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Generosity and Partnership in Three-Player Dictator and Impunity Games: the Role of Social Distance and Information

Jeffrey Avedisian

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Abstract

The purpose of this study is to investigate partnerships and generosity in economic games using social network analysis in an experimental setting. The experiment utilizes three-player dictator and impunity games to measure generosity and explore the concept of generosity homophily. The results show a significant increase in generosity in the impunity game compared to the dictator game, demonstrating the influence of the social distance imposed by the acceptance or rejection mechanism. While generosity homophily is not observed in the partner preference networks, participants display binary homogeneous preferences based on those who made a donation or not. Information such as donation amount, gender, and the charity selected appear irrelevant in influencing partner preferences. Results also indicate that a transition from imperfect to perfect information significantly impacts player behavior and network reciprocity. Overall, the findings highlight the importance of being endowed with a voice in social settings since information tends to shape cooperation and decision-making in economic games.

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1 Introduction

In daily life, whether in social or professional situations, people interact with one another. These interactions can be random and out of the control of a person or planned and organized by groups. When people interact opinions and impressions are formed about others. Superficial information is often available upon first encounter, such as gender and appearance. More information is also available in the virtual internet space, where people interact daily on social media platforms. Sometimes information about beliefs and behavior is explicitly available for others to see publicly. Whether or not people decide to engage in continuous interaction with those they encounter, opinions about them change based on observed behavior. Based on such behavior people decide to end or continue relationships with others. An event that tests the integrity of a relationship is a disagreement. Upon disagreement or discontent with the other party involved a choice is made. Usually, the choice options are to confront and discuss the reason for conflict or to stay silent about it. Depending on the dynamics of a relationship, one or the other may not be possible. In a setting where a large social distance exists, it may not be possible to express discontent or such expression may not be considered. The level of social distance thus has a significant impact on how interactions unfold and develop.

An aspect of these relationships that can be relevant in economics is generosity (Vesterlund 2015). Generosity is often perceived as a positive characteristic and it would seem obvious for people to attempt to form relationships with the more generous people around them (Fehrler and Przepiorka 2016). Generosity may also be expected to increase towards those viewed as generous (Servátka 2010). Generous people often donate to charities, which is considered selfless and should not be done according to the assumptions of rationality in economics. Yet millions of people donate to charities for various reasons every day.

How people choose partners in social or professional situations is widely studied (McPherson, Smith-Lovin, and Cook 2001). One show of how people are consistent in their formation of relationships is they tend to form them with those similar

to themselves. This is the concept of homophily, the tendency for individuals to associate and form relationships with others who are similar to themselves in certain attributes or characteristics (Currarini, Jackson, and Pin 2009; McPherson, Smith-Lovin, and Cook 2001). Homophily is commonly seen in people sharing the same demographic characteristics or beliefs. An understanding of how people form these relationships and how they evolve is important in the comprehension of human behavior. This thesis seeks to study these interactions in an experimental setting. The experiment presents a scenario where people are asked to indicate who they prefer to play with in a money-sharing game while being shown information about others in their group.

The tools used in this thesis are economic games called the dictator and impunity games. The games are extensions derived from the classic ultimatum game, which can be tools used to measure altruistic other-regarding behavior in economic contexts (Güth, Schmittberger, and Schwarze 1982). In this case, they are used to measure generosity in a sequential three-player variation of the dictator game where the first person begins with 23 euros and decides how much to give to the middleman. The middleman then decides how much (if any) to give of his amount received to the third person. The impunity game differs since the middleman and third person have to accept or reject offers from their prospective proposers. Upon acceptance, the amount is divided as proposed. If rejected, the proposers keep the amount allotted to themselves and the receivers get nothing. The theoretical equilibrium solutions to both games are for the first proposer to offer zero and for the game to end without ever beginning. If positive offers are made, responders should never reject them. This is often not the case in reality as seen in economic experiments (Güth and Kocher 2014).

Additionally, this thesis uses tools provided by the field of social network analysis. Specifically, homophily is measured by observing the number of similar ties with respect to unlike ties in the network (Currarini, Jackson, and Pin 2009; Newman 2003). The partner preferences expressed by participants in the experiment are used to create networks for each round and observe their characteristics over

time.

The research scope of the study is two-fold. First, a comparison of two popular economic games used to study generosity is conducted. A test between the three-player sequential dictator and impunity game institution is performed to observe if theoretical predictions of zero equilibrium offers hold (Frey and Bohnet 1995). It is believed the decrease in social distance imposed by the accept and reject mechanism in the impunity game will lead to an increase in generosity when compared to the dictator game, which is the first (voice) hypothesis tested. Second, when players are subject to the context of the economic games in which money is divided, partnership preferences will be observed through the lens of homophily (Brañas-Garza et al. 2010). Specifically, it is of interest to discover if a form of generosity homophily emerges, which constitutes the second (homophily) hypothesis tested.

An online experiment with three phases has been conducted with 48 students from LUISS Guido Carli University. Two sessions were conducted at separate times with different participants. The control in which the dictator game is played, and the treatment in which the impunity game is played. Participants are divided into groups of six at the beginning of the experiment and interact within this group for the entire duration. There are three phases in the experiment. In Phase I, participants answer demographic questions and a charity-specific question from which a level of generosity is elicited. In Phase II, participants indicate who they prefer to play with while being shown information about their group members. Then the dictator or impunity game is played for 12 rounds with imperfect information, after which Phase III begins for another 12 rounds with the games played with perfect information. The information varying from imperfect to perfect is the result of the adjacent game previously played in the group of participants. After the last twelve rounds, the experiment is finished and participants are paid accordingly. Errors during the experiment occurred that will affect the results, but meaningful interpretations from the outcome are obtained in any case. Further details are provided in the experimental design section.

The results for the institutional test of the dictator and impunity game show significant differences in generosity, with 13% greater generosity in the impunity game from the role of the first mover, which confirms the first hypothesis. The middleman role gave slightly more in the impunity game, but the result was not significant. The confirmation of the hypothesis leads to an interpretation of the mere presence of the accept or reject mechanism being enough to induce more generous behavior.

No homophilic preferences for generosity were found in the network analysis portion, therefore leading to inconclusive evidence for the homophily hypothesis. Participants chose at random their partners and did not find salient any of the characteristics displayed to them. This could have been done out of risk aversion as players sought to diversify their connections in hopes of not being punished in future rounds. Further investigation was conducted to see if any sort of indication can be found regarding partner selection. A regression was conducted with in-degree as the dependent variable and the displayed characteristics as the independent variables. Players were found to act homogeneously and select partners based on a binary choice structure: donated or not donated. Those who did not donate received on average close to two ties less with statistical significance. This could be due to the overwhelming amount of information on the participant screen and lead them to choose (or not choose) the quickest option. A more likely explanation is that players tend to perceive donating in general as a positive characteristic, rendering donation amounts irrelevant and leading to desired ties directed toward those who give, while avoiding those who do not donate at all.

While no specific hypothesis was developed with regard to the information shown to participants during the experiment, descriptive statistics and network visualization prompted a test of generosity and reciprocity between games played with imperfect and perfect information. Player behavior changed drastically from Phase II to III and a statistically significant increase in generosity is observed in both games. In the dictator game, a roughly 6% difference between imperfect and perfect information, and almost 8% in the impunity game. This indicates that

by having explicit game results displayed to them, players made more decisive allocations, possibly punishing those who gave small amounts in previous games and rewarding those who were generous. Average network reciprocity was tested between phases and a statistically significant difference in network reciprocity of 33% was found in the dictator game and 21% in the impunity game, further solidifying the evidence of information salience in economic decision-making. Further research will be conducted to analyze more in-depth this observed phenomenon.

Overall the research conducted finds that players gave more in the impunity game with respect to the dictator game, indicating that having a voice matters and can encourage generosity where selfish behavior may be optimal. Charity, donation, and gender characteristics seem to be irrelevant when expressing partnership preferences. However, players are found to act homogeneously in their choices as those who did not donate are systematically avoided as preferred partners. Finally, perfect information is found to assist players in games make more decisive decisions.

The thesis is structured as follows, section two covers the theoretical fundamentals used to test the hypotheses, section three contains a literature review of experimental evidence for seminal papers on the related theory, section four introduces the experiment design and protocol, section five contains the detailed methods and results of the hypothesis testing, and finally, section six concludes with a discussion. Appendix A contains experiment details and instructions, and Appendix B contains the network visualization figures for each group with nodes color-coded by the generosity category.

2 Theoretical Fundamentals

The theoretical fundamentals used throughout this thesis will be introduced. First, the concept of generosity and the tools used to measure generosity are introduced, starting with standard two-player bargaining games and then extending them to include a third person. Second, social distance is introduced as the main mechanism observed through the lens of generosity and economic games. Finally, homophily and endogenous network formation will be introduced as an analytical method to evaluate partnership preferences derived from the experimental data.

2.1 Generosity

Generosity is commonly defined as being liberal in giving, and in the field of economic research, it is often synonymous with altruism. In economics, generosity can be understood as the expression of human compassion, empathy, and moral values within economic transactions and decision-making. It goes beyond the narrow focus on self-interest and profit maximization, acknowledging the significance of a concern for the well-being of others and the interconnected nature of individuals in society.

The games mentioned in the introduction serve as tools employed by the field of game theory to study human interaction through mathematical models. In these games, players are assumed to be rational and motivated by maximizing their utility (Weimann and Brosig-Koch 2019). Consistent allocation of resources in a manner that provides them with the highest level of satisfaction is to be expected.

However, experimental research has repeatedly found evidence of players deviating from rational behavior based on standard assumptions. In many experiments, participants often exhibit generous behavior by consistently giving money to others (Engel 2011). This contradicts the notion of rationality, as giving away resources that could benefit oneself may appear senseless. Such phenomena are commonly observed in charitable giving, where people contribute for altruistic or self-serving reasons (Vesterlund 2015).

This thesis seeks to use the tools from game theory to study generous behavior

in the context of games, as well as from the context of a charitable scenario. The games used to observe generosity are structured in a manner to mirror the standard charity donation context of a three-agent interaction: donor, charity, and recipient. The theoretical explanations of the games used are explained in the next subsection.

2.2 The Two Games

2.2.1 The Ultimatum Game: The Godfather of Bargaining Games

The ultimatum game is one of the simplest non-cooperative games used to experimentally study bargaining behavior. While this thesis does not explicitly include the Ultimatum Game (henceforth UG) in the experimental analysis, it must be introduced as a precursor to the other games used. First tested experimentally in 1982 by Güth, Schmittberger, and Schwarze (1982), with the objective to investigate the game theoretic prediction in which it is assumed that players are rational and utility-maximizers. They found consistent evidence against the mathematical prediction and thus has led to decades of research on the topic (ibid.).

The most common form of UG is played with two players, a proposer, and a responder. The proposer begins the game with an endowment and proposes an offer to divide with the responder. The responder has two choices, to reject or to accept. If the offer is rejected, both receive nothing. Under acceptance, the offer is divided as proposed.

2.2.1.1 Game Theoretic Representation

Here the UG is represented as a normal-form finite game with perfect information. Under perfect information, players are aware of all aspects of the game, namely the choices available and the history of these choices previously made by all players. In the case such information is omitted a game is considered to have imperfect information.

Let X represent the proposer and Y be the responder. X begins the game with an endowment of π, where $\pi \in \mathbb{N}_0$. The amount that X gives to Y be

represented by an indivisible amount x, where $x \in \{0, 1, 2, ..., \pi\}$. The set of strategies are defined as $S = \{S_X, S_Y\}$, where $S_X = [0, \pi]$ and $S_Y = \{s_Y : [0, \pi] \mapsto \{Accept, Reject\}\}$. The resulting payoffs are $(\pi - x, x)$ if Y accepts and $(0, 0)$ if Y rejects.

If rationality is assumed, then the sub-game perfect equilibrium obtained by backward induction is that Y accepts any offer greater than zero. Following the notation, the strategy of Y becomes, $s_Y(x) = Accept$, if $x > 0$ and $s_Y(x) = Reject$, if $x = 0$

This strategy leads to the best response of X, which is now to offer the smallest possible share of x. Since in this case, π is defined as a natural number including zero, the optimal offer is $x = 1$ by X. Hence the game results in an extremely unequal split between the players. No further analytical elaboration on the UG is performed as it is the starting point for the games used in this research. Some interpretations of the UG are provided.

2.2.1.2 Interpretations

The results of such polarized payoffs intrigued economists to conduct experimental studies to verify if such behavior was common among humans and the experimental outcomes show that equilibrium offers are often rejected by Y (Güth and Kocher 2014). The proposer behavior studied in the UG can be broadly separated into two categories: proposers having altruistic other-regarding preferences and proposer fear of rejection by too low of offers. If $x > 0$ then X violates the rationality assumption and therefore displays altruistic other-regarding behavior or generosity. Since rejections are observed by Y, X is conditioned by this behavior and adjusts accordingly in order to earn an amount greater than zero. The responder who rejects offers of $x > 0$ has the desire to be treated fairly, as rejecting positive offers goes against the assumption of rationality. This desire to be treated fairly can be referred to as anger since they are upset about being treated unfairly (Camerer 2003). This anger is what conditions the fear of X to offer $x > 0$. In fact, the modal offer in UG experimental observations is an equal split (ibid.).

One way to isolate the fear of rejection and test solely the generosity of X is

to take away the ability to reject offers. Thus the dictator game was created.

2.2.2 The Dictator Game: What Game?

The dictator game is one of the simplest tools used in experimental economics to measure other-regarding altruistic preferences, or in our interest specifically, generosity. The dictator game was first introduced in 1986 as an attempt to show experimentally that people are motivated by a sense of fairness (Kahneman, Knetsch, and Thaler 1986). While the study by Kahneman, Knetsch, and Thaler (ibid.) was not directly derived from the UG, it was in 1994 by Forsythe et al. (1994) in an attempt to disentangle the two categories of behavior mentioned previously.

The Dictator Game (henceforth DG) is a scenario in which there are two players, a proposer, and a receiver. The proposer begins the game with an endowment, usually a sum of money, and decides how to divide it between themself and the receiver. The receiver has no action in the game and must accept the offer made by the proposer.

If it is assumed in the game theoretic solution that players are rational individuals, then the proposer should give nothing and keep the entire endowment for themselves. The latter reasoning, coupled with the passivity of the receiver, brings into question the validity of a game since there is no strategic interaction and just one decision-maker.

2.2.2.1 Game Theoretic Representation

Let X represent the dictator and Y be the receiver. X begins the game with an endowment of π, where $\pi \in \mathbb{N}_0$. Let the amount that X gives to Y be represented by an indivisible amount x, where $x \in \{0, 1, 2, ..., \pi\}$. Therefore, the payoff for X is equal to $\pi - x$ and the payoff of Y is x, denoted as $(\pi - x, x)$. The strategies of X and Y are defined as $S_X = [0, \pi]$ and $S_Y = 0$ respectively.

As mentioned before, the optimal amount that X should give is $x = 0$ under the assumption of rationality, and any $x > 0$ would indicate an other-regarding altruistic preference toward the receiver. The result of the game would then leave

X with a payoff of π and Y with a payoff of 0. In many decades of experimental research, proposers have often offered more than zero, but less than the offers observed in experimental tests of the UG (Engel 2011).

2.2.2.2 Interpretations

Previously it was mentioned what type of behavior was analyzed from the proposer's perspective, but not the responder's. When observing experimental results of the UG, responder rejection of equilibrium offers may be interpreted as an angry emotional reaction to being treated unfairly (Camerer 2003). In the DG, the dictator has no reason to consider the receiver since they take no action to punish an unfair offer. Then any offer of $x > 0$ can be considered an indication of generosity. Since the dictator has only to decide how much to give, they express their intrinsic generosity toward others and thus the DG can be considered a game used to measure levels of generosity, save any experimental intricacies.

A 1995 study attempted to observe whether the equilibria deviating offers were due to a fear of punishment or influenced by the lack of anonymity in experimental settings (Bolton and Zwick 1995). In order to do this, they developed the impunity game, in which the ability to punish the proposer was removed.

2.2.3 The Impunity Game: Can You Hear Me Now?

The impunity game (henceforth IG) is a modification of the UG which renders responder rejection powerless. By the inability to punish the proposer, the IG should show similar results to the DG since the proposer should not fear rejection. By comparing the DG and IG, the effects of a sort of "voice" can be observed by evaluating whether or not it affects proposer behavior. The powerless acceptance or rejection mechanism allows the observation of generous behavior by the proposer. If they give any $x > 0$ they can be seen as having an altruistic preference toward the responder.

2.2.3.1 Game Theoretic Representation

The same setup is used as with the UG. Let X represent the proposer and Y be the responder. X begins the game with an endowment of π, where $\pi \in \mathbb{N}_0$. The amount that X gives to Y be represented by an indivisible amount x, where $x \in \{0, 1, 2, ..., \pi\}$. Let the set of strategies be defined as $S = \{S_X, S_Y\}$, where $S_X = [0, \pi]$ and $S_Y = \{s_Y : [0, \pi] \mapsto \{Accept, Reject\}\}$. The only difference from the UG is that the payoffs now become $(\pi - x, x)$ upon acceptance and $(\pi - x, 0)$ upon rejection.

If the same assumption of rationality and utility-maximizing agents apply, there are two sub-game perfect equilibria. The first is for X to offer $x = 0$ and for Y to accept. The second is for X to offer $x = 0$ and for Y to reject. While under these assumptions in the UG, in the IG, the proposer no longer has to offer the smallest amount possible to avoid receiving a zero payoff. Hence, the optimal offer that X should make is $x = 0$ and since the resulting payoff in this case remains zero for the responder in the case of rejection and acceptance, they remain indifferent. This mirrors quite precisely the DG except that the proposer can understand the discontent of the responder by viewing their rejection signals. Such signals constitute information about the other player, which was missing in the DG structure. It is noted the only difference between the DG and IG is the psychological expectation of proposers and responders. The structural design of the games only allows for interactions in the form of opinion expression, not in concrete behavioral consequences. Therefore, a difference in structural social distance in terms of information is observed.

For the purpose of this thesis, the extension of these games to three players is investigated.

2.2.4 Three-Player Sequential Dictator and Impunity Games

What happens when a third player is added to a DG or IG? Theoretically, nothing should change since the proposer can still offer zero without punishment. Experimentally, it has been seen that proposers give more than in standard two-player

games (Bahr and Requate 2014; Engel 2011; Güth and Kocher 2014). These results could be due to a reduction in social distance from the addition of the third player as it has been seen that an increase in recipients increases generosity (Camerer 2003). The interesting aspect of the extension is the behavior of the second player as the middleman as they become a responder and proposer in the same game. This introduces a concern for a third party which, in repeated interaction, becomes increasingly important as the possibility for punishment is introduced. The reduction of social distance, paired with the additional concern should elicit some empathy from proposers and thus increase generosity. This concern for a third party introduces interesting dynamics to the games and can provide interesting behavioral interpretations.

The extension to three players results in a scenario in which there is a proposer, a middleman, and a receiver. The proposer begins with an endowment and must decide how much to give to the middleman. The middleman then decides how much to give to the receiver. The receiver is passive and takes no action.

From this point forward, when utilizing DG and IG, reference to the three-player games is made. Reference to the two-player game characteristics will be made explicit.

2.2.4.1 Three-Player Dictator Game Theoretic Representation

Let X represent the proposer, Y be the middleman and Z be the receiver. X begins the game with an endowment of π, where $\pi \in \mathbb{N}_0$. Let the amount that X gives to Y be represented by an indivisible amount x, where $x \in \{0, 1, 2, ..., \pi\}$. Let the amount that Y gives to Z be represented by an indivisible amount y, where $y \in \{0, 1, 2, ..., x\}$. The set of strategies is $S = \{S_X, S_Y, S_Z\}$ where $S_X = [0, \pi]$, $S_Y = [0, x]$ and $S_Z = 0$. The payoffs for X, Y, Z are $(\pi - x, x - y, y)$ respectively. See Figure 1 for a visual representation.

In order to observe a relative measure of generosity let $x = \alpha\pi$ and $y = \beta\alpha\pi$, where $\alpha, \beta \in [0, 1]$. α represents the portion of the endowment given by X to Y and β represents the portion Y gives to Z of the amount received from X. The payoffs then become $((1 - \alpha)\pi, (1 - \beta)\alpha\pi, \beta\alpha\pi)$. The payoffs and outcomes will

be henceforth denoted using this notation.

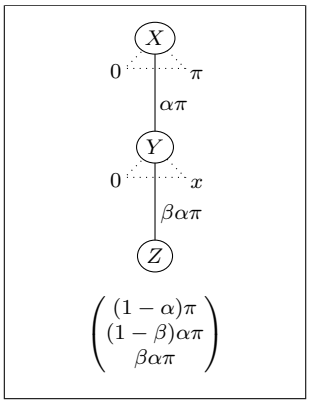


Figure 1: Three-Player Dictator Game

If the assumption of rationality holds, the optimal amount that X should give is $\alpha = 0$. Hence the payoffs would be $(\pi, 0, 0)$. Any $\alpha > 0$ should be considered as a violation of these assumptions and in such case Y now has a decision to make. Continuing under the aforementioned assumptions, Y should give $\beta = 0$. However, if $\beta > 0$, then it can be determined that X and Y exhibit altruistic other-regarding preferences.

2.2.4.2 Three-Player Impunity Game Theoretic Representation

For the three-player IG, the same structure as the DG is used where X represents the proposer, Y is the middleman and Z is the receiver. X begins the game with an endowment of π, where $\pi \in \mathbb{N}_0$. Let the amount that X gives to Y be represented by an indivisible amount x, where $x \in \{0, 1, 2, ..., \pi\}$. Let the amount that Y gives to Z be represented by an indivisible amount y, where $y \in \{0, 1, 2, ..., x\}$. The set of strategies is $S = \{S_X, S_Y, S_Z\}$ where $S_X = [0, \pi]$, $S_Y = [0, x]$ and $S_Z = 0$. The payoffs for X, Y, Z are $(\pi - x, x - y, y)$ respectively. See Figure 2 for a visual representation.

Let $x = \alpha\pi$ and $y = \beta\alpha\pi$, where $\alpha, \beta \in [0, 1]$. α represents the portion of the endowment given by X to Y and β represents the portion Y gives to Z of the amount received from X. The payoffs then become $((1 - \alpha)\pi, (1 - \beta)\alpha\pi, \beta\alpha\pi)$.

