POL 495 Assignment 3

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1. Understanding the details of Prisoner's Dilemma games and Public Goods games.
   A. Prisoner's Dilemma- 3 papers
   Paper 1: "Rational Cooperation in the Finitely Repeated Prisoner's Dilemma: Experimental Evidence" by Andreoni and Miller (1993)

   a) <u>Purpose of CP</u>: The purpose of the CP is Inducing Types. This means that the theories tested aren't replicative of human subjects' behavior but indicative of how the experiment will work. There are two players and each one can either choose to cooperate or defect. It is not replicative of human behavior because no player is strictly "irrational" or "altruistic" to exist. These are the types to be induced or represented by the CP. Each model has an altruism parameter of alpha (α). The first model designed to replicate in the CP is "Pure Altruism." In this case, players care about the payoff of the other player. Next, the CP model is "Duty," where the CP feels obligated to cooperate. Lastly, the third model is "Reciprocal Altruism," where both the CP and the opponent cooperate and it is 0 otherwise. This is why Marche's paper categorized it as Inducing Type since the CP is induced by a specific behavior type of altruism and the models are created after that.

   b) <u>Strategy of CP</u>: The strategy of the CP is adaptive. This was because the choice of the previous player was against a human player. It is an adaptive algorithm. The last two conditions of the game are computer50 and computero. Computer50 enables the users to go against a computer 50% of the time. Subjects in this group should be more keen to play as they may receive an altruistic opponent. The last condition of the gamer would make the CP play against the human in a tit-for-tat manner. This is why the strategy is adaptive since the CP is constantly reacting to the opponent.

   c) <u>Info to Subjects</u>: The experiment fully informed the subjects about the strategies and the CP. The game informed all the subjects of the conditions of the experiment and the four main strategies. In each iteration, they were told their last round round decision and their opponents' decisions in the last round of the iteration. In all four conditions, after the subjects played with each other, they were given a 10-period game where they were playing against a computer.

   Paper 2: "Group cooperation under uncertainty." by Gong et al.

   a) <u>Purpose of CP</u>: The purpose of the CP was to exclude Social Preferences. The experiment was conducted where two games were played: a stochastic prisoner's dilemma and a deterministic prisoner's dilemma. Each individual or group used one computer to make their decisions. The study examines the degree of group cooperation when there are uncertain outcomes involved. The understanding of the study was to exclude social preferences and have subjects decide on their choice not based on cooperation or any human tendencies. The main motivations that were trying to be reduced by human subjects by automation were greed, fear and persuasion. Guilt aversion and blame avoidance in terms of trust is likely to reduce when uncertainty is present.

   b) <u>Strategy of CP</u>: The strategy was to mimic humans. The computer was programmed to invest with a certain probability in each round. The strategy was similar to the other

exclude social preference experiments where the computer mimicked human behavior of greed, fear, etc. All the other variables are the same. The strategy is presented in a way where the study is understanding how human subjects will behave when they know they are playing against a computer (even if the computer behaves like a human player). In this sense, the CP behavior of mimicking human decisions makes sense.

c) <u>Info to Subjects</u>: The players were completely informed of the strategies and instructions of the game. With the same study instructions, the players were told that they would play with a computer player instead of a real player. The players were fully aware that they were playing against a CP or whether they were playing against other human subjects. This design adopted the basic structure and incentives in Study 1 (without computer automated players), but removed any interactive motivations for cooperation: such as social pressure to be nice, expectation of future cooperation, etc.

Paper 3: "Group size and cooperation among strangers" by Duffy and Xie.

a) <u>Purpose of CP</u>: The purpose of the CP is to remove strategic uncertainty. The CP is designed to isolate the impact of strategic uncertainty on decisions. When the subject performs the treatment with the CP, the presence of strategic uncertainty is no longer. In this experiment, achieving equilibrium means that in the experiment, a social norm of cooperation is sustained and all players adopt the "contagious strategy." The baseline design of the robots are programmed to play according to the contagious strategy which will help with cleaner tests of the monotonicity results. A main hypothesis that surrounds robots in this experiment is that the cooperation rate is lower with an increase in the ratio of human subjects to robots playing the contagious strategy. When there is more automation, the cooperation rate is lower.

b) <u>Strategy of CP</u>: The strategy of the CP is adaptive. This means that the CP Robots are programmed to make choices according to the given rules. The robot keeps choosing X until one of the other members chooses Y. Then, the robot chooses Y. Otherwise, the robot continues to choose X. This strategy is adaptive. Since the CP is taking into account what the other subjects in his team are doing and then making a decision, it is an adaptive algorithm. This replicates a tit-for-tat behavior.

