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PRISONER'S DILEMMA AND OTHER REGARDING PREFERENCES

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ABSTRACT

The cooperative behavior in Prisoner's dilemma always intrigues economists since game theoretic analysis predicts the behavior of non-cooperation in this game. Being cooperative in Prisoner's dilemma will incur a cost to themselves while giving a benefit to their opponent. Instead of saying that people are irrational, this paper assumes that people have other-regarding preferences so that people will become cooperative in Prisoner's dilemma. In order to observe this preference, this paper provides a new experimental methodology by controlling the opponent's payoff, and we call it "revised Prisoner's dilemma." Also, the setup of the revised Prisoner's dilemma can help us to further rule out some decision makings that are obviously "irrational," which cannot be identified in previous researches. As a result, by comparing the revised Prisoner's dilemma and standard Prisoner's dilemma, we have observed that the behavior of the participants changes if their opponent's payoff is changed. Specifically, we have observed that people are more willing to be cooperative in standard Prisoner's dilemma than in revised Prisoner's dilemma, confirming the existence of other-regarding preferences.

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Chapter 1

Introduction

Cooperation and conflict are the major topics in human society where governments are working on promoting cooperation because it will increase the total welfare of the society. Prisoner's dilemma (PD) is the simplest game which shows the behavior of cooperation and conflict at the same time. In this game, two individuals make their own decision. They can cooperate, or they can defect. By choosing cooperation, they will always gain a higher payoff no matter what their opponent will choose. On the contrary, they have to bear costs if they choose to defect. Therefore, the classic game theoretical analysis predicts that both individuals will choose to defect. However, what makes this game such important in game theory is that if both individuals choose to cooperate, they will both get a higher payoff than if they both choose to defect. Experiments have shown that people do not always stick to the non-cooperation strategy. They will sometime change their strategy when two players keep playing the games repeatedly. For example, Anatol Rapoport ran an experiment at the University of Michigan during the 1960s. He modified the payoff number in PD and just simply let the students play many times with the same opponent. The result was intriguing that the modification of particular parameter (e.g., the ratio of the parameter) will either promote or prevent the behavior of cooperation. Nevertheless, in the repeated setting, cooperative behavior is observed. However, if the explanation of cooperative behavior in a repeated PD can be explained by the assumption of reciprocity (since both individuals choosing the strategy of cooperation will lead to a higher payoff, people will try to persuade their opponent that they will stick to the cooperation), playing dominated strategy in the one-shot setting (i.e., playing once with the same opponent) seems deviated from the common assumption of rationality because they have no reason to trust or to be trusted when they only encounter with their opponent once. Yet, many research papers illustrated this “irrational behavior.” For this observation, rather than breaking the assumption of rationality, experimental economists often attribute such behavior to the existence of social preferences. The social preferences theory still holds the assumption of rationality, but that the theory will assume that the utility function will include more than their own utility function. Other-regarding preferences are the main contents of this theory: it assumes that individual will refer to preferences over another’s individual material payoffs, in addition to one’s own. Therefore, in this paper, we are interested in whether we can observe the other-regarding preferences in one-shot PD. We design an experiment in which we modified the opponent’s payoff of PD. By comparing the revised version of PD and the standard PD, we hope we can observe that given that the participants understand the payment system of the experiment, they are more cooperative in standard PD than the revised PD. The design of the experiment will be discussed in detail in the part of the methodology.

In this thesis, we will first have a literature review to track the works that have been done previously for Prisoner’s dilemma. We will present the methodology of the experiment. Following the methodology, we will have an analysis and discussion of the data from the experiment.

Chapter 2

Literature Review

Prisoner's dilemma, originally formed by Merrill Flood and Melvin Melvin (INFORMS, n.d.), is the most classic game in the field of game theory. In the past decades since the 1950s, experimental economists discovered that always sticking to defect by both sides never happen in their laboratory setting when they summon participants to actually play the Prisoner's dilemma. They discover that when people play the game repeatedly, with either the same opponent, or re-matched opponent, or even a computer opponent, the behavior of cooperation will always occur, though with different percentage of cooperation varied by the experimental setting. This observation can also be seen even in the one-shot setting. Those observations inspire decades of contributions to the Prisoner's dilemma itself.

Rapoport & Chammah (1965) was two early researchers who gave a comprehensive explanation of how cooperation occurs in the Prisoner's dilemma. In their book "Prisoner's Dilemma," several modifications of repeated PD have been done in the laboratory. For example, they discover that, if the ratio of parameters (the monetary payoff, which is the number of the matrix) in PD is changed toward stimulating cooperation, people will indeed keen on making more cooperative decisions. Also, they discovered that the trend of cooperation is downward sloping when the game is repeated, meaning that players are toward defection if the game goes on and on. Many other factors that can possibly affect the performance have experimented, such as the influence of interaction between participants, the effect of missing different games to subjects, the symmetrical or asymmetrical setting of the game.