For the IG, like in the two-player case, the equilibrium can be obtained by backward induction. The results are two subgame perfect equilibria. Under the

assumption of rationality, it can be assumed that X will give $\alpha = 0$ and hence the game stops since Y cannot give an amount they do not have to Z. If the payoff for Z is zero in the case of acceptance or rejection, they are indifferent to the offer. The same applies to Y if they are offered zero. Hence there is one equilibrium in which X offers $\alpha = 0$ and Y accepts and therefore Z receives nothing, and another in which X offers $\alpha = 0$ and Y rejects, leaving Z with nothing again. Given that Y cannot punish X by rejecting an offer, the optimal offer X should make is $\alpha = 0$. Any offer of $\alpha > 0$ leads to further gameplay, but under assumptions of rationality Y should offer $\beta = 0$. If $\beta > 0$ it can be assumed that Y exhibits altruistic behavior toward Z.

The novelty of the three-player IG game design is the possible behavior of Y. According to the equilibrium offers previously derived, Y should never reject an offer. However, players in experimental studies of two-player IGs have rejected offers resulting in no punishment of the proposer (Yamagishi et al. 2009). This three-person design positions Y in an even more difficult scenario where their rejection of an offer punishes the third party, Z. A rejection of an offer in the three-player IG by Y indicates an expectation of a certain level of generosity from X and a desire to be treated with more fairness. If Y intends to reciprocate such generosity to Z, a rejection of an unfair offer may be viewed as a sense of responsibility to provide also for Z.

Based on the equilibrium derivations presented above, which indicate that the DG and the IG result in offers of zero, one would expect to observe selfish behavior when experimentally testing these games under the assumption of rationality. The objective of this thesis is to examine the DG and IG within the context of repeated games, incorporating a matching mechanism determined by partner preferences. It is hypothesized that the structural social distance between the DG and IG will have a positive effect on generosity. To provide a brief introduction, the theory of social distance will be discussed.

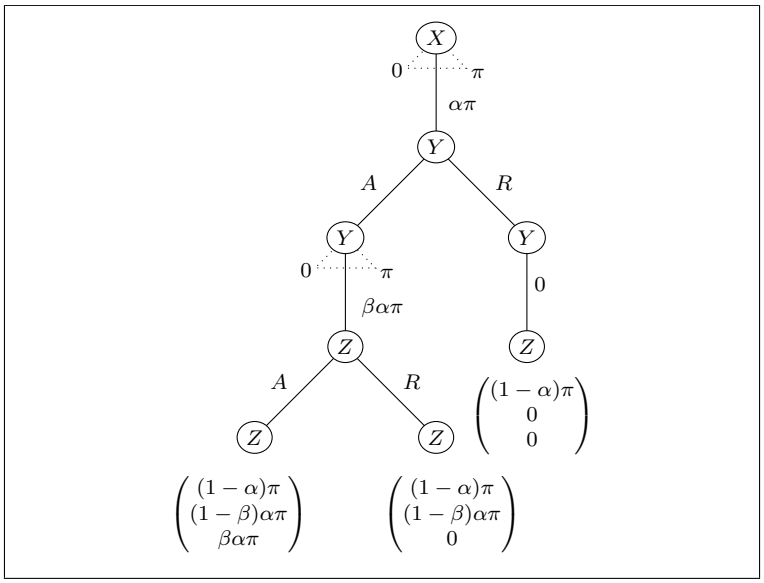


Figure 2: Three-Player Impunity Game

2.3 Social Distance and Generosity

Social distance refers to the perceived space between individuals or entities. Such perception can vary based on factors such as context, social status, power dynamics, or personal characteristics, leading individuals or groups to assess the distance differently. Social distance can exist in any situation involving interpersonal or group interactions. An institutional social distance refers to the distance imposed by the structure of a general social setting within which individuals or groups interact. The structural constraints individuals encounter limit their range of possible interactions, and each individual may have their own perception of social distance within this institutional framework. On an individual level, social distance can be influenced by characteristics such as race, gender, and beliefs. These distances play a significant role in shaping societal development and evolution.

Social distance is relevant in an economic context as the allocation of resources is of principal concern. Individual behavior can vary depending on the characteristics of those they interact with, as social distance influences their decision-making and behavior within economic transactions. Changes in the distance in experimental research have been found to change levels of generosity in bargaining scenarios (Charness and Gneezy 2008; Frey and Bohnet 1995; Hoffman, McCabe, and Smith

1996). The primary methods used to examine the impact of social distance on generosity are dictator games and ultimatum games, where two players need to decide how to divide a shared resource, typically a sum of money. In the context of a dictator game, the social distance is substantial, as recipients have no ability to respond to the dictator's actions. However, this social distance can be reduced in various ways, such as enabling recipients to react to the dictator's decisions.

One approach to reducing social distance is by introducing the impunity game institution. In this setup, recipients now take the role of responders and gain the ability to reject offers made by dictators without affecting the dictator's own payoff. The key distinction between the dictator game and the impunity game is the introduction of the recipient "voice" through the rejection option. This voice provides, via the acceptance or rejection mechanism, information about player preferences. Based on intrinsic personal characteristics and beliefs, such information will be interpreted. A dictator who displays more empathy may exhibit higher generosity, whereas a dictator who shows no concern for the other players will likely be less generous. The increase in available information to the dictator should increase generosity, as this is seen to be the case in some studies (Guth, Huck, and Ockenfels 1996). Theoretically, both games, under the assumption of rationality, should result in the same outcome: dictators making zero offers, as previously demonstrated. To distinguish between these structural institutions, it becomes essential to measure the differences in generosity displayed in each game.

By analyzing variations in generosity between the dictator game and the impunity game, insights can be gained into how social distance influences individuals' decision-making and behavior in resource allocation situations.

Empirical evidence suggests that reducing social distance can lead to an increase in generosity (Frey and Bohnet 1995). Further details on the experimental findings can be found in the literature review section. To specifically examine the impact of structural social distance on generosity, the study implements two different treatments while maintaining the same experimental constraints. The aim is to isolate the effect of the structural social distance disparity between the DG

and the IG. By comparing the outcomes of the DG and IG, even with an equal reduction in social distance within each game, the study aims to examine whether the presence of a structural social distance difference between the games has an additional impact on generosity. This approach allows for a more comprehensive understanding of the role of social distance in shaping individuals' actions and choices in resource allocation situations (Camerer 2003).

In both game structures, various measures are employed to reduce social distance among participants. This reduction in social distance is achieved by implementing repeated rounds with random matching and role assignment. These modifications are expected to introduce the development of reputation concerns, which can influence individuals' behavior and decision-making. With the introduction of reputational concerns, social distance is decreased since X or Y now may condition their decisions on what they believe Y or Z respectively, could do in future rounds. If a player in the role of Y or Z are fairness seekers and bothered by low proposals, they may retaliate in future rounds which could incentivize first movers to think twice before giving low amounts.

As introduced earlier in this section, the third player added to the traditional DG and IG reduces further the social distance as those who possess altruistic qualities may display concern for a third and passive player. X and Y must now keep in mind the presence of Z and this may condition their offers in a positive direction, as it has been shown an additional player increases generosity (ibid.). The final measure imposed to reduce social distance is the matching mechanism used to determine with whom players will play. By eliciting preference vectors with a simple question of with whom players would like to play, participants are primed to think about establishing connections in an activity that induces at the minimum other-regarding thought, whether positive or negative. Now this mechanism is explained in more detail using the concept of homophily.

2.4 Homophily

"Homophily is the principle that a contact between similar people occurs at a higher rate than among dissimilar people." (McPherson, Smith-Lovin, and Cook 2001). This definition comes from the 2001 seminal paper in which McPherson, Smith-Lovin, and Cook (ibid.) review the concept of homophily in society and lobby for more research toward the understanding of similarity-based ties within various social structures. The main concepts of the theory introduced by the paper are covered in this section and experimental studies regarding homophily are covered in the literature review.

Homophily refers to the tendency of individuals to establish social connections with others who share similar attributes such as age, gender, race, beliefs, interests, and attitudes. This preference for similarity is driven by a perceived higher level of trustworthiness, reliability, and relatability among similar individuals. These similarities create a sense of closeness and comfort, leading to increased interaction and the formation of social ties (ibid.).

Social network analysis is the primary method used to study social ties and homophily. Social networks consist of individuals who have some form of relationship with each other (Butts 2008). The focus here is on studying network formation within the context of economic games.

When individuals form social networks based on homophilic ties, groups emerge, which can have implications for interactions within society. These groups can sometimes have negative effects, as they can restrict information and interactions with individuals outside the groups. This can lead to segregation, discrimination, and inequality. In the context of the research, disparity in generosity may arise as those with similar characteristics may displace an in-group bias. Higher generosity may be observed toward in-group members with respect to out-group members, as seen in Güth, Ploner, and Regner (2009). Such outcomes can significantly impact social and economic outcomes for different groups within society.

This thesis explores the concept of "generosity homophily" in the context of economic games. Generosity homophily can be defined as the tendency of generous

individuals to form relationships or interact with others who exhibit similar levels of generosity. Given the context of a game where the objective is to divide a sum of money, it is expected that players will choose to interact with more generous individuals. If generosity homophily is observed in the experiment, it is expected that individuals with similar levels of generosity are more likely to exhibit increased generosity towards each other. Similar results have been observed where dictators gave more to those with a reputation for being generous (Servátka 2010).

Partner preferences are elicited as an incentive for gameplay with whom participants desire most. This allows for an indirect method of homophily observation. Participants are left to determine which characteristics they base their preferences on. Three different categories of information are displayed upon preference elicitation: gender, charity selected, and donation amount. The gender category was chosen since literature shows homophily to exist amongst similar genders (McPherson, Smith-Lovin, and Cook 2001). Three charities were selected with diverse missions, one related to the promotion of helping women who are victims of domestic violence, another related to climate change issues, and the last a popular charity that helps children around the world. This information seeks to show a measure of belief. The donation amount information is to show a level of generosity, which is believed to be the prominent feature sought in a partner when selecting who to play with.

For theoretical analysis, a model network formation is introduced in order to study these preferences indicated by participants. To a certain extent, the participants are forming endogenous networks but not necessarily interacting within the networks as they are matched randomly with others regardless of their preferences. The tools provided by the field of social network analysis are used to analyze the evolution of partnership preferences. For this thesis, the focus is on the measures used to identify connection types and less on the theoretical framework of network formation itself.

2.4.1 Endogenous Network Formation

Vast experimental research on networks has been conducted. However, most of them consist of the playing of games on already existent networks, and sometimes observations of these network evolutions are made. There seems to be a gap in the coverage of literature. There are many theoretical studies deriving optimal outcomes given various properties and applied research that seeks to verify such theories (Bala and Goyal 2000; Jackson and Wolinsky 1996). The experimental research in a laboratory setting seems to be scarce regarding network formation and could be leveraged to observe such theories in controlled environments, especially given the expanded capabilities provided by the internet. A contribution to this literature is made by using preference elicitation as the basis for network formation. When playing games on already established connections, the analysis is limited to what kind of behavior is exhibited based on the agent's position or role in the network. By allowing endogenous network formation, the "why" behind initial connection behavior can be analyzed. The experimental setup is represented using a modified noncooperative model of network formation introduced by Bala and Goyal (2000).

The model is modified since the networks formed are not completely representative within the games, and hence equilibrium analysis is left for future research. In a sense, preference networks indicated are hypothetical and only desires by players. Players will play with others which they did not select. This is a strategic design, as in professional and social scenarios people often interact with others they may not desire to associate with. A model is introduced to formalize the structure in which players will choose desired partners.

2.5 Model

While there are various groups of six participants within the structure of the experiment, the model is applied to each group since they interact only within their defined group for the entirety of the experiment.

Let $N = \{1, 2, 3, 4, 5, 6\}$ be the set of agents within each group, where i and j

are members of the group. The strategy of each agent $i \in N$ is a column vector $g_i = (g_{i1}, g_{i2}, g_{i3}, g_{i4}, g_{i5}, g_{i6})$ where $g_{ij} \in \{0, 1, 2, 3, 4, 5\}$ for each $j \in N \setminus \{i\}$. When participants are asked to give their game partner preferences in the experiment they are asked to rate on a scale from zero to five how much they desire to play with others in their group. Such preferences constitute the vector g_i. A one-way tie is established when $g_{ij} \neq 0$ for $i \neq j$, hence when formed the network will be directed. Directed networks are chosen and analyzed as players can choose with whom they want to play and such play is left to chance as the preference vectors are used as a random matching mechanism. Therefore, two-way connections constitute a mutual tie. Self-connections are prohibited as an agent cannot interact with themself in the game. Hence, loops are excluded and let $g_{ij} = 0$ where $i = j$ for all agents in N. To complete the model, the final preference network is represented as the adjacency matrix $G_m = (g_1, g_2, g_3, g_4, g_5, g_6)$ where each column represents the preference vector of a group member and $m = \{1, ..., M\}$ for M groups formed.

A preference vector of one group member will be randomly selected by the computer and used to determine the roles in the subsequent dictator or impunity games. In this sense, participants will not necessarily be playing games on this network since the games played do not reflect completely the preference vector. A player can choose to not play with any other player, but will still play with someone in a game. This reflects the randomness of social situations as people cannot always choose with whom they interact and might be sometimes obligated to do so when not desired.

In each round, participants are notified which group member's preference vector was chosen but do not know precisely the vector contents. Therefore, a network formation game in terms of giving a simple partner preference is played. Once the preference vector is randomly selected for matching and role assignment, players move on to play the DG or IG.

2.5.1 Full Game

From the network, a preference vector, g_i is selected with probability of $\frac{1}{6}$. Once selected, the vector is sorted in descending order and the two largest ratings of group members are selected and implemented via random role assignment in the DG or IG. If the agent expresses indifference between one or more different players and there is a remaining role to be assigned, the players with indifference ratings are selected randomly. Each participant has a $\frac{1}{3}$ probability of being selected for each role, X, Y, Z. Such random assignment and selection processes are denoted in Figure 3 as nature.

Once the players are selected from the vector, they are divided into two subgroups A_1 and A_2. Where A_1 is the group in which the selected preference vector is implemented and A_2 are the remaining three players. Upon allocation into a subgroup, roles for the DG or IG are randomly assigned and games are played.

In the experiment introduction, it was noted that there are three phases. In Phase III, players are given extra information: the results of the previous round played in their group for both games. In Phase II the previous game results of the game in which they played are only available by one's deduction; by memory or by written notes. Players are unaware of the results of the other game played in their group. Therefore the results of the previous round for both games in Phase III are provided to players, which indicates a transition from imperfect to perfect information. Within the individual games played, the games are played with perfect information. However, in the full game, Phase II is a game played with imperfect information and Phase III is a game played with perfect information. In Figure 3, the dotted line indicating imperfect information between groups A_1 and A_2 will be removed when transitioning from Phase II to III. To conserve space, the DG is used in the diagram and another diagram is not shown with the IG, but in such case, Figure 2 can be referenced. A theoretical model to predict utility functions within the full game structure is developed next.

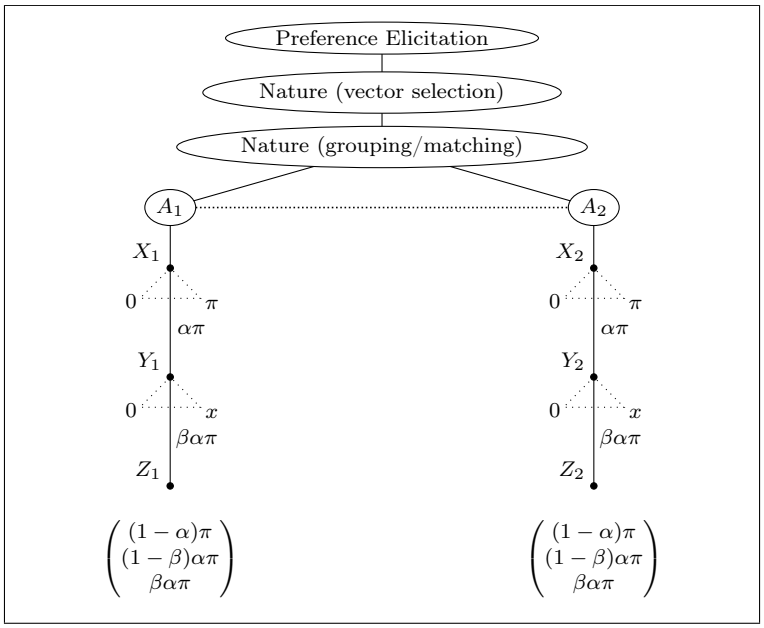


Figure 3: Full Game

2.5.2 Proposed Expected Utility Model

The theory proposed in this study revolves around the concept of expected utility and its interaction with fairness considerations within the context of uncertainty and repeated interactions. The primary objective is to develop an expected utility model that can address the uncertainty introduced by the random selection of a vector, allowing for the estimation of utility based on preference vectors. While the implementation of the utility model in the experimental analysis is beyond the scope of this study, further exploration of the model will be conducted in future research.

Building upon the models discussed earlier and the theoretical assumption of agents giving zero in all roles, the theory considers a form of fairness when examining players' indicated preferences. The desire to play with other players can be interpreted as an expectation of generosity, as players seek a sense of equality in their interactions. Given that the final payoff is determined by the random selection of one round of the game, repeated interactions under uncertainty are expected to foster a greater emphasis on sharing and fairness concerns.

The role of fairness is exemplified in the case of agent X, whose desire for

fairness leads to a preference for an equal division of the initial endowment by three, resulting in an alpha value of $\frac{2}{3}$. Similarly, if agent Y is concerned with fairness, they can be expected to divide their received amount equally with agent X, resulting in a beta value of $\frac{1}{2}$. By incorporating these fairness assumptions into the preference vectors, they can be transformed into optimism vectors, where a rating of five represents maximum optimism, corresponding to $\alpha = \frac{2}{3}$ and $\beta = \frac{1}{2}$. The vectors are then scaled down to reflect less optimistic ratings. Therefore, the estimator preference vectors are represented as $\hat{\alpha}(g_i) = \frac{g_i}{7.5}$ and $\hat{\beta}(g_i) = \frac{g_i}{10}$. To consider the uncertainty associated with role assignment and the players' potential partners, the average of the estimator vectors is taken, yielding the following representations of the agents' level of optimism: $\hat{\alpha}(g_i) = \frac{1}{(n-1)}[\sum_{i \neq j}^{n} \frac{g_i}{7.5}]$ and $\hat{\beta}(g_i) = \frac{1}{(n-1)}[\sum_{i \neq j}^{n} \frac{g_i}{10}]$.

Let the standard linear utility functions of X, Y, Z be represented as: $U(X) = (1 - \alpha)\pi$; $U(Y) = (1 - \beta)\alpha\pi$; $U(Z) = \alpha\beta\pi$. When attempting to derive the expected utility of the standard utility functions, the uncertainty of the parameters of α and β is encountered since they are private information to agents. By using the estimator vectors, the expected utility is obtained based on indicated preferences. Thus the utility functions become: $U(\hat{X}) = (1-\hat{\alpha}(g_i))\pi$; $U(\hat{Y}) = (1-\hat{\beta}(g_i))\hat{\alpha}(g_i)\pi$; $U(\hat{Z}) = \hat{\beta}(g_i)\hat{\alpha}(g_i)\pi$.

Based on the individual preference vectors provided by players in each round, the expected utility can be estimated using the elicited expected behavior of others. The objective is to utilize these estimators conditionally on the role played. For instance, if a player has a low $\hat{\alpha}(g_i)$, indicating a pessimistic attitude toward the expected behavior of others in the group, they can expect to receive low payoffs when assigned the role of Y or Z. The estimation of expected utility using preference vectors is considered a valid method for understanding possible expectations by players, as a portion of players is expected to give more than zero. Finally, overall experimental expectations are introduced based on these analyses.

2.6 Hypotheses

The main purpose of this thesis is to test the two institutions of the dictator and impunity games. It is believed both games provide valid representations of social or professional scenarios with large social distances given the lack of sanctioning power. In brief, the experiment follows a 2 x 2 design structure which varies the game and information available, as seen in Figure 4. This design allows a test of both the voice mechanism of the impunity game and the effect of information variation.

Dictator Imperfect Information	Dictator Perfect Information
Impunity Imperfect Information	Impunity Perfect Information

Figure 4: Experiment Design

The dictator game and the impunity game are essentially identical, except for the presence of an acceptance and rejection mechanism in the latter, which grants responders a "voice". This voice provides additional information about the responder for the dictator, who must decide how to act on such information. Despite the theoretical equilibrium predictions of zero offers in both games, it is expected that the decrease in structural social distance imposed by the acceptance and rejection mechanism in the impunity game will lead to higher levels of generosity compared to the dictator game. The presence of the mechanism is expected to evoke empathy in proposers, prompting them to be more generous. Based on this expectation, the first hypothesis of the thesis is formulated as follows: **Voice Hypothesis:** *The average proportion given in IG is greater than the average amounts given in DG.*

The Voice Hypothesis will be tested via a two-sample mean comparison method. More details are given in the results section.

Now the preference elicitation portion of the experiment is analyzed. Despite assuming rationality, it is highly unlikely to observe a complete absence of desired connections in the context of this experiment. Particularly because par-

ticipants are asked to indicate their self-reported generosity by stating how much they would donate to charity. Therefore, considering the influence of gameplay on preferences, it can be expected to observe some form of characteristic-based indications of partnership, resulting in non-zero preference vectors. In this study, the theory of homophily is examined, which suggests a tendency to form ties with individuals who are similar to oneself. Consequently, the following hypothesis related to homophily is formulated: **Homophily Hypothesis:** *Generous people want to associate with generous people.*

The donation amount shown is assumed to provide a measure of generosity for participants when providing partner preferences and given the context of a money-sharing game, will choose those with the higher donations. The Homophily Hypothesis will be tested using an assortativity coefficient to measure homophily based on discrete characteristics (Newman 2003). More details are given in the results section.

This concludes the theoretical section of the thesis. The following section will provide a literature review of the theories covered.

