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Are We As Rational As We Think? Bringing Rationality Versus Equality Preferences into the Classroom

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The Ultimatum Game examines the relationship between profit maximization and fairness in our decision making process. The setup: two players, a proposer and a responder divide an amount of money between them. The predicted outcome is a result where the proposer offers $1 to the responder and keeps the rest with the responder accepting the offer. The game introduces that monetary gain may not be the only force behind people's decision making process while introducing the ideas of fairness and equality. The game results seem to disprove the theory that people behave rationally, or economically speaking in their own self-interest.

From childhood, the principle of fairness to others has been instilled in us through learning to share our toys or wait our turn in line. However, economics assumes that individuals are homo economicus (self-interested and rational) and frequently overlook the role of fairness in market transactions. For example: Suppose that two friends find a $100 dollar bill on the street. How will the friends divide that money? Friend 1 picks the bill up (and therefore is in possession of it), and he wants to play "finders keepers" with a split of $99 to $1. Friend 2 has the option of accepting Friend 1's offer of $1 or taking the bill to the police station to report it as found and receive $0. The homo economicus suggests that Friend 2 should accept the $1 because rejecting it leads to a zero payoff. However, we find that this game is unlikely to play out in the manner described. This raises the question, why doesn't Friend 2 accept a smaller payoff compared to turning the bill in for a zero payoff.

The above game is a bargaining game called the Ultimatum Game. The game was introduced by Guth, Schmittberger, & Schwarze (1982) to discuss the proposed division of a pool of money that is received by one individual to divide between the two players. One individual receives the pool of money and proposes payoffs by demanding the largest portion of the pie that will result in acceptance by the respondent. The respondent maximizes payoffs by accepting any proposer demand that results in a payoff above zero for the respondent. Therefore, economists predict that proposer will keep all but just $1, which will go to the responder, and the responder will accept.

The Nash equilibrium is the ultimate rational decision, but in practice, players rarely reach the Nash. More formally defined, the Nash equilibrium is an outcome where each participant makes the best decision possible based on the decisions made by the other participants. The Nash equilibrium incorporates not only the choices made by the individual but also the strategic choices made by another rational player. The question then is what motivates players to play the game in an irrational manner? One possibility is that players are motivated by preferences for equality. Falk, Fehr, & Fischbacher (2008) found that players respond not just to the distributive results, but also to the degree of equality underlying the proposer's intentions. This leads to different acceptance rates of identical offers; dependent upon both the proposer's and receiver's perceived level of fairness. Guth, Huck, & Muller (2001) examined whether fair offers were accepted less often when the splits were near equal than when they were exactly equal. Bohnet and Zeckhauser (2004) examined ultimatum game experiments testing the influence of social comparisons on behavior. They found that when players compared their lot to that of others, the distance between the offer and the norm (the equitable split) decreased. More specifically, the social comparison caused players to focus on the norm.

When viewed in the context of the morality of equality, the ultimatum game becomes one in which people may not always behave rationally. This assumption examines only the monetary payoffs from the exercise. Various other studies (Fehr & Gachter, 2000; Zamir, 2001; Sobel, 2005; Fehr & Schmidt, 2006) found that money maximization may not be the sole motivating factor in the game, but other social payoffs such as a fairer outcome may provide a benefit to the participants. Therefore, the solution may still hold that the participants are maximizing utility but not solely through conventional monetary payoffs. As such, rational behavior would still be that which maximizes payoffs, but payoffs may be measured in terms of both monetary values and the utility derived from maximizing the payoffs to all players.

Equality preferences allow us to begin the discussion of whether playing the game repeatedly with the same opponent alters player behavior. If players play based on a preference toward equality, then having a fixed opponent should increase the likelihood of reaching a more equitable split because through the course of the treatment, proposers learn what responders will accept and adjust their offers accordingly. Nowak, Page, & Sigmund (2000)

found that when proposers were given information about the offers accepted by the respondents, the result was a gradual move away from Nash and toward equitable splits.

