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Ultimatum Game

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Synonyms

Dictator's game; Game theory

Definition

The ultimatum game is a task that allows us to test
the predictions of game theoretical assumptions.
In a standard ultimatum game, two players share
roles as the proposer and the responder. The task is
to divide a constant sum of money in a one-shot
interaction. The proposer makes an offer, and the
responder either accepts or rejects the offer. If the
responder accepts, the two parties share the money
based on the offer. However, if the responder rejects,
neither party earns anything.

Traditional game theory assumes that human
beings are fully rational. Thus, if the players in the
ultimatum game behave rationally (i.e., if utility
functions are monotonically increasing), they
should try to maximize their gains. Specifically,
the proposer should offer the minimum amount of

money different than, yet close to, zero to maximize her gains and the receiver should accept that
offer since it is better than nothing, which is what
he will get in case he rejects (Camerer 2003).

The first attempt to test these game-theoretical
predictions using the ultimatum game was
conducted by Güth, Schmittberger, and Schwarze
(1982). In their experiment, participants were
invited to a room where they all see each other
yet did not know their anonymous partners in the
game. The results were in contrast to the original
game-theoretical expectations; the modal offer
was equal share, and the mean offer ranged
between 35% and 39% for different amounts of
sum with an average of 36.7%. Numerous studies
have then been conducted to test the same prediction (e.g., Bolle 1990; Forsythe et al. 1994; Larrick
and Blount 1997; Solnick 2001). Although there is
considerable amount of variation in the actions of
players across studies, two general conclusions can
be derived from this literature: (1) Proposers tend to
offer more money than the minimum nonzero
amount, and (2) Responders tend to often reject
low yet nonzero offers. Therefore, these findings
challenge the well-established view in standard
economics that humans are rational in their financial decisions in the sense that they always pursue
their self-interests.

An alternative explanation to this game-theoretical framework posits that both parties are
motivated by reaching a fair share instead of by
self-interest driven by rational and selfish motivations. In one derivation of the original study

conducted by Güth et al. (1982), Kahneman et al. (1986) changed the rules of the game. In this novel version, responders had no choice but to accept the offer. Even though the proposer had nothing to worry about losing the whole share, most of the participants (76%) preferred equal share, implying a fairness motivation. Other researchers, however, rejected the fairness explanation (e.g., Hoffman et al. 1994) by claiming that proposers' offers are driven by the expectations about the responders' reservation value (i.e., minimum acceptable point one will agree in a negotiation). Thus, the proposer thinks that not zero but small amounts of offer will be more likely to be rejected, which sets an amount that the proposer assumes acceptable. In testing this prediction, Hoffman et al. (1994) compared offers in the ultimatum game and dictator game. In the dictator game, when the proposer makes the offer, the game ends since the responder has no option. Results showed that proposers in the dictator game behave more selfishly as compared to proposers in the ultimatum game, most of them (70%) keeping most of the money.

Accumulated evidence regarding the ultimatum game also allows to make inferences about the underlying mechanisms of three different behavioral strategies, each of which is derived from one of three hypotheses; (1) proposers take most if not all the share as expected by the game-theoretical expectation, (2) equal distribution between herself and responder based on the fair-share hypothesis, and (3) proposers behave in line with their experiences and expectations about partner's behavior as proposed by the expectations hypothesis (Suleiman 1996).

To test these predictions, variations of the original ultimatum game have been used such as creating an environment that leads people to behave more selfishly. In general, different versions aim to understand and explore the underlying mechanisms of fair-share inclinations.

Variations of the Ultimatum Game

Binmore et al. (1985) devised a *two-stage ultimatum game* where participants had the opportunity to interact. In this version, if the responder rejects the offer, they move on to the second tour and reverse the proposer-responder roles. Though game theory predicts that the game would not move on to the second tour since accepting any nonzero payment is the rational choice and should be accepted all the time, 15% of the participants rejected the offer. Furthermore, contrary to the initial expectation that the game will be played rationally as the participants gain experience through the rounds, offers in the second round were higher than the first round.

A *multistage ultimatum game* was also used to test the expectation that experience gained during the multistage game would unearth the rational economist out of the participants. Neelin et al. (1988) conducted four and five-stage versions, and Ochs and Roth (1989) applied a ten-stage ultimatum game. The results of these multistage games failed to provide strong support for the predictions of game theory. For instance, participants learned nothing through the trials, their strategies remained stable, and mean offers were larger than the equilibrium.

Weg and Smith (1993) designed two different versions of the game, *OneOne and OneTwo ultimatum game*. In the first, participants play the game twice with the same role, while in the second participants change roles in the second round. Game theoretical expectation suggests that as the proposer holds the power all the time in the OneOne version, she should take the whole share; yet the findings failed to provide support. The authors concluded that, as there is a chance for the responder to reject the offer, those offers tend to approximate equal share. An alternative interpretation of these results is that offering equal share is driven by self-interest, as the participants believe that they can only maximize their share by providing equal share, they behave in a more egalitarian way. In testing this prediction, Kravitz and Gunto (1992) conducted two experiments using the classical one-shot ultimatum game. Before the game, participants in the responder role indicated the minimum acceptable offer. Similar to other studies, calculated expected value referring to the optimal offer to secure maximum share for the proposer was $2, 40% of all share

which is close to equal share. However, when the participants were asked to make offers when they knew that the responder would behave rationally and accept any nonzero offer, the modal share was only 1%.