3 Literature Review of Experimental Evidence

The focus of this thesis is observing generosity and therefore a quick review of the literature regarding generosity in the context of charity is conducted. Despite the focus of the experiment conducted in the thesis being dictator and impunity games, we must first review briefly the ultimatum game and the general experimental results as it is the basis of the games used here. For two-player games, we will review the seminal paper by Güth, Schmittberger, and Schwarze (1982) and report results from a review by Güth and Kocher (2014). For the two-player DG, we will cover the seminal paper by Forsythe et al. (1994) and a review conducted in 2011 by Engel (2011). Since the literature for IG is a bit more scarce we will review the seminal paper by Bolton and Zwick (1995), a paper by Di Cagno et al. (2018a) and various other studies involving the IG. We will then review some papers in which the UG and DG are extended to three players (Guth, Huck, and Ockenfels 1996, Bahr and Requate 2014). Studies explicitly using the three-player IG we not found.

The review of the literature covering the topic of social network analysis will cover the model proposed by Bala and Goyal 2000, and a few papers that cover endogenous network formation in the laboratory. Finally, a review of some experimental laboratory studies investigating homophily is conducted.

3.1 Generosity

Economists have attempted for years to understand why people give to charity. The assumption of rationality implies agents should not give without some sort of benefit in return. When a person gives to charity, their motive is often altruism. The benefit received from giving comes from the effect their donations have on the well-being of recipients (Vesterlund 2015).

In the theory section, generosity was introduced as a characteristic elicited by the DG. The main methods to experimentally test for generosity in a charitable context are to use the public good game (or PGG) and DG. The literature primarily uses the PGG since it allows for the observation of many donors contributing

to one good and the possible tendency to free-ride. In both games, individuals are found to show concern for the welfare of others (Vesterlund 2015).

The focus of this thesis is on the institutions of the DG and IG, hence generosity is studied through the lens of these two games. Given the assumptions of rationality in the PGG and DG, economists asked if giving was in fact rational. This was investigated by testing the consistency of altruistic preferences by observing violations of the GARP (Generalized Axiom of Revealed Preference) by Andreoni and Miller (2002). The authors found that preferences were rarely violated and 98% of participants in a modified dictator game made choices consistent with utility maximization. Thus giving in DGs was deemed rational (ibid.). From this study stemmed other curiosities about how such preferences might change under different circumstances, such as more recipients, which we are interested in for this thesis as we employ a three-person DG. Andreoni (2007) tests this curiosity and finds rationality holds even when there are more recipients. In particular, a doubling of recipients increases total giving but does not double it. Hence as the group size increases, average contributions decrease (ibid.).

It is noted the main reason for such studies derives from the role of governments in some cases is to raise taxes or funds for public projects, and therefore seek to understand how to increase contributions. From studies of the PGG and DG, two main phenomena arise when understanding human behavior in the context of giving: crowding out and free-riding. Both have been found to discourage contributions by people to public goods and lead to the perception of giving by others as a perfect substitute for giving oneself (Vesterlund 2015).

In studying the motives for giving, crowding out and free-riding never completely dominated the results and therefore left economists with the task of interpreting the behavior of those who did neither. One example is a study by Bolton and Katok (1998) where they investigated crowding out by implementing tax and no-tax treatments to a DG. They find when subjected to a tax treatment giving is crowded out as people reduce the amount given under the tax treatment as they take advantage of the compensation by another. Specifically, 73.7% of the tax is

crowded out and the authors fail to find evidence of complete crowding out and posit impure altruism as an explanation of giving.

Under the investigation of pure and impure altruism, Andreoni (1989) proposed the concept of warm glow, where people felt a joyous feeling from giving. While pure altruism stems from the disregard for oneself and sole regard for others, impure altruism allows for some egotistical regard for oneself. An impure altruist will view giving by others as an imperfect substitute for giving themself due to the fact they desire some positive emotion from the action of giving. The overall consensus for giving motives is a combination of altruism and a warm glow, with motives depending on initial endowments and the direction of giving (Vesterlund 2015).

While the current experiment design does not seek to investigate reasons or motives for giving to charity, the structure is imitated to promote generous behavior by participants. The games used to measure generosity are introduced.

3.2 Games

3.2.1 Ultimatum Game

The ultimatum game has been used in experimental economics to study human behavior for more than 30 years. The original purpose of using the UG in an experiment was to test the game theoretical prediction of the game in which it is assumed that players are rational and therefore should always attempt to maximize their payoffs (Güth, Schmittberger, and Schwarze 1982). There are two players: a proposer and a responder. The proposer usually begins the game with an initial endowment and must decide how much to give to the responder. The responder then reacts to the proposal by accepting or rejecting it. In the case of acceptance, the game is finished and both players obtain the amounts decided. In the case of rejection, both receive nothing. Therefore, the behavior in a negotiation context is assessed.

The usefulness of the UG stems from the fact that strategic interaction only occurs by way of anticipation of counterpart behavior. In the paper of Güth,

Schmittberger, and Schwarze (ibid.), the authors wanted to evaluate the extent to which the "take-it-or-leave-it" or ultimatum aspect of the UG is used to the advantage of a player. In other words, how often do players leverage their power in obtaining favorable results for themselves. From the rational assumptions mentioned before, we know the optimal offer from proposers should be extremely low. Therefore the authors attempted to verify if this type of behavior would be exhibited in real life.

The authors conducted two experiments deemed easy and complicated. The easy experiment was a standard UG, where player one is the proposer and player two is the responder. Player one makes an offer to player two and they must decide to accept or reject. Upon rejection, both receive nothing, and if accepted the offer is distributed as proposed. Under the assumptions of rationality also used in the experiment, the indivisibility of money indicates that there is always a minimal positive amount of money. This minimal amount then becomes, just as derived before theoretically, the optimal offer by the proposer. Another assumption imposed is the responder will always prefer to receive more money to less and will choose to reject offers only in the case it does not cost them anything. In more general terms, any offer of zero will be rejected, since any offer greater than zero should be accepted. This outlines the ultimatum aspect of the UG, in which the proposer makes their decision and this implies the responder can only accept the minimum offer or choose to reject.

The complicated experiment required more elaborate decision-making on the part of the participants, hence the name. The objective was derived from the divide and choose the method in which the players must divide five black chips and nine white chips. Player one must construct a bundle of chips and propose it to player two. Player two can choose from the bundle compiled by player one or they can choose the alternative bundle which is the difference in chips remaining from the first bundle. The payoffs for each player differ in their determination. Player one received two Deutsche Marks (DM) for each chip and player two received two DMs for each black chip and one DM for each white chip.

The optimal equilibrium solution of the game is for player one to construct a bundle of five black and zero white chips, or a bundle of zero black and nine white chips. Player two should choose the first bundle in the former case and the second bundle in the latter case. The payoffs would be 18 for player one and ten for player two.

There were 21 games conducted of the easy experiment and the beginning endowment varied from four DM to 10 DM. There was another experiment conducted the following week. In the second week, there were more rejections of offers compared to the first week and it was found that rejections increased as the beginning endowment decreased. The authors ran a third experiment to observe consistency in participant behavior, both player one and two roles were played by the same participant. Here they found that more fair distributions were offered, hinting at a sign of empathy on behalf of the participants. The average shares demanded by player one were 55% when controlling for consistency, 65% in the first-week experiment, and 69% in the second-week experiment. The results indicate that participants have their own opinions about what they consider just or fair and express so in the UG. In this case, the "take-it-or-leave-it" aspect of the UG cannot be used to the advantage of proposers since responders do not hesitate to punish. Given the conditional deviation from rationality by participants, it may be useful to investigate if people would offer similar amounts in the absence of the possibility of punishment. This is the entire concept of the DG and will be covered later on.

In the complicated experiment participants playing as player two always accepted the bundle with a higher payoff. It was also found that bundles constructed by most participants playing as player one followed the assumptions of rationality and were close to the optimal equilibrium. This indicates that players did not deviate from the optimum due to the difficulties of solving the game. An intuition as to why this may have been the case is because the rational solution is determined unacceptable or unfair by those playing as player two. In this case, it is confirmed that player one often took advantage of the ultimatum aspect of the

UG and the results confirm so as they tended to approach the normative solution where payoffs were more unbalanced between participants.

The main finding from the perspective of the responder is that they deviate from the expected rational, payoff-maximizing behavior by rejecting positive offers because they desire to be treated fairly, further indicating a willingness to sacrifice their own monetary gain for the sake of fairness. While from the proposer's perspective, there are two possible behavioral explanations of why they do not follow the rationality assumption and give amounts well above the expected equilibrium amount. First, proposers may attempt to avoid rejection by making offers they believe will not be rejected and therefore make attempts to predict responder behavior. This essentially renders the UG a one-person game. Second, proposers may simply care about fairness and subsequently decide to share a larger amount than expected by the rationality assumptions.

These results from Güth, Schmittberger, and Schwarze (1982) were groundbreaking and guided the field of experimental economics into numerous pieces of research on the UG and its variations. We now look at a qualitative review by Güth and Kocher (2014) in which they look at the progress made over the last 30 years.

The initial purpose of the UG was to document the limits of rationality in bargaining situations and to observe material selfishness and opportunism, as the UG challenges directly the assumption that agents maximize their payoffs in all scenarios (ibid.). The overarching result found by the authors is that the UG in fact refutes the standard assumption of material opportunism by high rejection rates of equilibrium offers. However, this is not enough to completely rule out a broad assumption of rationality as some agents accept equilibrium offers.

The majority of results show equal splits of endowments as a common occurrence and such offers are robust. In a standard UG, offers range from 40 to 50%. As for rejection rates, it is observed as offers approach 20% of the endowment, rejections tend toward zero. Such behavior by responders indicates they not only care about their own payoff but also the payoff of the proposer. When responders

perceive proposer payoffs to be too high, they become frustrated. When offering significant amounts, proposers are either aware of the willingness to reject by responders or have genuine fairness concerns, rendering the UG an ideal tool to use when studying theories of other-regarding payoffs.

When the UG is played repeatedly, backward induction has provided reasonable experimental results. When agents are partnered using a stranger matching mechanism, it seems proposers learn the acceptance threshold by first making varying offers and once found, adhere to such norm so as to avoid rejection.

There have been various modifications of the UG, such as the DG and IG studied in this thesis. With respect to the DG, the authors mention experimental results confirming proposer behavior is guided by concerns for fairness, and despite no punishment mechanism available to the receiver, some generosity is expected. However, results may vary and depend highly on the context in which the DG is played.

Other modifications include the addition of players to the UG. In this case, three-player variations are of specific interest which are similar to those mentioned in the theoretical section of this thesis. Such games present a novelty in the study of middleman behavior. Authors observe offers made by middlemen to the passive receiver are highly influenced by the initial proposer's offer.

Various studies have attempted to explain UG behavior using socio-demographic factors, such as age, gender, income, and education, but results seem to be inconclusive. When considering the influence of personal features on behavior, behavior has been predicted in whichever hypothesized direction. Cultural factors have also been deemed unsystematic as it is difficult to test differences across cultures for various reasons. With regard to partner selection, females and low-income individuals are more popular than males or high-income individuals. Various studies have also found in-group partner preferences more common than those from the out-group. In this thesis, an attempt to identify in-group partner preferences will be made utilizing the concept of homophily and network analysis measures.

In sum, the authors identify three phases of the evolution of the UG. First,

the game was a tool used to demonstrate the inadequacy of assumptions in popular economic models. Second, the contradicting results from early experiments inspired economists to attempt to explain the assumption-defying actions taken by agents. Third, today the UG has become the workhorse for social scientists as it is used in many fields and studied in many different ways (Güth and Kocher 2014).

The empirical findings of agent behavior in the UG indicate proposers have equitable other-regarding beliefs or they fear rejection by responders. One way that economists have attempted to separate this behavior is by taking away the ability of responders to reject offers (Camerer 2003). This variation of the UG is the DG.

3.2.2 Dictator Game

As previously described, the dictator game has the same setup as the UG in which the proposer or "dictator" begins with an initial endowment and must decide how much to give to a second player. Here the second player can be referred to as a receiver since there is no action taken and they must accept any offer made by the proposer.

The DG was first introduced in 1986 as an attempt to show experimentally that people are motivated by a sense of fairness (Kahneman, Knetsch, and Thaler 1986). The authors ran a DG experiment in order to understand the frequency of voluntary fairness. The results showed that despite the fact that proposers could not be punished, they still gave a significant amount.

Another early study conducted to evaluate fairness using the DG and UG was in 1994 by Forsythe et al. (1994). The seminal paper's main objective labeled the fairness hypothesis, was to determine if offers different from expected equilibrium predictions can be explained by a concern for fairness by proposers. Authors expected if high offers are given only because of fairness concerns, the results from UG and DG should be the same. Additionally, the authors developed the pay hypothesis, which states the distributions in games with and without payment are

the same. They tested such a hypothesis by conducting experiments (Forsythe et al. 1994).

At first glance, offers were significant in both the UG and DG, which indicates that participant behavior is not completely due to fairness concerns. The results of the experiments led to the rejection of the fairness hypothesis with statistical significance. In the five-dollar DG with pay 36% of participants gave nothing and 22% gave an equal share or better. In the five dollar UG with pay no participant gave zero and 65% gave at least an equal share. In the ten-dollar DG 21% offer zero and 21% give an equal split. In the ten-dollar UG, no participant offered zero, and 75% offered at least an equal split. When the stakes were increased from five to ten, rejection rates dropped.

The authors credit spitefulness as the reason why some positive offers with less than an equal split are rejected. Agents feel they are treated unfairly and therefore seek to punish the other acting unfairly in their eyes. The authors offer some alternative explanations for the differences in UG and DG behavior, such as anonymity and incomplete information. The study by Forsythe et al. (ibid.) inspired a slew of research on the dictator game as a way to isolate fairness concerns and altruistic other-regarding behavior. Next, a review of a meta-study by Engel (2011) is conducted to highlight some of the main findings from the past years.

The meta-study seeks to answer one question: what is the willingness to give of the dictators? Using the mean portion given of the initial endowment as a dependent variable, Engel (ibid.) runs various regressions to observe which aspects may have an effect on dictator generosity. At first, a meta-regression is used to observe overall effects and then multiple regressions are used in order to isolate certain variables. The intricacies of the meta-study are not the objective of this thesis and we therefore only report on the final results found. The study uses various articles which provide 616 treatments for DG.

It was found that dictators gave receivers on average 28.3% of the endowment (ibid.). This is an astounding result, especially given that according to the assumption of rational and payoff-maximizing agents, dictators should offer nothing

at all. Some overall distributional statistics show 36.11% of all participants give nothing to the recipient, 16.74% choose to split the endowment equally and 5.44% give everything.

In the meta-regression analysis, dictators were found to give less when uncertain about the intended kindness of others. Stake sizes in the papers studied range from $0 to $130, with an average of $21.77. Dictators give less as the stakes increase.

When experimenters implemented a design with multiple rounds, dictators are less generous as amounts decrease by less than 10%. Since repeated dictator games are run in the thesis, data can be compared with (Bahr and Requate 2014) as they run a one-shot game with a very similar structure. When there are multiple recipients dictators give much more, with generosity increasing by more than 10%.

If observing the effects of the variables studied on generosity by the model chosen in the paper, one can check for consistency of the effects. Specific interest is taken in the effects of multiple recipients, repeated games, social distance, and student participants. For multiple recipients, in five out of seven models, there is a positive effect on giving. When looking at whether being a student or a non-student affects generosity, in only one model out of five did students give more than non-students. In all three models tested for effects of repeated rounds, it is shown to have a negative effect on generosity. When considering social distance as a factor, it is unclear as half of the models show a positive effect and half show a negative effect. The takeaway from these models seems to be that the DG results are dependent on the context in which they are implemented or carried out.

Some final overall statistics by the author show 63.89% of all participants give and therefore 36.11% give nothing. When comparing these results to the theory, more often than not people violate the rationality assumption. When dictators who are willing to make some sort of donation decide to give, they give on average 42.64% of the endowment.

The DG can be used to study various types of social interactions as it is an easy experimental tool to implement in order to observe generosity. It is even possible

to model DG experiments by just using dictators and not having any recipients. The interest of this study is in understanding the perception of dictator offers by recipients and one way of doing so while leaving the power to the dictator is to modify the game to be an IG. This rejection of an offer is considered to be a voice that can be used to express discontent. It is expected to see a difference despite theoretical equilibrium equality in DG and IG due to only the existence of the voice option by responders.

3.2.3 Impunity Game

Another, less-studied variation of the UG is the IG, in which the responder can accept or reject the offer from the proposer but with different payoff results. If the responder rejects, they receive nothing, and the proposer receives the amount kept for themselves. This type of variation allows responders to have a voice in order to express their discontent with an offer, but at their own cost.

One of the first studies which tested the IG was Bolton and Zwick where the authors attempted to disentangle experimenter effects and the fear of punishment from an unfair offer in a UG. They executed three experiments, a standard UG, a UG with complete anonymity, and an IG (Bolton and Zwick 1995). They found that in the IG, participant behavior matched that of the game theoretic UG perfect equilibrium where proposers offer the minimum amount or nothing at all.

The paper tests two hypotheses: anonymity and punishment. The anonymity hypothesis attempts to observe experimenter effects. In more detail, given that experimenters can trace choices back to specific participants, subjects may believe the experimenter's view of them will be negative if they exhibit self-interested behavior. The punishment hypothesis posits that the rejection by responders constitutes a punishment strategy.

The three main assumptions by the authors are that each player prefers more money to less, participants know such information and proposers can calculate the optimal offer. Starting from these basic assumptions, two different first assumptions are developed in order to test the hypotheses. The first, related to the

anonymity hypothesis, is the want for more money to less is reduced by a desire to appeal more equitably. The second, related to the punishment hypothesis, is the want for more money by the responder is changed by the preference for disagreement when offers are deemed small relative to the proposers kept share. In other words, responders do not show fairness concerns in general but are concerned only about the fairness towards themselves.

The results of the three games played show some surprising results. In the standard UG, 30% of proposers chose an equilibrium offer. In the anonymity UG, 46% chose an equilibrium offer. In the IG, 100% of proposers chose the equilibrium offer. The IG results show a lack of possible experimenter effects as players gave the bare minimum or nothing. It also shows the punishment mechanism in the UG indeed is a large factor in determining proposer fair offers and deviations from equilibrium are driven by the desire to be treated fairly (Bolton and Zwick 1995).

In 2009, Yamagishi et al. (2009) conducted a study consisting of three experiments with the objective of investigating social preferences of fairness and punishment in the UG. They used a standard UG, a standard IG, and an IG in which the rejection signals remained private and the proposer was unaware of the rejection option (ibid.). The authors assume rejections in the IG will decrease with respect to the UG since under a social preference for inequity aversion, players should not reject unfair offers. However, they expect the private IG rejection signals to be almost nonexistent as such behavior is unexplainable by any social preference theory.

The results of the UG show a 70% rejection rate of extremely unfair offers. In the standard IG, extremely unfair offers were rejected at a rate of about 30-40%. The rejection rates in the private IG were surprisingly similar to those of the standard IG. Such results are in contrast with the study of Bolton and Zwick (1995), where almost no offers were rejected in the IG. The authors posit the high IG rejection rates are explained by a social preference for inequity aversion, but that such preferences explain less than half of the rejections in the UG. The rejection rates between the two IGs were almost equal and statistically significant.

The results of IG rejections can be interpreted as a sort of symbolic punishment, but this explanation loses viability since offers are rejected privately (Yamagishi et al. 2009). To explain such irrational behavior, the authors look to emotions. They view rejection as an emotional response of anger to the reception of insults or appearing as easily exploitable. If a responder is angry they are constrained from accepting unfair offers and may suffer further losses as such behavior becomes known. Responders with a reputation for being angry may receive even more inequitable offers as proposers seek to provoke such emotions, especially when no punishment option is available to responders. Responders use this anger to override the losses they incur by rejecting positive offers in an attempt to preserve their reputation and pride.

Continuing on the basis of an emotional explanation of IG offer rejections, we cite the study by Balafoutas and Jaber-Lopez (2018) which investigates the role of emotions in the IG by subjecting participants to time constraints. By using the framework of dual process reasoning, System 1 and System 2, the authors study whether players are quick to reject offers in short time periods and whether they accept offers with more time to think. In short, System 1 represents intuitive, quick thinking, and System 2 represents elaborate, methodological thinking. The experimental design follows a two-by-two between-subjects structure in which players are subject to a private or public IG and a short or long time window. The results show offers are highly rejected under short time windows in both private and public. By provoking subjects' System 1 process with the implementation of a short time window, the authors confirm the role of emotions as a commitment device since rejections are higher under such windows.

In a recent study by Crosetto and Güth (2021), behavior in an impunity game is monitored using an fMRI device in order to distinguish between intuitive and deliberate actions. They experimenters vary the pie size and allow proposers to make only unfair offers. The experimental design was quite creative and in order to account for individual heterogeneity, two laboratories were used. The first, a traditional experimental economics laboratory, hosted 240 proposers and

the 24 responders were in a separate fMRI laboratory. The main purpose of using the fMRI device is to avoid priming subjects with time constraints, in the sense that if players know they are under time constraints they will decide on their strategy in advance. The results indicate an intuitive response is subject to player heterogeneity which is categorized by opportunistic, fairness-minded, and monotonic types. Findings show those who almost always reject offers are quicker to do so and those who almost always accept take their time. However, on average, offer acceptance is faster than offer rejection. In general, the authors point out that the role of subject heterogeneity and self-priming are the main drivers of response rates and vary depending on player type (Crosetto and Güth 2021).

A study by Di Cagno et al. (2018b) shows how a weak social influence can be quite strong when observing counterfactual generosity intentions. Participants are asked to provide threshold levels and generosity intentions and are then matched in pairs. An impunity game, yes-no game, and ultimatum game are played in order to vary the level of strategic considerations. The players observe the generosity intention of another player with whom they do not play, hence the study of "weak" social influence. The observed offer has no relevance, but players seem to be influenced by such observations. The authors find that in the impunity game, the weak social influence of conditional generosity has a strong influence on player behavior (ibid.).

In a similar study, the same authors focus on gender differences when observing conditional generosity. They find, as in the previous article, a relation between factual generosity and counterfactual generosity. The generosity of females in the modified impunity game is less than males. Females however seem more tolerant of selfishness and give more when it is seemingly needed by a responder. In turn, females give less in general but are also inclined to accept lower amounts (Di Cagno et al. 2018a).