Moreover, Rapoport & Chammah brought up a strategy for repeated PDs: the Tit-For-Tat strategy (equivalent retaliation). In a famous competition called Axelrod's Tournament, Robert Axelrod, professor of political science at the University of Michigan, invited well-known game theorists to submit their strategies to be run by computer. The Tit-For-Tat strategy, which only consists of the simple command to the computer, won the tournament ("Axelrod's Tournament," n.d.). The detail of the tournament is written in Axelrod's book: "The Evolution of Cooperation (1984)"

Selten and Stoecker (1986) studied the influence of experience on the last few rounds of finite Prisoner's Dilemma. They used 35 subjects and let them participate in 25 PD in ten periods each. As a result, they observed that most of the experienced subjects choose to cooperate in the first few rounds of the game and those experienced subjects will strategically start to defect when they know the game will end soon. They summarized such phenomenon as the "end effect," and they built a model called "learning theory," claiming that they successfully predict the last five rounds in PD.

Kreps et al. (1982) discussed the occurrence of cooperation behavior is due to the existence of asymmetrical information about the opponent from the player's perspective, even under the assumption of rationality for both players. The argument comes as follows: even though defecting by both players in the one-shot PD is a dominant strategy, when it comes to repeated game, trying to cooperate must yield a strict greater payoff than simply defecting throughout the game; and, commented by Kreps et al., it must be seen in informational asymmetries. Hence, such behavior constitutes the concept of sequential equilibrium in the finitely repeated PD.

The works done by Andreoni & Miller (1993) was trying to verify Kreps et al.'s theory of incomplete information model by modifying the probability of types of pre-programmed, virtual players that the actual participant may encounter.

Andreoni & Miller (1993) conducted an experiment with four conditions (Partners, Strangers, Computer50, and Conputero), each with 200 choices totally, and each consist 14 subjects with no interflow in each condition. The condition of Partners involves 20 rounds of 10-period games in which participants are assigned to match each other participant and are rematched randomly by the computer for each round. The Strangers condition let participant play one-shot PD with each participant with 200 times. Computer50 differs from the condition of Partner by changing their opponents with 50% of probability to meet a computer partner (computer partner will certainly play Tit-For-Tat strategy). Computero simply lowers the probability of the Tit-For-Tat strategy to 1/1000. The result shows that Computer50s shows the highest cooperation as high as 60% in the first 8 rounds, with the lowest cooperation rate shown by strangers in 40%. In the last round, cooperation rates fall to around 10 percent, while the computer50s still shows the highest cooperation rate. This significant difference varied by conditions implies that people are changing their strategies depending on different opponents and on types of game. Specifically, in repeated games, participants are more willing to show altruistic behavior and to cooperate. Such observation is consistent with the reputation building hypothesis, proposed by Kreps et al (1982). The decrease in cooperation is the last round is also consistent with the finding of Selten & Stoecker, which we have discussed previously.

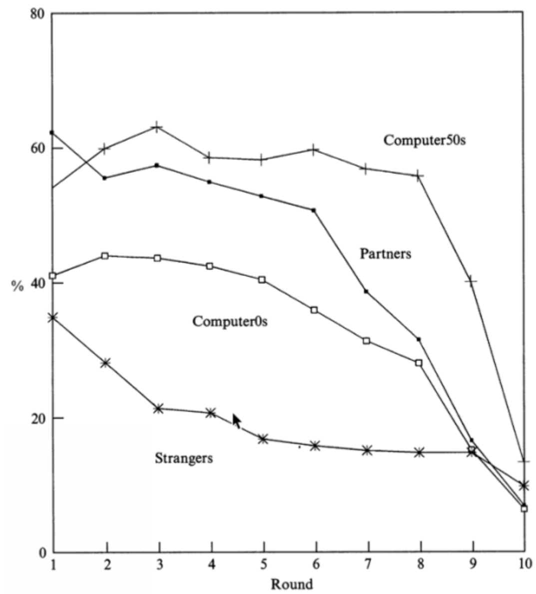

Fig. 2. Percent cooperation by round. Averaged over all 20 10-period games.

