UNIVERSITA' DEGLI STUDI DI PADOVA

DIPARTIMENTO DI SCIENZE ECONOMICHE ED AZIENDALI "M. FANNO"

CORSO DI LAUREA IN ECONOMIA

PROVA FINALE

"Game Theory, Prosociality, and Religion"

RELATORE:

CH.MO PROF. Edoardo Grillo

LAUREANDO: Andrea Gottardi

MATRICOLA N. 2003263

ANNO ACCADEMICO 2022 – 2023

Dichiaro di aver preso visione del "Regolamento antiplagio" approvato dal Consiglio del Dipartimento di Scienze Economiche e Aziendali e, consapevole delle conseguenze derivanti da dichiarazioni mendaci, dichiaro che il presente lavoro non è già stato sottoposto, in tutto o in parte, per il conseguimento di un titolo accademico in altre Università italiane o straniere. Dichiaro inoltre che tutte le fonti utilizzate per la realizzazione del presente lavoro, inclusi i materiali digitali, sono state correttamente citate nel corpo del testo e nella sezione 'Riferimenti bibliografici'.

I hereby declare that I have read and understood the "Anti-plagiarism rules and regulations" approved by the Council of the Department of Economics and Management and I am aware of the consequences of making false statements. I declare that this piece of work has not been previously submitted – either fully or partially – for fulfilling the requirements of an academic degree, whether in Italy or abroad. Furthermore, I declare that the references used for this work – including the digital materials – have been appropriately cited and acknowledged in the text and in the section 'References'.

Firma (signature) ……  ……

Italian Abstract

La teoria economica si basa su un modello di agente chiamato *homo economicus*, ovvero un individuo ideale e sempre razionale, e che, tra le altre caratteristiche, pensa solo ed esclusivamente a massimizzare il proprio profitto. La teoria dei giochi che si sviluppa su questa idea, però, riesce a fatica a spiegare molte delle reali interazioni che avvengono tra le persone. È in quest'ottica che nasce l'economia comportamentale, che con i suoi giochi ha l'obbiettivo di spiegare e capire come e perché il comportamento degli agenti economici si discosta da quello teorico dell'*homo economicus*. I giochi comportamentali sono difatti in grado di analizzare diversi comportamenti, quali l'altruismo, la cooperazione, o il senso di giustizia, che vengono in generale definiti comportamenti prosociali. La letteratura scientifica economica, psicologica e sociologica ha ampiamente studiato la prosocialità attraverso l'utilizzo dei giochi comportamentali; elementi come la ripetizione delle interazioni, la preoccupazione per la propria reputazione e il favoritismo rispetto al gruppo si dimostrano correlati con maggiori livelli di prosocialità. Allo stesso modo, le persone si comportano prosocialmente anche in singole interazioni e in completa anonimità; perché? Tra le altre, la religione potrebbe essere una spiegazione. Giochi economici ed esperimenti dimostrano come le credenze in divinità sovrannaturali aumentino la prosocialità. Anche in chiave evoluzionistica, la fede in entità omniscienti e onnipotenti avrebbe infatti aiutato a diminuire i costi di controllo e monitoraggio dei credenti, promuovendo contemporaneamente la prosocialità nel gruppo e la discriminazione degli altri.

Index

Introduction

Since the birth of game theory, economic games have been widely used in different scientific disciplines, such as psychology, biology, sociology, or political science. Initially developed in economics, games were affected by the idea of *homo economicus*, a very peculiar and ideal individual that, among other characteristics, always behaves rationally. While this model works in pure economic theory, real interactions between people are barely explainable by games developed on this idea. In this optic, behavioral game theory was later developed; its objective was (and still is) to understand how and why individuals behave differently from *homo economicus*. Behavioral games' simplicity and ability to describe interactions between actors made them a powerful tool to explicitly quantify human behavior.

Economic theory has forever been captivated by the search for an explanation to behaviors such as altruism, cooperation, or fairness. These human behaviors, defined as prosocial behaviors, cannot be fully explained by standard economics, which lacks in theoretical tools. It is in this context that behavioral economics, and especially behavioral game theory, are able to provide interesting insights. Through economic games it has been demonstrated that repeated interactions, reputation concerns, and membership or affinity with a group are positively correlated to prosociality. More interestingly, individual still behave prosocially in one-shot games and in full anonymity, namely when all the previous elements are not present in the game setting. The question still remains unanswered. Why do people behave prosocially?

One explanation might come from religion. Beliefs in so-called Big God religions, which centered around omniscient and omnipotent deities, are found to predict prosociality in believers; religions are positively correlated to good behavior, especially when religious elements are presented to experimental participants through the technique of priming. Through the employment of economic games, factors like the possibility of a supernatural punishment (more impactful than the possibility of a divine reward) or the participation in religious rituals were determinant influences in prosociality. From an evolutionary standpoint, religion might has helped lower monitoring and controlling costs, and discouraging defectors and not-enough committed individuals. Although religion and prosociality are correlated, the same experiments and techniques were used to find links between religion and discrimination, racism, and violence.

Chapter 1 – On Games

1.1 – Analytical Game Theory

Game theory is the field that studies strategic interactions, that are situations in which the outcome depends not only on the actions of one agent, but of multiple ones, who have multiple interests and multiple variables which affect decisions.

The first studies on games date back to the 19th century, with the scientific papers of Cournot (1838) and Bertrand (1883), who studied oligopolistic competition and dealt with production and pricing. The birth of Game Theory as a field of economic studies is due to the book *Theory of Games and Economic Behavior* (1944), wrote by the scholars von Neumann and Morgenstern; in this book, they stressed the need to use mathematics and games to study the behavior of economics agents.

1.1.a – Games and the Payoff Matrix

In game theory, a game is every strategic situation in which various actors contribute to reach a certain outcome. These actors are the decision-makers of the game and are called players. Each player has a choice set, which is a set of different possible choices. A strategy is a complete plan of action that describes what a player will do under all possible circumstances. The decisions the players take, based on their strategies, are called actions. At the end of the game, the outcome a player gets is called payoff, which can be money, but also utility. The rational player tries to maximize his own payoff, because a greater payoff implies a greater utility.

The payoff matrix is a simple way to visualize a game, in which players, strategies, and payoffs appear all together. Below, a simple game payoff matrix is displayed:

The Payoff Matrix

		pB	
		left	right
pA	up	$\mathbf{A}_{up,left}$ $\mathbf{B}_{up,left}$	$\mathbf{A}_{up,right}$ $\mathbf{B}_{up,right}$
	down	$\mathbf{A}_{down,left}$ $\mathbf{B}_{down,left}$	$\mathbf{A}_{down,right}$ $\mathbf{B}_{down,right}$

In this game there are two players, pA and pB, each one with his own strategies and payoffs. The strategies the players choose from are ‘up’ or ‘down’ for player pA, and ‘left’ or ‘right’ for player pB. The payoffs are represented as two outcomes, one for each player. The payoff of player pA starts with the letter A, and the one of player pB starts with the letter B. Let us analyze the example of the bottom right cell, the one in which the payoffs are ($A_{down,right}$, $B_{down,right}$). In this case, player pA chose the strategy ‘down’ and player pB chose ‘right’. Therefore, the strategy profile (a vector of strategies, one for each player) <down, right> leads to the payoffs ($A_{down,right}$, $B_{down,right}$).

1.1.b – Dominant Strategies and Equilibrium

Not all strategies are the same; sometimes, some are just better than others, because they yield greater payoffs no matter what the other players do, and therefore greater utility. These strategies are called dominant strategies, because their reward is at least as good as the one of other strategies.