The equilibrium offers in the IG and DG should be the same. Therefore, a test between the two institutions should show the power of the existence of a voice.

3.2.4 Three-Player Games

The study of three-player games, in the specific case of DG and IG, is limited. A majority of the research conducted is on two-player games with respect to DG and IG. The three-player IG used in this thesis, to our knowledge, has not been used in experimental studies. There have been a few studies conducted on three-player DGs, but most used dummies as the third player since it was not really optimal to have a participant show up just to play a passive role. There have also been quite a few studies where the endowment is not shared sequentially, and sometimes the proposer selects which of the other two to give to or the third player acts as a judge or mediator between participants playing a standard bargaining game (Güth and Kocher 2014).

The study closest to the research conducted in this thesis that we are aware of is Bahr and Requate (2014). In their study, they measured indirect reciprocity by observing if the generosity of the middleman was influenced by the generosity of the proposer. The structure of the DG used in their design is identical to the one used in this thesis. Differences arise as repeated games are conducted in this experiment, whereas they run a one-shot game. Both studies have a form of social interaction, but they differ in the sense of actual versus desired. The experimenters have their participants interact socially by playing a board game together in person before playing the DG. Whereas participants are asked who they would like to play with, a hypothetical form of social interaction based on characteristics. The main scope of their study is to investigate indirect reciprocity, which would observe if the proposer is generous to the middleman, then whether or not the middleman reciprocates by being generous toward the final recipient. The results show an overall increase in generosity compared to the two-player DG. In regard to the proposer's behavior, a regression of various demographic variables and social interaction on the portion given by the proposer. They find generosity is increased by social interaction and females give more. Investigation of middleman behavior shows a decline in average amounts given when the proposers' offers decrease. When the proposer gives two-thirds of their endowment, middlemen

reciprocate by giving an equal split over 75% of the time.

In another three-person DG experiment, Greiner, Güth, and Zultan (2012) investigates the importance of communication on generosity and discrimination in offer values by dictators. The difference in the DG structure of this thesis is the sequentiality of moves in our DG. Authors allow the dictator to allocate a pie between themself and two other receivers. These receivers have the ability to communicate with the dictator which varies based on the treatment they assigned. The three treatments are no communication, video-only, and audio-visual. The results indicate higher donations when the receiver is heard and seen, hence in the audio-visual treatment. Whereas in the video-only treatment, generosity is not observed, however, discrimination between receivers is seen by using elicited social ratings. There is also a high correlation between social ratings and generosity. Therefore, the authors conclude the impression made by receivers significantly impacts the amount received by dictators (ibid.).

In a study by Guth, Huck, and Ockenfels (1996), they use a three-person UG design to observe if the proposer is altruistic or just scared of rejection. The game structure is very similar to the one used in the three-player IG in this thesis. The authors implement incomplete information in the form of limiting the knowledge of pie size (large or small) by the second proposer (or middleman). When the pie size is large, the first proposers pretend to have a small pie and give less, therefore leading the middlemen to believe they had a small pie. This behavior indicates a method of hiding behind greed as first proposers want to appear victim to a small pie and thus only able to give little. The main effect of the experiment is increasing greed as unfair offers go unrecognized. In other words, players able to hide greed want to appear fair, as mentioned before. While proposers with small pies are unable to hide their greed, they balance the desire to maximize payoff by taking more for themselves and the fear of rejection (ibid.).

Three-player games like UG, DG, and IG are less studied experimentally with respect to two-player games. The importance of exploring the addition of a third player is believed to be highly applicable to real-world interactions. Simulating a

three-person sequential money-sharing game can represent many scenarios such as charitable giving, government subsidies, the role of financial intermediaries, and inter-organizational relationships. All presented scenarios can represent interactions of three individuals or entities and varying the social distance between them can reveal useful insight into their relational dynamics. Introducing three-player games into the experimental setting will help understand the behavior of players in certain positions, which can be translatable to the aforementioned situations.

3.3 Social Distance

In the previously reviewed literature, experimenters often varied the social distance between players using different mechanisms within the game or completely different game structures. The focus of this portion of the literature review is to focus on principal studies which study social distance within bargaining games. As the goal of this thesis is to compare the IG and DG, if the DG is considered first, the dictator has unidirectional power, and recipients cannot respond. If the social distance is reduced by providing the recipient with a way to express their opinion about proposed offers, then

The first study we review was a seminal paper that discusses the possible effects structural changes in games can have on behavior. Frey and Bohnet (1995) define three institutional dimensions: property rights, social interaction, and opportunity set. With respect to the DG, property rights indicate the level of possession felt over the endowment. The authors define four categories: undefined and earned property rights, and property rights defined by gift and by luck. Property rights are thought to impact fairness behavior based on how the initial endowment is framed. The social interaction dimension implies the higher the interaction, the more likely fairness norms will be enacted due to social sanctions on the individual's possible actions. The authors define three categories of interaction that are seen within the institutional framework: anonymity, identification, and communication. Under anonymity, fairness should remain nonexistent, especially in the context of the DG. When participants are identifiable fairness should increase as

a sense of guilt may be felt in case they believe acting selfishly will appear unfavorable from the others' perspective. The opportunity set dimension is defined by the actions available to players in a game. Varying the opportunity set can impose or remove restrictions on player behavior. In the context of this thesis, we are focusing on the difference in the opportunity set between the DG and IG. The results show communication in the DG has an equally strong influence on generosity as the punishment mechanism in the UG. When communication is allowed from an anonymity scenario, fairness increases by 44%. The study overall stresses the importance of institutional conditions and the impact they can have on experiments (Frey and Bohnet 1995).

Hoffman, McCabe, and Smith (1996) study the influence of experimental procedures and instructions on social distance in the context of various games, including the DG. The authors predict that the difference in outcomes of similar DG structures stems from the social distance between the dictator and recipient and the dictator and the experimenter. Various experiments are conducted, beginning with highly restrictive environments ensuring large social distances and then removing elements in steps to observe the effects. The prediction is a decrease in social distance will result in an increase in generosity. The research hypothesis is confirmed and the results show an inverse relationship between social distance and DG offers (ibid.). This discovery shaped the way experiments were conducted in laboratories, where even the smallest aspect of the interaction between the experimenter and participant was controlled for.

Charness and Gneezy (2008) were curious to observe if knowing the family names of other players in the DG and UG had an effect on generosity. They implement a two-by-two experiment design where the games were varied and whether or not last names were revealed to the proposers. They argue by showing the last name to participants should decrease the social distance and therefore impact generosity. The experimenters conducted the session in two different universities, with proposers from one and responders from another. The participants were divided into groups randomly by game and had to decide how to allocate or divide the

endowed points. In the DG, allocators who were shown the family name of the opponent gave 50% more than those who were not shown the name. These differences show statistical significance. The frequency of zero offers was also different between the name-revealing treatments. In the UG, there was no statistically significant difference in generosity by participants who were shown or not shown the family name. This indicates the strategic interaction imposed by the structure of the UG crowds out the desire to be generous. The implications of this study posit that social distance has the ability to affect behavior even when face-to-face interaction is not permitted (Charness and Gneezy 2008).

In this thesis, social distance is reduced intentionally in order to observe if the difference in opportunity sets of the dictator game and impunity game are significant. One measure to decrease the social distance in the thesis experiment is to impose repeated rounds of gameplay to establish reputation effects and assign participants to small groups of six in which they play games with random role assignments. The intention is that repeated interaction within the group will encourage generosity. The literature finds in repeated games, offers decrease over time, but reputation effects can arise, initially increasing generosity (Camerer 2003; Engel 2011). When dictators are offered the chance to give to a charity they often give more than when giving to a single person (Eckel and Grossman 1996). The experimental setup used in this thesis subjects participants to a charity question in an attempt to put them in the mindset of a charitable donation scenario. An additional player is added to the DG and IG in order to reduce social distance, a measure shown to increase generosity (Camerer 2003; Engel 2011). A random matching mechanism in which players indicate who they would like to play with in order to encourage tie formation. Which segues into the next subsection on homophily.

3.4 Homophily

Before introducing the experimental literature on homophily, some studies on endogenous network formation must be introduced to understand the mechanisms

which allow for the study of homophily.

3.4.1 Endogenous Network Formation

Bala and Goyal (2000) develop a theoretical model for noncooperative network formation for both two-way and one-way (or undirected and directed, respectively) networks. When a strict Nash equilibrium is required, directed networks converge to a wheel network in which costs are distributed equally. When evaluating undirected networks, the equilibrium converges to a star network and thus costs are shifted to the center player. While equilibrium analysis is currently outside the scope of this research, visualization of networks will allow for the observation of possible equilibrium networks in the experiment.

Conte, Di Cagno, and Sciubba (2015) conduct an experiment to investigate behavioral types in a network formation game in order to explain deviations from game theoretical equilibrium network formation. The authors define three strategy types, myopic best response, reciprocator, and opportunistic, and place players in the game into one of the three categories. Using a mutual tie requirement, players must form links over time in repeated rounds with costs for direct links. The results show 40% of participants were myopic best response and opportunistic types, and 37% were reciprocator types. The percentage exceeds 100% as players can be defined under both strategies. The authors find significant results in explaining 74% of the strategies and display that they are deliberately not chosen randomly by players. By controlling for the overlap in strategies, approximations of actual types are 45% myopic best response, 30% reciprocator, 25% opportunistic (ibid.). The results have implications on theory as well as policy as the prominence of strategies other than myopic best response indicates deviations from theoretical equilibrium. This indicates people may not always behave rationally when establishing network ties, something done almost on a daily basis. This thesis shows evidence of non-equilibrium networks when choosing DG and IG game partners.

Di Cagno and Sciubba (2010) conduct a study where endogenous network formation is observed experimentally in the context of a trust game. The study

consists of three treatments. The first subjects participants to a network game first where connections are established based on potential benefits, followed by a one-shot trust game. The second has the same content but in a different order, the trust game first and then the network game. Finally, a baseline treatment consists of only a trust game. The purpose of the study is to investigate how networks impact trust and trustworthiness. The results indicate the behavior of tie formation influences the level of trust and to whom it is directed. Authors found lower trust levels after network games, indicating possible disappointment effect by the tie results. Reciprocal generosity is found to be greater toward players with which stable ties are maintained. Findings also indicate an effect of continuation play on trust and trustworthiness when the trust game is played first (Di Cagno and Sciubba 2010). The experiment in this thesis is similar to this study structurally but differs by the sequentiality in treatment order. Our objective is not to observe the effects of network formation on gameplay, but to observe whether certain types of players prefer to play with similar types.

In a similar study to this thesis conducted by Brañas-Garza et al. (2010), a network is elicited, and then a DG is played. The objective of the paper is to observe if highly connected players are more generous after controlling for framing and social distance effects. To modify social distances between treatments, the experimenters told participants they would be playing with a friend in one treatment and with someone from their general group in the other. For framing effects, two treatments were devised, one with verbiage indicating the reliance of recipients on dictator actions. They compare the relative network position of players with their generosity level, something similar is done in this thesis but on a network-wide scale to observe overall preference patterns. Four measures are utilized to observe social integration, in-degree, out-degree, reciprocal degree, and betweenness centrality. The results of regression analysis show the first two measures have little effect on generosity, but the last two have significant effects on both selfish and altruistic behavior. 19% of dictators gave zero and 11% gave an equal split. With regard to treatment effects, both the changes in framing and social distance had a

positive and significant effect on generosity when compared to the baseline treatment. The authors, like in this thesis, used the assortativity coefficient to observe the similarity in ties and observe a positive measure, indicating that more social players tended to connect with more social players.

3.4.2 Homophily

Currarini and Mengel (2016) study the relationship between homophily and in-group biases. The general structure of their experimental session is similar to the one used in this thesis and consists of endogenous or exogenous partner matching with games played subsequently. The authors measure homophily by eliciting a willingness to pay for a connection with an in-group member. In-group bias is measured by the differences in game behavior based on participant identity. In the endogenous treatment, the results show 47% of agents are strictly homophilous, or willing to pay more for an in-group match. 43% are neutral and 10% are strictly heterophilous. Authors also find different game behavior between endogenous and exogenous treatments with regard to relinquishing choice to the other player indicating increased trust in the endogenous treatment. It is also noted that in-group biases are larger in the exogenous treatment, with players exhibiting higher generosity toward in-group members. While in-group biases almost disappear in the endogenous treatment. The study notes that endogenous matching cannot explain such differences in behavior and it must have been due to a change in the matching institution. By investigating the post-experiment questionnaire, the authors find that risk-averse players are more likely to pay for an in-group match. In conclusion, the study finds allowing homophilic connections can help reduce in-group biases (ibid.).

In the experimental economics literature, most studies conduct analyses of in-group and out-group biases, such as Güth, Ploner, and Regner (2009), where authors observed beliefs for in-group favoritism using dictator games. In the first experiment, when comparing dictator generosity between different groups, almost twice as much is given to in-group members with respect to out-group members

when group identity is publicly known. When only the dictator knows the group membership, offers are substantially lower. In the second experiment, dictators can choose to expose their beliefs to the recipient or not. Results show dictators avoid learning recipient identity when it involves revealing their own. Authors find an in-group bias but it is considerably lower when compared to when recipients know the dictator's identity. It is also found the same group membership of players was expected to increase generosity. Overall the authors conclude group identity has a positive effect on in-group favoritism, by way of increased generosity (Güth, Ploner, and Regner 2009). While this thesis does not specifically investigate in-group biases, measures of homophily could indicate such tendencies and prompt further analysis. In the experimental design groups of six are randomly formed and it is observed whether or not subgroups form within these already designated groups based on characteristic information.

In a working paper, Charroin, Fortin, and Villeval (2021) conducts a real-task effort experiment and subsequently observes if participants display homophilic preferences by seeking similar ties with others. The experiment consisted of three environments that varied the matching process, a baseline with random matching, another with exogenous matching, and finally endogenous matching. Participants of the experiment repeatedly perform a task to earn money. Before the task, they are given the option to choose how their earnings will be reported to their potential partners. In automatic mode, participant scores are calculated by the computer and reported as is. In manual mode, the participant has to calculate and self-report their task outcome, allowing for the opportunity to cheat. The experimenters sought to identify how and if the matching process resulted in peer effects of conformity or homophily. Results from the endogenous matching treatment show that those who chose manual mode and lied about their earnings in the task, were more likely to select other peers who had done the same. Whereas those who chose automatic mode or manual mode but did not misreport earnings showed no signs of homophilic matching. From the exogenous matching treatment, when exhibiting dishonest behavior, a positive relation was found between the size of the lie and

reported performance. While this review is overly concise with respect to the analysis performed in the paper, the overall results show that when participants have the ability to choose their partners, homophily is observed since participants seek to confirm the norms willing to adapt (Charroin, Fortin, and Villeval 2021).

This concludes the literature review section of the thesis. Various studies have been reported regarding experimental results. Theoretical reviews were not covered as the thesis is primarily experimental and hence much detail on theory was not covered. However, many models have been developed to observe homophily and many of them are applied to existing networks. Future work stemming from this thesis is hoped to contribute to literature similar to those reviewed here on endogenous formation in experimental settings. By manipulating the experimental design, motives for homophilic preferences may be discovered and then investigated in larger real-world contexts. In light of the social distance effects on generosity investigated by the thesis, it is hoped a valuable contribution to the literature on impunity games is made. It is believed the IG represents many scenarios in everyday life and should be considered a valid institutional design when investigating bargaining or generous behavior. Now the experimental design and protocol are introduced.

4 Experiment Design

4.1 Experiment Summary

A summary of the main experiment events is briefly provided, with more details to follow in the section.

The experiment was conducted using the online platform Webex, following the lab-like protocol developed by Buso et al. (2021). The experimental design consists of three distinct phases. Upon logging into the experiment, participants were randomly assigned to a group of six individuals, without any predetermined criteria.

Phase I involved participants answering various demographic questions, as well as a specific question related to charity and donation amounts.

In Phase II, participants were introduced to either the dictator game (DG) or the impunity game (IG). They were provided with information about the gender, charity choice, and donation amount of the other participants in their group. Using a rating scale ranging from zero to five, participants indicated their preferences for playing the DG or IG with specific individuals from their group. These preference ratings were then used to match participants in gameplay roles. Subsequently, the DG or IG was played for a total of 12 rounds.

Phase III involved playing the same DG or IG game again, but with the addition of explicit information about the previous round results of both games within the group. One round was randomly selected, and payoffs were distributed accordingly based on the outcomes of that round. The experiment is now concluded.

4.2 Experiment Protocol

The experiment was conducted online following the protocol of Buso et al. (ibid.) in which a laboratory is replicated using the Webex platform. The experiment was conducted in the Italian language and 60 Italian students from LUISS Guido Carli University were recruited and invited via ORSEE (Greiner 2015). The experiment program was developed using oTree (Chen, Schonger, and Wickens 2016). Two

sessions were conducted on April 27, 2023. The first session was the DG and the second the IG.

The lab-like protocol requires the opening of 30 separate Webex rooms. Two experimenters opened 15 rooms each and invited all participants via the Webex invitation process. For the DG session, 20 out of 30 participants entered the online rooms and due to the matching group's requirement of six per group, two were informed that their participation was no longer needed. They were awarded a five-euro participation fee and disconnected. For the IG session, 24 out of 30 invitees entered the online rooms and the experiment was conducted as so.

To prevent explicit participant interaction, controlling for the use of cellular or computer communication devices was performed, but it cannot be fully guaranteed that participants did not communicate during the experiments.

Upon participant arrival in online rooms, their identification was verified by the presentation of a valid identification card and they were asked to confirm possession of an active PayPal account. oTree links were then sent using the chat function of Webex. Once all participants were logged in to oTree, they are randomly assigned into groups of six by the program and the instructions were played into the microphone via a prior recording. Participants are informed their identity will remain anonymous to the other participants and experimenters. The experiment proceeded as intended. More details of the different phases follow below.

4.2.1 Phase I

After the initial instructions are read, participants answer some demographic questions, followed by a specific charity donation question (available in Appendix A). For this experiment, the only relevant demographic datum required is gender, irrelevant demographic questions are asked to avoid demand effects regarding gender (Weimann and Brosig-Koch 2019).

For the charity question, the initial scenario is depicted in such a manner as to ask participants to donate the remaining salary to charity after all of their normal

and extracurricular expenses for a month. The purpose of such framing is to get the participant to self-report a measure of generosity that resembles closely the DG or IG. Bargaining games are often played with windfall profits, or money out of the blue. Hence the charity question relates well to the experiment scenario in which proposers are endowed with 23 euros in each round.

4.2.2 Phase II

Participants then received additional instructions about Phase II. First, the DG or IG is introduced. Second, they are shown the following information about the others in their group in a table: gender, charity chosen, and donation amount. They are then requested to rate others in their group that they would like to play in a DG or IG on a scale from zero to five. Zero indicates no desire to play and five indicates a strong desire to play. Participants can rate more than two players. To provide incentives for preference selection, one participant's preferences will be selected at random and implemented in the next round.

Participants are then notified that they will play 12 rounds of the DG or IG and before each round, they will rate the other participants. During the games, they are shown the same table of information with gender, the charity chosen, and the donation amount. Participants' payoff in each round is the amount they keep for themselves. The payout at the end of the experiment will be determined by the random selection of a phase and round. The payout then is the participant's round payoff, plus a five-euro participation fee.

4.2.3 Phase III

After the first 12 rounds of gameplay. There is a pause for additional instructions. In Phase III participants are given additional information, which is the amount given in the previous round by all members of the group. Participants now play another 12 rounds of the DG or IG with the same format in Phase II. After the 12 rounds have been completed, the experiment is finished, and participants are paid via PayPal.

4.2.4 Important Experimental Notes

During the pilot experiment, participants exhibited a significantly longer completion time for the IG compared to the DG. Unfortunately, this discrepancy was not taken into account when scheduling the experiment, resulting in the IG session running longer than anticipated. As a result, some participants had to leave the experiment prematurely, with a few departing at the beginning of the 15th round.

To address this issue, the two experimenters made the decision to terminate the IG session prematurely after the 18th round. They continued playing in place of the participants who had exited early. The limitation imposed by the early exits of participants is considered when conducting the statistical comparison between the two sessions. Detailed discussions regarding the experiment results will be presented in the subsequent section.

Following the completion of the experiment and the initiation of data analysis, a discrepancy in the data output was discovered. There was a matching error where the amounts given by participants to others did not correspond to the amounts assigned based on their partners. It appeared as if two individuals assigned as X gave their portions to the individuals assigned as Y, resulting in most Y participants receiving the same amount. Similarly, when Y participants gave their portions, two Y individuals were selected, and their amounts were assigned to the Z participants, leading to similar amounts being received by the Z individuals.

Unfortunately, this matching error has compromised the accuracy of the results, and it has become challenging to analyze partner preferences accurately. Participants received amounts from individuals who did not intend to give to them, and vice versa. Additionally, assessing the role of Y participants based on what they received and from whom has become problematic.

Despite these challenges, valuable insights can still be derived from the experiment. Given that the rounds are analyzed dynamically and average portions are utilized, participant behavior can still be accurately evaluated. Using portions as a measure of generosity renders the amount received less relevant. Regard-

ing preference elicitation, a more qualitative analysis is feasible, considering the possibility of incorrect information being displayed in the payoff tables, thus making it difficult to determine preferences based on game behavior. Consequently, the focus shifts towards identifying the characteristics that participants prioritize when selecting partners. The matching error has been rectified and will be closely verified before the next session is conducted. Now the results of the experiment are analyzed.

5 Analysis

Over the two sessions of the pilot experiment, 42 participants participated, for a total of 288 game observations. *R software* is utilized to analyze and display experimental data (R Core Team 2018). Specifically, the *Statnet* package is used to analyze and visualize the preference networks (Pavel N. Krivitsky et al. 2003). The *homophily* package is utilized to analyze homophily and assortativity (Knapp 2019). The *perm* package is used to execute permutation tests for the two-sample statistical mean comparison of our experimental data (Fay and Shaw 2010). Finally, the *ggplot2* package is consulted to graphically display data (Wickham 2016).

First, some descriptive statistics are shown, and then hypothesis testing is performed.