Figure 1

Cooper et al. (1996) argued that neither reputation building hypothesis nor altruism model along can explain their own experiment. They simply run an experiment with two finitely repeated PDs with 10 rounds and 20 one-shot PDs. They observed that both setting end with a cooperation rate that is significantly larger than zero. Specifically, the reputation building hypothesis fails to explain that that in one-shot PD there is still a positive amount of cooperation rate, even though the cooperation rate is indeed lower than in the repeated PD. Also, the altruism model alone fails to explain the higher cooperation rate they observed. Cooper et al. (1996) hinted the possibility of combining both theories but still, they noted that the mixed theory failed to explain the time variation under certain conditions.

Bereby-Meyer & Roth (2006) found that the stochastic payoff, or as the authors said, “noisy payoff,” even with the same expected values, can lead to the different behavior than the setting in which participants play with the certain payoff. Specifically, in repeated prisoner’s dilemma, the random payoff with the same expected value will lead the decease of cooperation rate, even though both players' previous actions are common knowledge. However, in one-shot PDs, such randomness can lead to an increase in cooperation rate. These result can be due to the fact that random payoff can slow the speed of people's decision time of choices. They called it the "partial reinforcement learning" that:" Whatever earned behavior we see in the deterministic game will develop more slowly in the probabilistic game." Their experiment, also commented by authors themselves, raising the feedback from our first literature: how influential does leaning plays in people's decision making?

Speaking enough of finitely repeated PDs, we may turn our eyes to different types of games within PDs. Dal Bo (2005) makes a contribution to infinitely repeated PDs, and Friedman & Oprea makes a contribution to the continuous time setting.

Dal Bo (2005) predicted that the shadow of the future will increase the cooperation rate. Since no one can really test what is the actual behavior of a participant in an infinitely setting of games, Dal Bo simulates a mental environment by randomizing the terminated round for the participant. Also, he uses finitely repeated games with similar numbers of rounds as a control group in avoidance of suspect that participant is affected by the increase of the expected number of rounds. They founded that the rate of cooperation is indeed higher in the infinitely repeated game than in the finitely repeated game. Also, and surprisingly, in terms of the first round, the cooperation rate in the first round of the infinitely repeated game is higher than in the finitely repeated game and in the one-shot game.

Freidman & Oprea (2012) innovated PDs with flowing times where given 60-second periods of time, each pair of randomly matched players can switch between cooperation and defection in their own will, and both strategy and payoff will be shown on the screen instantaneously. Then, after finished one round, they will enter to the next round a rematched opponent. As usually, one-shot periods and repeated discrete time PDs will act as a control group. Their result shows that, throughout the design of the experiment, the cooperation rates are increased, and the defection rates are decreased by the limited capacity of processing the information, even with the parameter of high temptation to defect.

Recent research recaps the theory of hypothesis building. While we now commonly believe exogeneous long-term period can yield higher cooperation rate, Schneider & Weber (2013) investigated how willingness of cooperation affect the cooperation rate, i.e., the endogenous effect. By letting participants voluntarily choose the larger number of rounds of interaction, they show a drastically higher rate of cooperation, mounting up to 98% of cooperation. This laboratory result gives a hint to the real world such as marriage or employment that voluntariness usually leads to greater efficiency.

Kagel and McGee (2016) compare the differences between teams and individuals play during finitely repeated PDs. They show that with the dialogue in the terms, the cooperation rate is statistically lower than individual play in the first round for the safety consideration; however, in the following rounds, the cooperation rate is higher in term play than in individual play, explained by the author that: "they are more willing to take some risks in order to earn the higher profit from cooperation." In sum, these two deviations from the individual play are concluded by authors as the influence of intergroup relations and group discussion.

Finally, Mao et al. (2017) using Amazon's Mechanical Turk to trace people's behavior in a long-term period. In the 20 consecutive days, 94 subject plays up to 400 supergames with ten-round of PDs. They found that, in such a long period, even though the first round of defection occurs earlier, over 40% of players have shown consistent cooperation even such cooperation may bring the cost to them. These "irrational resilient cooperator" are continuously showing permanently stable cooperation and their continuing behavior of cooperation while being "exploited" by the "rational player" in the meantime, enjoy a cooperative payoff in the long-run. Strikingly, the overall rate of cooperation is 84%, suggesting cooperation as a sequential equilibrium in the repeated PDs.