c) <u>Info to Subjects</u>: The subjects of this experiment have been fully informed that they are playing with humans or robots and the contagious strategy that they are employing for the experiment. In this study, it makes sense that this is adaptive to humans since the robots need to know what the subject chooses in order to make this choice. The article does hypothesize that it may be concerning that explicitly telling subjects about the contagious strategy used by robots will create a need in the subjects to also follow the same contagious strategy. However, if that were the case, then the hypotheses that the group size n matters would not find any support since subjects in all of our treatments were told the same information about the contagious strategy played by the robot players. On the other hand, if the observation holds true that a higher cooperation rate under a group size of n = 6 than under a group size of n = 2 or n = 3, then it implies that subjects rationally choose to follow the contagious strategy more frequently when the equilibrium conditions were satisfied.

B. Public Goods:
   Paper 1: "Revisiting Kindness and Confusion in Public Goods Experiments," by Houser and Kurzban.

a) <u>Purpose of CP</u>: The strategy is excluding social preferences. The experimental design consisted of two conditions. First condition is the "human condition" which is a standard linear public goods game. The second condition is the "computer condition" which is the same as the first condition but each group consists of one human player and 3 CP players. The CP condition reported was subsequent to the human condition. This was created to provide subjects with this information to limit the chance that the path created by the CP is a response to their own actions. If players believed that their decisions could influence the computer players' moves, the inferences about confusion effects would be confounded. The way the subjects view the experiment is really important since confusion is the key element to the experiment. This is why the CP is designed in a way to help with this aspect.

b) <u>Strategy of CP</u>: The strategy of CP is to mimic humans. Subjects are either assigned to humans or CP conditions in 6 out of 9 experimental sessions. Each session had between 4 to 12 subjects. Everything, including instructions provided to subjects, was left unchanged in the sessions. This strategy closely followed mimicking human subjects. All the subjects draw a sequence of choices made by a single human subject for each CP. The CP mimics other humans. The instructions follow those of Andreoni (1995) closely but differ in adding the aspect of computer interface. The instructions describe the ROI and their experimental earnings are the sum of their earnings over all ten rounds in the game.

c) <u>Info to Subjects</u>: The subjects were fully informed about whether they were playing against a human or a computer. Since confusion contribution and game play were the main highlights of the experimental design, the game's incentives may be more open to the computer condition. Confusion in treatment may be systematic. The instructions specified to the subjects are similar to the water irrigation experiment. It is about investment behavior. Between each round of instruction, it was noted to the subjects that there are also three computer players. Each subjects' play does not affect the computers' play in the experiment.

Paper 2: "Detecting Other-Regarding Behavior with Virtual Players," Ferraro et al.

a) <u>Purpose of CP</u>: The purpose of CP is to exclude social preferences. The article states how cooperative behavior is contradictory to self-interested individuals. Discrimination among three different things such as other behavior, self-interested play and decision errors in the lab experiments. "Virtual players" or CP in public goods experiments are placed to remove concerns of human subjects for other players which creates empathy and cooperation. Subjects are then motivated by fairness. Virtual-player techniques can discriminate against other experiments. The control experiment is humans playing against humans and the treatment is humans playing against virtual players to create strategic incentives and isolate other-regarding behavior. The non-human virtual players have actions that reflect past human play and this is informed to the subjects. This is why the purpose of the CP was to exclude social preferences.

b) <u>Strategy of CP</u>: The strategy of CP is to mimic humans. The VCM environment has virtual players where the main strategy was to contribute nothing to the public account. Overall though, the virtual players strategy was exactly replicating other human subjects which is why it falls under mimic humans. The only difference is that the subjects are

told the virtual players are not behaving like humans so they act differently and it takes away from other-regarding behavior.

c) <u>Info to Subjects</u>: The info to subjects is partial. If subjects are told that they are playing against non-human or virtual players that behave exactly like humans, they tend to play differently because subjects will still show other-behavior towards CP. However, if subjects are informed that the non-human players play by pre-defined decision rules not associated with actions of other players, subjects behave in a non-strategic, non-other-regarding behavior towards the CP. In virtual-player treatments, a single human subject plays with $N - 1$ virtual players, which are characterized in the instructions as non-human agents. The human subject also receives information on the way in which the virtual players' actions are determined so they behave in the least other-behavior way.

