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On ultimatum bargaining experiments –A personal review

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Abstract

This review of ultimatum bargaining experiments concentrates on studies in which the author was actively involved. The basic game situation is either the ultimatum game or multiperiod-ultimatum bargaining. We outline a behavioral theory of ultimatum bargaining based on a dynamic reasoning process. The stages of this process specify either an intention generator and its corresponding intention filter or, as the final step, an ex post-evaluation of the actual behaviour. In our concluding remarks the merits of behavioral theories versus rational choice-explanations are elaborated.

JEL classification: C72; C78; C91; D63

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1. Introduction

This review of ultimatum bargaining distinguishes between the simple ultimatum game and multiperiod-ultimatum bargaining. In the ultimatum game a positive monetary amount, the 'cake,' can be distributed by one party proposing an ultimatum, i.e. the other party can either accept the proposed distribution or there is no agreement at all. The game theoretic solution therefore assigns nearly all the cake to the proposer. Experimental studies have not supported this prediction which inspired a lively and still ongoing debate about the predictive role of game theory and, more specifically, about how fairness considerations influence decision

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behaviour. It is discussed how later experimental studies may help to decide between competing hypotheses.

In multiperiod-ultimatum bargaining a rejection implies conflict only if the last of finitely many possible bargaining rounds has been reached. In earlier rounds a rejection of a proposal only means that the next round is reached. The cake size, the monetary amount which can be allocated among the two parties, will typically depend on the round during which an agreement has been reached. If, due to discounting the cake decreases over time, we speak of a shrinking cake. Most experimental studies rely on a 'shrinking cake,' i.e. on discounted payoffs, and on parties taking turns in being the proposer and the responder. Whereas the first study claimed that at least experienced decision makers behave like gamesmen, later studies questioned this conclusion.

A behavioral theory of ultimatum bargaining is outlined which assumes a dynamic decision process of finitely many stages. Early in the process the inexperienced decision maker typically relies on a simple cognitive procedure. Later, as experience accumulates more sophisticated considerations may enter the picture. To capture this, I specify an intuitive hierarchy of 'intention generators' and 'intention filters' for ultimatum bargaining which can explain most of the previously discussed experimental results. My conclusions focus on the ongoing debate between rational choice explanations and behavioral approaches like the one developed here.

There are too many experimental studies to give a complete overview (see the surveys by Güth and Tietz, 1990, Ochs and Roth, 1989, and Roth, 1995, which are already outdated or incomplete). The present discussion concentrates on the research interests of the author and on experimental studies in which he has been actively involved.

2. The ultimatum game

The main motivation to explore ultimatum bargaining experimentally was to avoid very complex situations for which a given behaviour can be justified by many possible explanations and to start from scratch, i.e. to begin with the most basic problem and gradually and carefully to enrich its complexity.

Consider two parties X and Y who can distribute a positive amount of money, e.g. 120 Dutch guilders (f 120), which we, in general, denote by c. We refer to c as to the 'cake' which X and Y can 'eat.' The distribution of c is determined via an ultimatum of X as follows: X determines a demand x with $0 \leq x < c$ for himself which Y can either accept or reject. If Y accepts, X receives x and Y the residual amount $y(x) = c - x$. If not, both parties receive no payment at all. This ends the game.

When Y is purely guided by monetary incentives, he clearly must accept all ultimatum proposals x since $y(x)$ is positive because of $x < c$. Thus X's optimal demand is $x^* = c - \epsilon$ where $\epsilon(>0)$ is the smallest monetary unit, e.g. $\epsilon = f\ 1$. Thus the game theoretic solution of the ultimatum game predicts that X asks for $c - \epsilon$ and that Y will accept every ultimatum.

Imagine an ultimatum game with $c = f$ 120: Would you really dare to demand f 119 for yourself? Very few participants do and those who dare to do so fail nearly always, i.e. their proposal is rejected. This was shown by the first experimental study of the ultimatum game (Güth, Schmittberger, and Schwarze, 1982) and additionally validated by numerous subsequent studies, e.g. Güth and Tietz (1985) and Güth and Tietz (1988), Kahneman et al. (1986), Prasnikar and Roth (1989), Bolton (1991), Harrison and McCabe (1992), Güth, Ockenfels and Tietz (1992), Hoffman et al. (1992) or the more psychologically motivated investigations of Kravitz and Gunto (1992), Eckel and Grossman (1992), Oppewal and Tougareva (1992). The main tendencies observed were that responders are willing to sacrifice substantial amounts to punish a greedy proposer and that this is well anticipated by most proposers who, on average, ask only for 1/3 of the cake.

