta_P > \frac{1}{2}$, and $\max_{\alpha_R,\beta_R} \underline{s}(\alpha_R, \beta_R|\widehat{\gamma}_P) \leq s^f(\gamma_P)$, proposition 5 tells us that sophisticates and naives propose the fair share, which gets accepted by the responder with certainty.

In the reverse case the utility of a bargain with share s is decreasing in s. The maximisation problem is thus characterised by the trade off between a higher probability of acceptance and the associated costs. If the conditions of lemma 3 are satisfied, the naive proposer assesses the fairness perception of the respondent wrongly and thus underestimates the MAS. This implies that for every pair of utility parameters (α_R, β_R) she underestimates the MAS resulting in a higher estimated probability of acceptance than the actual probability, $prob\left(\underline{s}(\gamma_R) > s \geq \underline{s}(\widehat{\gamma}_P)\right) \geq 0$. The maximisation calculus thus results in a lower share for these proposers.

As shown above the share of a sophisticated proposer is weakly bigger than the share of a naive, $s^*_{\hat{\gamma}_P=\gamma_R} \geq s^*_{\hat{\gamma}_P=\gamma_P}$. The probability of bargaining breakdown equals the probability of acceptance of a share. Thus the probability of breakdown is smaller with a sophisticated proposer, as for $s^*_{\hat{\gamma}_P=\gamma_R} \geq s^*_{\hat{\gamma}_P=\gamma_P}$

$$prob\left(s \geq s^*_{\hat{\gamma}_P=\gamma_P}\right) \geq prob\left(s \geq s^*_{\hat{\gamma}_P=\gamma_R}\right).$$

■

The probability of a bargaining breakdown is higher if the proposer is naive than if she is sophisticated. The intuition for this result is straightforward: Naive and sophisticated proposers face uncertainty concerning the parameters that determine the loss resulting from a deviation from the responder's reference allocation. The decision how much of the pie to offer to the responder is thus based on expectations. In some cases the proposed share is going to be too low for the responder to accept it. This is one source of bargaining breakdown which is identical for a naive and a sophisticated proposer. If the naive proposers share the belief about the responder's fairness perception with the sophisticated, they face the same propensity of bargaining breakdown out of uncertainty. However, generally the naive proposers do not share beliefs with sophisticated. Their belief about the responder's reference allocation is based on their own assessment of fairness. We have seen in propositions 3 and 4 that this can lead to an offer that is below the actual MAS in the complete information case and a generally smaller offer than the offer of a sophisticated agent in the incomplete information case. This is an additional source of bargaining breakdown. Consequently, the probability of acceptance and therefore the probability of bargaining breakdown is larger with naive than with sophisticated proposers.

The prediction of a higher propensity of bargaining breakdown implies in particular that the presented theory predicts a higher propensity of bargaining breakdown in presence of asymmetric outside options than does the theory of inequity aversion by Fehr and Schmidt (1999). An increase in the rejection rate in ultimatum games with asymmetric outside option compared to symmetric outside options could be explained by the presented theory.

5 Evidence

So far a couple of experiments on ultimatum bargaining have been carried out that provide evidence for the presented theory. Knez and Camerer (1995) conduct an experiment of the ultimatum game with two players where they introduce asymmetric outside options. Players are fully informed about each others' outside options. They divide a pie of \$10. The proposer's outside option amounts to \$3 while the respondents are divided into two groups: The first half of the responders gets a smaller outside option than the proposers, namely \$2, and the second half of the responders gets a higher option of \$4. Instead of asking the responders whether they accept a particular offer, responders are asked to state their MAS by circling a number in a table of integers. Integers range from their outside option of 2 resp. 4 to the entire pie minus the outside option of the proposer, 7. This method extracts more information from the participants and is called strategy method. The proposers make the offer to the responder without restrictions. Only in one treatment the responder has to circle the offer he wants to make from the restricted scale $[2, 7]$ resp. $[4, 7]$. Offers to the responder with the small outside option R1 are significantly lower than to the responder with the high outside option R2. In the treatment with unrestricted scale for the proposer, the mean (median) offer for R1 is 3.8 (4.0) and for R2 it is 4.66 (4.5). Also the MAS are significantly different for the two groups of responders. The R1 agent's mean (median) MAS is 4.27 (4.5) while the mean (median) MAS of the R2 agents is 4.96 (5.0). The increase in the offer to R2 in comparison to R1 as well as the higher MAS of R2 compared with R1 can be explained with inequity averse agents.

