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Summary

Inequity aversion models have been used to explain equitable payoff divisions in bargaining games. I show that inequity aversion can actually increase the asymmetry of payoff division if unanimity is not required. This is due to the analogy between inequity aversion and risk aversion. Inequity aversion may also affect comparative statics: the advantage of being proposer can decrease as players become more impatient.

Keywords: Noncooperative Bargaining, Coalition Formation, Inequity Aversion

JEL Classification: A13, C78

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1 Introduction

Game theory usually assumes that players care only about their own material payoffs. This hypothesis is clearly refuted by the experimental evidence in the ultimatum and related games (see Camerer (2003) for a recent survey). Inequity aversion theories have been developed in order to account for the stylized facts observed in the laboratory (see Fehr and Schmidt (1999) and Bolton and Ockenfels (2000)). Inequity aversion means that people are willing to give up some material payoffs in order to achieve more equitable outcomes. Inequity averse responders prefer to reject small offers in the ultimatum game, and the proposers, anticipating this, make higher offers.

In this paper I examine the implications of inequity aversion for bargaining games in which unanimity is not required (e. g., legislative bargaining games) and show that it may lead to a *more* inequitable outcome than would occur with selfish preferences.

The leading model of legislative bargaining is due to Baron and Ferejohn (1989). In this model, n symmetric players must divide a budget by simple majority. Each player has an equal chance of being chosen to propose a division of the budget. Once a proposal is made, the remaining players vote "yes" or "no"; if a majority of the players supports the proposal it is implemented and the game ends; otherwise the procedure is repeated. This model predicts that minimal winning coalitions will form and that the proposer will receive a disproportionate share of the proceedings. Thus, the equilibrium of the Baron-Ferejohn model with selfish preferences exhibits a substantial amount of inequity: some players are excluded (almost half of them if the decision rule is simple majority), and the proposer receives a substantial share (more than half of the total payoff if the decision rule is simple majority). The advantage of the proposer increases as players become more impatient or more risk averse.[1]

[1] Assuming that all players are equally likely to propose is not essential to the predictions of the model. For example, with three risk-neutral players and a discount factor arbitrarily close to 1, payoffs are $\frac{2}{3}$ for the proposer and $\frac{1}{3}$ for the coalition partner as long as each player's probability of being proposer is strictly between 0 and $\frac{1}{2}$; otherwise, payoff division is even more unequal.

The Baron-Ferejohn model has led to many applications and extensions.[2] In its simplest form, it assumes that parties are selfish, risk neutral and only concerned with their share of cabinet posts as opposed to policy. The predictions of the model under these assumptions have been tested by Ansolabehere et al. (2005) using data on the distribution of cabinet posts in coalition governments in Europe. A significant proposer advantage is found, though this advantage is not nearly as large as the theory predicts. Intuitively, this could be due to parties being inequity averse: if coalition partners were prepared to reject the small share of cabinet posts predicted by the theory, a more equitable outcome would be achieved.

A theoretical analysis of the implications of inequity aversion for the predictions of the model reveals that the most commonly used utility function, proposed by Fehr and Schmidt (1999), would lead to *more* asymmetric divisions. The reason is that, even though responders dislike getting less than the proposer, they are willing to accept smaller shares in order to avoid the risk of being excluded altogether.

Inequity aversion may also reverse the effect of impatience. The equilibrium outcome may be so inequitable that the responders who vote in favor of the proposal would actually prefer that all players get 0; by rejecting the proposal they can *temporarily* enforce this outcome. As players become more impatient, rejecting the proposal becomes more attractive and the proposer must compensate the responders if he wants the proposal to be accepted. Hence, impatience may work against the proposer.

The remainder of the paper is organized as follows. Section 2 introduces the bargaining procedure and its equilibrium assuming Fehr-Schmidt preferences and no discounting. Section 3 contains some extensions and discussion, and section 4 concludes.

[2]For example, McKelvey and Riezman (1992) use the model to analyze seniority in legislatures and the reelection of incumbents. Other papers incorporate policy preferences (e.g. Baron 1991, Banks and Duggan 2000), different risk attitudes (Harrington 1990), general voting rules (Montero 2006) or an endogenous status quo (Kalandrakis 2004).