A Dominant Strategy

		p2	
		left	right
p1	up	**10, 20**	**10, 12**
	down	**10, 15**	**10, 10**

Using the payoff matrix once again, a hypothetical game is described above. Two players (p1 and p2) have two strategies each (‘up’ or ‘down’ for p1, ‘left’ or ‘right’ for p2). Independently on p1’s decision, he will always get a payoff of 10. For p2, choosing ‘left’ or ‘right’ will not result in the same payoffs; depending on p1’s action, p2’s payoff may vary from 10 (bottom right cell) to 20 (top left cell). At the same time, independently on p1’s action, choosing ‘left’ would always result in a greater payoff than choosing ‘right’ (the smallest payoff of the ‘left’ strategy is 15, the greatest payoff of the ‘right’ strategy is 12). Strategy ‘left’ is a dominant strategy for player p2, which means that a rational player p2 would never choose otherwise. What would happen if both players were to play a game and they both had a dominant strategy? In the situation in which each player plays his own dominant strategy, the game

would reach an equilibrium, called a dominant strategy equilibrium, namely a situation in which no player would play otherwise. An example is portraited below:

Dominant Strategies Equilibrium

		p2	
		left	right
p1	up	**15, 20**	**11, 12**
	down	**8, 15**	**10, 10**

Contrary to the previous version of the game, p1's and p2's payoffs change, but that is not all: if p1 chooses 'up', his payoffs will be greater than if he chooses 'down'. The strategy 'up' (p1's dominant strategy), combined with the strategy 'left' (p2's dominant strategy), creates the vector of strategies <up, left>, and it will eventually result in the payoffs (15,20). It is irrational to think that even one of them players would deviate from their own dominant strategy.

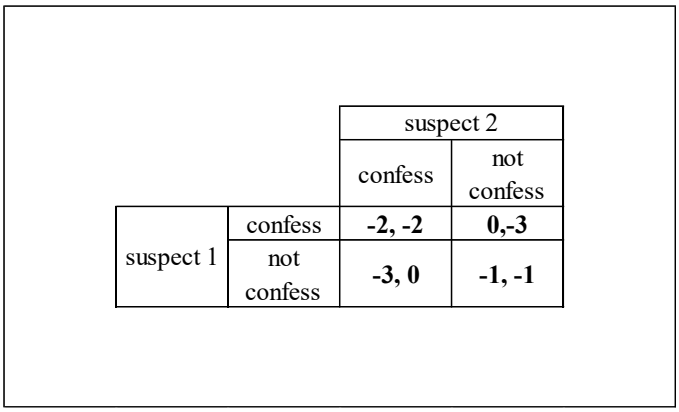
1.1.c – The Nash Equilibrium

John Nash (1928-2015) was an American economist and mathematician. He was awarded in 1994 for his "pioneering analysis of equilibria in the theory of non-cooperative games". His work centered on game theory, more specifically on Nash equilibrium theory. He defined the equilibrium point in this way: "One may define a concept of an *n*-person game in which each player has a finite set of pure strategies and in which a definite set of payments to the *n* players corresponds to each *n*-tuple of pure strategies, one strategy being taken for each player. […] Any *n*-tuple of strategies, one for each player, may be regarded as a point in the product space obtained by multiplying the- *n* strategy spaces of the players. One such *n*-tuple counters another if the strategy of each player in the countering *n*-tuple yields the highest obtainable expectation for its player against the *n*-1 strategies of the other players in the countered *n*-tuple. A self-countering *n*-tuple is called an equilibrium point." (Nash, 1950, pp.48-49)

A Nash equilibrium is a strategy profile which has the property that each *n*-player's strategy is the best response to the strategies of all the other *n*-1 players; this equilibrium concept has

assumed a pivot role in game theory, revolutionizing economics and other sciences, also due to the various interpretation of this concepts (Holt & Roth, 2004).

The Prisoners' Dilemma



		suspect 2	
		confess	not confess
suspect 1	confess	**-2, -2**	**0,-3**
	not confess	**-3, 0**	**-1, -1**

Let us analyze one of the most famous games, the Prisoners' Dilemma (PD), represented above, to better understand the concept of Nash equilibrium, how to find it, and how the equilibrium does not always result in the best possible payoffs option.

In this game, two suspects are accused of a crime. The prosecutor has enough proofs to convict them of a minor charge. For the major charge, he needs at least one confession. If both suspects confess, they will serve a 2-year sentence. If only one of them confess, he will be pardoned, and the other will serve 3 years in jail. If neither one of them confesses, they will only be convicted for the minor crime, and spend 1 year in prison. The payoff matrix of the game is the one illustrated above. What is the best strategy, and the best choice, for each suspect?

If Suspect 2 confesses, Suspect 1 is better off confessing, because 2 years of jail is better than 3 years; again, if Suspect 2 does not confess, Suspect 1 best option is to confess, sending the other to jail and walking free at the same time. Whatever the other does, Suspect 1 is always better off confessing (this is a dominant strategy). Since the game is symmetrical, the strategy of confessing is always the best one for both suspects. The equilibrium, which is a Nash equilibrium (and a dominant strategy equilibrium), is <confess, confess>, sending both suspects to jail for 2 years, which now makes them prisoners. Looking at the payoff matrix, it is clear that this is not the (Pareto) optimal strategy; if both of them did not confess, they would be convicted for the minor crime, and would spend less time in prison.

The Nash equilibrium works with games with no dominant strategies too. A textbook case is the so-called Battle of Sexes game, first introduced by Luce and Raiffa (1957). In this game, two players, boyfriend and girlfriend, have to decide where to hang out in the evening. He

would prefer to go to the movie theatre, she would prefer to go listen to some live music. The matrix, with strategies and payoffs, is represented below.

Battle of Sexes

		her	
		movie	music
him	movie	**2, 1**	**0, 0**
	music	**0, 0**	**1, 2**

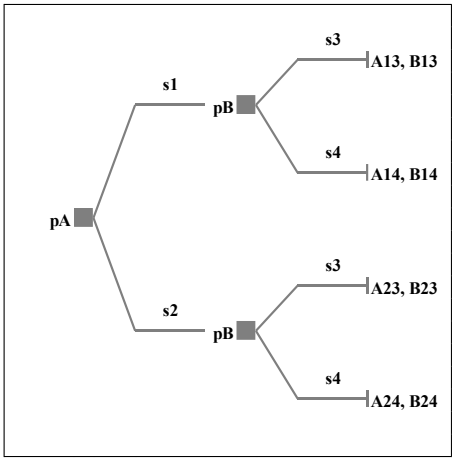
In this game there is no dominant strategy for either one of them. If one goes to the theatre and the other to the concert, the payoffs would be (0, 0), since the thing they care the most is being together. In this game there are two Nash equilibria, which are reached if the players coordinate on the same strategies, and are elucidated by the vectors <movie, movie> or <music, music>.

1.1.d – Sequential Games and Backward Induction

Up to this moment, games had the characteristic of being one-shot games, namely games played only once in which players choose at the same time. This does not happen very often, because one of the players might have the possibility to choose first, and the others to behave accordingly. Games in which not all decisions are taken at the same time are called sequential games.