Knez and Camerer (1995) find that rejection rates are around 45%-48%. This is much above the rejection rates found for two player ultimatum games with no outside options. Rejection rates in ultimatum experiments with no outside options are around 20%, see Camerer (2003). A likely cause for the increase in the rejection rate is the introduction of asymmetric outside options as the rest of the experimental set-up is identical to other ultimatum bargaining experiments in western countries. If agents are inequity averse with symmetric fairness perceptions as postulated in Fehr and Schmidt (1999), then rejection rates should not be influenced by the introduction of asymmetric outside options. But if we allow for conflicting reference allocations and that some agents might be sophisticated and some naive, then part of the additional inefficiencies can be explained: As we have seen, naive proposers underestimate the MAS and are thus likely to propose a share that is not acceptable for the responder. Hence, the bargain breaks down much more often than in the case where agents are sophisticated about their partiality or where there is no partiality at all.

Unfortunately the experimental set-up does not allow to distinguish whether the mere introduction of outside options has caused rejection rates to increase or whether the attached asymmetry of outside options is the driving force. So far economic theory predicts that the introduction of symmetric outside options does not cause rejection rates to increase. A game with positive symmetric outside options is equivalent to a game where the pie is reduced by the sum of the outside options. Nevertheless there might be some cognitive processes that render the game with positive symmetric outside options different to a game with no outside options and therefore breakdown might occur more frequently than with no outside options.

Falk, Fehr, and Fischbacher (2001) present an experiment on a reduced ultimatum game with an outside option for the respondent. There the proposer can choose between a split which gives herself 8 and the responder 12 and a split where she gets 5 and the proposer gets 15. Whenever the responder rejects the offer, the proposer goes home with nothing and the responder gets his outside option of 10. They argue that: “Since both offers give the responder a higher payoff than the proposer they cannot be viewed as unfair from the responder respectively. Thus resistance to unfairness cannot explain rejections in this game." They observe that 24% of the responders reject the 8/12 offer while only 4% reject the 5/15 offer with the difference being significant at a 1%-level.[8] They take this result as a case for the presence of spitefulness which they define as the willingness to sanction in order to increase the payoff difference between two agents. As the 8/12 offer decreases the payoff difference in comparison to the 0/10 outcome subjects that are spiteful will reject. In contrast the 5/15 offer does not change the payoff difference and therefore spitefulness cannot be a reason for rejection.

The evidence from this experiment can also be explained by self-serving biases in the perception of the fair allocation. If the proposer thinks that both subjects will unanimously believe that the 8/12 split is the closest to a fair outcome, she will propose this split. But she could be coupled with a responder that is convinced that splitting the difference between the pie and his outside option is fair and is therefore going to reject the inequitable share of 8/12. This provides another explanation to why the rejection of the 8/12 offer is significantly higher than the 5/15 offer. Which of these explanations suits the case better is yet to be determined.

Moreover Falk, Fehr, and Fischbacher (2001) present the results of a baseline reduced ultimatum game where the responder does not have any outside option. The possible offers are analogously 8/2 and 5/5. If the responder rejects, then none of the subjects gets any monetary payoff. They report a rejection rate of the 8/2 split of 56.3%. This is much above the rejection rate of the 8/12 offer in the game with outside options. This finding is also consistent with the above theory. Suppose an individual rejects the 8/2 split in the game without outside option. Confronted with the 8/12 split in the game with outside option, the same individual might be willing to accept this split. The reason is that the minimal offer the individual is willing to accept in the setting with outside option is bigger than the minimal offer when he has no outside option. But it is not increased by as much as the amount of the outside option. Hence potentially more subjects reject the 8/2 offer than the 8/12 offer.

