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A Dictator Experiment: Are there Differences between Gender, Age, and Experience?

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Abstract

A commonly used assumption in economics states that when making economic decisions people will choose the option that maximizes their expected utility (in this context utility refers to monetary gain). An application of the dictator game experiment was used to answer the question: Do UNCA students make decisions that maximize their monetary gain? The results showed that most participants did not choose the option that maximized their monetary gain, a finding consistent with previous research. The experiment tracked age, gender, and experience with the game but found that those factors were not related to choices. The motivation for conducting this research was to better understand models that are often used in economics in order to evaluate and prescribe complex scenarios. These models are based on assumption about the nature of human behavior. By improving the assumptions economists thereby improve the models they use and their predictive analyses.

1. Introduction

Game theory is a branch of mathematics and is also a tool used by economists because it can be used to study human interactions involving trade. An interesting aspect of game theory is the contradiction between a widely used theoretical assumption and the empirical evidence gathered over the past thirty years. The rational decision maker assumption can be interpreted in different ways depending on the context in which it is used. The assumption states that decision makers will always prefer actions that maximize their expected utility.[14]In the context of game theory and economics utility is interpreted as monetary gain but in other areas of study utility can refer to a range preferences. Empirical evidence, discussed in the literature review, suggests both individuals and firms have incentives to act fairly during trade. This experiment examines the issue of fairness and rational decision makers through an application of game theory; it will test the theoretical assumption of "rational decision makers" and possible demographic differences between age, gender, and experience with the game. The paper will continue with a brief introduction on models, a theory section (with a literature review), and sections outlining the method and results of the experiment. The essay concludes with a discussion of the results and their context within related studies.

According to Osborne "The models in game theory are highly abstract representations of classes of real-life situations"[16]. The models are abstract because they ignore some of the less important issues. This permits the model to isolate principles that apply to a range of problems and to control for various factors (such as incentives, available information, and repeat interactions). Thus, a model is heavily influenced by its assumptions. Experimental "games" are conducted in order to test our models. Osborne defined games as "a description of strategic interaction that includes the constraints on the actions that the players *can* take and the players' interests, but does not specify the actions that the players *do* take."[16]These games are also used to better understand a wide range of social phenomena such as the ways in which people interact within social relationships or when monetary gain is involved.[16] Models

can also be used to suggest ways human behavior can be modified in order to improve our interactions within society.

2. Theory

I will focus on two models in my research, the ultimatum bargaining game and the dictator game. The ultimatum bargaining game, developed in 1982, includes two players, a proposer and a responder, and a previously determined amount of money.[10]The job of the proposer is to offer a split of the money between him or herself and the responder and the responder's job is to either accept or reject the proposed split. If the offer is accepted then they split the money as proposed, but if the offer is rejected then both get nothing.

The assumption of rational decision-makers is an important one because it is fundamental in the models we use throughout economics. A rational decision-maker is one who systematically chooses to makes decisions that maximizes their utility.[14]Theory predicts the rational decision makers will maximize their utility by offering a split that gives the responder the least amount possible and that the responder will accept any positive offer. The responder will accept because any positive offer is better than nothing.[10]The basis for this assumption goes back to the beginnings of game theory in 1947 when Neumann and Morgenstern.

The dictator game also involves a proposer, responder, and a predetermined amount of money that is to be split among them. The only difference from the ultimatum game is that the responder has no choice but to accept the offer, giving the proposer total control of the split. This game is an adaptation of the ultimatum game and was describe in Kahneman, Thaler, and Knetsch (1986). The game is designed to take out the possibility of resisting unfair behavior or spite in order to look at the preferences of the dictator.[12]

This experiment will use the dictator experiment to test the model of rational decision makers and possible demographic differences. A main reason why these experiments have grown popular in the last thirty years is because they have produced unexpected results. Theory predicts that individuals participating in ultimatum and dictator games will allocate all but a trivial amount to themselves but both recent and past games have produced results that do not support the theoretical prediction.[7]

The contradiction between game theory predictions based on rational decision makers and the results of ultimatum bargaining and dictator games reflect the difficulties of developing theories in the social sciences. We want a simplified model in order to clearly view and understand problems but we also want a model that makes accurate predictions.[7] Therefore we must consider bridging the gap between real world experiences and theoretical predictions by including fairness in the preferences of "rational decision makers". To provide a clear picture of the fundamental economic assumption of rational decision makers we must first review its origins and important developments.