Chapter 3

Methodology

The concept of altruism and reciprocation have been investigated over the past decades and relevant concepts have been categorized into “social preferences.” Mentioned in the literature review previously, the incentive of cooperation in repeated PD has been researched deeply. However, the cooperative behavior in the one-shot setting is not very clear yet, while the observation is very common in the laboratory settings (Capraro et al, 2014). For example, Janssen (2008) using laboratory showed that the trustworthiness of the opponent will have a positive effect on participant’s cooperation. However, this experiment still does not give a fundamental explanation of why such cooperation exists. In our design of the experiment, we try to provide a more straightforward method to explain cooperative behavior. Specifically, we want to observe whether people will have other-regarding preferences by which people are willing to cooperate even why such behavior will incur a cost to themselves. This concept is frequently mentioned and research in the game of Dictator Game. The Dictator Game involves two participants. One is acting as ‘dictator,’ who is endowed with some amount of money, can transfer some amount of this endowment to the recipient acted by the second player. Under the assumption of self-interest, people will not transfer any amount of money to another player. However, several experiments indeed observe those money transfers. For example, Forsythe, et, al (1991) provided a significant observation that people will transfer a non-trivial amount of money to the recipient, even if the recipients are located in another room and they are completely stranger.

However, the concept of other-regarding preferences is not very frequently mentioned in the game of Prisoner's dilemma. We are going to assume that people's utility will incorporate both their own payoff and other's payoff. Specifically, the utility function is assumed to be:

$$V_1 = U_1 + \alpha U_2$$

$$V_2 = U_2 + \alpha U_1$$

Therefore, we have developed three games in four parts in order to investigate the concept of other-regarding preferences. In the first part of the experiment, we will randomly match pairs of participants. We are going to use the game of PD, but that we will modify their opponent's payoff into all 2 dollars. Hence, in this part, no matter what they choose in this round, their opponent will always get a payoff of 2 dollars. This design can control our participants' belief about their opponent's decision, which in return, by our assumption of other-regarding preferences, will affect their own decision. So, in this part, we completely rule out the possibility of the occurrence of other-regarding preferences, acting as a control group for the standard PD which will be our part 4. Theoretically, rational individuals will have no reason to not choose the dominant strategy in this round because their opponent will always get the same payoff. Therefore, by comparing the result of revised PD and standard PD, if there indeed shows a significant difference between these two games, we can conclude that we observe the existence of other-regarding preferences in PD.

The second part of the experiment will act as a complement of part 1. Since we need the data of the opponent's decision in part 1in order to calculate their payoff in part 1, we use the same matched pairs of participants in part 1, and we will let all the participant play the 2-2-2-2 setting. Therefore, no matter what they choose in this part, they will always get a payoff of 2 dollars in this part.

The third part is the classic Dictator Game. We want to replicate the previous research to see if we can also find a positive correlation between donating a non-zero amount of money and the cooperative in standard PD. However, a classic Dictator Game is conducted in two rooms where the "dictator" and "the recipient" will be separated and to be seated in different rooms. In our laboratory setting, this condition cannot be satisfied. Therefore, we will randomly match a new pair of participants previously, and we will give an initial 6 dollars provisionally to each pair of participants. We will let all the participants act as if they are all "dictator" firstly and to decide how much money they want to transfer to their opponent. Then, we will randomly select one participant in each pair to become the "actual dictator" and the other will become the "actual recipient" accordingly. If the participant is selected as the "actual dictator," the money they put in their own box will become their actual payoff, and the money they put in their opponent's (the actual recipient) box will become the opponent's actual payoff in this round. Likewise, if the participant is selected as the "actual recipient," then he will have no control of his payoff in this part. What his opponent has had put in the box of opponent will become their actual payoff in this part.

Part 4 is going to be the standard PD. We will also randomly re-match the participants and tell them explicitly that they will be matched with a new opponent.

Hence, optimally, we will expect a higher cooperation rate in standard PD (part 4) compared to the revised version of PD (part 1). If this expectation is indeed true, then our hypothesis of the existence of other-regarding preferences is proved. Then, we can calculate if there exists a positive correlation between the amount of donation and cooperation in standard PD.

Before starting the actual part, we will have a practice part: we set up a quiz to test participants' understanding of the payoff system. The practice part will be exactly the same as it is in part 1, part 2 and part 4 expect the completely different money payoff in the matrix. We will ask them that given the choice of their opponent, what is their payoff if they choose B. They must answer it correctly before they can move to the actual part.

Also, the design of this revised PD placed in the first round of the experiment can act as a double assurance in which we can identify those participants who choose dominated strategy in part 1 because it is obviously a deviation of the assumption of rationality if someone chooses the dominated strategy in our revised PD, which is out of the scope of this paper. A traditional experiment usually has a quiz or practice part before the actual experiment, aiming at making sure that the participants will understand the setup of the experiment. However, we cannot verify the effectiveness of those practice parts since even when participants have "passed" those practice parts because they may still either not understand, or just simply don't care about their decision. It turns out that the credibility of some participants' decision is very low, and those data are not very useful because we cannot explain their behavior under the assumption of rationality. Therefore, our revised PD in which the payment setup is very simple can also act as double insurance to verify that those participants' understanding of the experiment and their willingness to play seriously. Actually, it turns out that 17 of 101 participants choose the dominated strategy in part 1.