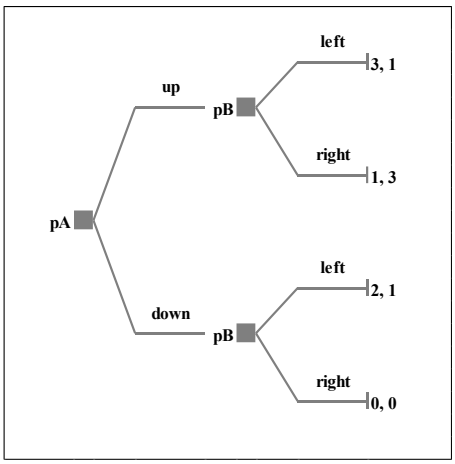
A sequential game is a multi-stage game, in which a player's decision affects the following one's outcome and decision too. A tree-looking representation is used to illustrate this game, and it is called either game tree or extensive form.

The Sequential Game



The game tree above represents a game in which two players, pA and pB, have a strategic interaction. In this simple model, pA moves first, or chooses first. He can either choose the strategy ‘s1’ or ‘s2’. The other player, pB, who moves second, can either choose ‘s3’ or ‘s4’. The payoffs of the game are represented at the end of the game tree (the leaves). The point in which a player has to make a decision is called node; in the game illustrated above there are three nodes, one when pA has to make a decision, and two when pB has to make a decision (depending on pA’s previous one). When there is a node, there is a subgame, which is a portion of the entire game. A subgame has the peculiarity that it can be treated as a separate game with its own equilibrium; in fact, the Nash equilibrium of a subgame is called subgame-perfect equilibrium. To find the equilibrium of the game, rational players use a technique called backward induction, which consists in reasoning backward in time, starting to look for the equilibria in the latest stages of the game, and looking for the sequence of optimal actions in each situation.

A Sequential Game



In the example of a sequential game illustrated above, two players move at different times. The player pA moves first, and his strategies can be ‘up’ or ‘down’. Player pB moves second and can choose either ‘left’ or ‘right’. The payoffs are at the end of the game tree (the first number is the playoff of pA, the second of pB).

If player pA chooses ‘up’, pB will then choose ‘right’, to maximize his own payoff. On the other hand, if pA chooses ‘down’, pB will go for ‘left’, because the payoff is greater. Since pA knows the strategies of pB and the respective payoffs, he knows that if he chooses ‘up’ pB will choose ‘right’, leaving him with a payoff of 1. He will therefore choose ‘down’, being certain that pB will go for ‘left’, obtaining a payoff of 2. This is backward induction. The reasoning of pA started from the latest stages of the game and moved backward in time to find his own best strategy. The equilibrium would be represented by the strategy profile <down, left> and the payoffs of (2, 1).

Real life examples of sequential games are chess, negotiations, tic-tac-toe, and many others daily interactions. Under the umbrella of sequential games, it is important to mention repeated games, which are normal form games, but repeated many times. Under certain conditions, the Nash equilibrium may vary if a one-shot game is repeated. In the PD, if repeated infinite times, a different equilibrium is achieved, since other variables make their way into the behavior of players, like cooperation and punishment (Angner, 2016).

1.2 – Behavioral Game Theory

Up to this point, all players were represented as standard economic individuals. The individual, in the standard economic theory, is portraited as a human being who maximizes his payoff, who is able to make rational choice, no matter the situation, and has independent tastes and preferences (Doucouliagos, 1994). Moreover, the standard economic individual has pre-determined preferences, which apply to produced, consumed, and exchanged material goods; he is self-interested, caring only for his own commodities, and for time spent working and on leisure; he only cares about others and his relationships with them only if those affect his wealth or consumption (Gintis, 2000). In fact, the individual in the standard economic theory is called *homo economicus*, to distinguish it from the *homo sapiens*. While the *homo economicus* perfectly works in the economic models, the real-world economic agents behave differently.

Behavioral economics is a subfield of economics that aims to analyze the behavior of people in an economic environment. It is often described as a field linking psychology and economics (e.g., Rabin, 1998; Camerer, 1999). In general, behavioral economics wants to study the deviation from the rationality in the economic behavior, which can be interpreted as

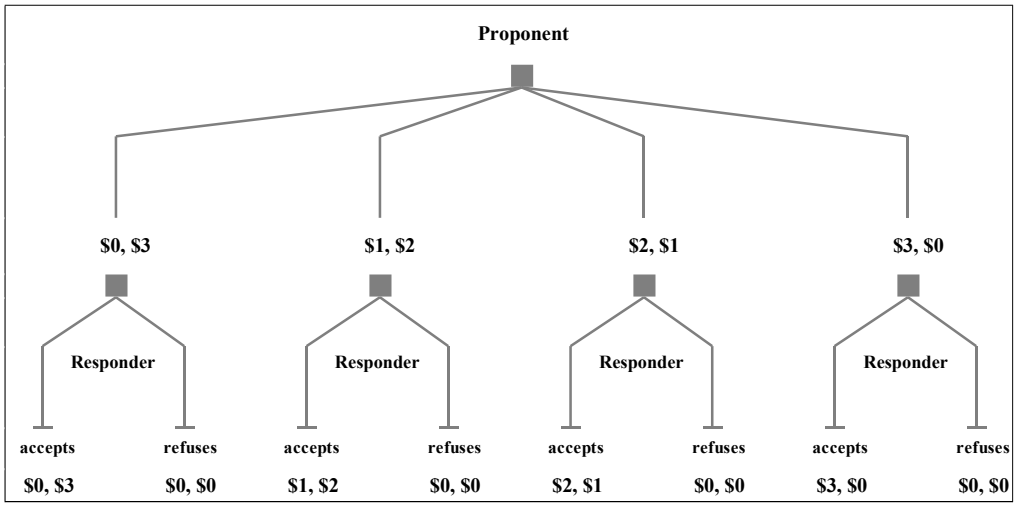
the deviation of the *homo sapiens* from the *homo economicus*, and why this deviation occurs. The best way to explore and map this approach is by using experimental studies, with the most relevant insights coming from behavioral economic games. There are two main games used in the literature to study how the human behavior deviates from rationality and the *homo economicus* assumptions, which are the Ultimatum Game and the Dictator Game.

1.2.a – The Ultimatum Game

The Ultimatum Game (UG) was used for the first time in 1982 by three German scholars, Güth, Schmittberger, and Schwarze, in a primordial version which they called 'The Ultimatum Bargain Game'. Since then, the UG was widely used in the study of prosocial behavior, such as fairness and altruism, but also punishment.

The textbook version of the UG is made in this way: there are two players, a Proponent (Player I) and the Responder (Player II). The Proponent is given a sum of money, let us say $3 (for the purpose of the example, let us suppose the sum is made of three $1 bills). In the first stage of the game, he has to make a proposal on a division of the $3 to the Responder. In the second stage, the Responder can either accept the proposal, or not accept it; if he refuses, neither one of them will get any share of the initial sum. We are in front of a sequential game, thus it is best to use a game tree to represent it, which is illustrated below:

The Ultimatum Game



Keeping in mind that the first number represents the Player I's payoff, let us analyze the situation in which the Proponent makes an irrational offer of ($1, $2) (second subgame from the left). In this case, if the Responder accepts, he will get the payoff of $2, while the

Proponent will get $1. On the contrary, if Player II refuses, they will both get $0. But why would he refuse?