Theory of Games and Economic Behavior (1947) is a book that is said to be the foundation for modern game theory. The authors, Neumann and Morgenstern, intended to begin a discussion dealing with fundamental questions about economic theory, specifically the issue of precisely describing the process of individuals obtaining maximum utility. Neumann and Morgenstern began their book by acknowledging the difficulties they faced; the lack of descriptive vocabulary and empirical evidence within the field and the overall difficult nature of developing mathematical theories around social problems**.** To continue, the authors describe the necessary limitation to the model, they only address the behavior of individuals within the simplest forms of exchange. Also, the model ignores the problems of measuring utility. Finally, the authors' created a mathematical theorem that stated if an individual's preferences met four specific axioms then they are "rational" and thus will make decisions that maximizes their expected utility.

The assumption of maximizing monetary gain makes sense if our economic situation was similar to that in the Robinson Crusoe story (a single person economy with total control of resources and the uses for those resources). However the experience of a social exchange economy is much more complex. When people trade with each other they inherent possess competing interests such that, each participant cannot always maximize their expected gain and therefore must compromise. Neumann and Morgenstern compare these two situations to show the complex nature of social interaction with competing interest. They also wanted to show that game theory and our assumptions about human behavior was the appropriate method to address this type social and economic problem.

Guth, Schmittberger, and Schwarze (1982) questioned why there were many theoretical studies conducted on bargaining behavior without any supporting experimental evidence. This was the first experimental attempt by game theorists in addressing individual behavior within a specific game. The authors developed the ultimatum bargaining game with a structure that was useful for investigating "players'" anticipations about the behavior of their

opposition. The proposer has to anticipate the actions of the responder and adjust his or her decision making based on those assumptions.

The theoretical prediction of the ultimatum bargaining game says the proposer will offer a split that benefits him or herself the most leaving the responder a trivial amount and the responder will accept any positive offer. The results of this study contradicted the theoretical prediction showing most of the offers were either even splits or slightly in favor of the proposer. The results also showed that responders would reject positive offers, indicating a concern for fairness and willingness to give up monetary gain in order to avoid unfair interactions. These results are similar to other ultimatum game applications including, Armin et al (2003), Charness et al (2002), and Forsythe et al (1994). However, the reasons for the difference between empirical evidence and theory are not clear. The authors suggest a few possibilities: that people are acting strategically in order to ensure the responder accepts the offer, that people have varying concerns of fairness when making economic decisions and that people are sometimes spiteful when involved in unfair interactions. The results of this research sparked a renewed interest in the social sciences with regards to game theory because the experimental evidence did not align with theoretical predictions. Notable contributions that resulted from this study include recognizing the element of spite within games and the development of the dictator game.

The dictator game was first used by Daniel Kahneman, Jack Knetsch, and Richard Thaler in 1986. The study examined whether or not it is useful to increase the depth of the rational decision maker assumption by including preferences people have for being treated fairly. They first applied the dictator game by giving a proposer the option of choosing an even split of twenty dollars or an uneven split that would favor the proposer. Three-quarters of the students chose the even split.