Given the fact that responders Y sacrifice substantial amounts to punish a greedy proposer, the average proposal behaviour is easy to justify (this is elaborated in more detail by Harrison and McCabe, 1992, as well as by Prasnikar and Roth, 1989). What has to be explained is therefore why responders refuse proposals although they assign significant amounts to them (see Table 1 in Güth and Tietz, 1990, which contains a case where a proposal x with $y(x) = DM$ 19 was rejected). Clearly, this cannot be explained by monetary incentives. This makes it understandable why a discussion about fairness versus gamesmanship resulted.

A weakness of most experiments is that positions are allocated by chance. Participants who received their position in such a way may not feel entitled to exploit its strategic possibilities. In order to induce entitlement Güth and Tietz (1985 and 1988) auctioned the positions of X and Y for relatively large cakes (e.g. for $c = DM$ 100). An auction winner earned what he received in ultimatum bargaining minus his position price. Since such a difference can be negative, e.g. in case of conflict, we sometimes had to collect substantial amounts. On average the position price of X was twice as high as the one of Y. The average demanded quota x/c was 2/3, i.e. entitlement does not improve the predictive power of the game theoretic solution. When entitlement was provided in this way we, however, never encountered an equal split. Thus neither fairness nor gamesmanship alone can explain the observed behaviour.

The experiment of Güth, Ockenfels, and Tietz (1992) tried to provide the most favourable conditions for the game theoretic solution (see also Weg and Smith, 1993). The idea was to support its extreme allocation result also by fairness considerations, more specifically to justify it as an equal split. In addition to what party Y earned in the ultimatum game Y received a transfer payment t which did not depend on what happens in the ultimatum game. To guarantee entitlement positions were auctioned.

Clearly, for $t=c$ game theory predicts essentially an equal split: X earns $c-\epsilon$ in the ultimatum game, Y altogether $c+\epsilon$; c as his transfer income and ϵ from the ultimatum game. The experimental design relied on $t=0$ and $t=c$ and on three different cake sizes ($c = DM$ 18, DM 32, and $DM54$). In average, the sum of the bids is far less than $c+t$ what could be justified by the relative frequency of conflict (24%). In summary, greedy proposers were punished as in usual ultimatum experiments and, although the average demanded quota x/c was significantly higher for $t=c$ than for $t=0$, it was invariably far below the extreme value of 1, predicted by game theory.

Up to now Prasnikar and Roth (1989) seem to have produced the only study which could induce a game theoretic type of behaviour: 10 participants were asked to submit the minimum level $\underline{y}$ for acceptance in the sense that all proposals x with $y(x) = c - x \geq \underline{y}$ will be accepted. As on a Bertrand-oligopoly market the participant with the lowest acceptance level became party Y which was committed to its chosen level $\underline{y}$ in the resulting ultimatum game. At least with experienced participants competition drives down $\underline{y}$ to its competitive level of 0, i.e. fairness is only one of several competing motivational forces.

Having learned that fairness matters but that it is only one of several competing incentives one naturally encounters the problem to elaborate the notion of fairness and to investigate who of the strategically interacting parties is motivated by fairness considerations. Güth et al. (1982) have tried already to investigate whether different participants rely on different focal distributions when playing the ultimatum game. Each participant played two ultimatum games with different opponents, one as party X and one as party Y (see also Table 3 of Güth and Tietz, 1990). As party Y they simply had to determine the minimum acceptance level $\underline{y}$, introduced above. Similar observations were elicited by Kahneman, Knetsch, and Thaler (1986). Exactly 15 of 37 participants relied on a focal point in the sense of $x+\underline{y}=c$, i.e. the demand x as party X and the minimum acceptance level $\underline{y}$ as party Y add up to the cake c. In 7 of the 15 cases this was the equal split, i.e. $x = c/2 = \underline{y}$. Clearly, different focal points can explain why conflict results. Other participants (17 out of 37) leave more to party Y than their own minimum acceptance level $\underline{y}$. 5 participants left less than their own level $\underline{y}$ to party Y, i.e. they must consider themselves as being exceptionally tough.

Inspired by a study of Bolton (1993), who compared behaviour in ultimatum bargaining and in dictator games, Güth and Huck (1994) looked at four different games altogether: Beside the two polar games, namely ultimatum bargaining, where Y can veto any agreement and thereby positive payoffs of both players, and the dictator game, where Y is purely a dummy, they also included two intermediate games, namely the x-veto game, where Y can only veto the x-payoff, and the y-veto game where Y can only reject the y-component. One of the two intermediate games was already studied by Bolton (1993). Whereas Bolton put more emphasis on double blindness (which aims at minimizing the observability of individual behaviour by the experimenter), Güth and Huck (1994) allowed for greed by informing only the proposer X about the actual cake size c. Actually, one can view the way by which Hoffman, McCabe, Shachat, and Smith (1992) aim at double blindness as an extreme case of such private information ($c=0$ has positive probability).