6 Conclusion

There is strong empirical evidence that in bargaining situations with asymmetric outside options people exhibit self-serving biases concerning their fairness judgements and that these self-serving biases are a driving force of bargaining impasse. This paper provides a theoretical framework for analysing the behaviour of self-servingly biased agents in simple bargaining situations. I build on the notion of inequity aversion and extend it to incorporate self-serving biases due to asymmetric outside options. I distinguish between

[8] Falk, Fehr, and Fischbacher (2001) also ask the responder to state their decision to accept or reject for each possible offer.

sophisticated and naive agents, that is, those agents who understand their partiality and those who do not. I then apply the framework to analyse the behaviour of naive and sophisticated partial agents in ultimatum bargaining with asymmetric outside options. In the case of complete information, I find that bargaining can only break down, if partial proposers are not aware of their partiality. In the incomplete information case, the propensity of bargaining breakdown is higher with naive than with sophisticated agents. Comparing the predictions, concerning bargaining breakdown, for partial agents with the predictions for unpartial agents, i.e. agents that share the same fairness perception, I find that the propensity of bargaining breakdown doesn't change, if the partial agents are sophisticated. An increase in the propensity of breakdown can only appear if the partial agent is ignorant about her partiality.

So far the framework only incorporates one prominent form of asymmetry, due to outside options. One path of further research could be to think of incorporating other forms of asymmetries in bargaining games that might bias the perception of fairness, such as asymmetric payoff possibilities. Kagel, Kim, and Moser (1996) have run ultimatum experiments with asymmetric payoff possibilities. There players bargain over the distribution of chips with different exchange rates and different information concerning these rates. When both players are fully imformed and proposers have higher exchange rates, conflicting fairness norms seem to develop. This is reflected in unusually high rejection rates.

Another path of further research could be to apply the framework to other bargaining games like the trust game.

Appendix

A Recipient Behaviour in Dictator Games

To be written.

B Proof of Lemma 2

The value of the outside option depends on the notion of fairness.

$$u_i(\omega) = \begin{cases} (1-\beta_i(1-\gamma_i))\,\omega_i - \alpha_i(1-\gamma_i)\,\omega_j & if\ \gamma_i \leq 1 \\ (1-\alpha_i(\gamma_i-1))\,\omega_i - \beta_i(\gamma_i-1)\,\omega_j & else \end{cases}$$

We distinguish two cases, in the first the proposer has a higher outside option than the responder while in the second the situation is reversed. The following table gives the MAS and MOS of the players.

	$\gamma_R \leq 1$	$\gamma_R > 1$
$\gamma_P \leq 1$	$\underline{s} = \frac{\alpha_R - \alpha_R\omega_P + \omega_R(1-\beta_R+\gamma_R(\alpha_R+\beta_R))}{1+2\alpha_R}$ $\overline{s} = \frac{1+\alpha_P+(\beta_P-1-(\alpha_P+\beta_P)\gamma_P)\omega_P+\alpha_P\omega_R}{1+2\alpha_P}$	relevant if $\omega_R > 0$ $\underline{s} = \frac{(1+\alpha_R)\omega_R+\alpha_R}{1+2\alpha_R}$ $\overline{s} = \frac{1+\alpha_P+\alpha_P\omega_R}{1+2\alpha_P}$
$\gamma_P > 1$	relevant if $\omega_P > 0$ $\underline{s} = \frac{\alpha_R(1-\omega_P)}{1+2\alpha_R}$ $\overline{s} = \frac{1+\alpha_P-(1+\alpha_P)\omega_P}{1+2\alpha_P}$	$\underline{s} = \frac{\alpha_R-((\alpha_R+\beta_R)\gamma_R-\beta_R)\omega_P+(1+\alpha_R)\omega_R}{1+2\alpha_R}$ $\overline{s} = \frac{1+\alpha_P-(1+\alpha_P)\omega_P+((\alpha_P+\beta_P)\gamma_P-\beta_P)\omega_R}{1+2\alpha_P}$