Backward induction has to be used once again to solve the game. From an analytical point of view, the Proponent is rational and knows that the Responder is rational too. Therefore, the Responder will not refuse anything that increases his wealth, which means that he is willing to accept any offer that has a payoff greater than zero. The Proponent is not sure how the Responder will react to the ($3, $0) offer, though. In fact, Player II might as well refuse the proposal, because he will get $0 anyway; in this situation, the Responder is said to be indifferent. The Proponent will then offer ($2, $1), to maximize his own payoff, and to avoid the risk of his offer being rejected. This is how the *homo economicus* will behave, but not the *homo sapiens*.

As it was said above, we humans are not the classical *homo economicus*. On average, the Proponent makes offers around 50% of the original amount; moreover, the Responder often rejects offers below 20% of the original amount (Camerer, 2003). The human behavior seems to appear determined by other factors, rather than just payoff maximization, because both players' behaviors are not consistent with the standard economic theory: Responders do not accept every offer that results in a payoff greater than zero, and Proponents do not even make offer that are likely to be rejected. Responder's rejection might be explained by the non-monetary arguments in his utility function, since it probably includes fairness and justice; on the other hand, significantly positive Proponent's offers might be explained by two motives: fairness and the fear of rejection of an unbalanced offer (Thaler, 1988).

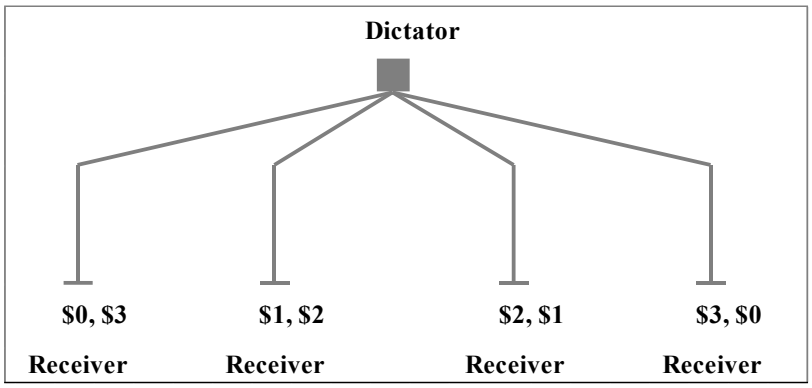
1.2.b – The Dictator Game

The Dictator Game (DG) was used for the first time in 1986, by Kahneman, Knetsch and Thaler. The American scholars developed this game from the Güth and colleagues' UG, with the objective of studying punishment of unfair players.

The standard DG has a structure very similar to the UG's one, except the fact that Player II neither can accept nor can reject the offer, he just receives it from the other player, and that is it. Just to be clear, let us make the rules of the game explicit.

In the standard DG, there are two players, the Dictator (Player I) and the Receiver (Player II). The Dictator has a sum of money which must be divided between the two players. The Receiver can do nothing but accept what the Dictator decides. The game tree of a DG, where the initial sum is $3, is represented below:

The Dictator Game



Since the DG gives absolutely no power to the Receiver to accept or reject the offer, the Dictator does not have to use backward induction to maximize his own payoff. In fact, the only equilibrium of the game is when the Dictator keeps all the money for himself, and the Receiver is given nothing. However, real world experiments show that only 40% of the Dictators give nothing to Receivers (Guala & Mittone, 2010), and the percentage of the initial amount of money varies a lot depending on variables, such as anonymity (Hoffman et al, 1994), social influence (Cason & Mui, 1998), or sense of entitlement (Schurter & Wilson, 2009). Comparing the DG and the UG, Dictators offer less money than Proponents to their respective Players II (Camerer, 2003).

Talking about the DG a little more, it is important to note that this game is widely used in many fields of studies, not just in experimental economics, but also in psychology, sociology, and political science. The power of this game is its simplicity, since it can measure Dictators' behaviors free of the possibility of rejection, characteristic element of the UG.

1.2.c – Other Games

A game to measure trust between players is the Trust Game (TG). The Trustor and the Trustee are the two players of the game. The Trustor is given an initial sum of money and has to decide whether to share a portion of it with the Trustee. In the classic form of the game, the money given to the Trustee is multiplied by a factor greater than one. In the second stage of the game, the Trustee has to decide how much of his sum he will send back to the Trustor. It is important to specify that the Trustor has no power on the Trustee, since the latter can send back nothing of the money received; in fact, the equilibrium for the Trustee is to receive the money and not send back anything, which is the way to maximize his payoff. Knowing this, the Trustor will not send any money to the Trustee. The equilibrium of the game has no money flow in it.

Once again, the standard economic theory does not work in real life situation. In experiments, Trustors send between 40% to 50% of their sum, and Trustees send back between 30% to 40% of the sum received (Johnson & Mislin, 2011), although variability in results has to be noted (Angner, 2016).

Another game use in behavioral economics is the Public Goods Game (PGG). This game is played by *n* players, each one of them with an initial sum of money. The players have the possibility to put a share of their money into a public account. The money in the account is multiplied by a factor greater than one, as in the TG, and then split equally between all the players. The optimal strategy would be for everyone to put all their money into the account, but this strategy does not lead to the equilibrium; one of the players could share no money and still receive something, maximizing his payoff. In fact, the standard economic theory equilibrium is when everyone withholds his sum, contrary to experimental results which show that an average of 37% of the total initial endowment is invested in the account (Zelmer, 2003).

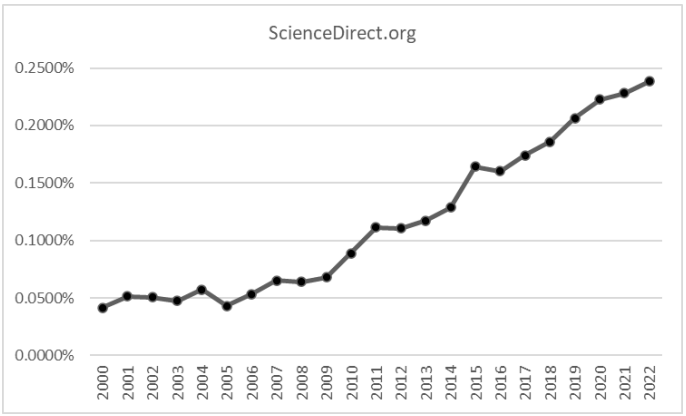
Chapter 2 – On Prosociality

Why do people behave prosocially? Why do we volunteer, or donate to charity? Why do we care for those in needs? Why do we help them? The behavior of humans, especially the prosocial behavior, is still not totally understood; in fact, prosociality is a puzzle (Gintis, 2001; Gintis, 2003). Economists, sociologists, and biologists use different tools to try to explain it, but none of them is fully successful (Gintis, 2001). Prosociality is a mystery even from an evolutionary point of view; a universal accepted explanation for the rise of large, stable, and cooperative societies is not yet achieved (Norenzayan et al., 2016).

The study of prosociality and of prosocial behavior has indeed received a lot of attention, which is growing year after year. For example, in ScienceDirect.org, a website with a large scientific research database, the percentage of scientific papers containing the word 'prosociality' over the total number of publications has grown in the last twenty years (see *Figure 1*).

Because of the increasing relevance of prosociality in the literature, it is necessary to outline few core concepts of the subject.

Figure 1



2.1 – Definitions

Prosociality is a chaotic concept. As mentioned, the trend of scholars studying the subject is growing, but there still is a big hole in defining the meaning of prosociality and prosocial behavior. While reading articles, it is instantly clear that this concept is used in many ways, making it difficult to compare different studies and papers. Anyway, there are three macro trends in using the concept of prosociality and prosocial behavior (Pfattheicher et al., 2022).