A popular assumption among economists during this time was that of "non-fairness" (where being fair implies not exploiting legal opportunities for monetary gain). This assumption resists the idea that moral values can be used to explain economic decision making. The authors speculate that this is due to a founding principle of our economic system which is the economy is better off, as a whole, by the free actions of self-interested decision makers. This reflects another common view of the time, that aspects of fairness in economic decisions have little significance. The authors of this study were not among the believers of the non-fairness assumption and provided recent evidence showing that fairness is not an isolated phenomenon. In 1981 Arthur Okun provided a detailed account of consumers and employees demanding fair treatment and how perceived unfairness started their search for alternative suppliers. Okun is also responsible for the observation of customer markets failing to clear because of the hostility customers have to price increases that are not justified by increased costs.[15]

The purpose of this study was to determine if it was beneficial to complicate the model of rational decision makers in order to receive more accurate results. The conclusion was that incorporating fairness into the behavioral assumption of rationality will both enrich the model and possibly reduce the contradictions between theory and empirical evidence. The question then becomes, how much does fairness influence individual's economic decision making?

Forsythe, Horowitz, Savin, and Sefton (1994) studied whether nontrivial offers in ultimatum and dictator games can be explained by the proposers concerns with fairness. This was done by comparing four different variations of games, including two ultimatum games (one with pay, one without) and two dictator games (one with pay, one without). The fairness hypothesis provides that if participants are solely concerned with fairness then the distributions in the ultimatum and dictator games should be identical. The results of the tests rejected the fairness hypothesis in games with pay, meaning the proposer's tastes for fairness by itself does not explain distributions within ultimatum and dictator games. So, decision makers are neither solely concerned with fairness nor maximizing monetary gain which suggests people lie on a continuum that includes various preferences for various outcomes.

The results of all four games found that most players do give away nontrivial amounts of money, which is consistent with the results of Guth 1982, Kahneman 1986, and Camerer 2003. The authors suggest that changing the assumption of perfect information (players know all possible outcomes) within these games to imperfect information (players are different, some are pure gamesmen others have concerns of fairness) will improve our ability to explain the preferences of the players. This is similar to the conclusion reach in the study, *Are Women Less Selfish than Men? Evidence from Dictator Experiments (1998).* The authors Catherin Eckel and Phillip Grossman suggested that more considerations for expanding the parameters of the experimental setting (i.e. gender and age effects, social pressures) would allow the model to produce more accurate predictions.

3. Method

The present research received institutional review board approval in order to conduct research using human participants. The single round dictator game was used to gather economic decision making data. Participants for this experiment were recruited on the University of North Carolina Asheville's campus through person to person solicitation. Each participant was a student at UNCA and was above the age of eighteen. The dictator games involve one player at a time with full knowledge of the possible outcomes of the game. The player is told to choose a division of the ten dollar Amazon gift cards among him or herself and a player that will be chosen at a later time. Each player reads and signed the informed consent, filled out a short demographic questionnaire, and decided how to split the ten dollar value by filling out the record form. Once the decision was made, I allocated the gift cards according to the dictators split on the record form. I repeated this process until I obtained fifty observations.

The null hypothesis of the experiment was the dictator will allocate all of the ten dollar value to him or herself, due to the assumption of rational self-interest. The hypothesis for the independent variables is; there are no differences in decision making between gender, age, and experience. The rules of the game enhance the analysis because they eliminate possible explanations for the dictator's decision, such as spite, repeat interactions between players and experimenters, and the possibility of participants having incomplete information. This brings the dictators preference for fairness or self-interest to the forefront, theoretically.

A t-test using $p<.02$ was used to compare the treatment conditions. I will also compare the average amounts kept between the demographic groups to find possible patterns within the data.

4. Results

Table 1. T-Testing To Compare Treatment Conditions.