Straightforward calculations show that it is always true that $\underline{s} \leq \overline{s}$:

1. $\gamma_P, \gamma_R \leq 1$

$$\begin{aligned}
\underline{s} &= \frac{\alpha_R - \alpha_R\omega_P + \omega_R\left(1-\beta_R+\gamma_R\left(\alpha_R+\beta_R\right)\right)}{1+2\alpha_R} \\
&\leq \frac{1+\alpha_P+\left(\beta_P-1-\left(\alpha_P+\beta_P\right)\gamma_P\right)\omega_P+\alpha_P\omega_R}{1+2\alpha_P} = \overline{s} \\
& \left(-\alpha_R\left(1+2\alpha_P\right)+\left(1-\beta_P+\left(\alpha_P+\beta_P\right)\gamma_P\right)\left(1+2\alpha_R\right)\right)\omega_P \\
& +\omega_R\left(\left(1+2\alpha_P\right)\left(1-\beta_R+\gamma_R\left(\alpha_R+\beta_R\right)\right)-\alpha_P\left(1+2\alpha_R\right)\right) \\
&\leq 1+\alpha_R+\alpha_P
\end{aligned}$$

It is sufficient to show that for $\omega_i > 0 = \omega_j$

$$\begin{aligned}
\left(-\alpha_j\left(1+2\alpha_i\right)+\left(1-\beta_i+\left(\alpha_i+\beta_i\right)\gamma_i\right)\left(1+2\alpha_j\right)\right) &\leq 1+\alpha_i+\alpha_j \\
\left(\alpha_i+\beta_i\right)\gamma_i+2\alpha_j\left(\alpha_i+\beta_i\right)\left(\gamma_i-1\right) &\leq \alpha_i+\beta_i \\
\gamma_i\left(1+2\alpha_j\right) &\leq 1+2\alpha_j
\end{aligned}$$

2. $\gamma_i \leq 1, \gamma_j > 1, \omega_j > 0 = \omega_i$:

$$\begin{aligned}
\underline{s} &= \frac{\alpha_R - \alpha_R\omega_P + \left(1+\alpha_R\right)\omega_R}{1+2\alpha_R} \leq \frac{1+\alpha_P-\left(1+\alpha_P\right)\omega_P+\alpha_P\omega_R}{1+2\alpha_P} = \overline{s} \\
&\leftrightarrow \left(1+\alpha_P+\alpha_R\right)\omega_P+\left(1+\alpha_R+\alpha_P\right)\omega_R \leq 1+\alpha_R+\alpha_P
\end{aligned}$$

3. $\gamma_P, \gamma_R > 1$

$$\begin{aligned}
\underline{s} &= \frac{\alpha_R - \left(\left(\alpha_R+\beta_R\right)\gamma_R-\beta_R\right)\omega_P+\left(1+\alpha_R\right)\omega_R}{1+2\alpha_R} \\
&\leq \frac{1+\alpha_P-\left(1+\alpha_P\right)\omega_P+\left(\left(\alpha_P+\beta_P\right)\gamma_P-\beta_P\right)\omega_R}{1+2\alpha_P} = \overline{s} \\
&\leftrightarrow \left(-\left(1+2\alpha_P\right)\left(\left(\alpha_R+\beta_R\right)\gamma_R-\beta_R\right)+\left(1+\alpha_P\right)\left(1+2\alpha_R\right)\right)\omega_P \\
& \quad +\left(\left(1+2\alpha_P\right)\left(1+\alpha_R\right)-\left(\left(\alpha_P+\beta_P\right)\gamma_P-\beta_P\right)\left(1+2\alpha_R\right)\right)\omega_R \\
&\leq 1+\alpha_R+\alpha_P
\end{aligned}$$

It is sufficient to show that for $\omega_i > 0 = \omega_j$

$$\begin{aligned}
-\left(1+2\alpha_i\right)\left(\left(\alpha_j+\beta_j\right)\gamma_j-\beta_j\right)+\left(1+\alpha_i\right)\left(1+2\alpha_j\right) &\leq 1+\alpha_i+\alpha_j \\
-\left(1+2\alpha_i\right)\left(\alpha_j+\beta_j\right)\gamma_j+\beta_j\left(1+2\alpha_i\right)+\alpha_j\left(1+2\alpha_i\right) &\leq 0 \\
1-\gamma_j &\leq 0
\end{aligned}$$

References

Babcock, L., and G. Loewenstein (1997): "Explaining Bargaining Impasse: The Role of Self-Serving Biases," *Journal of Economic Perspectives*, 11(1), 109–126.