This paper provides an outline for professors to introduce the game into their classroom and the results that should be obtained from the exercise. The four remaining sections are as follows: The next section details the design of the classroom exercise and how aspects of fairness can be incorporated. The following section details the results from the classroom exercise and discussion on the concept of fairness. The final section summarizes our findings.

Classroom Design

The Ultimatum Game (along with other classroom exercises) has been provided to instructors by the Veconlab from the University of Virginia through a NSF grant (VeconLab, 2005). The website allows instructors to create a free account to design their exercise. We have conducted the exercise using a variety of common setups from multiple classes to provide you with examples that may best fit your classroom. Each exercise was conducted using three ten-round sections that allow the instructor to illustrate various topics for discussion (See Table 1 for a breakdown of the exercises). For the first exercise, we began the first ten-round section with a slight variation of the ultimatum game, the dictator game. The dictator game differs from the ultimatum game in that the responder has no decision to accept or reject the proposal. Therefore, it allows discussion on how participants will behave with no checks on their behavior. The second ten-round section was the standard ultimatum treatment with the pool of money (pie) fixed at $10. The pairing of opponents was random. In the third section, we expanded the pie size to $20 with all parameters being equivalent. In the second exercise, all three treatments were the standard Ultimatum design. We differed these ten-round treatments by varying the pie size and the method of pairing the participants from random to fixed.

Table 1: Exercise Set-Ups

	Game Setup	Pie Size	Matching
Exercise 1			
First Ten Rounds	Dictator Game	$10	Random
Second Ten Rounds	Ultimatum Game	$10	Random
Third Ten Rounds	Ultimatum Game	$20	Random
Exercise 2			
First Ten Rounds	Ultimatum Game	$10	Random
Second Ten Rounds	Ultimatum Game	$20	Random
Third Ten Rounds	Ultimatum Game	$20	Fixed

The issue of how to mimic actual behavior by the students to reflect "accurate" outcomes is a controversial one. Researchers have found that students behave differently when using "hypothetical" payoffs than when there is some tangible benefit to the students. These hypothetical earnings may cause students to be disinterested or create a "noisy" set of data, which may not be useful for discussion (Dickinson, 2002). Therefore, instructors typically use one of two methods to encourage "cleaner" results. First, instructors may convert dollars from the exercise into classroom or extra-credit points. Second, instructors can pay either the entire amount of the earnings or a portion of the earnings in cash. There is a variety of ways to accomplish this payment setup. The instructor may pay all students or randomly select one student from the class. Each payment option has costs that each instructor must weigh in deciding the payoff from the exercise.

With the use of the website, the process is streamlined from the old system of physically writing the offers out and redistributing through the class to the respondents and then back. The website allows for easy access for the students to see a history of their offers and the acceptance/rejection of those offers. The entire process (30 rounds) of the exercise can be done in a 50-minute class period. After the exercise is over, the average offers and rejection percentage are calculated for each round. The results provide discussion on how students view fairness and equality.

Discussion

A variety of topics can be introduced through this game. From a Principles of Microeconomics class, we have provided an example of results, typical to other experiments done using this game.

Topic 1: Will Proposers capture more monetary payoffs in the dictator games than in the standard Ultimatum game? In the dictator game, proposers are not constrained by the lack of fairness shown to the respondents. The discussion revolves around proposers being torn between rationality and equality. The results show students that people in the role of dictators may utilize that power to extract from helpless respondents. The Nash Equilibrium for how the proposer should behave in a dictator game is to keep all the pie, while in the ultimatum

game the proposer should keep all but $1. The dictator does not have the possibility of zero payout due to rejection, therefore proposers should be motivated by maximizing payoffs, but social norms still may alter their preferences. From the first exercise, Table 2 details the number of offers for each proposer demand in the exercise. It also provides the rejection rates.