Some scholars use intentions to define prosociality. For example, Batson and Powell (2003) defined prosocial behavior as a "broad range of actions intended to benefit one or more people

other than oneself" (p.463). Intention is key. Praying for someone's recovery from a bad illness is a prosocial behavior, regardless of its effectiveness.

Others use the consequence of an action as a measure of prosociality. Staub simply defined prosocial behavior as a "behavior that benefits other people" (Staub, 1978, p.2). The result of the action (the payoff, in the game theory language) is now put at the center of the concept. Praying for someone is no longer a prosocial behavior since it has no (proven) consequence. At the same time, complimenting a professor to get a better score at a test is considered a prosocial one, because it will have the consequence of making him or her feel better about himself or herself, while the intentions are not prosocial, but moved by ethically questionable intentions.

One last definition of prosociality uses approval by the society as the fulcrum of positive social behavior. Dovidio suggested that prosocial behavior is nothing else than "behavior that is valued by the individual's society" (Dovidio, 1984, p.364). The pivot role of is now played by the opinion of a group of people. From this point of view, a behavior that decreases social welfare but is approved by the same society is considered prosocial. A group that discriminates another one for some reason, let us say because of religious motives, would be viewed as a prosocial behavior by the members of the group.

These three perspectives are important to understand. Since its beginning, the field of prosocial studies has been dominated by the chaos of its definitions. The Yale professor John Dovidio wrote: "despite (or perhaps because of) the impressive amount of research that has focused on prosocial, helping, and altruistic behaviors, there is little consensus concerning how these terms should be defined and distinguished from one another"; it was the year 1984 (Dovidio, 1984, p.363). The situation has not really changed in the past 40 years. A studied conducted on more than 270 articles published between 2010 and 2021 which used 'prosocial' and 'altruism' as key words found out that only one fourth of the articles (70 out of 273) contained a relevant definition of prosociality (Pfattheicher et al., 2022).

2.2 – Behaviors

Up to this point many behaviors were mentioned. Altruism, cooperation, fairness, and so on, which are key concepts in the description of prosociality, but, as mentioned above, it is often difficult to establish what is what, since authors do not always use definitions. The same economic game might be used to measure cooperation or altruism, depending on the experiment. Sometimes, the feeling is that these behaviors can be substituted with each other, as if they represented the same concept. While it is true that they all lay under the umbrella of

prosociality, they are not the same. To seek completeness, some economic games will be discussed to provide a vivid definition of a few prosocial behaviors.

The Ultimatum Game (UG) is used to measure fairness. Player 2 will accept only if Player 1 leaves him a fair amount of the initial sum of the game (Güth et al., 1982). Since evidence proves rationality wrong in the UG, fairness can be an explanation of Player 2's rejections of positive offers. Treating people equally, with honesty and justice, might be more important than money returns, to some extent. The concept of justice is often used along with the one of fairness, as a co-motivation behind the irrational behavior of Player 2 (e.g., Thaler, 1988). Player 1 does not behave rationally either. Offers are not as expected in analytical game theory. The most spoken motivation of this misalignment is the fear or rejection of the offer, or the fear of punishment. Punishment of defectors leads to greater rates of prosociality in the long run (Boyd & Richerson, 2002), and it is demonstrated that players do punish even in one-shot interactions (Fehr & Gachter, 2002), with little concern to group selection (Mendoza et al., 2014).

The Dictator Game (DG) is used to measure different behaviors, such as egocentrism (e.g., Handgraaf et al., 2008) or inequity aversion (e.g., Fehr & Schmidt, 1999). In the DG, contrary to the UG, Player 2 is powerless. Which means that Player 1 has no fear of rejection or punishment, and thus behavioral irrationality is free of external conditioning (with some limitations). To explain the Dictator's actions, early literature talks about 'other-regarding behaviors' (Hoffman et al., 1994; Forsythe et al., 1994), which were later identified as altruism and fairness (Eckel & Grossman, 1996). Once again, the concept of fairness is associated with a prosocial behavior. Altruism is defined as that practice of doing things that are advantageous to others, even if it is disadvantageous for the perpetrator of the action.

The Prisoners' Dilemma (PD) is used essentially to analyze cooperation. As explain above, cooperation is never a successful rational strategy. The fear of defections by the other player will eventually end up in a mutual defective strategy, leaving no other result than non-cooperation. Some factors may lead to cooperation in the PD anyway, such as repetition (Camerer & Weigelt, 1988), experience (Selten & Stoecker, 1986) or reputation concerns (McKelvey & Palfrey, 1992).

Once again, it is important to acknowledge that authors do not always define their subject of studies, and often use prosocial behaviors as synonyms, making it more difficult to compare different studies and find good information on specific behaviors. In this thesis they are not always defined and specified, because of the difficulty to distinguish between them. As among the scholars, these behaviors are being discussed as a whole, but with the awareness that they should be separated and analyzed independently.

2.3 – Reciprocity and Selection

The reasons behind prosocial behaviors have been always investigated. The motivations of a positive social behavior can be grouped into two ideas: reciprocity and selection. Reciprocity refers to a situation in which two agents do something similar to each other, allowing each other to have the same benefits received from the other party; reciprocity can be either positive or negative. Furthermore, selection refers to various processes and concepts related to the choice or the propagation of something, like an idea or a group. Thus, group selection is said to have had an important role in the evolution of prosocial behavior, with all the meanings the word 'group' can represent.

2.3.a – Direct Reciprocity

Direct reciprocity is a mechanism based on repeated interactions (Trivers, 1971) and is the propensity to return prosocial acts of others (Baek et al., 2016). Because of repeated interactions, individuals can modify their behavior depending on previous outcomes (Rand & Nowak, 2013). Experiments show the power of repetition in promoting cooperation; in repeated plays of the PD, the reciprocity effect is strong and positive (Rapoport & Chammah, 1965). In Roth and Murnighan (1978), subjects had to play the PD with three different probabilities that the game would continue with another round: players made cooperative choice more frequently when the probability was greater. The above-mentioned scholars repeated the experiment and confirmed that cooperation increased as the probability of continued play increased (Murnighan & Roth, 1983). Many experiments followed; for example, Duffy and Ochs (2006) associated cooperation with experience and other factors, such as fixed pairing protocol (versus random matching, which led to almost zero cooperation as players gained experience); moreover, when player switched from fixed pairs to random matches, cooperation fell to almost zero, suggesting the fact that learning to cooperate has no influence in future behavior; the opposite is true as well: when switching from randomly matches to fixed pairs, players reached even more rapidly high level of cooperation.
The 'shadow of the future' plays an important role, since current actions and decisions influence future ones (Rand & Nowak, 2013).

2.3.b – Indirect Reciprocity

With indirect reciprocity, game theory encounters reputation. A third player enters the game and has information about the previous behavior of the other two. This mechanism is very powerful, because of the role of reputation and possible punishment. Indirect reciprocity is a peculiar characteristic of humans, since it involves communication; while direct reciprocity is

studied in the animal world as well (e.g., Clutton-Brock, 2009; Bshary & Grutter, 2006), flow of information is a key feature of our species.

A clear example of indirect reciprocity comes from the first time the DG was used. Kahneman, Knetsch and Thaler (1986) made several students play in a modified version of the DG, in which Dictators had to allocate $20 between them and Receivers, with two possible formulas: $18 to themselves and $2 to the Receivers, or $10 each. The second stage of the game was created to see if a third-party player was willing to incur a cost to punish unfair dictators, the ones who took the $18-$2 possibility. First, the scholars found that Dictators allocated less evenly when a third-party was judging on their behavior, confirming the fact that individuals are willing to pay the cost of prosociality to earn later benefits of a good reputation (Rand & Nowak, 2013). Second, they found out that third-party players were more willing to split $10 with a fair Dictator rather than splitting $12 with an unfair one.