Babcock, L., G. Loewenstein, S. Issacharoff, and C. Camerer (1995): "Biased Judgements of Fairness in Bargaining," *American Economic Review*, 85(5), 1337–1343.

Bolton, G. E., and A. Ockenfels (2000): "ERC: A Theory of Equity, Reciprocity, and Competition," *American Economic Review*, 90(1), 166–193.

Camerer, C. F. (2003): *Behavioral Game Theory - Experiments in Strategic Interaction.* Princeton University Press, Princeton, New Jersey.

Charness, G., and M. Rabin (2001): "Social Preferences: Some Simple Tests and a New Model," *Quarterly Journal of Economics.*

Cox, J. C., and D. Friedman (2002): "A Tractable Model of Reciprocity and Fairness," University of Arizona and University of California.

Dahl, G. D., and M. R. Ransom (1999): "Does Where You Stand Depend on Where You Sit? Tithing Donations and Self-Serving Bias," *American Economic Review*, 89, 703–727.

Dufwenberg, M., and G. Kirchsteiger (1999): "A Theory of Sequential Reciprocity," *Discussion paper, CentER for Economic Research, Tilburg University.*

Falk, A., E. Fehr, and U. Fischbacher (2001): "Driving Forces of Informal Sanctions," *Institute for Empirical Research in Economics, Working Paper*, 59.

Falk, A., and U. Fischbacher (2000): "A Theory of Reciprocity," *Institute for Empirical Research in Economics, Working Paper*, 6.

Fehr, E., and K. Schmidt (1999): "A Theory of Fairness, Competition and Cooperation," *Quarterly Journal of Economics*, 114, 817–868.

——— (2003): "Theories of Fairness and Reciprocity - Evidence and Economic Applications," in *Advances in Economics and Econometrics*, ed. by M. e. A. Dewatripont, pp. 208–257. Cambridge University Press, Cambridge, Mass.

Gaechter, S., and A. Riedel (2002): "Moral Property Rights in Bargaining," *CESifo Working Paper*, 696 (10).

Hennig-Schmidt, H. (2002): "The Impact of Fairness on Decision Making - An Analysis of Different Video Experiments," in *Experimental Economics: Financial Markets, Auctions, and Decision Making*, ed. by F. Andersson, and H. Holm, pp. 185–210. Kluwer Academic Publishers, Boston, Dordrecht, London.

Kagel, J. H., C. Kim, and D. Moser (1996): "Fairness in Ultimatum Games with Asymmetric Information and Asymmetric Payoffs," *Games and Economic Behaviour*, 13, 100–110.

Knez, M. J., and C. F. Camerer (1995): "Outside Options and Social Comparison in Three-Player Ultimatum Game Experiments," *Games and Economic Behavior*, 10, 65–94.

Konow, J. (2000): "Fair Shares: Accountability and Cognitive Dissonance in Allocation Decisions," *American Economic Review*, 90, 1072–1091.

Levine, D. K. (1998): "Modeling Altruism And Spitefulness in Experiments," *Review of Economic Dynamics*, 1(3), 593–622.

Messick, D., and K. Sentis (1979): "Fairness and Preference," *Journal of Experimental Social Psychology*, 15, 418–34.

O'Donoghue, T., and M. Rabin (1999): "Doing It Now or Later," *American Economic Review*, 89(1), 103–124.

——— (2001): "Choice and Procrastination," *Quarterly Journal of Economics*, 161(1), 121–160.

Rabin, M. (1993): "Incorporating Fairness Into Game Theory and Economics," *American Economic Review*, 83(5), 1281–1302.