Table 2: Proposer Demands and Rejections in the Dictator/Ultimatum Game for Exercise 1

Amount of the Proposer Demand	Dictator Offers	Ultimatum Offers	Rejections
0	3	1	0/1(0%)
5	47	105	2/105 (1.9%)
6	1	5	2/5 (40%)
7	1	6	2/6 (33%)
8	12	4	3/4 (75%)
9	9	3	3/3 (100%)
10	57	6	6/6(100%)

From Table 2, we can see the various demands made by the proposers for their portion of the pie. Table 2 shows distinct differences in the frequency distribution of proposer demands between the Dictator and Ultimatum rounds. In the Dictator treatment, 44% of proposers demanded the Nash equilibrium offer, compared to 36% who demanded the equitable split. Contrast that with the Ultimatum treatment in which only 2% demanded the respective Nash equilibrium offer of 9 compared with 81% who demanded the equitable split. A look at the rejection rates for the Ultimatum treatment provides insight into why proposers behaved so differently between the two treatments. When respondents were able to influence proposer behavior in the Ultimatum treatment, which they did at a rejection rate of 75-100% for unfair and near unfair offers, proposers' sense of fairness took over, and the result was a less than 2% rejection rate for fair offers. So, when players faced the possibility of zero payoffs resulting from rejection of inequitable demands, their behavior may have been based much more on equality than on rationality. Table 3 shows the mean proposer demand in the dictator game was higher than that of the small pie ultimatum game and was significant at the 1% level.

Table 3: Mean payoffs for the dictator and small pie ultimatum games

Mean Proposer Demand Dictator Game	Mean Proposer Demand Small Pie Ultimatum Game	t-value	Observations
7.65	5.51	11.90	260

An interesting finding in this exercise was that only 4 times did the proposers in 20 rounds offer to take no part of the pie. In the Dictator game, the same person in rounds 9 and 10 offered to take $0 of the $10 and give it to their partner. The individual who did not take any part of the pie in Rounds 9 and 10 had taken $10 in the previous eight rounds. Thus, this finding leaves to interpretation the motive for such a drastic change in behavior, which may have been caused by emotions such as shame or guilt. In addition, the dictator game did not consistently produce the Nash equilibrium of $10. This provides an opportunity to discuss why dictators may not extract the entire pie but leave some for the powerless responders. With about a quarter of the countries in the world considered "not free" by the Freedom House (2011), it provides the students a glimpse of how different economies and businesses may not operate with the freedoms seen in the Western countries.

Topic 2: How much will the participant accept when given the choice? The homo economicus student will always accept any offer that includes at least one dollar. However, we can see from Table 4 below that students will reject $1 (100% of the time) in favor of receiving nothing.

Table 4: Offers in the Small Pie Size Settings

Amount of the Proposer Demand	Ultimatum Offers in Exercise 1	Rejection Rates	Ultimatum Offers in Exercise 2	Rejection Rate
0	1	0/1(0%)	0	N/A
2	0	N/A	1	0/1 (0%)
3	0	N/A	2	0/2 (0%)
4	0	N/A	3	0/3 (0%)
5	105	2/105 (1.9%)	86	0/86 (0%)
6	5	2/5 (40%)	22	8/22 (36%)
7	6	2/6 (33%)	10	8/10 (80%)
8	4	3/4 (75%)	3	1/2 (50%)
9	3	3/3 (100%)	2	2/2 (1005)
10	6	6/6(100%)	1	1/1 (100%)
Total Offers	130	18/130	130	20/130

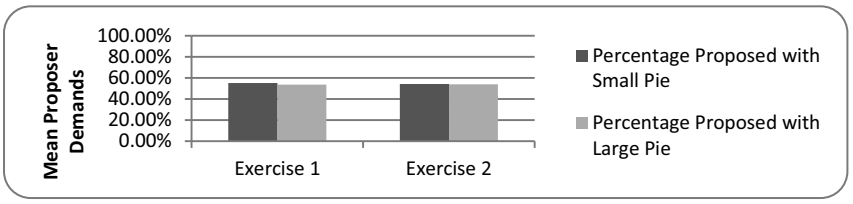
The above table falls nicely into the following observations from experimental results (see Güth, Schmittberger, & Schwarze,1982; Kahneman, Knetsch, & Thaler, 1986; Güth, 1995; Camerer & Thaler,1995; Roth, 1995; Falk & Fischbacher, 2006). Summarizing these studies, we see that using the small pie size set-up:

1. Very few offers are below $5
2. The Modal offer is between $5 and $6
3. Offers above $8 are extremely rare
4. Rejection Rates near $5 are close to 0%
5. Rejection Rates above $8 are close to 100%

The results lead into a discussion of fairness and perception of various types of offers made by the proposer. Forysthe, et al. (1994) discussed how offers may contain both fairness and strategic considerations. Why do proposers offer more than $1 originally? Is it because they believe (correctly) that $1 offers are summarily rejected and that the responder will only accept fair offers? Or do the proposers believe that the money should be split? Rabin (1993) found that positive altruism (helping classmates) and negative envy (punishing the intentions of others) allows a focus on a "fairness equilibrium" that is closer to a 50/50 split than the Nash equilibrium. With a "fairness equilibrium," we can add "attributions" into the economic analysis. This leads to a discussion concerning an extension to the game, not performed in the exercises, involving effort by the proposer to determine the size of the pie. If the proposer has to work for the pie, then how do the proposer and responder react to an "earned" pie compared to a "found" pie? (see Hoffman & Spitzer,1982; Hoffman & Spitzer,1985; Keasy & Moon, 1996).

Topic 3: In the Ultimatum Game, does pie size matter? Often, we face the issue of discussing different behaviors based on the wealth of businesses, individuals or countries. Do people with greater monetary resources (wealth) have different behavior? If we alter the wealth available for the proposer to split, does that have an impact on their distribution? If you have more to give, then are you more likely to give a greater percentage than if you have less to give? These questions allow us to investigate the decision making process for how people donate to charities, how countries allocate foreign aid, etc. In our exercise, we compared proposer demands when faced with a small pie and with those when faced with a larger pie. Figure 1 illustrates the percentage of the proposer demands of the pie for each exercise in the small and large pie rounds.

Figure 1: Percentage of Pie Demanded by the Proposer



From Figure 1 and Table 5, we can see small pie and large pie proposer demands were approximately equal. Using a two tailed t-test, we found that the differences were not significantly different from each other at the 10% level. We observe that the offers were slightly greater than the 50/50 split. Some students may point out, like early ultimatum game critics, that the pie size is too small and does not reflect the decision made if the pie size was increased. Hoffman, McCabe & Smith (1997) found similar results to the stylized facts and outcomes in Table 5 that increasing the pie size does not affect the responder's decision to reject or accept an offer.

Table 5: Percentage of Small and Large Pie Demanded by Proposer in Exercise 2

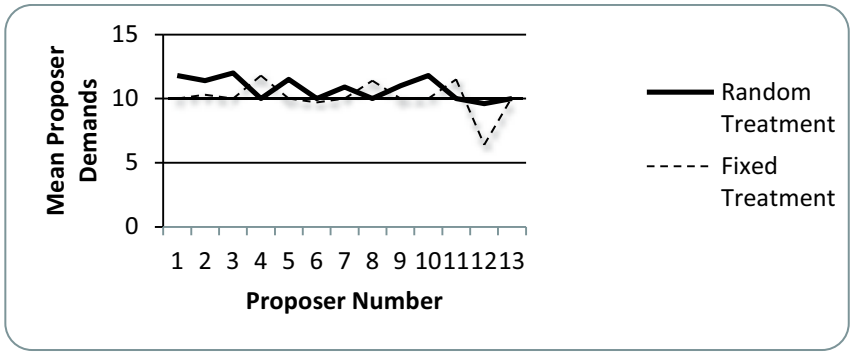
	Small Pie Percentage	Large Pie Percentage	Difference	T –value
Exercise 1	55.08%	53.61%	1.46%	1.37
Exercise 2	54.15%	53.85%	0.03%	0.40
Total	54.62%	53.73%	0.88%	1.34

Topic 4: Does a relationship between the players impact the offer? To begin the discussion, we look at the relationship between proposers and responders. In the second exercise, we allowed different pairings of students. In the first 10 rounds, students were randomly matched while in the next ten rounds they had fixed opponents. The students had a causal relationship during the fixed part of the exercise. They had the same partners but they were not able to actively collude because their opponent's identity was not revealed to them. The question is then, if a

relationship exists between the players, are they more likely to play fairly, and if so, why? In other words, when playing against the same partner repeatedly, did proposers offer more equitable splits? If so, was it because responders could efficiently influence proposer's demands by rejecting lower offers?