In all four games, described above, the cake was large, i.e. $c = \bar{c} = DM$ 38, with probability 2/3 and small, i.e. $c = \underline{c} = DM$ 16, with the complementary probability of 1/3. Whereas X knew whether $c=\bar{c}$ or $c=\underline{c}$ was chosen, Y only knew the a priori-probabilities. In the experiment a participant was asked to act as the proposer X, respectively as the responder Y, for all four games of which one was finally selected to be played. Thus responders had to decide before knowing the actual proposal (responders had to state for all integer offers y with $DM0 \leq y \leq DM$ 38 and for the three veto-games whether they would accept this offer y or not).

The major tendencies were that the offers are more generous in the x-veto game, which imposes no monetary costs on responders who punish unfair proposers, than in the ultimatum game. The offers in ultimatum bargaining in turn are clearly higher than those in the dictator game which are still higher than those in the y-veto game. One possible explanation of the latter result is that full control of all payoffs like in dictatorship induces more generosity. Another possibility is, of course, that proposers in the y-veto game simply feared that small assignments y would be wasted since Y will refuse them.

The minimum demands by responders Y reveal an analogous tendency since they are largest, respectively second largest in the x-veto game, respectively ultimatum game. Many responders have chosen non-monotonic acceptance strategies, i.e. they refuse larger offers although they accept lower ones. This is by no means unintuitive: If, for instance, a responder Y wants to accept only an equal split of c, he might accept $\underline{c}/2$ and $\bar{c}/2$ but reject offers y with $\underline{c}/2 < y < \bar{c}/2$. A very interesting result is that extremely generous offers in the sense of $y > \bar{c}/2$, are also facing a considerable risk of rejection: Being too 'polite' can be socially as unacceptable as being too greedy.

3. Multiperson-ultimatum bargaining

Güth and Van Damme (1993) make a more systematic attempt to explore the notion of fairness and to investigate who of the interacting parties is actually trying to achieve fair results: Are, for instance, proposers intrinsically motivated by fairness or do they only refrain from greedy proposals since they fear a rejection? Similarly, one can ask whether responders reject profitable proposals since they are frustrated how little they get in comparison to X or whether they are guided by general norms of fairness, regardless of their own share.

In the experiments, performed by Güth and Van Damme (1993), each ultimatum game involved three parties: Party X could propose a distribution (x,y,z) with $x,y,z \geq 5$ and $x+y+z = 120$ of altogether 120 points which represented a cake of f 12,-or f 24,-. As before x is what X demands for himself whereas y and z are what he assigns to his partners Y and Z, respectively; and as before Y has to accept the proposal to induce such an allocation result (if Y rejects, all parties receive nothing). There was, however, an important systematic variation: When deciding whether to accept or not, responder Y knew the whole proposal (x,y,z) only in the xyz-condition whereas he knew only y or z in condition y, respectively z.

Clearly, such a design allows to answer the questions raised above: If, for instance, X is intrinsically motivated by fairness, he should assign a significant amount y to Y in condition z and similarly a significant share z to Z in condition y. Responders Y who do not care only for their own share y should reject proposals (x,y,z) with low z-assignments. There are additional questions related to this experimental design: Does, for instance, a low assignment z in condition z signal a greedy proposal? Does a high assignment z in condition z signal a large y or will it be seen as falsely pretending generosity?

The results of Güth and Van Damme (1993) clearly reject the idea that proposers are intrinsically motivated by fairness. Thus fairness is a social norm which yields reliable behavioral expectations only when its compliance can be monitored. There is, furthermore, no support for the hypothesis that responders choose conflict for the sake of others (whenever a proposal was rejected in conditions xyz and y, this could be explained by its very low assignment y). In condition z both, extremely low and high assignments z were rejected. According to the observed behaviour for condition z one should neither reveal drastic exploitation nor pretend too much generosity. Low, but not extremely low assignments z seem to convey the impression that also party Y can hope for something.