2 The model

2.1 Preferences

The players have Fehr-Schmidt preferences, that is, given a division $x = (x_1, ..., x_n)$ of the budget, player i's utility is

$$u_i(x) = x_i - \frac{\alpha_i}{n-1} \sum_{j \neq i} \max(x_j - x_i, 0) - \frac{\beta_i}{n-1} \sum_{j \neq i} \max(x_i - x_j, 0) \quad (1)$$

where $0 \leq \beta_i < \frac{n-1}{n}$ and $\beta_i \leq \alpha_i$. Assume moreover that $\alpha_i = \alpha_j = \alpha$ and $\beta_i = \beta_j = \beta$ for all i, j. Thus, players are symmetric and not too averse to advantageous inequality.[3] Preferences are complete information.

The utility function assumes that a player compares himself separately with every other player. Notice however that it is only the *total* payoff of players with $x_j > x_i$ and that of players with $x_j < x_i$ that matters. Any redistribution of payoffs inside one of those two groups does not affect i's utility unless it changes the rank of x_i.

Some implications of the utility function can be found below

Lemma 1 *Let* $\beta < \frac{n-1}{n}$.

a) Any donation makes the donor worse-off.

b) Any donation equally divided between several recipients makes all recipients better-off.

Proof. a) Let i be the donor. Suppose i donates ϵ to another player j. The donation has two effects: it reduces i's material payoff, and it affects i's position with respect to other players. The most favorable case corresponds to i having the highest payoff both before and after the donation, so that the donation reduces i's disutility from advantageous inequality with respect to all players. In this case, the change in utility is $-\epsilon + \frac{\beta}{n-1}(2\epsilon) + \frac{\beta}{n-1}(n-2)\epsilon$, which is negative if $\beta < \frac{n-1}{n}$. If the donation creates or exacerbates a disadvantageous position for i, the disutility is even higher.

[3] If $\beta > \frac{n-1}{n}$, there is no conflict of interest between the players: everybody's ideal outcome is $x_i = \frac{1}{n}$ for all i.

b) Suppose ϵ is divided equally between s recipients including j. The donation increases j's material payoff and leaves j's position with respect to the other recipients unchanged. In the most unfavorable case, j suffers from advantageous inequality with respect to the remaining $n-s$ players, and the total change in j's payoff is $\frac{\epsilon}{s} - \frac{\beta}{n-1}\left(\frac{\epsilon}{s} + \epsilon\right) - \frac{\beta}{n-1}\frac{\epsilon}{s}(n-s-1)$, which is positive if $\beta < \frac{n-1}{n}$. ■

Lemma 2 *Consider a lottery over distributions of material payoffs in which distribution x^h occurs with probability p^h. Then players weakly prefer the sure outcome in which each player i receives $\sum_h p^h x_i^h$ to the lottery.*

Proof. Consider the situation of player i. Player i's expected utility from the lottery would be

$$\sum_h p^h x_i^h - \frac{\alpha}{n-1}\sum_h p^h \sum_j \max(x_j^h - x_i^h, 0) - \frac{\beta}{n-1}\sum_h p^h \sum_j \max(x_i^h - x_j^h, 0).$$

The first term in the utility function would be unaffected if the players received the sure outcome. What changes is the disutility from inequality. If all players have the same expected material payoff, then it is clear that the sure outcome is weakly preferred. Otherwise, let us focus on two players such that $\sum_h p^h x_j^h > \sum_h p^h x_i^h$. Then i's disutility from inequality between the two players given that the sure outcome is realized equals

$$\frac{\alpha}{n-1}\sum_h p^h(x_j^h - x_i^h) = \frac{\alpha}{n-1}\sum_{h:x_j^h > x_i^h} p^h(x_j^h - x_i^h) - \frac{\alpha}{n-1}\sum_{h:x_i^h > x_j^h} p^h(x_i^h - x_j^h). \tag{2}$$