Paper 3: "The Source and Significance of Confusion in Public GoodsExperiments," by Ferraro and Vossler.

a) <u>Purpose of CP</u>: The purpose of the study is to exclude social preferences. Since this study is similar to the previous one, it also focuses on confusion. The main purpose of the CP is important since minimizing the confusion would result in subjects being able to participate in the public goods experiment with a more clear and meaningful incentive. The CP method distinguishes between confusion and other-regarding behavior in single-round public goods experiments. It also discriminates between confusion and other-regarding behavior or self-interested strategic play in repeated-round experiments. The method relies on the introduction of nonhuman or virtual players. They are programmed to execute pre-determined contribution sequences made by human players in an otherwise comparable treatment. Each participant is knowingly grouped with either humans or with virtual players. The procedure that ensures that human participants understand how the virtual players are programmed. Subjects gain no benefit by being altruistic to CP, using this key aspect to the experiment's research. Strategic play in a repeated-game has no impact on the predetermined decisions of virtual players. The random assignment of participants to an all-human or a virtual-player group allows the researcher to net out confusion contributions by subtracting contributions by human participants in the virtual-player treatment from all-human treatment contributions.

b) <u>Strategy of CP</u>: The strategy of the CP is to mimic humans. This strategy also works in the same way as the previous one since it mimics human conditions. The CP is trying to replicate the human actions without the human subject they are playing against having to feel altruism or any other cooperative feelings towards it. The virtual-player instructions are similar with the exception that they emphasize that participants are matched with pre-determined contributions.

c) <u>Info to Subjects</u>: The information provided to subjects is partial. The subjects are informed that there are virtual players in the game as well as other human players. In the CP method, they are informed they will be playing against a CP. However, in the repeated-round experiment, the human subjects are exposed to both virtual and human players and they are not aware of the distinction. This is why there is partial information given to the subjects. In single-round experiments where the decisions of other players are not known, the use of virtual players should have no effect on human contributions nor should they confound any comparison between all-human and virtual-player treatments. Thus, randomly selecting the contribution sequence of any previous human

participant, with replacement, as the contribution sequence for a virtual player ensures comparability.

Paper 3: "Inducing efficient conditional cooperation patterns in public goods games, an experimental investigation," by Guillen et al. (2010)

Purpose of CP: The purpose of CP is to exclude social preferences. This means that the strategy of the CP is predetermined. When the CP is predetermined, subjects will not think of the CP in mind when considering their decisions as their decisions do not affect the CP decisions or actions in mind. This study analyses behavior where subjects know the existence of strict conditional cooperators. The CP or automata plays a grim trigger strategy. The automata in the threat treatment contribute to 90% of the endowment or units in the public goods game as long as subjects have contributed a similar amount previously. The purpose of the CP is to ensure the subjects make decisions that are not corresponding to how they will be received by the other player.

Strategy of CP: The strategy of the game is mimicking humans. The strategy of the game is grim strategy. The CP plays a grim trigger strategy. In the grim trigger strategy, a player cooperates in the first round and in the subsequent rounds as long as his opponent does not defect from the agreement of 45 units. Once the player finds that the opponent has betrayed in the previous game, he will then defect until the end of the game.

Info to Subjects: The subjects were fully informed about the experimental structure. The subjects are informed that there may or may not be computer simulated subjects. Any number of CP players can be in the game ranging from 0-3. The players are not informed of how many players there will be in the group. The subjects are informed about the strategy played by the CP.

Paper 4: "Detecting motives for cooperation in public goods experiments," by Yamakwa and Okano (2016)

Purpose of CP: The purpose of the CP is excluding social preferences. Reciprocity will not affect subjects' choices since they are playing against a CP. This is to determine how subjects' choices change when they are playing with a CP versus a human. Understanding this difference is vital to understand why humans behave the way they do when they are in real life. Is there a difference in the way they interact with CP versus human subjects? The altruism factor is one of the key components that might potentially change. This experiment determines whether multi-round motives play an important role in cooperative behavior. These behaviors are altruism, warm-glow, reciprocity and other social factors. This study separates these motives into confusion, one-shot and multi-round motives. The experiment attempts to remove confusion while maintaining the social dilemma. When the subjects are playing with the condition called "C condition", the subjects are playing with a human and a computer player.

Strategy of CP: The strategy is to mimic humans. The choices of the computer actions are derived from human actions' data in H condition. The H condition is where the subjects play with other human players. The strategy is that they examined human conditions and the choice of the computer is half the average aggregate contribution in H condition. The response is a real choice of subject exclusive of social preferences.

<u>Info to Subjects</u>: The subjects are fully informed of the game strategy. In the beginning of each round, the subjects are informed on the computer screen on the number of tokens the computer will invest in the round. The subjects are also informed of the strategy of the CP and the game, where the subjects can make a comprehensive decision that will be different with CP and with other human players.