Another 3-person ultimatum bargaining study (Güth, Huck, and Ockenfels, 1996) assumes incomplete information about the cake size c. Whereas the proposer X knows whether c is large ($c = \bar{c} = DM$ 24,60) or small ($c = \underline{c} = DM$ 12,60), the two other players Y and Z only know the a priori-probability of $c = \bar{c}$ with 2/3, and $c = \underline{c}$ with 1/3. Thus the cake size is private information of the proposer as, for instance, in the ultimatum experiment of Mitzkewitz and Nagel (1993) or in the experiment of Güth and Huck (1994) described above.

Güth et al. (1996) rely on two level-ultimatum bargaining, i.e. first X offers an amount y with $0 \leq y \leq c$ to Y and Z which Y can accept or reject. In case Y rejects, the game is over and all three players receive 0-payments. Otherwise X receives $c - y$ and Y has to propose an amount z with $0 \leq z \leq y$ for Z which then Z can accept or reject. In case Z rejects, both, (s)he and Y, receive 0-payments. Otherwise Z receives z and Y the residual amount $y - z$. Notice that player Y faces both sides of a usual ultimatum game: With respect to X he is a responder whereas he is a proposer in view of Z.

The 2×2-factorial experimental design varied systematically the way how participants were prepared for their game playing behaviour: Once the distinction was between auctioning positions versus assigning them simply by chance and

once between a detailed pre-experimental questionnaire versus letting participants decide immediately. The pre-experimental questionnaire induced more generous offers although it inspired considerations of backward induction. Since after auctioning the roles of players position prices were publicly announced, it was predicted that offers will try to avoid monetary losses of others if possible. Although this hypothesis could not be confirmed, some offers tried to avoid losses of others even when this implied a loss for the proposing player.

In general, the most important result was that proposers X with large cakes $c = \bar{c}$ offered 2/3 of $\underline{c}$ to Y and Z, i.e. they were either trying to lie about the cake size and pretending to be extremely fair or thinking that only X deserves the difference $\bar{c} - \underline{c}$ when c is large. If they were just pretending to be fair, this might have been detected by player Y. Proposers X with small cakes $c = \underline{c}$ were less likely to offer 2/3 of $\underline{c}$ to Y and Z so that an offer $y = 2/3\underline{c}$ should have made Y suspicious. However, no offer $y = 2\underline{c}/3$ was ever rejected. The regression function $z = .47 + .35\ y$ whose coefficients are highly significant, reveals that player Y, who is confronted with both aspects of ultimatum bargaining, tries to share with Z what is offered to them. Nevertheless, whenever X with $c = \bar{c}$ offered more than $\underline{c}$, this was exploited by Y. Thus also players Y become greedy if they can hide their greed by pretending that either c was small or that X was greedy.

4. Multiperiod-ultimatum bargaining

The initial experiments of Güth et al. (1982) stimulated a lively discussion concerning the predictive role of game theory. So Binmore, Shaked, and Sutton (1985) conceded that the experimental results for the ultimatum game itself are quite robust but claimed that in less extreme situations behaviour will be more consistent with game theory. This claim was substantiated by the results of two period-ultimatum bargaining experiments for a shrinking cake.

In general, multiperiod-ultimatum bargaining relies on a given number T of possible bargaining rounds and on a given cake size c_t for every possible round $t = 1,\ldots,T$. The monetary amount c_t can be distributed if the parties reach an agreement in period t. If $c_{t+1} < c_t$ for $t = 1,\ldots,T-1$, one speaks of a shrinking cake. In every round t first the proposer determines his demand x_t with $0 \leq x_t < c_t$ which the responder can accept or reject. Acceptance implies that the proposer receives x_t and the responder $y_t(x_t) = c_t - x_t$. But unlike in the ultimatum game rejecting x_t implies conflict and 0-payoffs for both parties only in the last round $t = T$. In rounds $t < T$ a rejection implies that parties enter round $t+1$ whose cake size c_{t+1} is smaller than the case size c_t for period t. All the experimental studies, performed up to now, assumed that parties take turns in being the proposer. Unlike the bargaining model, analyzed by Rubinstein (1982), experimental studies of multiperiod-ultimatum bargaining must rely on $T < \infty$ (Weg, Rapoport, and Felsenthal, 1990, have tried to approximate the limiting case $T = \infty$).

In the initial study of Binmore et al. (1985) the parameters were $T = 2$, $c_1 = £1$, and $c_2 = £.25$. In round $t = T = 2$ the responder must always accept if he is only guided by monetary incentives. Thus $x_2^* = c_2 - \epsilon$ is the optimal demand in round 2. From this follows that the responder in round $t = 1$ can reject all proposals x_1 with $x_1 > c_1 - c_2$, i.e. the highest demand x_1 which will be surely accepted in round $t = 1$ is $x_1^* = c_1 - c_2$. The game theoretic solution play, derived by backward induction, consists therefore of the initial proposals $x_1^* = c_1 - c_2$ which the responder accepts.