In some other versions, to increase rational and self-interest-driven actions, researchers manipulated expectations such as by letting participants play the game to earn the proposer position (Hoffman et al. 1994) and applying an auctioning procedure (Güth and Tietz 1986). Weg and Smith (1993) proposed a two-category distinction across the variations of the ultimatum game. Accordingly, *framing incentives* such as the auctioning procedure or winning the proposer role are external to the game and are intervening variables. On the other hand, *structural incentives* such as multistage variations of the game are embedded and internal to the game. Thaler (1988) asserted that although games using framing incentives led to an increase in greedy and selfish offers, they do not necessarily provide support for the game-theoretical predictions, since the action strategies are at least partially determined by variables outside the game itself.

Research using various versions of the ultimatum game conducted on qualitatively different samples to test the game-theoretical and alternative hypotheses also revealed that there is considerable amount of variation in the number of shares offered by proposers and the rejection rate of responders. For instance, the average offer was 26% in a study conducted on a Peruvian sample (Henrich 2000), while it was 51% in another study conducted on a Japanese sample (Buchan et al. 1999). One possible explanation for the variation is the amount of total share since, as the total amount increases, the stakes become higher. Other research focusing on the amount of share revealed that there is no difference in the percentage of the amount offered by the proposer while the rejection rate decreases as the total share increases (e.g., Cameron 1999; Slonim and Roth 1998). The first study (Cameron 1999) was conducted on an Indonesian sample and the latter on a Slovakian sample. Thus, another possible explanation for the variation is cultural characteristics which might somehow influence the actions of players.

Oosterbeek et al. (2004) conducted a meta-analysis of 75 ultimatum game experiments. They only included one-shot ultimatum game experiments and two variations of the game. The first variation is the original classical ultimatum game. In the second one, responders set the minimum amount to accept the offer before the offer is being made, called the strategy method, in which responders had no chance to take action conditional on the actual share offered by the proposer. Results of the meta-analysis showed that the average amount offered by the proposer was 40%, and the average rejection rate by the responder was 16%. In the experiments using the strategy method, proposers' offers were smaller for larger total amounts whereas larger for inexperienced participants. Responders' rejection rate is lower for larger total amounts while it is higher when the strategy method is employed. In terms of cross-cultural differences, the results of the meta-analysis showed no difference between different geographic regions on the offers of proposers but revealed significant differences in the rejection rate of the responders. Specifically, Asian participants had a higher rejection rate than American participants. Cultural-level differences of individualism and power distance did not predict either sharing or rejection rates.

Animal Behavior

To understand the evolutionary roots of action strategies such as cooperation, fair-share preferences, and self-interest, researchers look up to the actions of our close relatives: chimpanzees. Recent research showed that chimpanzees and capuchin monkeys display preferences similar to humans in terms of cooperation and aversion to unequal treatment (e.g., Brosnan et al. 2005; Melis et al. 2009). Therefore, how those non-human primate cousins behave in the presence of another agent that has the opportunity to influence the outcome of the action, as in the ultimatum game, attracts the attention of researchers. Recent research on chimpanzees and bonobos revealed that nonhuman primates behaved in line with the expectations of the game-theoretical perspective:

They offered the smallest amount possible, and nonhuman primate responders accepted almost every offer even if the offer were zero, implying that they might fail to apprehend the task and hence cannot be evaluated as rational maximizers (Jensen et al. 2007; Kaiser et al. 2012). However, designs of these experiments have been criticized since they utilized a device not present in human experiments: Games were played within primates' social group which violates anonymity. Besides, the incentive was food instead of a more abstract reward such as money (primates have been shown to provide strong responses to visual food inputs, Boysen and Berntson 1995). Furthermore, unique to the primate version, they reject the offer by inhibiting their actions and waiting for 30 s which have been shown to influence human actions as well. Smith and Spielberg (Smith and Silberberg 2010) replicated the chimpanzee experiment on humans and found that waiting before taking action decreased the rejection rate of the responder from 52% to 18%.

In a more recent experiment, children and chimpanzees were recruited for two tasks similar to the ultimatum game and dictator game (Proctor et al. 2013). They used tokens with a trade value akin to money used in human designs. Chimpanzees were next to each other in two different rooms positioned against six slices of bananas. They had two options, equal share token which is used to trade three slices for each, and unequal share token which is used to trade five slices for the proposer and one slice for the responder. Each chimpanzee took 12 trials, and as a result, in 75% of all trials, they preferred the equal share token. In the same experiment, chimpanzees played another game such as the dictator game in which each chimpanzee is matched with a "foil" partner, naïve to the conditions and passive to the share offered by the proposer. In this version, 90% of the chimpanzees preferred the unequal (selfish) token. Those results were in line with the children sample tested in the same experiment.

Overall, the ultimatum game is a powerful tool to study human and nonhuman primates' social behaviors. Future research should strive to increase the level of comprehension of the ultimatum game, for both human and nonhuman participants.

Cross-References

► Cooperation
► Decision-Making
► Economics
► Game Theory
► Nash Equilibrium

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