If instead the lottery is played, we have

$$\frac{\alpha}{n-1}\sum_{h:x_j^h > x_i^h} p^h(x_j^h - x_i^h) + \frac{\beta}{n-1}\sum_{h:x_i^h > x_j^h} p^h(x_i^h - x_j^h). \tag{3}$$

The difference between equation (3) and equation (2) is the nonnegative number $\frac{\beta}{n-1}\sum_{h:x_i^h > x_j^h} p^h(x_i^h - x_j^h) + \frac{\alpha}{n-1}\sum_{h:x_i^h > x_j^h} p^h(x_i^h - x_j^h)$. It is strictly positive if $x_i^h - x_j^h > 0$ for some h, or in general if some actual outcomes reverse the rank of the expected material payoffs. An analogous exercise reveals that player j also prefers the sure outcome to the lottery. ■

Thus, inequity aversion is closely related to risk aversion.[4] Player i is strictly risk averse with respect to lotteries in which the rank of x_i varies, and risk neutral for other lotteries.

2.2 The bargaining procedure

There are $n \geq 3$ identical players bargaining over how to divide a budget of size 1; q out of n votes are needed to pass a proposal, with $\frac{n}{2} < q < n$. Each player's utility function is given by (1).

Bargaining proceeds as follows. A player is randomly selected to be the proposer (each player selected with probability $\frac{1}{n}$). This player proposes a vector $x \in \mathbb{R}^n$, with $x_i \geq 0$ for all i and $\sum_{i \in N} x_i \leq 1$, where x_i is player i's share of the budget. The remaining players in N accept or reject the proposal sequentially in some predetermined order. If at least $q-1$ players accept, the proposal is passed and x is implemented. If less than $q-1$ players accept, a new proposer is selected, again each player with probability $\frac{1}{n}$. All players discount future payoffs by a factor δ ($0 \leq \delta \leq 1$). In this section we will assume no discounting, i.e. $\delta = 1$.

Baron and Ferejohn (1989) show that there is a multiplicity of subgame perfect equilibria in this game. Because of this, they restrict the analysis to stationary subgame perfect equilibria (SSPE). These are subgame perfect equilibria in which the players' strategies do not condition on elements of history other than the current proposal.

Using arguments parallel to those of Baron and Ferejohn (1989) and Okada (1996), it is easy to see that all SSPE have the property of immediate agreement. Even though there is no discounting in the model, there is pressure to reach an agreement because of the risk of being excluded. Only minimal winning coalitions form in equilibrium, that is, $n-q$ players receive 0. Because players are not too averse to advantageous inequality, there is no reason to offer a positive amount to more than $q-1$ others. Because of

[4] The analogy between other-regarding preferences and risk preferences has been explored by Neilson (2006).

a standard subgame perfection argument, the other $q-1$ players must be indifferent between accepting and rejecting the proposal.

Lemma 3 *Any SSPE exhibits immediate agreement.*

Proof. If a player makes a proposal that is not accepted, the game goes to the next period. According to lemma 2, all players weakly prefer to agree on getting their expected material payoffs rather than go to the next period. The proposer can find a player i with a positive expected material payoff and propose that all players get their expected material payoffs except for i's payoff, which is divided equally between the proposer and $q-1$ other players. This proposal must be accepted and makes the proposer strictly better-off. Player i can always be found unless the proposer has an expected material payoff of 1 to begin with, but this is clearly not an equilibrium. ■

Lemma 4 *Any proposal accepted in an SSPE is such that $n-q$ players get* 0 *and $q-1$ players are indifferent between accepting and rejecting the proposal.*

Proof. If the proposal is accepted in equilibrium, at least q players (including of course the proposer) must weakly prefer the proposal to pass. Equilibria in which a proposal passes just because more than q players vote in favor and nobody is pivotal are ruled out since voting is sequential.

Let S be a set of players with exactly q members including the proposer, all of which weakly prefer the proposal to pass. The remaining $n-q$ players must get 0. This is because according to lemma 1 any positive payoff could be divided equally between the players in S and make them better-off. For the same reason, no money can be thrown away in equilibrium.