As said above, indirect reciprocity relies on a person's good behavior, but also on the ability to produce and distribute good reputational information (Rand & Nowak, 2013). It is important to acknowledge that humans predominantly talk about third-party persons (Dunbar et al., 1997) and lately, especially with the internet, reputation has become more important; a lot of websites use reputation system to direct clients to certain sellers, such as eBay, Vinted, Amazon and so on. Different studies on eBay reputational system of its sellers (summarized in Resnick et al., 2006) show how positive feedbacks, prices, and buyers' willingness-to-pay are positively related, and how sellers with a good reputation are trusted more. Reputation concerns and the fear of punishment seem to be an innate characteristic of the human species, since studies have demonstrated that the presence of fake eyes increased prosociality in games (e.g., PGG in Burnham & Hare (2007), and DG in Haley & Fessler (2005)).

2.3.c – Group Selection

Most experimental settings use randomly mixed populations to study behaviors, which can be a dangerous assumption, and could undermine the external validity[1] of experimental findings. Societies are not made up randomly but are structured. Repetition of interactions and spatial closeness create groups. Members of a group who cooperate can prevail on defectors, and different groups can work together to achieve higher payoffs (Rand & Nowak, 2013). In the presence of social networks and spatial proximity, groups may enhance prosocial behaviors (Nowak, 2006).

[1] External validity refers to the extent to which the findings of a scientific study can be generalized and applied to situations that somehow differ from the specific context of the original study.

Different authors propose dissimilar definitions of group selection, creating confusion around the subject; evolutionary fitness, culture, genes, and functionality are used as explanations, depending on each author's point of view (van den Berg & Gowdy, 2009). Generally, group selection refers to the idea that natural selection can act at the level of groups, instead of at the level of the individual.

The idea that prosociality that is correlated with genes relatedness (Hamilton, 1963) is named kin selection (Smith, 1964). What is known as the Hamilton's rule (Hamilton 1964a, 1964b) is now the core principle of evolutionary biology and kin selection. The rule says that selection will favor altruistic behavior if the benefits multiplied by the relatedness between receiver and actor outweigh the cost of the actor (van Veelen et al., 2017).

Another approach analyzes between-group selection (Williams, 1966) which studies interactions between different groups. Richerson and Boyd (2005) assert that multilevel selection (another name of between-group selection) has probably played a more important role in the development of prosociality than kin selection; while a gene mutation might increase prosociality among kins in the long period, imitation of a more successful behavior can become predominant in a very short time. Between-group selection, or multilevel selection, occurs when there is competition between groups (Traulsen & Nowak, 2006), which idea can be traced back to Darwin, who wrote: "There can be no doubt that a tribe including many members who … were always ready to give aid to give aid to each other and to sacrifice themselves for the common good, would be victorious over most tribes; and this would be natural selection" (Darwin, 1871, p.215). Multilevel selection stands opposite to the concept of kin selection, and to the wider idea of within-group selection, which refers at the process of natural selection that operates at the level of individuals within a group.

2.4 – Anomalies

What happens to prosociality when subjects do not know each other, when they are anonymous? What happens when there is no repetition in games? In different studies where all these assumptions are removed, players still behave prosocially. Why?

Hoffman, McCabe, Shachat, and Smith (1994) played two one-shot games, an UG and a DG; full anonymity was granted, and players were different for each game. In both games, players behaved non-rationally. They also played a modified version of the DG, which they called the 'Double Blind experiment'. In this game, anonymity was not only between players, but also between players and experimenters, since the latter were chosen among the players. Even in this situation, players did not behave rationally; 11% of the players gave to the counterparts 30% or more of their initial endowment. In the scholars' words, "this may approach the

appropriate indicator of fairness as a pure preference phenomenon" (Hoffman et al., 1994, p.371). Anyway, the difficult experimental setting, created because they believed that experimenters affected the results, was proven to not have a significant effect (Engel, 2011). Similar experiments were made after. Forsythe, Horowitz, Savin, and Sefton (1994) demonstrated that prosociality and experimental setting (whether it is an UG or a DG) matter. Eckel and Grossman (1996) proved once again that with anonymity, people still behave prosocially, and the relaxation of it increases donations in the DG.

Once again, prosociality among humans is not understood. Reciprocity and group selection enhance prosociality, but they are not necessary for prosocial behavior to happen (Fehr & Fischbacher, 2003). Prosociality among humans still is a puzzle, because "people frequently cooperate with genetically unrelated strangers, often in large groups, with people they will never meet again, and when reputation gains are small or absent" (Fehr & Gachter, 2002, p.137). Different theories try to explain the reason behind prosociality; one answer could come from norm internalization (Gintis, 2003), which is the process by which individuals adopt moral, normative, and social models. Another theory states that our mind simply fails to optimize maximizing behaviors, but instead it reflects the social and cultural environment in which we grew (Burnham & Johnson, 2005).

Another explanation of good behavior might come from religion, which has shaped human culture from the beginning of history. Form an evolutionary standpoint, the rise of large and cooperative societies and the worldwide spread of beliefs in omniscient and omnipotent deities seems to begin in the same period of time (Norenzayan et al., 2016). These deities, often referred to as Big Gods, are believed to have unlimited power and knowledge, and to be concerned with human behavior. The presence of nonstop watchers and judges might have had an impact on humans, providing specific boundaries for what is wrong and what is right, and therefore enhancing prosociality.

Chapter 3 – On Religion

The connection between prosociality and religion is deeply studied by the scientific literature, which tries to identify which one causes the other, how they are interconnected, and to what extent Big Gods interfere with behaviors, using theoretical and empirical research. Religious teachings and doctrines helped to lower monitoring costs, wiping out not-enough committed individuals. Moreover, the presence of hell in almost all Big Gods religions, which outsourced the task of judging to these supernatural actors, being used as a threat of divine punishment for defectors, and divided the human behaviors (and thoughts) into right and wrong. These and other factors are the reason why religion is believed to be linked with prosociality.

3.1 – Religious Prosociality

Adherents of all major world religions are encouraged to behave prosocially by their religious texts. For example, in the Bible, the religious book of Christianity, it is written: "Treat others just as you want to be treated" (Luke 6:31), or also "Contribute to the needs of the saints; extend hospitality to strangers" (Romans 12:13). In the Quran, sacred for the Muslims, it can be found the phrase "Those who spend their wealth in charity day and night, secretly and openly, their reward is with their Lord" (The Qur'an, 2:274). Again, in the Veda, the oldest sacred scriptures of Hinduism, concepts like *dharma*, *ahimsa*, and *seva*, untranslatable (Lomas, 2016), all refer to prosocial behaviors (Lomas, 2021). Christianity, Islam, and Hinduism are the religions with most followers in the world, making up to almost three fourth of the world population[2]. Prosociality looks like an intrinsic feature of religion, and it seems safe to assume that religious believers would have stronger prosocial tendencies (Norenzayan & Shariff, 2008).