We recruit participants using the Laboratory for Economics, Management and Auction's email system at the Pennsylvania State University. We let all the participants sit in front of the computers and do all the parts of the experiment. After they finish all the parts, their decision history will be displayed on the screen and they are required to write down their decision on a paper. The experimenter will collect all the sheets and match pairs randomly using the random number generator for the calculation of the final payment of the participants. We hold six sessions. In the first five sessions, we have recruited 20 participants in each session. Since there is an attendance problem that not all 20 participants show up in each session. Also, if there are only 19 participants showing up, we must let the 19th participant leave because we need even number of participants for matching. We have added one more session in which we only recruit 10 participants. As a result, we have recruited 102 participants. Participants will receive 7 dollars as a participation fee, and they are told that they will play 4 parts in which they will receive an additional monetary payoff.

Chapter 4

Results

The result of the experiment will be discussed as follows. As we mentioned in methodology, the revised PD (part 1) can help us to further rule out those “crazy people” from our data set since their decisions tell nothing about their true preferences. It turns out that there are such 17 out of 102 participants who act as “crazy people.” Therefore, in the following results and discussion, we will not take those participant’s decisions into account. Since the main parts of this experiment focus on the comparison between part 1 (revised version of PD) and part 4 (standard PD), we will first discuss the result of part 1 and part 4, and then we will discuss part 2 and part 3 sequentially.

Since we have ruled out all the “crazy people,” i.e., the people who choose A (dominated strategy) from part 1, all the 85 participants left choose B in part 1. For part 4 (standard PD), the number of participants who choose B decreases to 57, accounting for 67.06%, which also means that 28 out of 85 participants choose to be cooperative in PD. Using the One-sided t-test of the mean for part 4 with the null hypothesis of the mean equal to 0 against the alternative that the mean is greater than 0 (I replace “A” with 0 and “B” with 1 for the convenience of calculation), the result is significant with $p = 0.000$. This result can basically prove our hypothesis that there exists other-regarding preferences among people when they play the game of Prisoner’s dilemma.

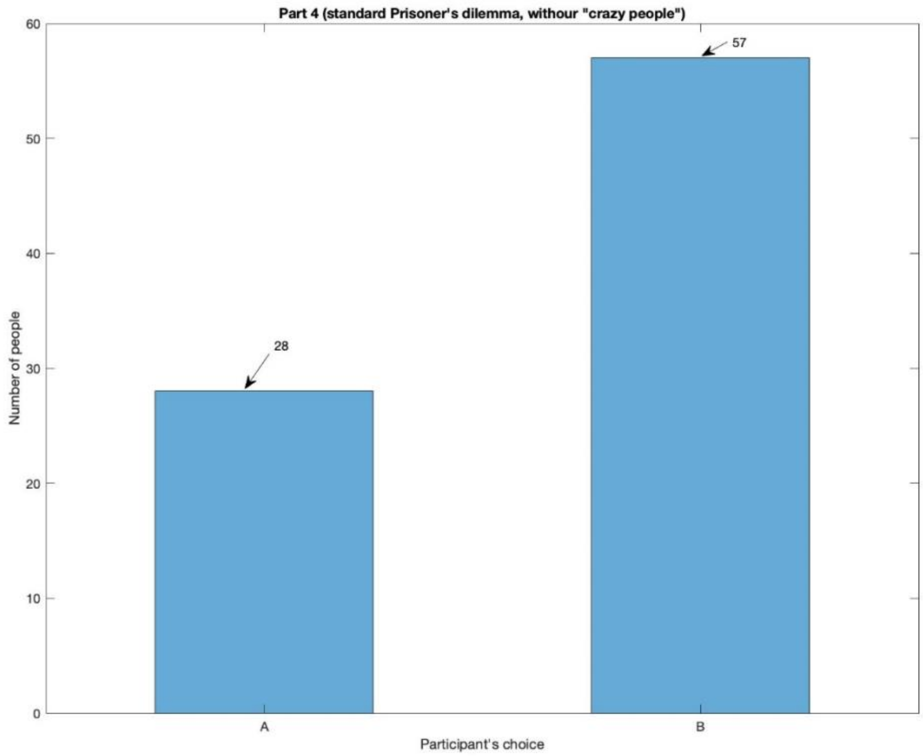

Figure 2

For part 2, which is designed to be a “dummy part” (because we need the data from the opponent to calculate the final payment for part 1), we find that 62 out of 85 participants choose B, which accounts for 72.94%. We have also done a one-sided t-test about its mean with the null hypothesis that the mean equal to 0. We can also reject this null hypothesis with p = 0. This result is very interesting, but we will leave it until our discussion part.