Analogously, $q-1$ players must be just indifferent between the proposal passing and failing. Suppose $j \in S$ strictly prefers the proposal to pass. A proposal with $\sum_{k \in N} x_k = 1$ and $x_j = 0$ would give j his lowest possible utility, thus if j strictly prefers the proposal to pass it must be the case that $x_j > 0$. Then the proposer could reduce x_j by a sufficiently small amount and divide this amount equally between the players in $S \backslash \{j\}$. The proposal would still pass and the proposer would be better-off. ■

Proposition 1 *In a symmetric SSPE, the proposer's share increases in both α and β.*

Proof. Lemma 4 implies that, in a symmetric equilibrium, the proposer offers y to $q-1$ other players, and 0 to the rest. In order for symmetry of equilibrium to be preserved, each player must receive proposals with the same probability, $\frac{q-1}{n}$ (for example, each proposer proposes to each of the other players with equal probability). The equilibrium value of y is determined by the responder's indifference condition

$$\begin{aligned} y - \frac{\alpha(1-qy)}{n-1} - \frac{\beta\,(n-q)\,y}{n-1} &= \\ = \frac{1}{n}\left[1-(q-1)y-\beta\left(1-(q-1)y-\frac{(q-1)y}{n-1}\right)\right] &+ \\ + \frac{q-1}{n}\left(y-\frac{\alpha(1-qy)}{n-1}-\frac{\beta\,(n-q)\,y}{n-1}\right)+\frac{n-q}{n}\left(-\frac{\alpha}{n-1}\right) & \qquad (4) \end{aligned}$$

This equation assumes that the equilibrium payoff of the proposer, $1-(q-1)y$, is at least as large as the equilibrium payoff of the responder, y. This will be shown to be the case.

The solution to this equation is

$$y = \frac{\alpha+(n-1)(1-\beta)}{\alpha q(n-q+1)+n(n-1)-\beta(n^2-nq+q(q-1))}$$

This expression is decreasing in both α and β. Thus, the more inequity averse players are, the more inequity we observe.

When $\alpha=\beta=0$, we are back in the original Baron-Ferejohn model, in which $y=\frac{1}{n}$ and the proposer's payoff is $\frac{n-(q-1)}{n}$. Since y is decreasing in α and β, the difference in payoff between proposer and responder is at least $\frac{n-(q-1)}{n}-\frac{1}{n}=\frac{n-q}{n}>0$. Thus, the proposer gets the highest payoff as assumed in equation (4). ■

Example 1 *Let $n=5$ and $q=3$. The equilibrium with selfish players gives $\frac{1}{5}$ to two responders and $\frac{3}{5}$ to the proposer. With $\alpha=\frac{3}{4}$ and $\beta=0$, the responders only get about 0.18; for $\alpha=\frac{3}{4}$ and $\beta=\frac{1}{2}$ they get about 0.15. In the limit when α tends to infinity, the responders get only $\frac{1}{9}\approx 0.11$.*

The reason for this counterintuitive result is that responders dislike the fact that the proposer is getting more than them, but they also dislike the possibility of being left out altogether if they reject the proposal. It turns out that the second effect is stronger, so that players are willing to settle for less rather than endure the possibility of being excluded in the future.

The analogy between inequity aversion and risk aversion plays an important role in this result. In order to see this, it is instructive to collect the $y - \frac{\alpha(1-qy)}{n-1} - \frac{\beta(n-q)y}{n-1}$ terms together in (4) and divide by $1 - \frac{q-1}{n}$ to obtain

$$\begin{aligned} y - \frac{\alpha(1-qy)}{n-1} - \frac{\beta\,(n-q)\,y}{n-1} = \\ = \frac{1}{n-q+1}\left[1-(q-1)y-\beta\left(1-(q-1)y-\frac{(q-1)y}{n-1}\right)\right] + \\ + \frac{n-q}{n-q+1}\left[-\frac{\alpha}{n-1}\right] \end{aligned} \tag{5}$$

Thus, the equilibrium offer must make the responders indifferent between the proposal and a lottery in which there is a probability $\frac{1}{n-q+1}$ of becoming the proposer and a probability $\frac{n-q}{n-q+1}$ of being excluded from the coalition.