Observations	**Overall**	**Gender**	**Age**	**Experience**
Mean amount Kept ($)	5.40	Male = 5.20 Female = 5.75	18-20 = 5.10 21-22 = 5.29 23-34 = 6.08	No experience = 5.25 Experience = 7.30
# of Equal splits	27	Male = 15 Female = 12	18-20 = 11 21-22 = 12 23-34 = 4	No experience = 25 Experience = 2
# that kept all the gift cards	5	Male = 3 Female = 2	18-20 = 2 21-22 = 1 23-34 = 2	No experience = 5 Experience = 0
# that kept none of the gift cards	4	Male = 2 Female = 2	18-20 = 3 21-22 = 1	No experience = 4 Experience = 0
Participants	50	Male = 26 Female = 24	18-20 = 21 21-22 = 17 23-34 = 12	No experience = 44 Experience = 6

The results of this dictator experiment show that fair allocations (even splits) are observed under the conditions of full anonymity and no possibility of retaliation. Out of the fifty students that participated, 54% of them chose an even split and only 10% chose to keep all of the gift cards. A difference of means test was used to analyze the results. The t-stat was significant, $t = -12.496$, $p<02$. Females, on average, did keep more than males but the difference between them is not statistically significant.

In addition, the difference in allocations between ages was not statistically significant. The averages, however, do show a pattern. The 23-34 age groups chose to keep one more gift card than the 18-20 age groups. Also, only 30% of the eldest group chose even splits, while 70% of the middle age group and 52% of the youngest group chose even splits. 27% of the youngest group chose to give all of the gift cards to the responder and nobody from the eldest group chose this option. The experience of the participants with the dictator game does seem to influence the outcome. The average amount kept from people with experience is 7.30, roughly 20% higher than the average

participant with no experience, though the sample size was relatively small. The experience variable was right on the edge of being statistically significant, t-stat = -1.99 and t-critical = 2.01.

4. Discussion

The dictator experiment is used to test the assumption, that rational individuals maximize monetary gain when making economic decision. The results of my dictator experiment show that students at UNCA, on average, play the game with concerns other than maximizing monetary gain, results consistent with Guth et al (1982), Forsythe et al. 1994, and many others. The Meta study of dictator games conducted by Christophe Engel in 2011 showed that out of 20,813 dictators, 13,298 or 63.89% chose to give a positive amount to non-powerful recipients. 36.11% of the dictators chose not to allocate positive amounts. The Meta study also controlled for age and found statistically significant results between student age, middle age, and the elderly. Student age dictators mostly gave equal or less than equal splits while middle age participants mostly gave equal splits. The elderly mostly gave more than equal splits.

The Meta study found statistically significant sex differences, showing that women, on average, give more than men**.** However, other research conducted on gender has produced mixed result, Eckel and Grossman (2001), and Bolton and Kotax (1995) found no real behavioral difference. While Eckel and Grossman (1998) and Andreoni (2001) found women to be less selfish. Men were found to be more generous in the Prisoner's Dilemma experiments conducted by Kahn et al. (1971) and Mack et al. (1971). These mixed results may be due to the variation in circumstances within individual studies, such as the range of stakes, sampling issues (i.e. homogeneous qualities, non-randomness, etc.), and the framing of the experiment. Also, different results within similar experiments show the difficulty of creating social and economic models that accurately explain human behavior.

The limitations of this experiment included a small sample size, an uncontrolled testing area, and a non-randomized sample group. A larger sample size increases the accuracy of the analysis and the scope of the results. A highly controlled testing environment allows for continuity in gathering data (i.e. participants are under the same conditions when doing the experiment), which improves the accuracy of the results. Finally, the participants of this experiment were recruited through person to person solicitation rather than from a randomized list of names from a computer. A more randomized sample would increase the validity of the results.

The simplicity of the dictator game is important because of reasons described in the introduction and it allows the experimenters to work with highly controlled circumstances. Recent dictator studies have controlled the incentives given to dictators, the aspect of anonymity, social cues, demographics, and many other factors. The experiments are concerned with "exploring human heterogeneity"[7] because of the understanding that human social interactions are complex situations that differ upon many different components. Game theorists, in a sense, are trying to map out human sociality and for the past twenty five years they have created main roads but there are still undeveloped areas.[7]

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