In both the first and second trial of playing this game, Binmore et al. (1985) observed an aggregate distribution of initial demands x_1 with two focal points, namely the equal split $x_1 = c_1/2$ and the game theoretic prediction $x_1^* = c_1 - c_2$, i.e. participants were either fair or gamesmen. Whereas in the first trial $x_1 = c_1/2$ dominated $x_1^* = c_1 - c_2$, the opposite was true for the second trial. Because of this reversal Binmore et al. (1985) concluded that at least for experienced participants gamesmanship dominates fairness considerations.

It is a convincing hypothesis that more experienced participants understand more thoroughly the strategic aspects of a given bargaining situation and that this will inspire attempts to exploit strategic possibilities (already in Güth et al., 1982, experienced proposers asked for more than inexperienced ones but they were, in average, also less successful). To demonstrate that this will, however, not bring about a game theory-like behaviour Güth and Tietz (1985) and (1986) performed a two period-ultimatum bargaining experiment whose main difference to the study of Binmore et al. (1985) was the amount by which the second round cake c_2 shrank: In the radically shrinking cake-games c_2/c_1 was $1/10$ whereas this relation was $9/10$ in the nearly no shrinking cake-games.

The evidence was convincing: The game theoretic proposal $x_1^* = c_1 - c_2$ served never as a focal point. On the contrary, average behaviour differed significantly from $x_1^* = c_1 - c_2$, especially in the nearly no shrinking cake-games where hardly any proposal x_1 with $x_1 < c_1/2$ was observed in spite of $x_1^* = c_1/10$.

The controversy inspired further experimental studies of multiperiod-ultimatum bargaining (e.g. Neelin, Sonnenschein, and Spiegel, 1988, Ochs and Roth, 1989, Weg et al., 1990, Binmore et al., 1991). Partly these studies allowed for more than just two rounds of bargaining, partly they represented cake shrinking via discount factors which can be different for the two parties involved. It was frequently observed that the responder rejects a greedy proposal x_t although the residual amount $c_t - x_t$ exceeds c_{t+1}, the maximal future payoff. Thus also in the more general framework of multiperiod-ultimatum bargaining responders are willing to sacrifice substantial amounts in order to punish a greedy proposer.

If one is convinced that the desire for fairness is a strong behavioral incentive, one naturally becomes interested in the question whether trust in fairness can assure cooperation in situations where, according to monetary incentives, this would be unreliable. Güth, Ockenfels, and Wendel (1993) have tried to answer

this question empirically. More specifically, Güth, Ockenfels, and Wendel (1993) is a multiperiod-ultimatum bargaining experiment with an increasing cake, i.e. with

$$0 < c_1 < c_2 < \ldots < c_{T-1} < c_T.$$

Its rules, furthermore, allowed the proposer of every period $t = 1, \ldots, T-1$, to declare period t as the final period, i.e. the proposal x_t could be made a real ultimatum (either the responder accepts it or conflict with 0-payoffs for both results) or just a proposal whose rejection leads to the next round $t+1$ as in previous multiperiod-ultimatum bargaining experiments.

Backward induction, similar to the case of a shrinking cake, yields that every ultimatum proposal will be accepted whereas every non-ultimatum proposal is rejected. Thus the proposer of every round $t = 1, \ldots, T-1$ declares period t to be the final one for reaching an agreement and asks for $x_t^* = c_t - \epsilon$. Thus both parties would reach an extremely unfair agreement in the first round although they could have shared a possibly much larger cake by delaying the agreement. This illustrates why the study of Güth et al. (1993) is closely related to the experiments of McKelvey and Palfrey (1992) who investigate the well-known centipede-game.

The two-factorial experimental design distinguished games with $T = 2$ or $T = 3$ and a mildly ($c_{t+1} - c_t = DM\ 3$) and strongly ($c_{t+1} - c_t = DM\ 10$) increasing cake. Each participant played the same game twice with two different opponents but always in the same position. In 70 out of 102 plays no ultimatum was imposed in round 1: Whereas for the mild cake increase only 28 of 50 proposers in round 1 refrained from imposing an ultimatum, this number was 41 out of 52 for the strong cake increase. Thus unlike game theory's prediction behaviour seems to be driven by two competing incentives, namely to strive for efficiency by delaying the agreement and the fear of being exploited. Clearly, striving for efficiency is strengthened by a strong periodic cake increase what is also demonstrated by the centipede experiments of McKelvey and Palfrey (1992) in which the cake is always doubled.