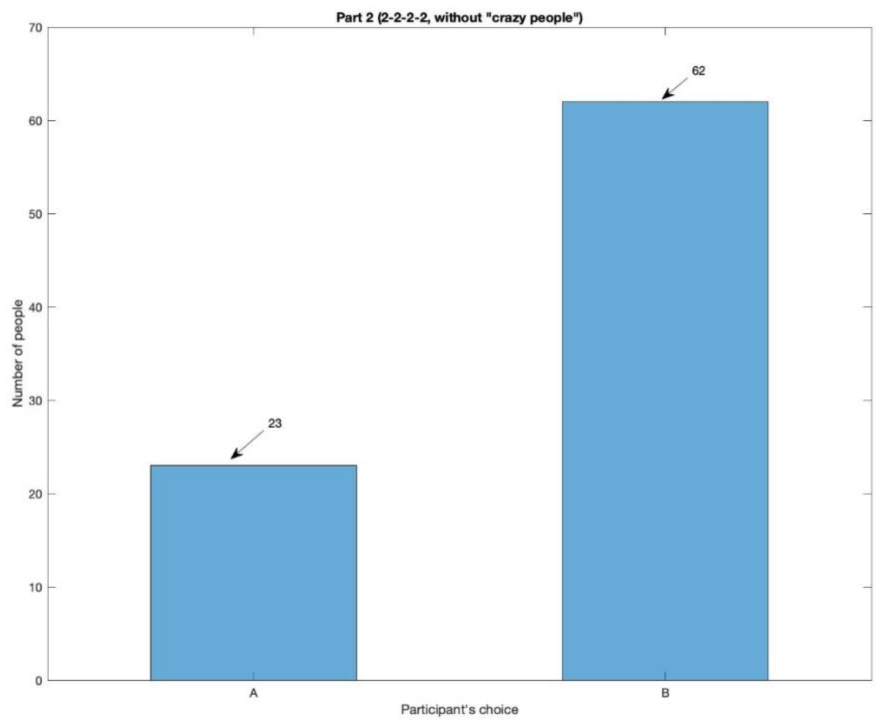

Figure 3

For the Dictator game, which is our part 3, we find out that 31.76% of participants choose to keep $6 and transfer nothing (I am going to use ratio notation such as 6:0 in the following). 8.24% of participants choose 5:1; 16.47% of participants choose 4:2; and 43.53% of participants chooses 3:3. We develop a simple regression model

$$\text{standard PD} = \beta_0 + \beta_1 * donation + error$$

to find if there is a positive correlation between the money those participants transfer to their opponent, and their cooperative behavior (remember we denote "1" as cooperation and "0" as defect) . We find out that there is a slight positive correlation in which $\beta_1 = 0.054439$ but that the result is not significant at 5% significant level with p = 0.16662.

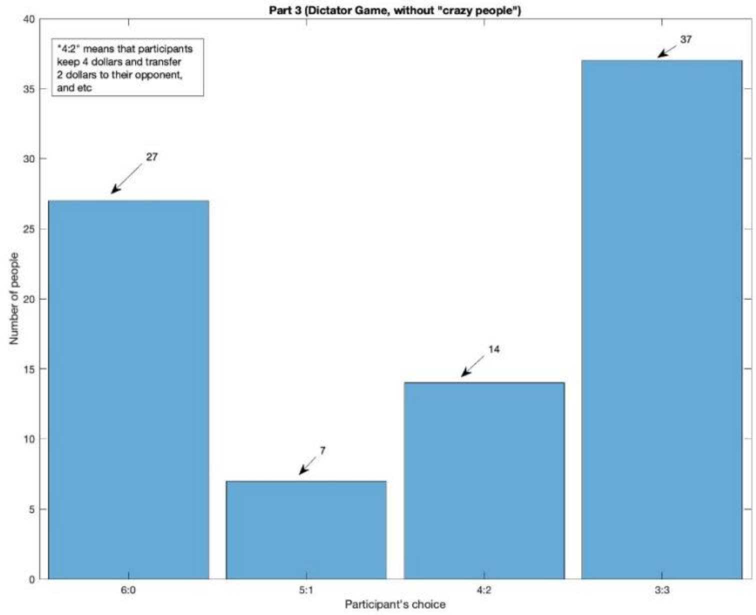

Figure 4

Estimated Coefficients:

	Estimate	SE	tStat	pValue
(Intercept)	0.2359	0.084208	2.8015	0.0063287
x1	0.054439	0.039013	1.3954	0.16662