Figure 2 illustrates the difference that even a very casual relationship had on proposer demands. It graphs proposer demands for large pie treatments by method of opponent pairing either random or fixed pairings. The line shows each proposers average offers based on either the random or the fixed effect.

Figure 2: Proposer demand for large pie treatments by method of opponent pairing



From Table 6, the overall mean proposer demand for the random and fixed pairings was 10.77 and 10.09 respectively. The difference between the random and fixed pairing was $0.63 or 3.15% of the pie and was significant at the 1% level. This finding supports the idea that a longer-term interaction or relationship, regardless of how loosely it is defined, may increase the level of fair play engaged in by the players.

Table 6: Proposer Demands for Random and Fixed Treatments in Exercise 2

Mean Proposer Demand Random Treatment	Mean Proposer Demand Fixed Treatment	t-value	Observations
10.77	10.09	5.44	130

Research has focused on how the question is framed and how the perceived relationship between the proposer and respondent impacts the level of fairness. Hoffman, et al. (1994) and Hoffman, McCabe & Smith (1997) found that participants may expect future interactions with their partners, which may affect their decisions. While students in the classroom had no idea which classmate they were playing against, they may have expected future interactions with the pool of students as a whole, which may have influenced their decisions. This brings up the topic of how pricing decisions may differ in repeated situations (long-time customers) versus one-time transactions that occur in situations such as tourist destinations, which can easily fit into marketing discussions. In addition, cultural differences may enter into the discussion with different countries having different views and behaviors in various settings. Roth & Erev (1995) ran the ultimatum game across four different countries, USA, Japan, Israel and Slovenia, and found little difference in the modal accepted offers. The offers typically ranged from $4 to $5 with participants of Israel closer to $6.

The discussion following the game causes student to often wonder if there are moderating variables such as gender, age and/or socioeconomic conditions that may explain the outcomes. The benefit of this exercise is that those variables have been eliminated as possible explanatory variables (Hoffman, McCabe & Smith, 1996). This allows the instructor to focus on the outcomes from the various treatments.

CONCLUSION

For instructors in all fields of business, not just economics, the Ultimatum game is an easy-to-use tool to explore the topic of fairness in the classroom. The basics of the game are simple for students to understand, yet the game allows for complex discussion of how fairness plays a role that may move results away from the homo economicus assumptions. This paper provides a guideline to an exercise that most students find rewarding and engaging in the discovery of not only economic principles, but also human behavior in a variety of business settings.

The ultimatum game illustrates that rationality is not always the motivation for behavior. Hoffman, et al. (1994) and Hoffman, McCabe & Smith (1996) found that people do not always act simply to maximize their own payoffs, but have behavior that follows a manifestation of rules of reciprocity that have been learned over in the course of

everyday life. However, that is not to say that people do not behave in their own self interests. It simply means that purely rational behavior may not be the only factor influencing self-interest.

As experiential learning plays a greater role in the classroom, an exercise like the ultimatum game gives instructors another technique to introduce and encourage discussion in the classroom. It allows exploration on the weights that individuals assign to fairness and equality. We all play the ultimatum game every day, whether we realize it or not. Each time we leave a restaurant, we play the dictator treatment of the game when deciding how to tip the servers. We may have even played the standard ultimatum treatment when deciding how to split the bill among our dinner companions. Thus, utilizing the tools of bargaining games like the ultimatum game will give students a view of the world that may be more memorable and a means of applying an understanding of decision making processes in their everyday lives.

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