One might have expected that non-ultimatum proposals are more fair than ultimatum proposals since a non-ultimatum proposal seems to tell: 'Look, I am not using my ultimatum power since I believe that we both can get more by mutual trust. Why don't we simply always try to share equally, hopefully c_T, i.e. the largest cake?' Surprisingly, ultimatum and non-ultimatum proposals of the same round are nearly identical. The proposals become, however, significantly fairer the longer the play lasts supporting the hypothesis that trust, revealed by not using the ultimatum power, induces fairness in the sense of more balanced payoff proposals.

5. Toward a behavioral theory of ultimatum bargaining

My main motivation when studying ultimatum bargaining experimentally was to develop a behavioral theory of bargaining. The lively debate about what to conclude from ultimatum bargaining experiments seemed, however, to have a different focus: Paralleling the so-called Nash-program (Nash, 1953) to model bargaining as a strategic game and to determine bargaining behaviour by selecting one of its equilibria (see Güth and Kalkofen, 1989, for a more thorough discussion of Nash's program) one was very interested in experimental studies of noncooperative bargaining models like the very simple ultimatum game. Apparently, many scholars were shocked when confronting some reliable evidence that the game theoretic solution with respect to monetary incentives may have no predictive power.

This reaction came as a surprise to me since I considered game theory as the theory of perfectly rational individual decision making which pays no attention at all to the cognitive limitations of human decision makers and which therefore can hardly be expected to explain human decision making. But apparently not everybody accepts the need to supplement normative game theory by a behavioral theory of game playing. For those who do, the following rudimentary outline of a behavioral theory of ultimatum bargaining will hopefully provide some inspiration.

My basic assumption is that human decision making can be viewed as a dynamic reasoning process each of whose stages involves an intention generator and filter. The intention generator analyses the decision problem based on some boundedly rational cognitive approach. The intention filter prescribes an acceptability test of the intended behaviour.

Here I do not present this approach and general theory. Instead I simply illustrate how it might be used to explain ultimatum bargaining and major results of ultimatum bargaining experiments.

5.1. Stage 0: 'Guidance by past experiences'

Faced with a new decision problem the initial cognitive task is to determine whether one has envisaged this or a similar decision task before. If so, one will ask further whether the previously chosen behaviour has been successful or not. The behavioral intention generated is then: Repeat the previously successful mode of behaviour! The obvious acceptability test for this intention is related to questions like: Is the present problem really structurally similar to the situation previously experienced? Are the previous experiences reliable results or could they be simply lucky events?

So the dictator game may, for instance, be perceived as a 'fair division task' (typically in case of reward allocation as studied by Shapiro (1975) and Mikula (1977)) or as a 'charity task' (X, who is rich, may want to help Y who is poor). Whereas in the latter case proposers X might suggest different allocations due to different attitudes regarding charity, the typical intention, triggered by 'fair division task,' is to split evenly. The obvious filter for the intention to split evenly is the question: Shouldn't I give less to Y? Whereas in case of 'small cakes,' this question is usually denied, this may not be true anymore for large cakes. Also

double blindness seems to offset the equal split. I, however, doubt that a similar effect of double blindness will be observed in case of reward allocation which, in my view, is the better test of allocation behaviour by dictators.

Similarly, for the ultimatum game most people will conclude that they have experienced similar situations before. After all the ultimatum game appears at first sight like a simple distribution task where both parties should receive an equal share. The resulting intention $x = c/2$ may, however, be questioned by the intention filter: Is it okay to ask only for $x = c/2$ although I as party X seem to be much more powerful? Inexperienced decision makers will think 'why bother?', the same might be true for experienced decision makers confronted with small cakes like in the study of Güth et al. (1982). If, however, serious doubts exist whether $x/2$ is acceptable, the reasoning process continues with the following.

5.2. Stage 1: 'Superficial strategic analysis'

The vague intention is to ask for more than $c/2$. The cognitive problem to be solved seems to be: How much can I demand without risking conflict? More specifically, one needs an idea about the minimal acceptance level $\underline{y}$ of the likely responder in the sense that only demands x with $c - x \geq \underline{y}$ will be accepted by the responder of an ultimatum game. The intention $x = c - \underline{y}$ will, however, be subjected to acceptability tests like: Can I really be sure that the demand $x = c - \underline{y}$ will not be rejected? If one does not trust in one's own prediction, one either might go back to the initial idea of $x = c/2$, especially if $c/2 - \underline{y}$ is relatively small, or rely on a compromise between both solutions, e.g. the midway proposal $x = 3/4c - \underline{y}/2$ (all of the 17 observations with $x + \underline{y} < c$ in Güth et al., 1982, rely on $x > \underline{y}$ and could therefore be explained by such considerations).