Studies which use self-report measures suggest that this connection between religion and prosociality exists. Research shows that religious affiliation (Gore et al, 2019; Van Tongeren et al., 2020) and religious attendance and practices (Putnam, 2010; Monsma, 2007) are associated with positive social behaviors, like charity donations, kindness, generosity, empathy, emotional support, and volunteering (Tsang et al., 2021). These findings, consistent with the assumption, are entirely based on self-reports (Norenzayan & Shariff, 2008), which might not be reliable (Paulhus, 1984); since religions push individuals to positively behave, religious believers are more prone to engage in social reputation management, consistent with

[2] In 2020, Christians were the 31.1% of the world's population, Muslims 24.9%, and Hindus 15.2%, according to the CIA's World Factbook (cia.gov/the-world-factbook/field/religions/)

the idea of religion being positive correlated with socially desirable responding (Gebauer et al., 2017), defined as the tendency to give overly positive self-descriptions (Paulhus, 2001). Once again, reputational concerns play an important part in the development of prosocial behaviors. Big Gods are almighty, omnipotent, and omniscient, they know and watch everything, making reputation an important concern for believers. Before digging into this topic, it is important for the discussion to explicit the experimental technique of priming, used in the religious scientific literature to evoke thoughts of supernatural deities.

3.1.a – Religious Priming

The links between religions and human behaviors have a long history of studies. Publications date back to the beginning of the 20th century; Sigmund Freud (1856-1939), the father of psychoanalysis, wrote the book *The Future of an Illusion* (1927), discussing the origins, development, and future of religions, and the impact on the human behavior. However, early studies lacked methodological tools to make proper conclusions, which were later developed, and permitted a growth in psychological research on religion (Shariff et al., 2015). In particular, one of these innovations is the use of priming techniques, which assumed an important role in generating insights into the religion's causal effect in human behavior. Priming refers to the experimental technique of the activation of knowledge structures, such as stereotypes, by the situational context (Bargh et al., 1996). The presentation of stimuli exerts an influence on the behavior of participant in experiments (Bargh, 1994). Experimental studies on religion use priming methods to overstep limitations in 'normal' experimental settings, namely to test the causal effects of religious reminders on outcomes, like prosocial behaviors, and, more importantly, disentangle those outcomes from other possibly interfering factors (Shariff et al., 2015).

Different types of priming techniques are used in experimental settings, and they can be distinguished by how the primes are presented to the subjects of the experiment. Generally, participants to experiments are exposed to primes explicitly, implicitly, or contextually. Each method has its strengths and weaknesses.

Explicit priming is a method in which the priming stimulus is consciously perceived by the participant, because it is presented in a way that the participant is aware of its presence and can identify it. Usually, subjects are asked specific questions about their relationship with religion, such as if they pray regularly, how important is religion in their lives, or how often they attend religious ceremonies (e.g., Ginges et al., 2009; Schumann et al., 2014). A clarifying example comes from Carpenter and Marshall (2009), in which participants of the experiment were asked to read verses from the Bible. Explicit primes are actively perceived

and consciously processed by the individual. They activate complex constructs, but can be subject to demand characteristics[3] (Shariff et al., 2015). Since the explicit nature of the primes, subjects might behave as they think they are supposed to. Notwithstanding its limitations, with the purpose of studying prosociality, explicit priming has the characteristic of being a more tradition-oriented approach, since virtually all world religions exhort their followers to behave in a non-selfish manner towards others (Smith, 1991).

On the other hand, implicit priming refers to the concept in which the stimulus is not consciously perceived by the participant. Primes might be hidden in other tasks the subjects have to complete before running the actual experiment. The most used is the unscrambling-sentence task (Srull & Wyer, 1979), which involves rearranging words to form a grammatically correct sentence, and can be used to prime religion with words like 'God', 'spirit', or 'divine', (e.g., Shariff & Norenzayan, 2007). Priming implicitly creates very little awareness of the priming itself, as found in different studies through suspicious probes measures (e.g., Bargh & Chartrand, 1999; Rounding et al., 2012), and in accordance with psychology, which distinguishes between implicit and explicit memory (Fazio & Olson, 2003).

A particular way to prime implicitly is the method of subliminal priming, which is used by experimenters to make participants undergo primes in a non-conscious manner (Shariff et al., 2015). Regarding experiments on religion, an example is the practice of flashing religious words in front of subjects, like 'faith', 'gospel', or 'prayer', for a very short time (less than 40 milliseconds), not enough for them to be consciously aware (e.g., Johnson et al., 2010) (for non-religious subliminal priming, see also Dijksterhuis et al., 2007).

The last method is contextual priming, in which the processing of a stimulus is influenced by the context in which it is presented. Various techniques can be used, such as displaying specific symbols, playing audio recordings (e.g., Aveyard, 2014), or conducting the experiment in particular places or in sight of proper buildings. A big range of field studies analyzed the sight of religious buildings and people's behaviors, such as voting (Rutchick, 2010), prosociality (Xygalatas, 2013), or ambiguity aversion and judgment certainty (Sagioglou & Forstmann, 2013). Contextual priming allows experimenters to replicate more naturalistic settings. It can be a powerful tool, which permits to simulate real-life religious reminders and to maintain experimental control at the same time (Shariff et al., 2015).

[3] Demand characteristics refer to signals in an experimental setting that hint to participants about the experimenter's expectations.

3.1.b – Punishment

From theoretical and empirical evidence, game theory, and evolutionary biology, another explanation for prosociality comes from the concept of punishment of defectors (e.g., Ostrom et al., 1992; Sober & Wilson, 1998). Since individuals still behave prosocially when reciprocity and selection cannot interfere, the threat of punishment could be a possible explanation of within-society prosociality. With this in mind, religion offered a system of moral values enforced by punishment. Religious traditions, taboos and mythology worked as a system of norms, similarly to modern laws, dividing behaviors into right and wrong, and promoting prosociality. More importantly, religion provided the threat of supernatural agents willing to punish those who did not stick to its system of norms (Johnson & Kruger, 2004). "The very proclamation of hell indicates that the defenders of religion found it necessary to balance the attraction of its promise with a threat for the others, who rejected it or failed to meet its tests" (Berstein, 1993, p.x). Reward for good behavior and punishment for non-in-line one are the two complementary forces that religion uses, even if punishment (the stick) plays a much more relevant role than reward (the carrot). In fact, everyday-life evidence suggests that negative events, or the eventual occurring of them, have a stronger impact on an individual's mind (and therefore behaviors) than positive ones (Baumeister et al., 2001). 'Carrots' are not enough to ensure good behavior, because although reward may contribute to it, it does not prevent people from cheating and defecting (Johnson & Kruger, 2004). Scholars agree that punishment, or the possibility of it, is key to ensuring good behaviors.

This supernatural punishing theory is proved by a wide range of different empirical studies. Ethnographic data from different societies around the globe indicate that those who greater believe in moralizing and punishing deities are positively associated with higher rates of cooperation (Johnson, 2005). Fear of punishment and reputational concern seem to be an innate characteristic of human beings; for example, in Bering (2004), children were told not to look inside a box after they were left alone in a room; those who were previously told that a fictional character ('princess Alice') was invisible and in the same room were significantly less likely to peek inside the box. Shariff and Norenzayan (2011) stated that "how much you believe in God matters less than what kind of God you believe in" (p.92) after they found that cheating decreased if participants believed in an angry and punishing God rather than a loving one.

In addition, it is important to mention the relationship between earthly and supernatural punishment. Laurin, Shariff, Henrich, and Kay (2012) found that those people who greater believe in powerful and involved deities are less willing to engage in costly punishment of defectors, suggesting that there is a trade-off between the two forms of punishment. This

could be an explanation to the birth of Big Gods religions and the contemporary rise of large-scale societies, since religious beliefs in morally concerned deities could have helped to lower controlling costs.