5.1 Descriptive Statistics

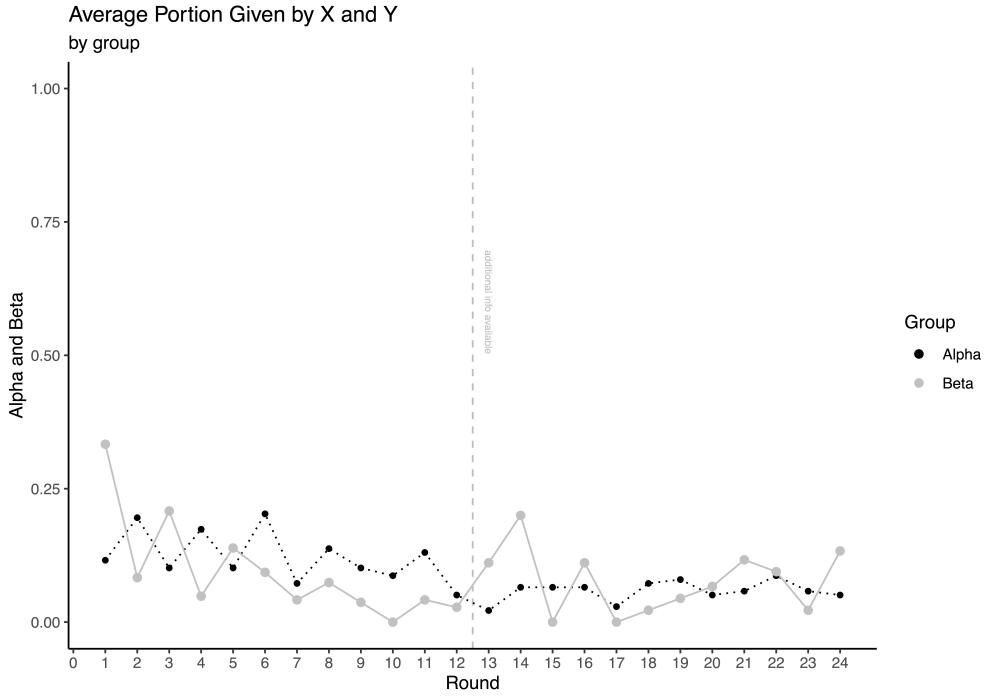
For the DG session, the gender distribution is as follows, nine males and nine females. The average age of session participants was 21.22 ($SD = 1.52$). Participants earned on average 14.11 euros ($SD = 7.39$). The average portion given by Xs over all rounds, denoted by $\bar{\alpha}$ is 0.091 ($SD = 0.048$). Thus the average euro amount shared was around 2 euros. Females gave on average around 12% of their endowment as X and 12.5% of the amount received as Y. Males gave on average 6% of their endowment as X and 13% of the amount received as Y. The average portion given by Ys over all rounds, denoted by $\bar{\beta}$ is 0.085 ($SD = 0.078$). The average $\bar{\alpha}$ and $\bar{\beta}$ given in each round can be observed in Figure 5.

At first look, we can see the behavior of X levels out after the additional information is introduced in Phase III. While the average β per round is quite sporadic.

The charities selected are as follows: Donna Differenza = 1, Green Cross = 4, Save the Children = 11, and None = 2. The average amount donated to selected charities is 22.56 ($SD = 18.58$), with a median of 20.

For the IG session, there were nine males and 15 females. The average age of the session participants was 22.46 ($SD = 1.79$). Participants earned on average 12.83

Figure 5: DG Average $\bar{\alpha}$ and $\bar{\beta}$

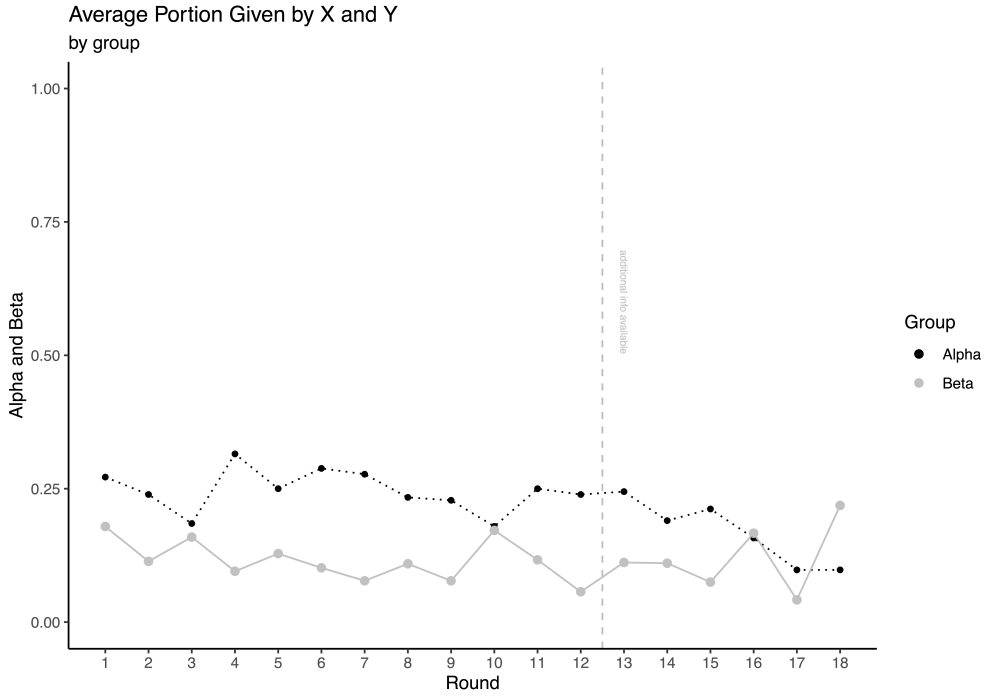


euros ($SD = 8.47$). The average portion given by Xs over all rounds, denoted by $\bar{\alpha}$ is 0.220 ($SD = 0.060$). Thus the average euro amount shared was around 5 euros. Females gave on average around 21% of their endowment as X and 23% of the amount received as Y. Males gave on average 22% of their endowment as X and 14% of the amount received as Y. The average portion given by Ys over all rounds, denoted by $\bar{\beta}$ is 0.117 ($SD = 0.045$). The average $\bar{\alpha}$ and $\bar{\beta}$ given in each round can be observed in Figure 6.

The charities selected are as follows: Donna Differenza = 2, Green Cross = 11, Save the Children = 7, and None = 4. The mean amount donated to selected charities is 31.63 ($SD = 33.62$), with a median of 15.5.

Given the similarities between the self-report donation question and actual game scenarios, we want to observe whether or not the players' self-report behavior matches game behavior. To provide an overall picture of generosity we observe consistency between self-report generosity and the average portion given as X. There were eight players in each of the DG and IG who gave large amounts in the self-report donation but had an average of less than half of such self-report for the

Figure 6: IG Average $\bar{\alpha}$ and $\bar{\beta}$



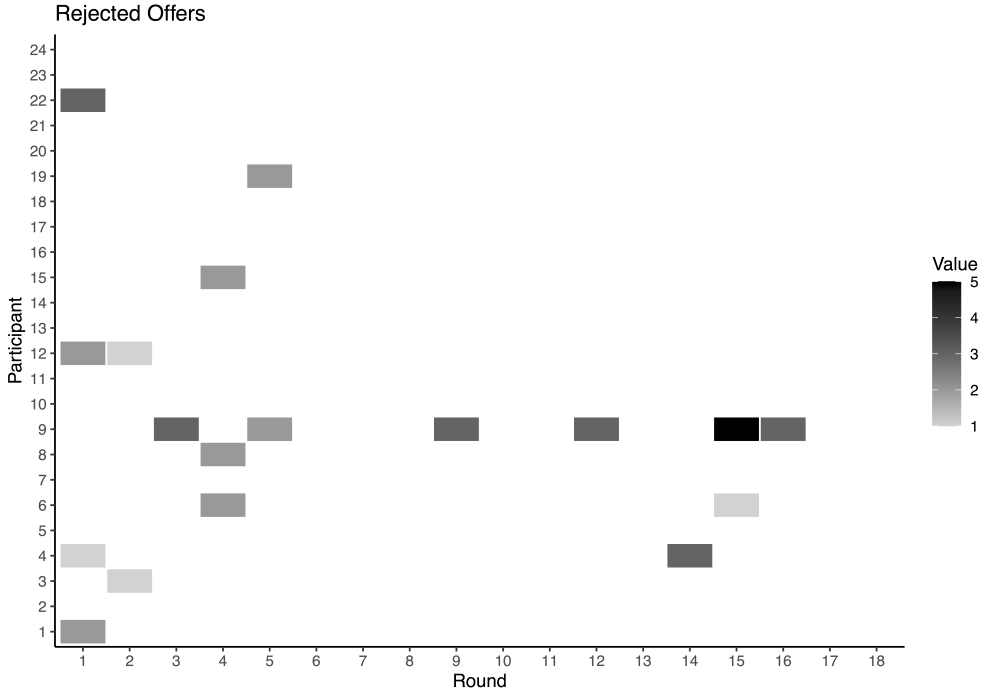
entirety of the game. One player gave nothing for both in the DG. Nine players in the DG and 16 in the IG give an average portion as X equal to or two times their self-report generosity measure.

Those who gave at least or greater than their self-report are defined as altruistic as they maintain generous behavior throughout the experiment. While those who self-reported high donation amounts, but then gave less in the game are considered as a random act of kindness as they appear generous on the surface but place less importance on other-regarding actions with repeated behavior. The implications of this type of behavior illuminate the fact that one-time generous offers do not guarantee altruistic characteristics in a person (Vesterlund 2015). Sutan et al. (2018) show that donations decrease in cases where a pledge is made to donate a certain amount with respect to when no pledge is given. The explanation is that pledging has the possibility of removing the good feeling obtained by donating (ibid.). A semantic debate could be started about how altruism and generosity are not in fact synonyms and should be used accordingly. Altruism is an intrinsic concern for others' well-being, while generosity can be used liberally to mean both

consistent giving behavior and one-time actions. While minuscule in significance, such a clarified definition could highlight ways to better define positive actions toward others.

Rejection behavior by responders in the IG session can be seen in Figure 7 which shows overall rejections regardless of role. The x-axis is the rounds played and the y-axis is the players in the experiment. A colored cell indicates a rejected offer and the amount of the offer can be determined by the shade of the color as indicated on the sidebar.

Figure 7: Rejected Offers in the IG



Note: Overall rejections of role Y and Z. The x-axis are the rounds played and y-axis are the players in the experiment. A colored cell indicates a rejected offer and the amount of the offer can be determined by the shade of the color as indicated on the sidebar.

The analysis of offer rejections throughout the experiment reveals interesting patterns in participants' decision-making. In the initial five rounds, there is a notable frequency of rejections for varying offer amounts. This suggests emotions and subjective considerations may have influenced participants' responses during this early stage of the game. However, as the rounds progress, the number of

rejections decreases significantly.

The decline in rejections after the initial five rounds can be interpreted in a few ways. One possibility is participants' emotional responses gradually subside, allowing rational thinking to prevail and leading them to accept offers regardless of their initial emotional reactions. This suggests a shift from more impulsive decision-making to a more calculated and strategic approach.

Another interpretation is proposers learn from responder demands over time and adjust their offers accordingly. As depicted in Figure **??**, the offers made by X show a decreasing trend toward the final rounds. This suggests that proposers may have become more aware of responder expectations and adapted their offers to align with these expectations, resulting in a reduced number of rejections.

These observations highlight the dynamic nature of decision-making in economic games. Initially, emotions and subjective considerations may play a significant role, leading to a higher frequency of rejections. However, as the game progresses, participants appear to rely more on rational thinking and strategic considerations, leading to a decrease in rejections.

5.2 Treatment Analysis

Given the small sample sizes of the data collected, different statistical tests are considered during the analysis. A specific procedure was followed to ensure the highest possible validity of our statistical testing. The independence of participants is confirmed as none of the same students participated in both sessions, hence there is an experimental design meeting the requirements for between-subject analysis for the comparison of the DG and IG sessions. The limitation of the data must be noted again here regarding the early termination of the IG session. Given such circumstances, for the statistical analysis, tests for all rounds of both sessions are conducted, and as a control, tests for the first 14 rounds of each session as well. This will allow the control for the performance of experimental tasks by experimenters caused any significant changes and if the results still hold despite such occurrences.

First, the mean portions given by X and Y per round are verified to follow a normal distribution by conducting a Shapiro-Wilks test (henceforth SW) as it is seen to have good power for asymmetric distributions (Yap and Sim 2011). Asymmetric distributions are expected due to the presumed low offers by X. If the data does not follow a normal distribution, the nonparametric method of a Pitman permutation test is used, recently suggested by Holt and Sullivan (2023) when data may not meet the required assumptions for the standard t-test used to compare two sample means.

Second, if both samples follow a normal distribution by the SW test, an F-test is performed for equal variances. If variances are equal, a two-sample t-test is used. If the variances are not equal, a Welch two-sample t-test is performed.

Permutation tests and t-tests are both conducted even if the data do not meet the required assumptions of normality and variance equality, to contribute to the literature. The standard procedure in the experimental analysis is to conduct the Mann-Whitney U test (henceforth MW) but it is specifically built for ordinal data. Portions of the amounts given are being tested and hence a method in which quantitative data can be used is preferred.

The specific test used will be the Pitman test for between-subject design suggested by Holt and Sullivan (ibid.). The test is conducted using the suggested *perm* package in *R software* or the code provided in the article (ibid.). When the sample is small enough to compute the p-value using complete enumeration, we use the code provided. When the sample size is too large for the endowed computing power, the *permTS* function from the *perm* package is used, with p-value estimates calculated by performing 999 Monte Carlo simulations (Fay and Shaw 2010).

The test statistic is denoted as $T = \bar{\alpha}_{IG} - \bar{\alpha}_{DG}$, where both variables represent the mean of the average portions given in each round.

$$\text{The one-sided p-value for the Pitman test} = \frac{\sum_{i=1}^{\binom{m}{n}} 1(T_i \geq T_{obs})}{\binom{m}{n}}$$

T_i represents the test statistic of the i-th permutation. $\binom{m}{n}$ represent all of the possible permutations of the combined data, where m is the total number of observations and n is the number of observations for $\bar{\alpha}_{IG}$. In this case, $m = 42$ and $n = 24$.

To imply the statistical significance of the permutation test, a confidence interval of 95% is used and therefore the threshold for the p-value to imply significance is 0.05. Hence, for any p-value < 0.05, the associated test statistic is considered significant. Now hypothesis testing is conducted.

5.2.1 Voice Hypothesis

We construct two hypotheses for the sake of testing the differences in the mean portion given in the two sessions.

Hypothesis 1 *The average portion given per round by X in IG is greater than the average portions given per round by X in DG.*

$$H_0\text{: } \bar{\alpha}_{IG} \leq \bar{\alpha}_{DG}$$
$$H_1\text{: } \bar{\alpha}_{IG} > \bar{\alpha}_{DG}$$

Hypothesis 2 *The average portion given per round by Y in IG is greater than the average portion given per round by Y in DG.*

$$H_0\text{: } \bar{\beta}_{IG} \leq \bar{\beta}_{DG}$$
$$H_1\text{: } \bar{\beta}_{IG} > \bar{\beta}_{DG}$$

The values for $\bar{\alpha}_{DG}$ and $\bar{\beta}_{DG}$ for all rounds do not follow a normal distribution. This is an expected result as it is believed the players in the DG will give less overall and hence skew the distribution to the right. Conversely, the values for $\bar{\alpha}_{IG}$ and $\bar{\beta}_{IG}$ seem to follow a normal distribution according to the SW test. Again, such results are in favor of the voice hypothesis, indicating a possible higher portion given by players in the IG compared to the DG. The disparity in distributions between the DG and IG data leads to the use of permutation tests since the two samples are being compared and do not meet the assumptions for the use of a t-test.

The sample size was too large to perform the Pitman test for all rounds with complete enumeration and therefore a permutation test estimated by Monte Carlo simulations using the *perm* package as defined before was conducted. The sample estimate for the difference between $\bar{\alpha}_{IG}$ and $\bar{\alpha}_{DG}$ is 0.1292 (p-value = 0.001). The average portion given by X in IG was around 12% more than in the DG with statistical significance, thereby rejecting the null hypothesis.

In the second set of hypotheses, the average portion given by Ys in the IG is tested against the average portion given by Ys in the DG. Given the previous result, this is expected to be true, as the overall amount received by Ys will be greater, but does not necessarily guarantee they will give more. A permutation test estimated by Monte Carlo simulations using the *perm* package was conducted and the sample estimates for the difference between $\bar{\beta}_{IG}$ and $\bar{\beta}_{DG}$ is 0.0319 (p-value = 0.076). At the predefined significance level of 0.05, the result is not significant. However, the average portion given in the IG is about 3% higher than in the DG.

To control for the experimental mishaps, the same tests are conducted for the first 14 rounds of both sessions. The tests were conducted using the code provided by Holt and Sullivan (2023) as the sample size was small enough for the allotted computing power. The sample estimate for the difference between $\bar{\alpha}_{IG}$ and $\bar{\alpha}_{DG}$ is 0.1310 (p-value = 3.99e-07). The result is similar to all rounds and on average Xs give around 13% more of their endowment in the IG with respect to the DG. The difference in means between $\bar{\beta}_{IG}$ and $\bar{\beta}_{DG}$ is 0.0122 (p-value = 0.3299). The result indicates an even higher insignificance of the difference in means, indicating that players give close to the same amounts in the first 14 rounds of the sessions.

To further confirm if it is solely the presence of the voice mechanism, the average portion given in the first round of both games is tested. Using a Pitman test a mean difference in the portion given of 0.1558 (p-value = 0.0699) is observed. While significance is not observed at the 0.05 acceptance threshold, relaxing the testing requirements would allow for the result to be significant. If this is considered, an almost 15% increase in portions given in the first round is a surprising result.

The results of the hypothesis test reveal a significant increase in the average portion given by participants in the IG compared to the DG. This suggests the presence of an institutional 'voice' mechanism can effectively enhance generosity among first movers. These results align with previous research by Greiner, Güth, and Zultan (2012) which demonstrated increased generosity in three-person dictator games with varying levels of communication.

If these findings persist in future sessions, it could provide further evidence the voice mechanism in the IG elicits empathetic responses from proposers. The larger social distance observed in the DG, despite the theoretical equality between the games, may be attributed to the absence of any interaction. In contrast, the voice mechanism in the IG may reduce social distance by invoking empathy and potentially triggering guilt aversion.

Although these findings cannot definitively establish that the IG is fundamentally distinct from the DG, the presence of an institutional voice within the game structure already primes subjects towards more generous behavior. This has potential implications for workplace settings which implement feedback systems. If employees perceive that their voices will be heard by employers, it may foster a greater sense of cohesiveness and cooperation among team members.

Overall, these results shed light on the role of institutional voice mechanisms in promoting generosity and suggest that such mechanisms can influence behavior in social and professional contexts.

5.3 Preference Analysis

5.3.1 Homophily Hypothesis

When playing modified bargaining games it is believed that people will tend to want to play with others they believe will be more generous. Therefore a measure of generosity homophily based on the amounts indicated by the self-report donation amount in the preliminary questions of the experiment is created.

For ease of computation, we utilize the assortativity coefficient developed in the *homophily* package (Knapp 2019). The assortativity coefficient is developed by

Newman (2003) in a paper in which network mixing is discussed. Such a coefficient is developed as a way to observe how assortative mixing within networks occurs. We use this measure as it is consistent also with the economic literature regarding homophily in economic networks, in which the concept of inbreeding homophily is developed as the difference in the fraction of like ties between the relative fraction of like ties in the population, over the total possible bias in ties (Currarini, Jackson, and Pin 2009). The calculation of r is applied to all directed preference networks G_m, as modeled in the theoretical section before.

The assortativity coefficient is defined as:

$$r = \frac{Tr(\boldsymbol{e}) - ||\boldsymbol{e}^{\boldsymbol{2}}||)}{1 - ||\boldsymbol{e}^{\boldsymbol{2}}||}$$

where $\boldsymbol{e}$ is a mixing matrix with elements e_{ij} that are the fraction of edges in a network that connect nodes of type i to type j. Then we have that the value $Tr(\boldsymbol{e})$ is the sum of the diagonal or the sum of the portion of like ties ($i \to i$ and $j \to j$). The value $||\boldsymbol{e}^{\boldsymbol{2}}||$ is the sum of all elements in the mixing matrix (Newman 2003). When $r > 0$ a network shows assortativity or homophily. When $r < 0$ a network shows heterophily or disassortativity. When $r \approx 0$ a network shows the properties of a random network. The assortativity coefficient will be calculated for three different categories per group in each round, which will allow visualization of the changes in homophily over time.

The first step in the analysis is to define the categories to which the players belong. The information elicited in Phase I is used to create three categories: gender, charity, and donation. Gender and charity are categorical data, so the identification of which category is simple. Since the donation data is numeric, the median of the amounts donated separately in both the DG and IG session are taken and players who gave above the median are defined as "generous" and those below the median as "not generous". At this point, the hypothesis can be developed.

Hypothesis 1 *If homophily exists, the average donation assortativity coefficient across groups will be on average larger than the average gender and charity assor-*

tativity coefficients.

$$H_0\text{: if } \bar{r} > 0,\ \bar{r}_{donation} \leq \bar{r}_{gender,charity}$$
$$H_1\text{: if } \bar{r} > 0,\ \bar{r}_{donation} > \bar{r}_{gender,charity}$$

The overall existence of homophily ($\bar{r} > 0$) and the average assortativity coefficient per round for the donation (or generosity) category to be greater than both the gender and charity average coefficient is expected. This would indicate on average, generous players preferred to play with other generous players. An analysis of matched pairs is conducted here as the group average assortativity per category is aggregated per round.

Before performing any calculations of r, the network evolution with nodes color-coded by generosity is visualized. The visualizations are provided for each group from both sessions in Appendix B. The visualizations do not appear to show any obvious generosity homophily. When observing the networks with nodes color coded as the other two categories, no homophily for either is obvious. From a first look, it appears players wanted to connect with everyone in Phase II, but changed their strategy with the introduction of perfect information. Such behavior indicates the possible irrelevance of the displayed information when choosing a partner for a money-sharing game.