The few observations $x^* = c - \epsilon$ consistent with game theory indicate that at least a few participants seem also to rely on another acceptability test: Can I really be sure that proposals x with $c - x < \underline{y}$ are rejected? If one has serious doubts in this respect and if $c - \underline{y}$ is considerably smaller than c, one has to enter the next and (for the ultimatum game) final stage of the dynamic reasoning process:

5.3. Stage 2: 'Strategic backward induction'

The cognitive task is here to imagine the emotional state of a responder who is confronted with an extremely greedy proposal: Why should he sacrifice a positive amount of money to punish the greedy proposer? Shouldn't he accept things as they are and accept angrily what is left? From post-experimental discussions as well as from actually observed behaviour (see Table 1 in Güth and Tietz, 1990) we know that some participants think this way. The generated intention is to ask for $x = c - \hat{\epsilon}$ where $\hat{\epsilon}$ must not necessarily be the smallest positive monetary unit ϵ, but a small unit compared to c. This behavioral intention has to pass the intention filter: Does it really pay to ask for nearly everything? Isn't there a significant risk that the responder does not accept facts as they are and simply reacts emotionally? In most cases this seems to prevent extremely greedy proposals, but not always (see Table 1 of Güth and Tietz, 1990). If a participant does not dare to ask for $x = c - \hat{\epsilon}$, he usually will fall back on his previous intention $x = c - \underline{y}$ or even on $x = c/2$ if $c/2 - \underline{y}$ is a relatively small amount.

Up to now we have always concentrated on the dynamic reasoning process of a proposer engaged in the ultimatum game. Since the responder is in a much more passive situation, his cognitive task depends crucially on the proposal x which he envisages. If x is rather fair, he will happily accept the proposal. In case of a greedy proposal, in our view this can be $x = c - \underline{y}$ as well as $x = c - \hat{\epsilon}$, he will simply have to decide to which of the two competing forces he yields, his desire for money or his incentive to punish the greedy proposer who after all would suffer a much larger monetary loss. Viewed as a dynamic reasoning process a responder will first ask whether the given proposal x is reasonably fair or not. In case of an unfair proposal he then will determine whether the desire for revenge dominates its cost $y(x)$ or not.

According to Tables 1 and 3 in Güth and Tietz (1990) responders can react very differently: Proposals x, which some responders accept, are unacceptable for others, i.e. there is usually no clearcut boundary $\underline{y}$ such that all responders will accept all proposals x with $c - x \geq \underline{y}$ and reject those with $c - x < \underline{y}$ (Güth et al., 1993, have, however, observed such a clearcut boundary $\underline{y}$ in a situation where this is additionally supported by prominence considerations).

It is important that the cognitive process does not stop when the first intention, which has passed its acceptability test, is carried out. Since Stage 0 reflects on previous experiences, it is very important to check whether the actual result supports the considerations by which this behaviour has been generated. If, for instance, a proposal $x = c - \underline{y}$ is rejected, one obviously has wrongly predicted the responder's emotional state. If, on the other hand, one would learn that far more greedy proposals were accepted, one might correct the own beliefs concerning $\underline{y}$ downwards. Similarly, a proposer who has chosen $x = c/2$ might think that he has made a bad choice when he learns that nearly all 'greedy proposals' were accepted.

Thus the post-decisional evaluation will strongly depend on the information feedback provided. There can be general feedback in experiments where participants can communicate between experimental sessions like in Güth et al. (1992), feedback concerning the own play only as in Güth and Van Damme (1993), or nearly no feedback as in Güth et al. (1993).

Post-decisional phenomena like post-decisional regret which appear completely nonsensical in a neoclassical world can thus serve an important purpose, namely to prepare a repertoire of successful behaviours for future decision tasks. Decision experts will usually have to rely on both, a rich repertoire of successful behaviours and the ability to proceed to later stages of the dynamic reasoning process if necessary.

Let us briefly indicate how the dynamic decision model could be extended to multiperiod-ultimatum bargaining where we restrict ourselves to shrinking cake games with $c_t/2 > c_{t+1}$ for all $t = 1, \ldots, T-1$. As in the ultimatum game $x_1 = c_1/2$ will be the first intention of unexperienced decision makers which is then questioned by: Can't I ask for more without risking conflict?