For $y = \frac{1}{n}$, the sure outcome and the lottery yield the same expected material payoff to player i. Note that the expected utility on the right-hand side for player i does not correspond to a unique lottery: the payoffs for players other than i are not completely determined. A lottery with this expected utility is the following: i is selected to be proposer with probability $\frac{1}{n-q+1}$ and gives y to $q-1$ players (including j), and j is selected with probability $\frac{n-q}{(n-q+1)}$ and gets the whole payoff. Because of lemma 2, player i strictly prefers every player to receive his expected material payoff for sure. The expected material outcome of the lottery is such that i gets $\frac{1}{n}$, $q-2$ players get $\frac{1}{n-q+1}\frac{1}{n} < \frac{1}{n}$, and player j gets the remaining payoff. If $q > 2$, the utility on the left-hand side of (5) is obtained by a transfer from j to the $q-2$ players. This reduces i's disadvantageous inequality with respect to j as well as the advantageous inequality with respect to the $q-2$ players, and leaves i's position with respect to $n-q$ players unchanged, making i strictly better-off. Thus, $y = \frac{1}{n}$ cannot be an equilibrium because the responders would strictly prefer the proposal to pass, and the proposer could cut their payoffs.

In this reasoning it is important that i doesn't care about the distribution of the payoff between the other players when he is excluded from the coalition. In the lottery that actually corresponds to the equilibrium strategies player j's expected material payoff is lower than $1-(q-1)y$.

There is a difference between the effect of α and the effect of β. The effect of α is perverse because of the risk of being excluded from the coalition; the perverse effect of β exists regardless of whether there is a risk of being excluded. Indeed it is already present in two-player bargaining.

Consider the effect of an increase in β in two-player bargaining. Because the proposer gets more than the responder, the increase in β has no effect on the attractiveness of a given share y for the responder. On the other hand, if the responder rejects y, he will be the proposer next period with probability $\frac{1}{2}$ and will suffer from advantageous inequality. Since accepting the proposal is equally attractive and rejecting it has become less attractive, the proposer can cut the responder's payoff. This seems paradoxical: the proposer can exploit the responder precisely because the responder would suffer from advantageous inequality if he rejected the proposal and happened to be selected as proposer in the next period.

Without unanimity the effect of an increase in β is not straightforward. A given share y is now less attractive, since the responder suffers from the advantageous inequality with respect to the players who are excluded. On the other hand, rejecting the proposal is also less attractive since player i will suffer from the advantageous inequality with respect to all other players as a proposer, and with respect to the excluded players as a responder. The second effect predominates for small enough values of y ($y < \frac{n-1}{n^2-nq+q(q-1)}$, an inequality that is satisfied by $y=\frac{1}{n}$).

3 Extensions and discussion

3.1 The effect of discounting

Proposition 1 holds for sufficiently high values of δ. However, the value of y is increasing in both α and β for sufficiently low values of δ. It is easy to see why by focusing on $\delta = 0$. For $\delta = 0$, what happens in the next period is irrelevant and players compare the proposal to the outcome in which all players receive 0. A given value of y becomes less attractive as α and β increase, and responders must be compensated for this.

Proposition 2 *Let $\delta \leq 1$. In a symmetric SSPE, the proposer's share increases in both α and β if δ is sufficiently large. It decreases in both α and β if δ is sufficiently small.*

Proof. The equilibrium value of y is

$$y = \frac{\alpha(n - \delta(n-1)) + \delta(n-1)(1-\beta)}{\alpha q(n - \delta(q-1)) - \beta(\delta q(q-1) + n(n-q)) + n(n-1)}. \tag{6}$$

Both $\frac{dy}{d\alpha}$ and $\frac{dy}{d\beta}$ are decreasing in δ for any $\delta \leq 1$. Moreover, they are positive for $\delta = 0$ and negative for $\delta = 1$. ■