The average $\bar{r}$ from all rounds for each group with standard deviation in parenthesis per group in each session can be observed below.

Table 1: Assortativity Coefficient Statistics

Treatment	**Group**	$\bar{r}_{donation}$	$\bar{r}_{gender}$	$\bar{r}_{charity}$
DG	1	-0.17 (0.21)	-0.28 (0.07)	-0.23 (0.15)
	2	-0.22 (0.09)	-0.22 (0.09)	-0.21 (0.07)
	3	-0.24 (0.15)	-0.26 (0.09)	-0.25 (0.09)
IG	1	-0.14 (0.07)	-0.30 (0.08)	-0.19 (0.05)
	2	-0.25 (0.14)	-0.23 (0.15)	-0.25 (0.06)
	3	-0.25 (0.04)	-0.17 (0.09)	-0.17 (0.06)
	4	-0.18 (0.03)	-0.18 (0.03)	-0.23 (0.03)

Note: Average $\bar{r}$ from all rounds for each group with standard deviation in parenthesis.

Despite the averages per group being negative and the visualization of the mean assortativity coefficient over time indicating random network properties a

paired t-test on the average r variables across rounds in the DG and IG sessions is performed. For the DG session, all data satisfied the SW test for normality and F test for equal variance and hence met the assumptions for conducting a paired t-test. For the IG, only the donation mean assortativity coefficient did not follow a normal distribution, all others met the required assumptions for a paired t-test. However, since the main concern is with the donation category, a Fisher permutation test is conducted provided by the R code from Holt and Sullivan (2023). The same test is performed for the DG.

The Fisher permutation test statistic and p-value calculation are briefly introduced. The test statistic is denoted as $T = \bar{r}_{donation}$ - $\bar{r}_{gender}$ (or $\bar{r}_{charity}$), where the variables represent the mean assortativity coefficient across groups in each round.

$$\text{The one-sided p-value for the Fisher permutation test} = \frac{\sum_{i=1}^{2^n} 1(T_i \geq T_{obs})}{2^n}$$

where 2^n represents the number of ways all matched pairs can be permuted. The 1 indicates the indicator function as mentioned before for the Pitman test. The p-value represents the probability of observing a test statistic greater than or equal to the observed value.

The paired t-test of $\bar{r}_{donation}$ and $\bar{r}_{gender}$ for the DG session show a difference in means of 0.0408 (p-value = 0.0065). For the same variables, the Fisher permutation test results in the same mean difference with a p-value = 0.0056. For the paired t-test between the DG session $\bar{r}_{donation}$ and $\bar{r}_{charity}$, the difference is 0.0202 (p-value = 0.0341). For the Fisher permutation test a mean difference of 0.0202 (p-value = 0.0343) is observed.

The Fisher permutation test for the $\bar{r}_{donation}$ and $\bar{r}_{gender}$ variables shows a mean difference of 0.0175 (p-value = 0.1618). The mean difference between $\bar{r}_{donation}$ and $\bar{r}_{charity}$ is 0.0072 (p-value = 0.1071).

The statistical analysis suggests that in the DG session, there might be a tendency for participants to prefer connections based on generosity rather than gender or charity. However, upon examining the assortativity coefficients, which mostly exhibit negative values and rarely reach positive values, it can be concluded

that neither homophily nor heterophily preferences are evident. It appears that players adopt a strategy of connecting with everyone, possibly to minimize risks, even though they have access to character-specific information.

In order to obtain some sort of useful interpretation of which characteristics may be more prominent when players indicated partner preferences, multivariate regressions are conducted with the average player in-degree over all rounds as the dependent variable and pieces of information shown as the independent variables. In-degree is simply the number of incoming ties to the player.

Table 2: In-degree and Information Regression

Treatment	**Variable**	**Beta**	**SE**	**p-value**
DG	Intercept	3.87	0.58	0.000 ***
	Donation	-0.00	0.01	0.698
	Gender	-0.69	0.35	0.074 .
	Green Cross	0.21	0.70	0.773
	None	-1.91	0.76	0.028 *
	Save the Children	0.10	0.66	0.882
IG	Intercept	4.38	0.45	0.000 ***
	Donation	0.00	0.00	0.531
	Gender	0.18	0.30	0.548
	Green Cross	-0.49	0.48	0.321
	None	-1.65	0.56	0.009 **
	Save the Children	-0.96	0.48	0.059 .

*Note: Multivariate OLS Regression with average in-degree over all rounds as the dependent variable and information shown as independent variables (Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1)*

The regressions on DG and IG average in-degree and displayed information show a surprising but expected result. In both sessions, the participants who decided not to donate in the self-report question received 1.91 fewer incoming ties in the DG and 1.65 fewer in the IG, which are statistically significant. Consistent with the random network properties found by the assortativity, the donation amount information seems to have no effect on in-degree.

After observing the effects of information on in-degree, the same procedure is performed using average out-degree as the dependent variable and displayed pieces of information as the independent variables. The results indicate that no specific information has a significant impact on the average number of outgoing

connections. This seems to be due to the fact that partner preferences were, for the majority of players, a binary choice between donator and non-donator. Those who did not donate were intentionally avoided and those who donated were selected no matter the self-report donation amount.

The analysis of assortativity coefficients provides valuable insights into partner selection dynamics. Surprisingly, no evidence of homophily is observed in the participants' choices. This implies that characteristics such as charity, gender, and donation amounts have limited influence on individuals' decisions when selecting their game partners. However, an interesting finding emerges as participants exhibit a homogeneous tendency to avoid those who make no donations at all. This suggests that when players choose not to donate, it is seen as a lack of generosity and, consequently, undesirable behavior. As a result, they may face the risk of being excluded by potential partners.

Moreover, the discrepancies in the average portions given during Phase II and Phase III shed light on the importance of actual behavior in decision-making. Participants appear to prioritize observed behavior over superficial information when forming connections. This aligns with real-life social interactions, where individuals often revise their opinions based on the actions and conduct of others.

In conclusion, the investigation into homophily has uncovered intriguing patterns, but more research is required to fully understand the emergence of generosity homophily in both the DG and IG settings.

5.4 Additional Analyses

In this subsection, additional tests are conducted based on intriguing results from the experiment which were not initially planned, but merit investigation to observe significance.

5.4.1 Information Hypothesis

The initial visualization of some basic statistical measures and network measures led to a discovery of a stark difference between the behavior of participants in

Phase II compared to Phase III. It is noted the only difference in Phase III from Phase II is the introduction of perfect information for the full game. The participants have explicitly the results of the previous round for both games within the full game. Whereas in Phase II they were unaware of the other game results. The difference in reciprocal ties in Phase III prompted the investigation into other aspects of participant behavior. In particular, two-sample statistical significance tests are performed to see if such apparent salience in perfect information is worth further study in the future. Since the differences in means will be conducted within the same session and hence within subjects, the Fisher permutation test is used (Holt and Sullivan 2023).

To formally test the differences in phases it is stated in the form of a hypothesis test.

Hypothesis 2 *The average portion given as X with imperfect information* $\bar{\alpha}_{DG,II}$ $(\bar{\alpha}_{IG,II})$ *is greater than the average portion given with perfect information* $\bar{\alpha}_{DG,PI}$ $(\bar{\alpha}_{IG,PI})$.

$$H_0\text{: } \bar{\alpha}_{DG,II}\ (\bar{\alpha}_{IG,II}) \leq \bar{\alpha}_{DG,PI}\ (\bar{\alpha}_{IG,PI})$$
$$H_1\text{: } \bar{\alpha}_{DG,II}\ (\bar{\alpha}_{IG,II}) > \bar{\alpha}_{DG,PI}\ (\bar{\alpha}_{IG,PI})$$

Normality and variance equality assumptions are checked and the data is found to not meet all assumptions in all cases. Therefore only the Fisher permutation test is used. In the DG session, the Fisher permutation test results in a mean difference of 0.0640 (p-value = 0.002), indicating an average of 6.4% more of the endowment given in Phase II compared to Phase III. In all rounds of the IG session, the Fisher permutation test results in a mean difference of 0.0797 (p-value = 0.0012). The experimental issues are noted again and only the first 14 rounds are tested, which results in a Fisher permutation test result mean difference of 0.0290 (p-value = 0.0371). Despite the decrease in variables in the test of 14 rounds, a statistical significance of a greater mean in Phase II compared to Phase III is observed. All p-values indicate null hypothesis rejection and confirm the statistical significance of a larger portion given under imperfect information when compared to perfect information.

Given the implicit payoffs for players' own game and the lack of payoff information for the adjacent game in Phase II, the greater portion given under imperfect information can be interpreted as a genuine measure of generosity. Participants seem to play it safe and give higher amounts to avoid punishment in future rounds. The information shown to participants seems to be an irrelevant factor in influencing generosity, but once explicit behavior is revealed they seem to seek fairness by indirectly punishing others in the form of giving less. X behavior tends toward equilibrium offers of zero under perfect information (see 5).

If the differences in information from the perspective of comparison between DG and IG are observed, the willingness to give by X was moderately higher in IG than in DG under imperfect information. Such an indication further supports the positive impact of the "voice" mechanism on generosity in the IG. However, the limitations of the lack of equal comparison given the events affecting the IG results are noted.

Tests are also performed to observe if statistical significance is observed in the difference in means of the portions given by Y under imperfect and perfect information. The test is formalized in the form of a hypothesis test.

Hypothesis 3 *The average portion given as Y with imperfect information $\bar{\beta}_{DG,II}$ ($\bar{\beta}_{IG,II}$) is greater than the average portion given with perfect information $\bar{\beta}_{DG,PI}$ ($\bar{\beta}_{IG,PI}$).*

$$H_0\text{: } \bar{\beta}_{DG,II}\ (\bar{\beta}_{IG,II}) \leq \bar{\beta}_{DG,PI}\ (\bar{\beta}_{IG,PI})$$
$$H_1\text{: } \bar{\beta}_{DG,II}\ (\bar{\beta}_{IG,II}) > \bar{\beta}_{DG,PI}\ (\bar{\beta}_{IG,PI})$$

The results of the DG session from the Fisher permutation test show a mean difference of 0.0171 (p-value = 0.3132), indicating a slightly greater average portion given in Phase II, but does not hold with statistical significance. In the analysis of the IG session, all rounds and the first 14 rounds are tested again. In all rounds, a mean difference of -0.0051 (p-value = 0.5813) is observed, indicating an increase in Phase III. In the first 14 rounds, a mean difference of 0.0045 (p-value = 0.3442).

No significant effect on the behavior of Y is found given the transition from imperfect to perfect information. An interpretation of the result could be the

minimal amounts given in the first place was already small enough and could not vary enough to bring about significant changes.

The network diagrams in Appendix B, show the evolution of undirected (mutual ties only) preference networks over time and there seems to be a noticeable difference in reciprocity when the perfect information is introduced. The statistical significance is tested here using the Fisher permutation test to observe if the mean reciprocity across groups is greater under imperfect information, as what seems obvious in the network diagrams.

First, a measure of reciprocity must be defined. We use the definition of edgewise reciprocity, which is the proportion of reciprocated ties (Newman 2018). Let c_m be the edgewise reciprocity of the preference networks G_m for $m = \{1, 2, 3, 4, 5, 6, 7\}$. Then we have

$$c_m = \frac{1}{l} \sum G_{ij} G_{ji}$$

where l is the total number of edges in the network (ibid.).

Let $\bar{c}_{DG,II}$ and $\bar{c}_{IG,II}$ be the vector of average reciprocity across groups each round in Phase II and $\bar{c}_{DG,PI}$ and $\bar{c}_{IG,PI}$ be the vector of average reciprocity across groups each round in Phase III. The hypothesis test is stated below.

Hypothesis 4 *Average reciprocity per round with imperfect information* $\bar{c}_{DG,II}$ $(\bar{c}_{IG,II})$ *is greater than the average amount given with perfect information* $\bar{c}_{DG,PI}$ $(\bar{c}_{IG,PI})$.

$$H_0\text{: } \bar{c}_{DG,II}\ (\bar{c}_{IG,II}) \leq \bar{c}_{DG,PI}\ (\bar{c}_{IG,PI})$$
$$H_1\text{: } \bar{c}_{DG,II}\ (\bar{c}_{IG,II}) > \bar{c}_{DG,PI}\ (\bar{c}_{IG,PI})$$

The Fisher permutation test of average reciprocity in the DG results in a mean difference of 0.3326 (p-value = 2e-04). An astounding 33% percent difference in average reciprocity in Phase II compared to Phase III, with strong statistical significance. For all rounds in the IG, the Fisher permutation test results in a mean difference of 0.2184 (p-value = 2e-04). In the first 14 rounds, the mean difference is 0.1655 (p-value = 2e-04). All tests show statistical significance and indicate a rejection of the null hypothesis. The statistical significance of greater

reciprocity under imperfect information when compared to perfect information can be confirmed.

The distinct difference in reciprocity observed can be primarily attributed to the introduction of new information. In Phase II, the high connectivity of the networks suggests that participants had a strong desire to connect with all group members. However, as the experiment transitioned to Phase III and perfect information was introduced, the connectivity of the networks decreased significantly. This decline in connectedness indicates a shift in partner preferences toward the newly available information, specifically, the past behavior of other group members.

From a qualitative perspective, the substantial difference in reciprocity could suggest that the information displayed during Phase II was perceived as relatively irrelevant or insufficient in influencing partner selection decisions. Participants may have adopted a risk-averse strategy of connecting with everyone in an attempt to avoid potential punishment in subsequent rounds. As found in Frignani and Ponti (2012), players playing a DG under uncertainty or the veil of ignorance were risk averse. A possible explanation of the results and decrease in reciprocity and generosity is that in Phase II participants viewed the possible interactions as uncertain, but having explicit behavior available in Phase III allowed them to feel more certain about their game partner's potential actions. However, as perfect information became available, participants reassessed their connections and adjusted their behavior accordingly.

This finding underscores the importance of information and its impact on decision-making processes. The introduction of perfect information appears to have prompted participants to prioritize observed behavior, indicating a preference for forming connections based on past actions rather than relying solely on initial impressions or limited information.

In summary, the marked disparity in reciprocity between Phase II and Phase III suggests that participants placed less emphasis on the information provided during Phase II, instead focusing on observed behavior in Phase III.

Table 3: Gender Analysis Results

Model	SC	HC	Variable	Estimator	SE	p-value
DGX	yes	yes	Intercept	0.12	0.02	0.000 ***
			Gender	-0.07	0.02	0.006 **
DGY	yes	no	Intercept	0.13	0.03	0.000
			Gender	0.01	0.05	0.919
IGX	yes	yes	Intercept	0.12	0.02	0.000 ***
			Gender	0.00	0.04	0.915
IGY	no	no	Intercept	0.23	0.03	0.000 ***
			Gender	-0.09	0.04	0.045 *

Note: Serial correlation, heteroskedasticity, and coefficient test of OLS regression results for each role in both sessions. Each model corresponds to a regression where either the average α or β per round by gender is the dependent variable and gender (male = 1, female = 0) is the independent variable.
*(Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1)*

5.4.2 Gender Hypothesis

In light of the extensive research indicating higher levels of generosity among females, a brief analysis is conducted to examine gender differences in average portions given (Engel 2011). Due to the between-subject nature of the analysis, a test for serial correlation (SC) and heteroskedasticity (HC) is conducted. We first construct a simple linear model for all roles and sessions with the average α and β per round by gender as the dependent variable and gender as the independent variable, hence four separate models. To test for serial correlation, a Durbin-Watson test is performed in *R*. To test for heteroskedasticity a White's general test is conducted using the *bptest* function in *R* (Greene 2021; Hothorn and Zeileis 2021). The only model not showing either heteroskedasticity or serial correlation is the IG β, all other models showed either both or only one. Therefore, for all models, a coefficient test with a heteroskedasticity and autocorrelation consistent (HAC) covariance estimator is performed (Greene 2021).

The analysis of gender differences in generosity reveals interesting patterns within the experimental sessions. In the DG session, females exhibit a tendency to give approximately 7% more than males when assuming the role of X. Similarly, in the IG session, females demonstrate a higher level of generosity, giving around 9% more than males when playing the role of Y. However, it is important to note

that these gender differences in giving are not consistently observed across all roles and sessions.

The lack of consistent gender differences in means across roles and sessions complicates the interpretation of these findings. The study of Andreoni and Vesterlund (2001) shows that females are more generous when it is expensive, and males give more when it is less expensive. For the DG, these results would be comparable, as it is shown, albeit insignificantly, that males give slightly more than females in the role of Y. As Y has less in relation to X when deciding how much to give, males may view this as an opportunity to appear more generous and thus give less. Whereas, when in the role of X they take more for themselves. Given such results, females can be viewed as more generous toward others with no power, which is consistent with the results of Di Cagno et al. (2018a) in which females offer those appearing needy more than they would take themselves.

The IG results, however, exhibit contradicting results. Females are more generous as Y and thus the previous behavioral reasoning cannot be applied here. It may be that females view the institutional structure of the IG as less unfair as responders can say something if discontent arises. This could lead to accepted unfair offers being understood as acceptable and therefore females may not feel guilt in giving less when compared to the DG.

It is challenging to draw definitive conclusions regarding the reasons behind the greater giving behavior of females in this particular experiment. As the initial scope of the thesis did not include a specific analysis of gender differences, further attention will be devoted to understanding if these results remain persistent in future experimental sessions.

In concluding the analysis section, the results reveal a notable increase in generosity within the IG compared to the DG, highlighting the effectiveness of a structural voice mechanism in reducing social distance. However, partner preference networks do not exhibit a clear pattern of generosity, suggesting that tie formation is largely random. Although, individuals who did not make any donations receive significantly fewer incoming ties, indicating a tendency to avoid

those who exhibit undesirable behavior. A significant shift in behavior is observed when transitioning from imperfect to perfect information, particularly in terms of generosity and network reciprocity. Additionally, a gender analysis demonstrates that females tend to be more generous than males in specific roles and sessions, though this effect is not consistent across all sessions. A discussion follows in the next section.

6 Conclusion

6.1 Limitations and Lessons Learned

First and foremost, the sessions conducted were only pilot experiments, and therefore more sessions are needed to increase the observations. The external validity of the results is limited as the experimental setting does not exactly replicate real-life situations. In-person instead of online sessions will be conducted in the future and some aspects of the results will be compared to this study in order to contribute to the research on lab-like settings online (Buso et al. 2021). The random selection of a single round from either phase of the games led to a significant variation in payoffs in both sessions. In the future, to avoid discouraging further participation in experiments, consideration will be made about changing the payoff mechanism to an average payoff taken over three rounds. The procedure of downloading and exchanging the oTree file will be done with care in order to avoid errors in the program.

Notes on the analytical methodology are made as hindsight shows some improvements to be made. While the results may actually hold true, the study of homophily may be revisited as it was a preliminary look into the field of social network analysis. Instead of utilizing ready-made software packages, manual coding will be done for data analysis. Much of this thesis consisted of the designing and planning for the experiment itself. The statistical analysis of the data can and will be improved upon in the future to incorporate more robust econometric methods.

6.2 Discussion

The primary objectives of this thesis were to observe the possible institutional differences in the dictator and impunity game structures by measuring generosity and to observe if participants preferred to play with the more generous players in money-sharing games. The analysis conducted in this study provides valuable insights into the dynamics of generosity, tie formation, and the impact of infor-

mation in experimental settings. The findings contribute to the understanding of social interactions and the role of structural voice mechanisms in reducing social distance. The following paragraphs will expand and elaborate upon these results, drawing on relevant literature to support the conclusions.

The results of the voice hypothesis confirm a significant increase in generosity within the IG compared to the DG. This finding aligns with previous research that has demonstrated the positive impact of structural voice mechanisms on prosocial behavior (Di Cagno et al. 2018a,b; Frey and Bohnet 1995; Greiner, Güth, and Zultan 2012). By providing individuals with the opportunity to express their opinions and preferences, the voice mechanism reduces social distance and promotes more generous behavior. This supports the argument that when individuals feel heard and empowered, they are more inclined to exhibit cooperative and generous actions. From the perspective of interaction, those in power are more inclined to listen in order to avoid feelings of guilt.

The homophily hypothesis was not confirmed and contrary to expectations, the analysis of partner preference networks did not reveal a clear pattern of generosity homophily. The absence of significant homophily or heterophily in tie formation suggests that individuals choose their partners in a largely random manner. This result is inconsistent with the literature reviewed in this study, which all found some sort of homophilic tie formation (Brañas-Garza et al. 2010; Charroin, Fortin, and Villeval 2021; Currarini and Mengel 2016). Upon further investigation, a tendency to avoid individuals who did not make any donations was observed. These individuals received significantly fewer incoming ties compared to those who exhibited generosity. It indicates that reputation and social evaluations play a role in tie formation and reciprocity.

While not an initial topic for analysis, the study highlights a significant shift in behavior when transitioning from imperfect to perfect information conditions. This shift is particularly evident in terms of generosity and network reciprocity. These findings are consistent with previous research that has demonstrated the impact of information on decision-making and social behavior (Guth, Huck, and

Ockenfels 1996) Perfect information allows individuals to make more informed decisions and adjust their behavior based on the observed actions of others. It also seems to guide behavior closer toward rational expectations as lower offers are seen as time proceeds. The observed changes in generosity and network reciprocity suggest that information regarding explicit behavior influences social interactions and leads to more cooperative behavior, as seen in (Di Cagno and Sciubba 2010).

Gender analysis reveals that females tend to be more generous than males in specific roles and sessions, although this effect is not consistent across all sessions. This finding is in line with previous studies that have documented gender differences in prosocial behavior (Eckel and Grossman 1996; Engel 2011; Testa and D'Amato 2018). The variation in the gender effect across different roles and sessions suggests the presence of contextual factors that influence generosity. Further research is needed to explore these factors and their interaction with gender in shaping prosocial behavior

To conclude, the experimental data from this thesis provides valuable insights into the dynamics of generosity, tie formation, and the impact of information. The study demonstrates the effectiveness of a structural voice mechanism in increasing generosity and reducing social distance. It highlights the complexity of tie formation, indicating that partner preference networks are not easily influenced by specific characteristics such as gender or generosity. Participants are found to act homogeneously and make binary choices between those who donate and those who do not. The tendency to avoid individuals who do not exhibit generosity emphasizes the role of reputation and social evaluations in shaping social connections. The transition from imperfect to perfect information conditions leads to significant changes in behavior, suggesting the importance of information in economic decision making. Furthermore, the gender analysis reveals variations in the generosity of females compared to males in specific roles and sessions, suggesting the influence of contextual factors. These findings contribute to the understanding of social interactions, providing insights that can inform future research on prosocial behavior and network dynamics.