Number of observations: 85, Error degrees of freedom: 83
Root Mean Squared Error: 0.47
R-squared: 0.0229, Adjusted R-Squared 0.0111
F-statistic vs. constant model: 1.95, p-value = 0.167

Figure 5

Discussion

Given the specific design of the experiment and the result from the data, we can conclude that the other-regarding preferences are existed among people when they play Prisoner's dilemma. The distinct deviation of behavior from choosing the dominant strategy (participants choose B) in part 1 to choosing the dominated strategy (participants choose A) in part 4 shows that given that they have shown their understanding of the meaning of dominant and dominated strategy, they still opt to choose the dominated strategy in PD. The result of part 2 also provides strong support for our hypothesis. Given the seemingly indifferent choices to our participants, we can observe that those participants are more willing to make a choice that is beneficial to their opponent although it makes nothing improvement for themselves. It can tell us that they are indeed looking at their opponent payoff when they make decisions.

However, for the correlation test between the Dictator Game and the Prisoner's dilemma, although we find a slightly positive correlation between their donation and their cooperation, the result is not significant. Such insignificance can be explained in two way: First, our sample size only consists of 85 participants. Since Capraro et al. (2014) found a positive correlation between the Dictator Game and the Prisoner's dilemma, we expect that we can improve the significance if we have more participants. Second, traditional experiment for Dictator Game requires the "dictator" and "recipient" to sit in two different rooms, while our design of the experiment do not need to waste half of the data (the recipients do not need to make any decision so that they won't provide any decision information in the traditional setting). However, in our experiment, the explanation of such set up is more complicated than the traditional way. We guess that the participants do not have such patience to really want to understand the setting. Also, we did not give any practice for the Dictator Game, which can also be credited as a weakness of the experiment.

Chapter 5

Conclusion

In this paper, we are interested in addressing the issue of why players choose to cooperate in one-shot Prisoner’s dilemma because it is a strictly dominant strategy. While still holding the assumption of rationality, we try to provide a different explanation of this phenomenon. Specifically, we assume that people have other-regarding preferences such that their own utility function will also include other’s payoff. In order to verify this hypothesis, we design an experiment in which we modified the opponent’s payoff into all 2 dollars, which can control the participant’s belief of their opponent’s decision. This specific setting can also help us to rule out those participants who do not choose the dominant strategy in this part because their behavior obviously violates the assumption of rationality for which we will not discuss in this paper. Also, since previous researches have shown a positive correlation between cooperation in the Prisoner’s dilemma and donation in the Dictator Game, we also add the section of Dictator Game as a replication. Our results have shown a significant difference between revised PD and standard PD, which proves our hypothesis that people have other-regarding preferences when they play the Prisoner’s dilemma. However, for the correlation test between the Prisoner’s dilemma and the Dictator Game, due to several reasons such as the unconventional way of setting for Dictator Game, and the limitation of the sample size, we find a slight positive correlation between donation in Dictator game and cooperation in the Prisoner’s dilemma but that the result is not significant at 5% significant level. We may have more sessions in the future to restart this experiment about the Dictator game and the Prisoner’s dilemma.

Appendix A

Participant Instruction

Welcome

This is an experiment in economic decision making. During the experiment, you will play four parts from which you will receive cash earnings based on your decisions. Upon completion of the experiment, you will be paid your total earnings in cash plus a $7 show-up fee. If you have any questions, feel free to raise your hand and we will assist you. Please do not communicate with other participants during the experiment, and please refrain from using your cell phones.

Introduction

This experiment has four parts. After each part is completed, you will be given a new instruction for the next part. Your actual reward will depend randomly on the result one of the four parts. After four parts are all completed, your decision history will be shown on the screen and you are required to write down your decisions on the sheet. We will collect the sheets and we will calculate your final earnings. Before moving to part 1, we will have a practice in order to verify that everybody understands the rules. Your decision in the practice part will not be counted toward your final earnings.

Practice

You will be randomly paired together with one other participant in this room to complete this part. You will not be told which person will be paired with you either during or after the experiment. Both you and the other participant will have two possible choices. You can choose **A** or you can choose **B.** If both you and other participant choose A, you will get a payoff of 5 dollars. If you choose A, and other participant chooses B, you will get 2 dollars. Likewise, if you choose B and other participant chooses A, you will get 3 dollars; if both you and the other participant choose B, you will get 1 dollar. The **bold** number in the bottom of each box is the payment received by you, the number in the top portion of each box is the payment received by the other participant:

		Other participant's choices **A**	Other participant's choices **B**
Your choices	A	1 **5**	6 **2**
	B	3 **3**	3 **1**

Table 1

At the time of making your choice, you will **<u>not know</u>** the choice of your paired participant. Once you finish this part, your choice will be matched with your paired participant's choice and the payoff of this game will be determined. If this part is indeed counted as your final earnings, the result of this part will be revealed to you at the end of the experiment.