We now turn to the effect of a change in the discount factor holding other things constant. With selfish players, discounting always increases the advantage of the proposer. With inequity averse players the opposite can happen. This is because the responder may prefer the outcome in which all players get 0 to the equilibrium proposal. The responder nevertheless accepts the proposal because he cannot enforce the outcome in which all players get 0. However, if discounting is introduced, the responders enforce the situation in which everybody gets 0 for one period, and thus they would prefer to reject the proposal. Thus, if the equilibrium value of y for $\delta = 1$ is preferred to all players getting 0, discounting works in favor of the proposer; if it is not preferred, discounting works in favor of the responders. For some parameters, the equilibrium value of y may be above $\frac{1}{n}$: for example, if $n = 3$, $q = 2$, $\delta = 0.5$, $\alpha = 7$ and $\beta = 0.5$, the equilibrium value of y is about $0.37 > \frac{1}{3}$.

Proposition 3 *Let $\delta \leq 1$. In a symmetric SSPE, the proposer's share is decreasing in δ provided that the responders prefer the equilibrium proposal to the outcome in which all players get* 0.

Proof. Taking the equilibrium value in (6), one can calculate $\frac{dy}{d\delta}$ as well as the utility of the responder when he accepts the equilibrium proposal corresponding to $\delta = 1$. Both expressions are the product of a negative term and the term

$$q(n-q)\alpha^2 + (n-q-1)\left[n-1-\beta(n-q)\right]\alpha - (n-1)(1-\beta)(n-1-\beta(n-q)). \tag{7}$$

Therefore, both expressions must have the same sign. In particular, both expressions are negative for high values of α. Looking at the signs of the coefficients in equation (7) we see that it must have a positive and a negative root. The negative root is not relevant since α is constrained to be nonnegative. Because the coefficients of α^2 and α are positive, (7) must be positive for values of α above the positive root. ■

3.2 Alternative preferences

As shown in section 2.2, payoff division can be more inequitable under inequity aversion than under selfish preferences. This result is obtained under a concrete functional form, namely the one postulated by Fehr and Schmidt (1999). In this section we show that this result can also be found with nonlinear functional forms as well as for Bolton-Ockenfels (2000) preferences.

Keeping the assumption of symmetry and fixing the number of players, the linear functional form in Fehr and Schmidt (1999) can be generalized to

$$U_i(x) = u(x_i) - \sum_{j \neq i} c(x_j - x_i) \tag{8}$$

where $u(x_i)$ is i's utility for money and $c(x_j - x_i)$ is i's disutility from inequality (see Neilson, 2006).

Example 2 *Suppose* $n = 3$ *and* $q = 2$. *Each player's utility function is given by (8), with* $c(x_j - x_i) = 0$ *for* $x_j \leq x_i$ *(players are averse to disadvantageous inequality and neutral to advantageous inequality). Let* $u' > 0$, $u'' \leq 0$ *and* $c' > 0$ *for* $x_j > x_i$. *Any symmetric SSPE has* $y < \frac{1}{3}$.

Following the reasoning in section 2.2, it is easy to see that if there is an SSPE it must entail immediate agreement. Moreover, since players are not averse to advantageous inequality there is no reason for the proposer to offer a positive payoff to more than one player. In a symmetric equilibrium, the value of y is determined by the following equation:

$$u(y) - c(1-2y) = \frac{1}{2}u(1-y) - \frac{1}{2}\left[c(1-y) + c(y)\right]$$

If we compare the right-hand side with the left-hand side for $y = \frac{1}{3}$, we see that for $y \geq \frac{1}{3}$ the left-hand side must be strictly higher. Because $u'' \leq 0$, $u(\frac{1}{3}) \geq \frac{1}{2}u(\frac{2}{3})$. Thus it is sufficient to show that $c(1-y)+c(y)-2c(1-2y) > 0$ for $y = \frac{1}{3}$. This is the case because $c(1-y) - c(1-2y) > 0$ for all $y > 0$ and $c(y) - c(1-2y) \geq 0$ for $y \geq \frac{1}{3}$. Thus, if there is an SSPE, it must have $y < \frac{1}{3}$. For example, if $c(z) = z^2$ for $z \geq 0$, $y \approx 0.27$.