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Appendices

A Experiment Instructions and Details

The instructions have been translated by the author from Italian to English.

A.1 Demographic Questions

1. How old are you? (range from 18 to 50)
2. What is your gender? (Male/Female)
3. Where is your place of birth? (list of Italian regions)
4. Where did you mainly grow up? (list of Italian regions)
5. What is your university major? (list of LUISS undergraduate and graduate degree programs)
6. How many languages do you speak? (range from 1 to 10)

7. Do you speak frequently any regional Italian dialects? (Y/N)

8. What is your employment status during your studies? (not working, searching for work, employed part-time, employed full-time, internship)

9. Did you vote in the latest regional and national elections? (regional – Y/N; national – Y/N)

10. How would you describe your political views? (Very progressive, slightly progressive, center, slightly conservative, very conservative)

A.2 Charity Question

Suppose you earn a monthly salary of 2,500 euros. After your obligatory expenses (rent, car, utilities, etc...) and regular leisure activities (gym, dining out, etc...) you have 'E' euros remaining.

Suppose you could donate to one of the following charities:

- Donna Differenza - (mission in Italian)
- Save the Children - (mission in Italian)
- Green Cross - (mission in Italian)

Please indicate how much of your remaining salary you would donate and to which charity you would donate. If you do not wish to donate, please enter 0 and choose None.

A.3 Experiment Instructions

A.3.1 Phase I

Welcome to our experiment, thank you for participating!

During the experiment, you and other participants will be asked to make several decisions. Your decisions will determine your payoff according to the rules explained below. In addition to your earnings during the experiment, you will also receive a show-up fee of 5 euros.

Please note that from this point on any form of communication between participants is strictly prohibited. If you violate this rule, you will be excluded from the experiment with no payment. If you have any questions, please raise your hand. The experimenter will come to you and answer your questions individually.

You will be randomly assigned to a group with five other participants. Your personal identity will remain anonymous to other participants and the experimenters throughout the experiment.

There will be three phases, in the first phase you will answer some questions, in the second you will perform a task and in the third, you will perform another task.

You will now be asked to answer a few questions.

A.3.2 Phase II

In the next phase of the experiment, you will be interacting in the following scenario:

Consider the following scenario with three roles: X, Y, and Z. The task for X:

- X begins each round with E euros and will decide how much to give to Y.
  - Amount given must be a whole number. Such as 0, 1, 2,. . . , E.
  - This value is referred to as 'x' below

The task for Y:

- Y will decide how much of the amount received ('x') to give to Z.
  - Amount given must be a whole number. Such as 0, 1, 2,. . . , 'x'.
  - This value is referred to as 'y' below

The task for Z:

- Z receives an amount from Y and has no action

(Participants move on to the next page)

You will now be shown information about the other participants in your group.

Please rate on a scale from 0 to 5 who you would like to interact with in the previously explained scenario. Where 5 indicates you strongly want to interact and 0 indicates you do not want to interact with them at all.

Please note that one group member's preferences will be randomly selected and implemented in a scenario with random role assignment. The three remaining participants will interact in a scenario with random role assignment.

You will now interact in 12 rounds of this scenario.

Your payoff in each round is the amount you decide to keep.

Your payout for the experiment will be determined by the random selection of a round at the end. Your total earnings will be the payout of the selected round and the participation fee of 5 euros.

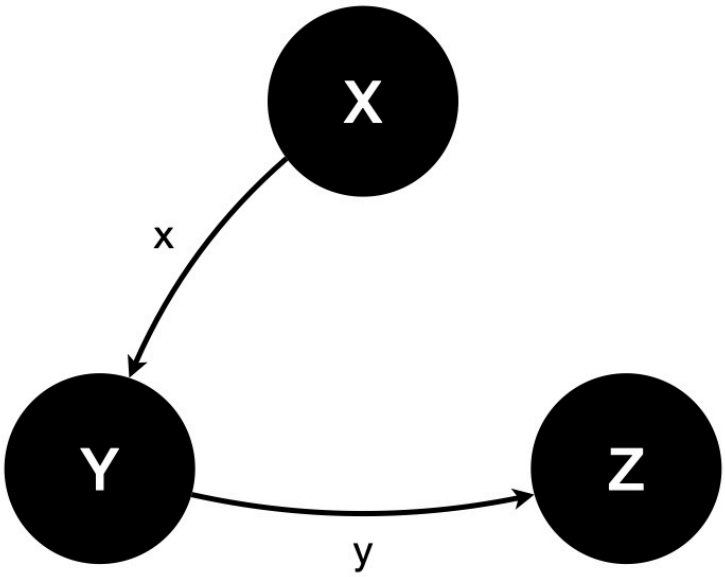

Figure 8: Game Diagram

A.3.3 Phase III

You will now interact in the same scenario for 12 rounds but now you will be shown the results of the previous rounds for both scenarios in your group. After each round, you will indicate your preferences of who you wish to interact within the scenario.

B Network Diagrams

Below are displayed the preference networks from each session. We choose to show the undirected networks in order to show the stark differences in reciprocity from Phase II to Phase III, whereas displaying the directed networks is quite difficult to understand due to a large number of ties. The network nodes are color-coded by their generosity designation, green representing "generous" and red representing "not generous" based on their donation above or below the median self-reported donation amount.

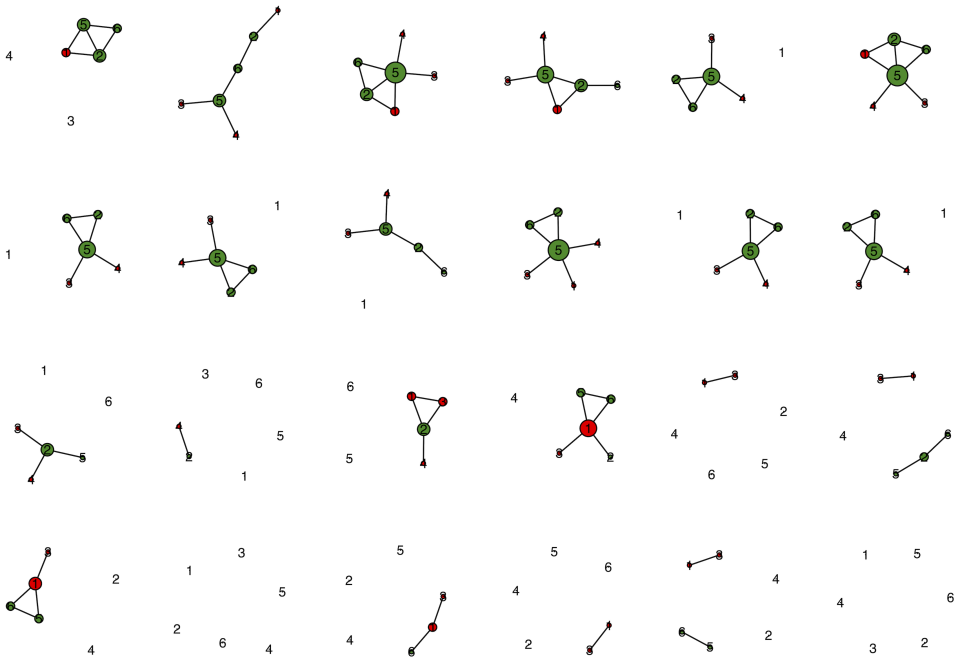

Figure 9: DG Group 1

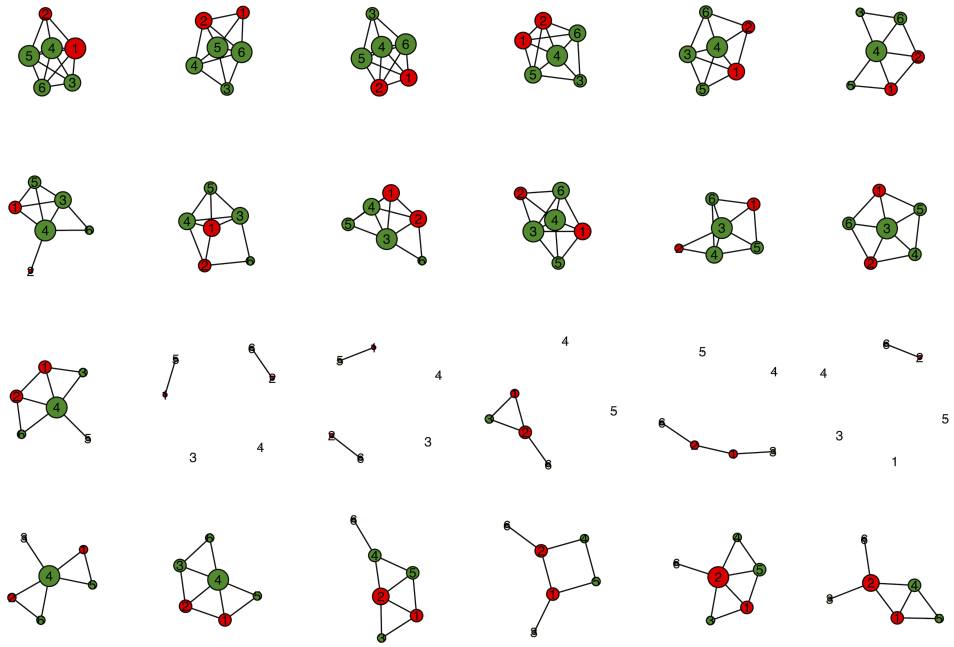

Figure 10: DG Group 2

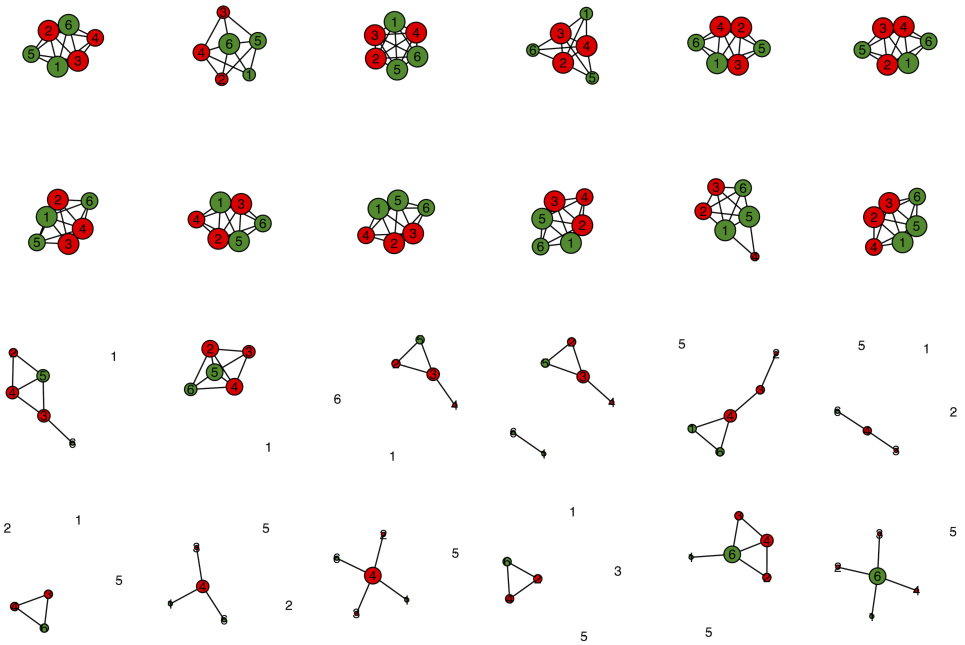

Figure 11: DG Group 3

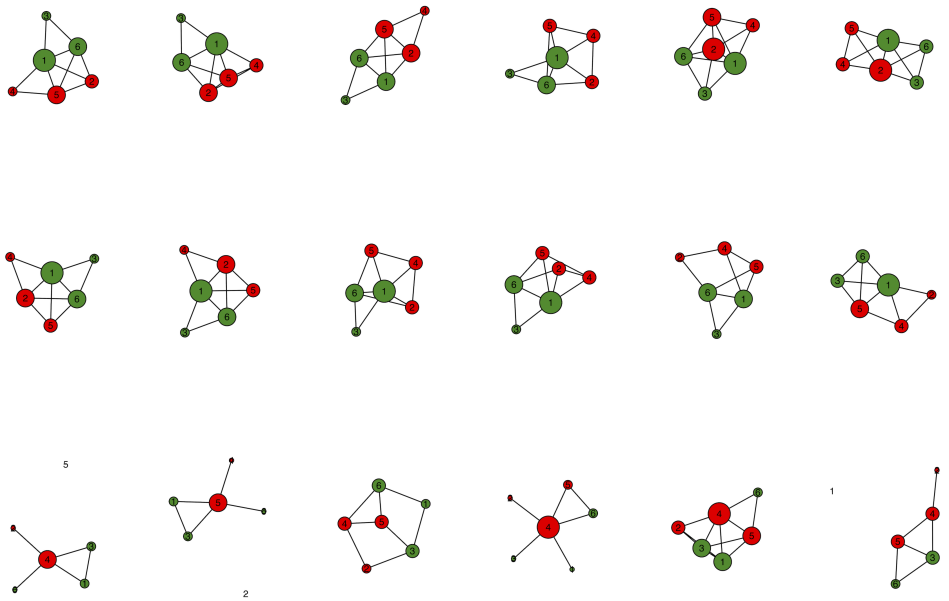

Figure 12: IG Group 1

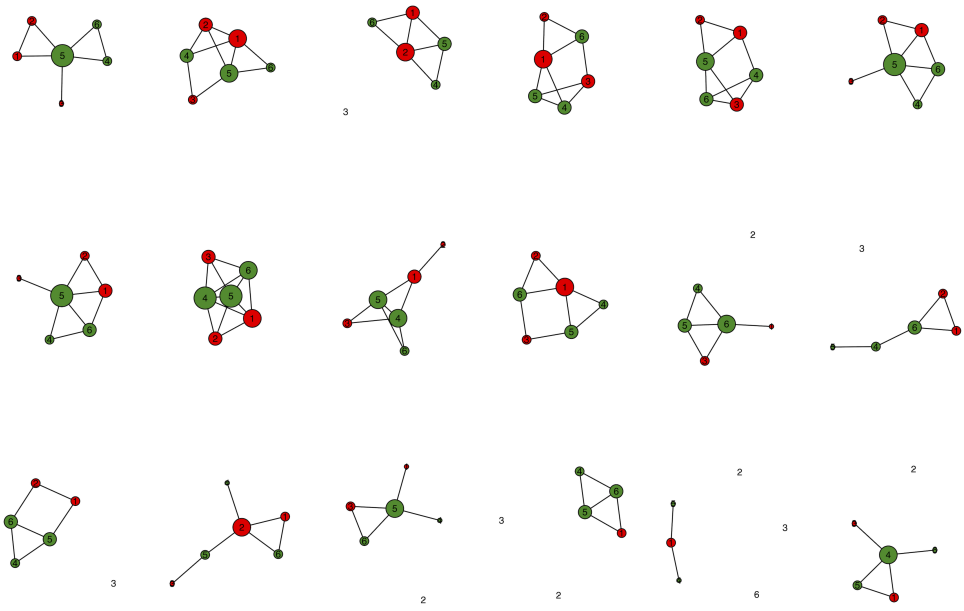

Figure 13: IG Group 2

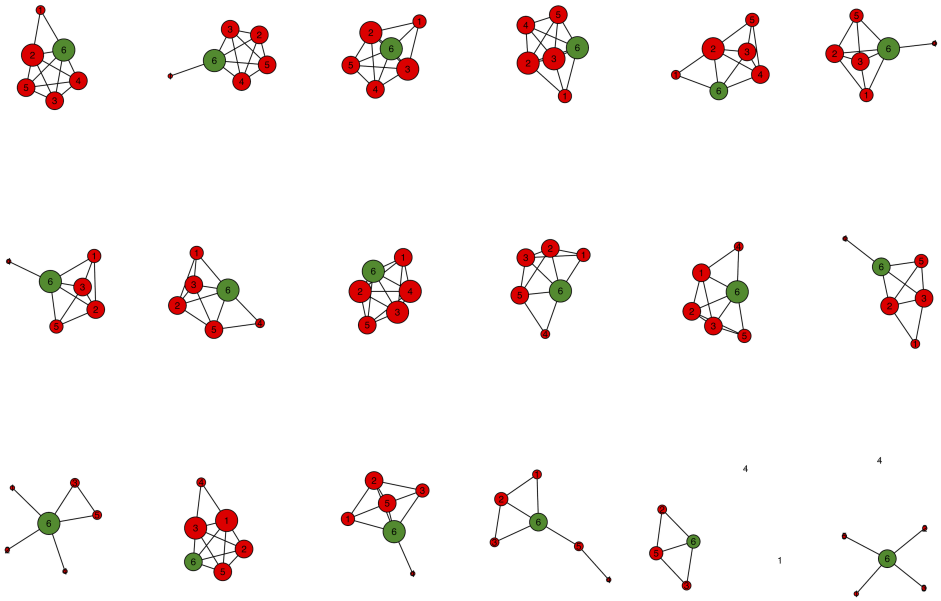

Figure 14: IG Group 3

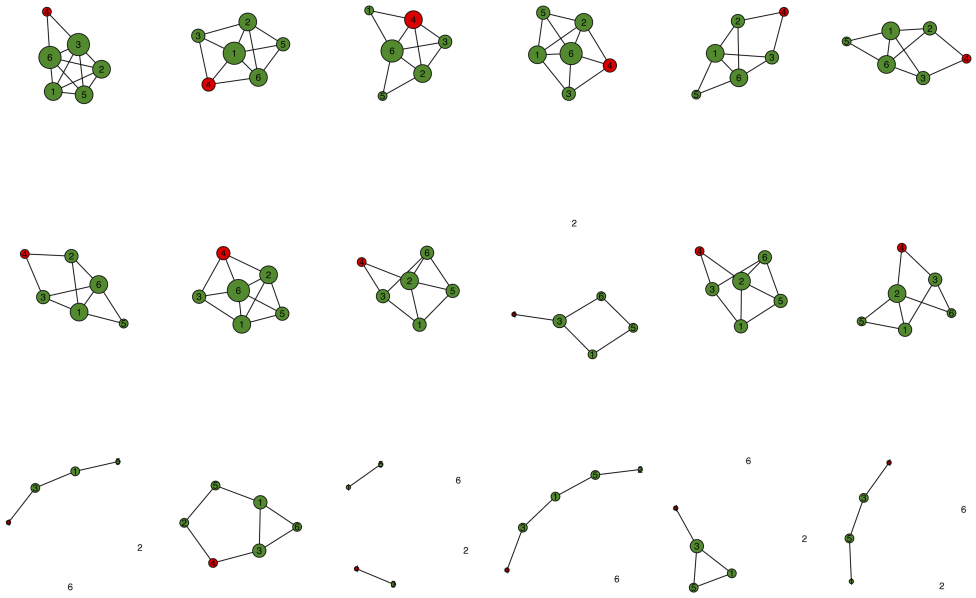

Figure 15: IG Group 4

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Summary

Generosity and Partnership in Three-Player Dictator and Impunity Games: the Role of Social Distance and Information

Jeffrey Avedisian

Abstract

The purpose of this study is to investigate partnerships and generosity in economic games using social network analysis in an experimental setting. The experiment utilizes three-player dictator and impunity games to measure generosity and explore the concept of generosity homophily using partner preferences. The results show a significant increase in generosity in the impunity game compared to the dictator game, demonstrating the influence of the reduction in social distance imposed by the acceptance or rejection mechanism. While generosity homophily is not observed in the partner preference networks, participants display binary homogeneous preferences based on those who made a donation or not. Information such as donation amount, gender, and the charity selected appear irrelevant in influencing partner preferences. Results also indicate that a transition from imperfect to perfect information significantly impacts player behavior and network reciprocity. Overall, the findings highlight the importance of being endowed with a voice in social settings since information tends to shape cooperation and decision-making in economic games.

1 Introduction

In daily life, whether in social or professional situations, people interact with one another. These interactions can be random and out of the control of a person or planned and organized by groups. When people interact opinions and impressions are formed about others. If continuous interaction is undertaken opinions change based on observed behavior. Based on such behavior people decide to end or continue relationships with others. An event that tests the integrity of a relationship is a disagreement. Upon disagreement or discontent with the other party involved a choice is made. Usually, the choice options are to confront and discuss the reason for conflict or to stay silent about it. Depending on the dynamics of a relationship, one or the other may not be possible. In a setting where a large social distance exists, it may not be possible to express discontent or such expression may not be considered. The level of social distance thus has a significant impact on how interactions unfold and develop.

This study seeks to analyze the social distance of interactions in an experimental setting using three-player dictator and impunity games. The two games subject participants to large social distances in a money-sharing scenario. The institutional social distance in the dictator game is assumed to be larger, whereas in the impunity game players have the ability to express their opinion using an offer acceptance or rejection mechanism (Frey and Bohnet 1995). This mechanism represents information communicated to the dictator, who must decide how to act upon the acceptance or rejection of offers. Generosity is usually studied using such games by measuring how much is allocated to other players, which has been shown to vary given the allowed social distance (Vesterlund 2015). When comparing the dictator and impunity games, it is expected that a reduction in social distance via the acceptance and rejection mechanism will lead to an increase in generosity. This expectation goes against the game theoretic prediction as both games should have the same outcome of dictators giving nothing at all.

Additionally, the concept of homophily is used to understand the role of information in partnership formation. Homophily is the tendency to establish social ties with those similar to oneself (McPherson, Smith-Lovin, and Cook 2001). The experiment presents a scenario where people are asked to indicate who they prefer to play with in a money-sharing game while being shown information about others in their group. It is expected that when presented with the gender, a charity chosen and donation amount about others in their group, the donation amount will be the prominent information used when selecting desired game partners.