Question: suppose that your paired participant has chosen B, and you have chosen A, what is your payoff in this part?

Table 2

You answer: [ ]

All the following parts might be for pay.

Part 1

You will be randomly paired together with one other participant in this room to complete this part. <u>You will not be told which person will be paired with you either during or after the experiment.</u> Both you and the other participant will have two possible choices. You can choose **A** or you can choose **B.** If both you and other participant choose A, you will get a payoff of 4 dollars. If you choose A, and other participant chooses B, you will get 0 dollars. Likewise, if you choose B and other participant chooses A, you will get 6 dollars; if both you and the other participant choose B, you will get 2 dollars. The **bold** number in the bottom of each box is the payment received by you, the number in the top portion of each box is the payment received by the other participant:

Table 3

		Other Participant's choices: A	Other Participant's choices: B
Your choices	**A**	2 / **<u>4</u>**	2 / **<u>0</u>**
	B	2 / **<u>6</u>**	2 / **<u>2</u>**

At the time of making your choice, you will **<u>not know</u>** the choice of your paired participant. Once you finish this part, your choice will be matched with your paired participant's choice and the payoff of this game will be determined. If this part is indeed counted as your final earnings, the result of this part will be revealed to you at the end of the experiment.

Part 2

You will be paired with the **SAME** participant as in part 1. Both you and the other participant will have two possible choices. In this part, no matter what you choose and what the other participant chooses, you will always get the payoff of 2 dollars. The **bold** number in the bottom of each box is the payment received by you, the number in the top portion of each box is the payment received by the other player:

Other participant's choices

Your choices	A	B
A	4 **2**	0 **2**
B	6 **2**	2 **2**

Table 4

At the time of making your choice, you will **not know** the choice of your paired participant. Once you finish this part, your choice will be matched with your paired participant's choice and the payoff of this game will be determined. If this part is indeed counted as your final earnings, the result of this part will be revealed to you at the end of the experiment.

Part 3

You will be randomly paired together with one other participant in this room. You will not be told which person will be paired with you either during or after the experiment. A sum of $6 has been provisionally allocated to player A in each pair and player A will decide how much money he/she is going to transfer to player B and how much money player A is going to keep. Player A can allocate all, some or none of the money to Player B. At the beginning of this part, we assume that you will all act as player A, i.e., you need to decide how much money you are going to transfer to player B. After all the decisions are made, we will randomly select one person in each pair to become the "actual Player B", and the other player will become the "actual player A" accordingly.

For example, if you put $4 in the box of player A and $2 in the box of player B, and you are selected as the "actual Player A", you will receive $4 and your paired participant will receive $2 in this part. If you are selected as the "actual Player B", and your paired participant (the actual player A) has put $5 in the box of Player A and $1 in the box of Player B, then you will receive $1 and your paired participant will receive $4 in this part. **Please notice that you will never receive the money you put in the box of Player B for yourself.**

Player A receives:	
Player B receives:	

Table 5

Be aware that the total amount of money you put in both boxes cannot exceed $6, and two amounts must add to $6. Also, numbers must also be whole dollars amount between $0 and $6. If this part is indeed counted as your final earnings, the result of this part will be revealed to you at the end of the experiment.

Part 4

You will be randomly paired with one other participant in this room to finish this part. You will not be told which person will be paired with you either during or after the experiment. You can choose **A** or you can choose **B.** If both you and the other participant choose **A**, you will both get a payoff of 4 dollars. If both you and the other participant choose **B**, you will both get 2 dollars. If you choose **B** but the other participant chooses **A,** you will get a payoff of 6 dollars, but the other participant will get 0 dollars. Likewise, if you choose **A** and the other participant chooses **B,** you will get 0 dollars and the other participant will get 6 dollars. The **bold** number in the bottom of each box is the payment received by you, the number in the top portion of each box is the payment received by the other player:

Table 6

		Other Participant's choices: A	Other Participant's choices: B
Your choices	**A**	4 **4**	6 **0**
	B	0 **6**	2 **2**

At the time of making your choice, you will **not know** the choice of your paired participant. Once you finish this part, your choice will be matched with your paired participant's choice and the payoff of this game will be determined. If this part is indeed counted as your final earnings, the result of this part will be revealed to you at the end of the experiment.

End

This is the end of the experiment. Thank you for your participation. Please wait for the researcher for the calculation of your final payment.

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