To generate an idea how much one can demand safely in round $t = 1$ is, however, less obvious in multiperiod-ultimatum bargaining. The results of Neelin et al. (1988) suggest that participants do not immediately rely on backward induction but restrict themselves first of all to the following simple consideration: 'If the responder rejects, the most he can hope for is c_2. So it seems that I safely can ask for $c_1 - c_2$ which is greater than $c_1/2$ due to $c_1/2 > c_2$.' Actually, $x_1 = c_1 - c_2$ was the unambiguous and surprisingly clearcut focal observation by Neelin et al. (1988). As clearly revealed by the results of Güth and Tietz (1985 and 1986) the intention $x_1 = c_1 - c_2$ has, however, an important acceptability test: If, for instance, $c_1 - c_2$ is close to c_1, as in the radically shrinking cake games, participants nearly always reject this behavioral intention, probably since they anticipate a rejection.

Notice that $x_1 = c_1 - c_2$ is the game theoretic demand for $T = 2$. Thus the support for the game theoretic solution claimed by Binmore et al. (1985) may be due to an unexpected coincidence, namely that this simple behavioral approach implies the same initial proposal $x_1 = c_1 - c_2$ as the game theoretic solution. Whereas, however, the game theoretic solution loses all its predictive power for $T > 2$, the same is not true for the intention $x_1 = c_1 - c_2$, at least if $x_1 = c_1 - c_2$ is not an extremely greedy proposal, i.e. if c_2 represents a substantial share of c_1.

6. Conclusions

The concept of a dynamic decision process provides a unique possibility to account for individual differences in behaviour which are often neglected (see Brandstätter, 1992). Depending on their personal experiences (see the effect of experience observed by Binmore et al., 1985) as well as on their potentially different repertoires of analytical approaches two different individuals can rely on different intentions and actual behaviour. So the strategic backward induction considerations may be obvious for somebody who is analytically skilful and/or has been educated correspondingly, whereas such an approach may only be understood by others after many experiences or even never at all. Neelin et al. (1988) have used an interesting idea to make experimental participants aware of the backward induction solution, namely by allowing them first to play the later stages of a sequential game before confronting them with the more complex situation with more decision stages. The fact that nevertheless the game theoretic backward induction solution was hardly supported could be explained in the framework of our simple dynamic decision model since the thus derived behaviour may not have passed its acceptability test successfully.

Experimental economics presently experiences a partly open (see, for instance, Ochs and Roth, 1989, Güth and Tietz, 1990, or Bolton, 1991) and partly hidden (by anonymous referee reports) debate how to explain so-called 'anomalies' (see Richard Thaler's *Anomalies* in the Journal of Economic Perspectives), i.e. empirical facts which do not comply with optimal decision behaviour according to monetary incentives. Very often this is done by including additional arguments of utilities (e.g. a preference for fairness like Ochs and Roth, 1989, or Bolton, 1991), altruism like in the context of public good provision, or expected altruism like, for instance, McKelvey and Palfrey (1992). Doubtlessly a lot can be learned from such attempts to explain experimental phenomena, especially when they are based on well accepted motivational forces. Very often this type of research resembles, however, a neoclassical repair shop in the sense that one first observes behaviour for a certain environment and then defines a suitable optimisation or game model which can account for what has been observed.

In my view, additional arguments of utility functions like a desire for fairness, altruism, or envy, as well as specific forms of incomplete information offer no really satisfying explanations, but shift only the problem to another level of research questions, namely why people have such utility functions and/or beliefs. To answer such questions one will have to rely on a preliminary analysis and evaluation of the decision problem, i.e. one basically assumes dynamic reasoning which we prefer to model and explore in detail instead of denying it or studying its stages separately.

Of course, the assumption of perfect individual rationality is simply wrong and can be justified at best as an 'as if'-explanation. Although we do not deny the need for a normative theory like game theory and, more generally, neoclassical theory, we prefer the natural psychological categories of human decision making over their artificial analogues resulting when they are represented in the typical neoclassical framework of utility maximisation based on subjective beliefs.

By experiments we can hope to distinguish between psychological ideas simply by observing behaviour and/or its underlying reasoning process. Utilities as well as subjective beliefs, e.g. in the form of subjective probabilities, are not directly observable: How should they if they do not exit?! It seems amusing to me that some psychologists are excited about the idea to explain empirical behaviour in the neoclassical way. But why shouldn't there be a psychologist who is deeply impressed by the elegance and rigour of neoclassical theory? After all, most economists are proud of neoclassical theory, even those who do not believe in its predictive power.

7. For further reading

Roth et al. (1991).

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