An online experiment with three phases has been conducted with 48 students from LUISS Guido Carli University. Two sessions were conducted at separate times with different participants. The control in which the dictator game is played, and the treatment in which the impunity game is played. Participants are divided into groups of six at the beginning of the experiment and interact within this group for the entire duration. There are three phases in the experiment. In Phase I, participants answer demographic questions and a charity-specific question from which a level of generosity is elicited. In Phase II, participants indicate who they prefer to play with while being shown information about their group members. Then the dictator or impunity game is played for 12 rounds with imperfect information, after which Phase III begins for another 12 rounds with the games played with perfect information. The information varying from imperfect to perfect is the result of the adjacent game previously played in the group of participants. After the last twelve rounds, the experiment is finished and participants are paid accordingly. Errors during the experiment occurred that will affect the results, but meaningful interpretations from the outcome are obtained in any case. Further details are provided in the experimental design section.

Overall the research conducted finds that players gave more in the impunity game with respect to the dictator game, indicating that having a voice matters and can encourage generosity where selfish behavior may be optimal. Charity, donation, and gender characteristics seem to be irrelevant when expressing partnership preferences. However, players are found to act homogeneously in their

choices as those who did not donate are systematically avoided as preferred partners. Finally, perfect information is found to assist players in games make more decisive decisions.

This summary consists of theoretical fundamentals, a brief literature review, analysis and concluding remarks.

2 Theoretical Fundamentals

Generosity, or liberal in giving, is studied using the dictator game (henceforth DG) and impunity game (henceforth IG). Derived from the ultimatum game in which two players decide how to divide a sum of money, the DG and IG remove the power of the responder to affect the proposer by rejecting and nullifying the payoffs (Bolton and Zwick 1995). Generosity has been observed in many experimental studies in which the DG and IG have been utilized, a tendency which contradicts the theoretical equilibrium predictions of zero offers (Engel 2011).

In this study, three-player games were chosen in order to reduce the social distance between players as it has been shown to increase generosity (Bahr and Requate 2014; Güth and Kocher 2014). The extension of the DG to three players results in a scenario in which there is a proposer, a middleman, and a receiver. The proposer begins with an endowment and must decide how much to give to the middleman. The middleman then decides how much to give to the receiver. The receiver is passive and takes no action. In the IG, the middleman and receiver can accept or reject offers from their respective proposers.

In the theoretical setup of the DG, let X represent the proposer, Y be the middleman and Z be the receiver. X begins the game with an endowment of π, where $\pi \in \mathbb{N}_0$. Let the amount that X gives to Y be represented by an indivisible amount x, where $x \in \{0, 1, 2, ..., \pi\}$. Let the amount that Y gives to Z be represented by an indivisible amount y, where $y \in \{0, 1, 2, ..., x\}$. The set of strategies is $S = \{S_X, S_Y, S_Z\}$ where $S_X = [0, \pi]$, $S_Y = [0, x]$ and $S_Z = 0$. The payoffs for X, Y, Z are $(\pi - x, x - y, y)$ respectively.

In order to observe a relative measure of generosity let $x = \alpha\pi$ and $y = \beta\alpha\pi$,

where $\alpha, \beta \in [0, 1]$. α represents the portion of the endowment given by X to Y and β represents the portion Y gives to Z of the amount received from X. The payoffs then become $((1-\alpha)\pi, (1-\beta)\alpha\pi, \beta\alpha\pi)$. Under the assumption of rationality, X should offer zero and the game should end, leaving Y and Z with no payoff.

In the IG, the payoffs are the same as the DG if all offers are accepted. If Y rejects the offer from X, the payoffs become, $((1-\alpha)\pi, 0, 0)$. If Y accepts and Z rejects, then the payoff vector is $((1-\alpha)\pi, (1-\beta)\alpha\pi, 0)$.

By solving the IG by backward induction under the assumption of rationality and payoff-maximizing agents, Z should prefer any amount of $\beta\alpha\pi > 0$ to no payoff at all and thus should never reject. The same applies to Y and thus there are two sub-game perfect equilibria. One in which X offers $\alpha = 0$ and Y accepts, and the other in which X offers $\alpha = 0$ and Y rejects. Both scenarios leave Z with zero.

The novelty of the three-player games is the newfound role of Y in which the role consists of acting as a proposer and a responder in the same game. It has been shown that the concern for the third player reduces social distance and thus increases generosity (Bahr and Requate 2014).

The concept of social distance as the perceived space between individuals or entities imposes an effect on the results of the DG and IG in experimental settings. It has been shown that modifying the social distance in dictator games has had an impact on generosity (Frey and Bohnet 1995). In this thesis, two identical experimental scenarios are introduced and it is tested whether or not the reduction in social distance from the impunity game will have an effect on generosity. The only difference between the two scenarios is the "voice" mechanism in the IG.

Four distinct measures are implemented in the experimental design in order to reduce the social distance between players within each treatment without losing control. A hypothetical charity donation question is asked in order to obtain a measure of generosity and prime the participants to think in a giving context in hopes to encourage generosity. A third player is added to the games in order to

mirror the context of giving to charity more closely than the standard two-player game. Participants are divided into groups of six to play repeated games with random matching so participants think about establishing a sort of reputation. A random matching mechanism is used based on partnership preferences when characteristics are displayed to encourage tie formation.

2.1 Model

Now the model in which the players choose with whom they want to interact is introduced. While there are various groups of six participants within the structure of the experiment, the model is applied to each group since they interact only within their defined group for the entirety of the experiment.

Let $N = \{1, 2, 3, 4, 5, 6\}$ be the set of agents within each group, where i and j are members of the group. The strategy of each agent $i \in N$ is a column vector $g_i = (g_{i1}, g_{i2}, g_{i3}, g_{i4}, g_{i5}, g_{i6})$ where $g_{ij} \in \{0, 1, 2, 3, 4, 5\}$ for each $j \in N \setminus \{i\}$. When participants are asked to give their game partner preferences in the experiment they are asked to rate on a scale from zero to five how much they desire to play with others in their group. Such preferences constitute the vector g_i. A one-way tie is established when $g_{ij} \neq 0$ for $i \neq j$, hence when formed the network will be directed. Directed networks are chosen and analyzed as players can choose with whom they want to play and such play is left to chance as the preference vectors are used as a random matching mechanism. Therefore, two-way connections constitute a mutual tie. Self-connections are prohibited as an agent cannot interact with themself in the game. Hence, loops are excluded and let $g_{ij} = 0$ where $i = j$ for all agents in N.

To complete the model, the final preference network is represented as the adjacency matrix $G_m = (g_1, g_2, g_3, g_4, g_5, g_6)$ where each column represents the preference vector of a group member and $m = \{1, ..., M\}$ for M groups formed.

A preference vector of one group member will be randomly selected by the computer and used to determine the roles in the subsequent dictator or impunity games. In this sense, participants will not necessarily be playing games on this

network since the games played do not reflect completely the preference vector. A player can choose to not play with any other player, but will still play with someone in a game. This reflects the randomness of social situations as people cannot always choose with whom they interact and might be sometimes obligated to do so when not desired.

In each round, participants are notified which group member's preference vector was chosen but do not know precisely the vector contents. Therefore, a network formation game in terms of giving a simple partner preference is played. Once the preference vector is randomly selected for matching and role assignment, players move on to play the DG or IG.

From the network, a preference vector, g_i is selected with probability of $\frac{1}{6}$. Once selected, the vector is sorted in descending order and the two largest ratings of group members are selected and implemented via random role assignment in the DG or IG. If the agent expresses indifference between one or more different players and there is a remaining role to be assigned, the players with indifference ratings are selected randomly. Each participant has a $\frac{1}{3}$ probability of being selected for each role, X, Y, Z. Such random assignment and selection processes are denoted in Figure 1 as nature.

Once the players are selected from the vector, they are divided into two subgroups A_1 and A_2. Where A_1 is the group in which the selected preference vector is implemented and A_2 are the remaining three players. Upon allocation into a subgroup, roles for the DG or IG are randomly assigned and games are played.

In the experiment introduction, it was noted that there are three phases. In Phase III, players are given extra information: the results of the previous round played in their group for both games. In Phase II the previous game results of the game in which they played are only available by one's deduction; by memory or by written notes. Players are unaware of the results of the other game played in their group. Therefore the results of the previous round for both games in Phase III are provided to players, which indicates a transition from imperfect to perfect information. Within the individual games played, the games are played

with perfect information. However, in the full game, Phase II is a game played with imperfect information and Phase III is a game played with perfect information. In Figure 1, the dotted line indicating imperfect information between groups A_1 and A_2 will be removed when transitioning from Phase II to III. To conserve space, the DG is used in the diagram and another diagram is not shown with the IG, but in such case, the payoffs above may be referenced.

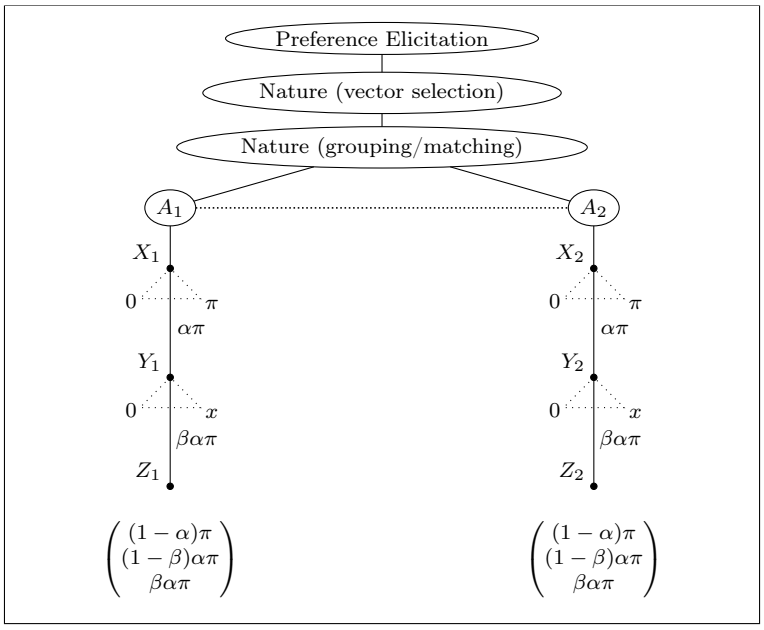

Figure 1: Full Game

2.2 Hypothesis

The main purpose of this thesis is to test the two institutions of the dictator and impunity games. It is believed both games provide valid representations of social or professional scenarios with large social distances given the lack of sanctioning power. In brief, the experiment follows a 2 x 2 design structure which varies the game and information available. This design allows a test of both the voice mechanism of the impunity game and the effect of information variation.

The DG and IG are essentially identical, except for the presence of an acceptance and rejection mechanism in the latter, which grants responders a "voice". This voice provides additional information about the responder for the dictator,

who must decide how to act on such information. Despite the theoretical equilibrium predictions of zero offers in both games, it is expected that the decrease in structural social distance imposed by the acceptance and rejection mechanism in the impunity game will lead to higher levels of generosity compared to the dictator game. The presence of the mechanism is expected to evoke empathy in proposers, prompting them to be more generous. Based on this expectation, the first hypothesis of the thesis is formulated as follows: **Voice Hypothesis:** *The average proportion given in IG is greater than the average amounts given in DG.*

In this study, the theory of generosity homophily is examined, in which it is expected that generous individuals will display a tendency to form ties with individuals who are also generous. To define generous individuals, the median amount given in the self-report questionnaire is used to determine who is considered generous and who is not. It will then be observed if those who give more, prefer their partners to be those who give more as well, establishing a sort of generosity norm. Consequently, the following hypothesis related to homophily is formulated: **Homophily Hypothesis:** *Generous people want to associate with generous people.*

3 Literature Review

Various pieces of literature are reviewed for the thesis and thus a brief summary is given here of the main topics. For a more complete review, please refer to the thesis.

Generosity is broadly reviewed in the context of charitable giving and it is noted that motivations for giving vary based on experimental settings (Vesterlund 2015). The seminal DG paper by Forsythe et al. (1994) is reviewed to show the rejections in the UG were due to a concern for fairness. A review of a meta study is conducted to identify the main empirical findings in many years of researching the dictator game (Engel 2011). The seminal paper by Bolton and Zwick (1995) is reviewed for the IG, in which experimenter effects are disentangled from the fear of punishment. Then Yamagishi et al. (2009) is reviewed to show the importance of

the voice mechanism in the IG and that emotions play an important role in game behavior. Three-player games are reviewed where it is shown the introduction of a third player, communication between players and the amount of available information increases generosity (Bahr and Requate 2014; Greiner, Güth, and Zultan 2012; Guth, Huck, and Ockenfels 1996). Social distance is reviewed from the lens of the DG, in which it is found systematically that a reduction in social distance amongst players increases generosity (Charness and Gneezy 2008; Frey and Bohnet 1995; Hoffman, McCabe, and Smith 1996). In regard to endogenous network formation, experimental evidence is provided by a review of three papers which highlight the equilibrium deviating choices of laboratory network games, the positive influence trust has on tie requests and the positive effect more ties has on generosity (Brañas-Garza et al. 2010; Conte, Di Cagno, and Sciubba 2015; Di Cagno and Sciubba 2010). For the homophily portion of the literature review, only experimental studies were chosen to highlight evidence of in-group biases and homophilic tendencies arising when people are able to choose partners or automatically assigned partners (Charroin, Fortin, and Villeval 2021; Currarini and Mengel 2016; Güth, Ploner, and Regner 2009). This concludes the literature review section of the thesis.

4 Experiment Design

Two sessions were conducted on the same day with different subjects, one using the DG and the other using the IG. The experiment was conducted using the online platform Webex, following the lab-like protocol developed by Buso et al. (2021). The experimental design consists of three distinct phases. Upon logging into the experiment, participants were randomly assigned to a group of six individuals, without any predetermined criteria.

Phase I involved participants answering various demographic questions, as well as a specific question related to charity and donation amount.

In Phase II, participants were introduced to either the DG or the IG. They were provided with information about the gender, charity choice, and donation

amount of the other participants in their group. Using a rating scale ranging from zero to five, participants indicated their preferences for playing the DG or IG with specific individuals from their group. These preference ratings were then used to match participants in gameplay roles. Subsequently, the DG or IG was played for a total of 12 rounds.

Phase III involved playing the same DG or IG game again, but with the addition of explicit information about the previous round results of both games within the group. One round was randomly selected, and payoffs were distributed accordingly based on the outcomes of that round. The experiment is now concluded.

4.1 Important Experimental Notes

Time constraints forced the experimenters to prematurely end the IG session and this is taken into consideration for the analysis of the results.

Following the completion of the experiment a matching error was discovered where the amounts given by participants to others did not correspond to the amounts assigned based on their partners. It appeared as if two individuals assigned as X gave their portions to the individuals assigned as Y, resulting in most Y participants receiving the same amount. The same happened for Y giving to Z. However, valuable insights can be derived from the experiment as generosity is measured using the portion of amounts given, hence the entire amount received is less relevant. Preference analysis is approached from a more qualitative point of view by considering just the vectors elicited and not game behavior. The matching error has been rectified and will be closely verified before the next session is conducted.

5 Analysis

A brief summary of the results are provided in this section. For more in-depth details please refer to the thesis.

In the two sessions, 42 people participated, for a total 288 game observations.

There were 18 participants in the DG session, nine males and nine females. The average portion given by Xs over all rounds, denoted by $\bar{\alpha}$ is 0.091 ($SD = 0.048$). The average portion given by Ys over all rounds, denoted by $\bar{\beta}$ is 0.085 ($SD = 0.078$).

In the IG session, there were nine males and 15 females. The average portion given by Xs over all rounds, denoted by $\bar{\alpha}$ is 0.220 ($SD = 0.060$). The average portion given by Ys over all rounds, denoted by $\bar{\beta}$ is 0.117 ($SD = 0.045$). A look at the rejection of offers in all roles show that in the first five rounds players rejected offers of five euros and less.

5.1 Voice Hypothesis

To analyze the differences in generosity between the DG and IG, a two-sample permutation test suggested by Holt and Sullivan (2023) is used, as the data does not always meet the assumptions of normality and variance equality. Due to the early termination of the experiment, the first 14 rounds are tested, as well as all rounds.

The hypotheses are as follows:

Hypothesis 1 *The average portion given per round by X in IG is greater than the average portions given per round by X in DG.*

$$H_0\text{: } \bar{\alpha}_{IG} < \bar{\alpha}_{DG}$$
$$H_1\text{: } \bar{\alpha}_{IG} \geq \bar{\alpha}_{DG}$$

Hypothesis 2 *The average portion given per round by Y in IG is greater than the average portion given per round by Y in DG.*

$$H_0\text{: } \bar{\beta}_{IG} < \bar{\beta}_{DG}$$
$$H_1\text{: } \bar{\beta}_{IG} \geq \bar{\beta}_{DG}$$

For all rounds, the sample estimate for the difference between $\bar{\alpha}_{IG}$ and $\bar{\alpha}_{DG}$ is 0.1292 (p-value = 0.001). The average portion given by X in IG was around 12% more than in the DG with statistical significance, thereby rejecting the null

hypothesis. The sample estimates for the difference between $\bar{\beta}_{IG}$ and $\bar{\beta}_{DG}$ is 0.0319 (p-value = 0.076). At the predefined significance level of 0.05, the result is not significant. However, the average portion given in the IG is about 3% higher than in the DG.

For the first 14 rounds, the sample estimate for the difference between $\bar{\alpha}_{IG}$ and $\bar{\alpha}_{DG}$ is 0.1310 (p-value = 3.99e-07). The difference in means between $\bar{\beta}_{IG}$ and $\bar{\beta}_{DG}$ is 0.0122 (p-value = 0.3299). This shows that despite the experimental mishaps, the results still hold.

The results indicate the reduced social distance by the acceptance and rejection mechanism in the IG has the possibility of increasing generosity when compared to the DG. The larger social distance observed in the DG, despite the theoretical equality between the games, may be attributed to the absence of any interaction. In contrast, the voice mechanism in the IG may reduce social distance by invoking empathy and potentially triggering guilt aversion.

5.2 Homophily Hypothesis

Homophily is measured by evaluating the preference networks with an assortativity coefficient. The assortativity coefficient is defined as:

$$r = \frac{Tr(\boldsymbol{e}) - ||\boldsymbol{e}^{\boldsymbol{2}}||)}{1 - ||\boldsymbol{e}^{\boldsymbol{2}}||}$$

where $\boldsymbol{e}$ is a mixing matrix with elements e_{ij} that are the fraction of edges in a network that connect nodes of type i to type j. Then we have that the value $Tr(\boldsymbol{e})$ is the sum of the diagonal or the sum of the portion of like ties ($i \to i$ and $j \to j$). The value $||\boldsymbol{e}^{\boldsymbol{2}}||$ is the sum of all elements in the mixing matrix (Newman 2003). When $r > 0$ a network shows assortativity or homophily. When $r < 0$ a network shows heterophily or disassortativity. When $r \approx 0$ a network shows the properties of a random network.

Using the information collected in Phase I, three categories for r are created: gender, charity and donation. Since the donation data is numeric, the median of the amounts donated separately in both the DG and IG session are taken and

players who gave above the median are defined as "generous" and those below the median as "not generous". Thus, the hypothesis is as follows:

Hypothesis 1 *The average donation assortativity coefficient across groups will be on average larger than the average gender and charity assortativity coefficients.*

$$H_0\text{: for all } \bar{r} > 0,\ \bar{r}_{donation} < \bar{r}_{gender,charity}$$
$$H_1\text{: for all } \bar{r} > 0,\ \bar{r}_{donation} \geq \bar{r}_{gender,charity}$$

The overall existence of homophily ($\bar{r} > 0$) and the average assortativity coefficient per round for the donation (or generosity) category to be greater than both the gender and charity average coefficient is expected. This would indicate on average, generous players preferred to play with other generous players. Visualizations of the networks are available in Appendix A in the full thesis.

Surprisingly, assortativity coefficients for every category over all rounds were found to be negative or only slightly positive, indicating a complete absence of generosity homophily. Thus, the hypothesis is invalid as $\bar{r}$ never exceeds 0.

In order to obtain some sort of useful interpretation of which characteristics may be more prominent when players indicated partner preferences, multivariate regressions are conducted with the average player in-degree over all rounds as the dependent variable and pieces of information shown as the independent variables. In-degree is simply the number of incoming ties to the player.

In both sessions, the participants who decided not to donate in the self-report question received 1.91 (p-value = 0.028) fewer incoming ties in the DG and 1.65 (p-value = 0.009) fewer in the IG, which are statistically significant.

The results imply that characteristics such as charity, gender, and donation amounts have limited influence on individuals' decisions when selecting their game partners. However, participants exhibit a homogeneous tendency to avoid those who make no donations at all. This suggests that when players choose not to donate, it is seen as a lack of generosity and, consequently, undesirable behavior. As a result, they may face the risk of being excluded by potential partners.

5.3 Additional Analyses

Upon observing a stark difference in generosity and network reciprocity between Phase II and III, tests were performed to observe if they are statistically significant. Using Fisher permutation tests, it was found that participants in the role of X on average gave 6.4% more in Phase II in the DG and 8% more in Phase II in the IG. The results do not hold for Y as no significance is found.

Fisher permutation tests were used to test differences in reciprocity and the results indicate a statistically significant difference in both sessions. In the DG, 33% more reciprocity is observed in Phase II and in the IG, 22% more reciprocity is observed in Phase II.

Gender differences in generosity were also tested using regression analysis and it is shown that females give 7% more as X in the DG and 9% more as Y in the IG. More details regarding both tests can be found in the thesis.

6 Conclusion

To conclude, the experimental data from this thesis provides valuable insights into the dynamics of generosity, tie formation, and the impact of information. The study demonstrates the effectiveness of a structural voice mechanism in increasing generosity and reducing social distance. It highlights the complexity of tie formation, indicating that partner preference networks are not easily influenced by specific characteristics such as gender or generosity. Participants are found to act homogeneously and make binary choices between those who donate and those who do not. The tendency to avoid individuals who do not exhibit generosity emphasizes the role of reputation and social evaluations in shaping social connections. The transition from imperfect to perfect information conditions leads to significant changes in behavior, suggesting the importance of information in economic decision making. Furthermore, the gender analysis reveals variations in the generosity of females compared to males in specific roles and sessions, suggesting the influence of contextual factors.