The same result can be obtained with Bolton-Ockenfels preferences. A player's utility function has two arguments: material payoff, x_i, and relative material payoff, $\sigma_i = \frac{x_i}{\sum_j x_j}$. For a given σ_i, the utility function is weakly increasing in x_i. For a given x_i, it is concave in σ_i with a maximum at $\sigma^i = \frac{1}{n}$. An example provided by the authors is $U_i = x_i - \frac{b}{2}\left(\sigma_i - \frac{1}{n}\right)^2$. If agreement is reached with certainty, total payoffs always add up to 1 and the utility function becomes $U_i = x_i - \frac{b}{2}\left(x_i - \frac{1}{n}\right)^2$. If b is small ($b \leq \frac{n}{n-1}$), u_i is increasing in x_i for any $x_i < 1$. In a symmetric equilibrium, the proposer still wants to exploit his position and offer y to $q-1$ players and 0 to $n-q$ players, and an equation analogous to (5) can be obtained. It follows that $y < \frac{1}{n}$ in equilibrium. This is because, if $y = \frac{1}{n}$, both sides of the equation would have the same expected material payoffs, but on the left hand side $\sigma_i = \frac{1}{n}$ for sure, whereas the right hand side would contain a lottery. More generally, the result obtains if the utility function is separable into $U(x_i, \sigma_i) = u(x_i) - c(\sigma_i)$ with $u'' \leq 0$, $c'' \geq 0$, and any payoff transfer makes the donor worse-off and the recipient better-off. [5]

3.3 Experimental evidence

The theoretical analysis shows that inequity aversion may have two perverse effects: more inequitable payoff division inside the coalition, and (for

[5]The payoff transfers mentioned in lemmas 3 and 4 can be made from player i to the proposer without affecting any other player's utility. Lemma 2 would hold because of concavity of the utility function with respect to σ_i.

relatively extreme preferences) the advantage of the proposer being reduced as players become more impatient. While these are interesting theoretical possibilities, none of these two effects have been observed so far in experiments on the Baron-Ferejohn model. Fréchette et al. (2003) report that subjects reject very small offers, and payoff division is more egalitarian than predicted by the SSPE with selfish players. Fréchette et al. (2005) report that discounting increases the proposer's advantage. This may be due to subjects using rules of thumb rather than playing SSPE, or to the responders wanting to punish the proposer for unkind offers (see Kagel and Wolfe (2001) and Falk et al. (2003) in the context of the ultimatum game).

Okada and Riedl (2005) investigate a three-player game in which a player is randomly selected to make an offer to either one or both of the other players, and the game ends if the proposal is rejected. The three-player coalition has a higher total payoff but a much lower per capita payoff. The Fehr-Schmidt and Bolton-Ockenfels models predict that the two-player coalition will form and the responder will get significantly more than 0; Okada and Riedl's findings are consistent with this prediction. The theory does not predict counterintuitive effects of inequity aversion in this case because the game assumes away the risk of being left out of the coalition that forms: players can be sure that everybody will get 0 if they reject the proposal.

4 Concluding remarks

It is well known that introducing competition in bargaining may make players behave as if they were selfish even if many of them are inequity averse (see Roth et al. (1991) for experimental evidence on the ultimatum game with proposer competition, Fischbacher et al. (2003) for responder competition, and Fehr and Schmidt (1999) and Bolton and Ockenfels (2000) for a theoretical analysis). Also, Bolton and Ockenfels (1998) and Okada and Riedl (2005) show that inequity aversion is compatible with excluding one player from the coalition that forms. This paper goes a step further: not only inequity aversion is compatible with one player being excluded but it may actually lead to *more* inequitable divisions *inside the coalition that forms.*

The fact that players dislike getting less than others does not trigger rejection of unfair proposals; on the contrary, players are more willing to accept such proposals rather than risk being left out altogether. A psychologically plausible assumption (inequity aversion) may lead to a psychologically implausible result (individuals being more willing to accept unfair proposals).

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