3.2 – Games, Secularity, and Signaling

As stated before, a large self-report surveys literature shows that religious engagement is positively associated with prosociality, but these insights might not be reliable due to social reputation management. Therefore, economic games are once again needed to overcome this problem. Experiments that use game theory to study the correlation between religion and prosocial behavior are so many that it is impossible to mention them all; however, some interesting consideration can be made.

In an investigation spanning 15 societies around the world, from South America to Asia, participation in a world religion, such as Christianity or Islam, was associated with an increase in offerings in the Dictator Game (DG), the Ultimatum Game (UG), and a Third-Party Punishment Game between 6 and 10 percent (Henrich et al., 2010). In a study conducted to test the correlation between collective rituals and cooperation through a common-pool resource game[4] (Ostrom et al., 1994), higher level of cooperation was displayed in Israelian religious *kibbutzim* (communities) than in secular ones (Sosis & Ruffle, 2003). Similar results were obtained from an experiment which studied different *terreiros* (Afro-Brazilian worship places), investigating the correlation between costly-religious signaling in religious rituals and within-group cooperation; using the Public Goods Game (PGG) to measure in-group prosociality, religious in-group cooperation was higher than non-religious one (Soler, 2012).The two experiments last mentioned lead the way into the discussion about two important topics associated with literature on prosociality and religion: secular institutions of morality and costly signaling.

With secular institutions of morality, the literature refers to the idea of a justice system, or more in general, of a social contract. The possible equivalence between religious and secular moral systems have been long discussed; at least from the 18th century, names like Voltaire (e.g., Venter, 2018) or Rosseau (e.g., Melzer, 1996) have faced the topic. More recently, experiments have shown that priming with religious words and with secular ones (such as ‘jury’, ‘court’, or ‘contract’) resulted in similar donations in the DG, both greater than priming subjects with neutral words; “[the] implicit activation of concepts related to secular moral

[4] The common-pool resource game, or dilemma, is very much like a Public Goods Game (PGG), discussed in Chapter 1.

institutions restrained selfishness as much as did religious suggestion" (Shariff & Norenzayan, 2007, p.807).

Speaking now about costly signaling, the topic was originally discussed in biology (e.g., Grafen, 1990) and social sciences in general (e.g., Spence, 1973), and it has been expanded to include aspects of human behavior, for example cooperation (Gintis et al., 2001). Regarding religion, costly signaling are religious rituals or requirements that can be interpreted as hard-to-fake signals of commitment; the elaborateness of religious practices is sufficiently difficult for an outsider to imitate, also because they are learned by people over a long span of time, usually since individuals are very young (Irons, 2001). The complexity and difficulty of such rituals reduce monitoring costs, weeding out free-riders[5] and less committed individuals (Iannaccone, 1992, 1994). Therefore, costly signaling is associated with direct and indirect reciprocity, and within-group selection.

Investigating longevity of religious and secular communes, the religious ones were found to outlast the secular ones (Sosis & Alcorta, 2003). Moreover, the religious communes were found to be imposing more than twice as many costly requirements than secular communities; costly signaling was positively correlated with longevity, and those religious communes with more requirements lasted more than the ones with fewer requirements (Sosis & Bressler, 2003).

Back to game theory, experiments that used the Trust Game (TG) found that Trustee's religiosity was positively correlated with the Trustor's level of trust, especially if the two believed in the same religion (e.g., Tan & Vogel, 2008), compatibly with attitudinal surveys which show that religious individual are more trustworthy than atheists (e.g., Edgell et al., 2006; Clifford & Gaskins, 2016; Chuah et al., 2016). In addition, a vast literature on PGGs investigates the relation between religion and prosociality. Many experiments tested cooperation when religious elements were already present, for example in *kibbutzim* (Sosis & Ruffle, 2003; Ruffle & Sosis, 2007) or in *terreiros* (Soler, 2012), using the technique of contextual priming. Others experiments tested level of cooperation comparing different religions; for examples, in Benjamin, Choi, and Fisher (2016), religious priming caused Catholics to decrease their contribution to PGGs, while priming Protestants did not affect their level of cooperation. Another study found that Muslim religious believers were more generous than non-believers (Ahmed, 2009). In general, it is safe to state that religious people display more prosociality toward their own group, that shown by the higher donations in DGs, TGs and greater contribution in PGGs.

[5] Free-riders are individuals who benefit from a shared resource or public good without paying their fair share or not paying anything at all.

3.3 – Religious Antagonism

The same mechanisms that enhance prosociality within religious communities or by religious believers might facilitate outgroup antagonism (Norenzayan & Shariff, 2008). The literature also studies the dark side of religion, which can promote antisocial behaviors, such as intolerance, conflict, and violence (Norenzayan et al., 2016). While for atheists the act of believing is a personal matter, for believers a lack in commitment to Big Gods religions is a threat (e.g., Gervais et al., 2011). Collective rituals were found to be correlated with outgroup discrimination and antisocial behavior (Hobson, 2013; Hobson et al., 2015), consistent with the idea that "religion as a whole is good; a minority group as a whole is bad" (Allport & Ross, 1967, p.442). Religiosity is also found to be positively correlated with discrimination, for example toward women, black people, or homosexual individuals (e.g., McFarland, 1989; Johnson et al., 2010). Moreover, violence, when authorized by deities, can result in greater aggressive behaviors (Bushman et al., 2007), consistent with the theory that states that violent religious scripture can enhance religious terrorism.

Once again, game theory is able to show this antagonism with empirical evidence. Just to make an example, Le Rossignol, Lowes, and Nunn (2022) studied the relationship between Big Gods believers and 'witchcraft'[6] ones; using the DG, a modified version of the DG, and a punishment game (called joy-of-destruction game, or money burning game (Zizzo & Oswald, 2001)), the scholars found out that players behaved less prosocially when the other player strongly believed in witchcrafts. In addition, participants felt it was more appropriate to punish when the other player had strong traditional beliefs. Interestingly, players who themselves held strong traditional beliefs treated other subjects with the same system of beliefs less prosocially, not exhibiting within group favoritism.

To seek completeness, it is important to mention that the entire literature corroborating the idea of a link between religion and prosociality was put in doubt. For example, Galen (2012) questioned the existence of such link and the possible causal effect between the two, due to the mixture of outcomes in experiments. In fact, the proportion of studies in which religion affects prosociality or vice versa, and the proportion in which that does not happen, are reported to be roughly the same.

[6] Traditional supernatural beliefs.

Conclusion

The power of economic games in quantifying human behavior has displayed them as an extraordinary tool. In addition to all the applications that were described in this thesis, economic games were and are employed in many other scientific disciplines, such as political science, diplomacy, military strategy, computer and data science. Economic games are of such large use because of their simplicity, and especially through the priming techniques, they can describe a large part of human behaviors, confuting and confirming theories that would remain just ideas without them.

Speaking now about prosociality, the role of good behavior if of key interest in human relationships. It is impossible to count how many socially good behaviors we did, or we were the subject of. As demonstrated by games, economic payoffs and utilities are not the only thing that shapes our decisions. It would be interesting to study the human part of economic agents since a younger age, leaving earlier the concept of a selfish, emotionless, and perfectly rational *homo economicus*, and acknowledging the fact that we humans are economic agents, with our characteristics, such as friendship, fear, pain, or love.

Now about religion, as mentioned above, it can either promote good and bad social behaviors; moreover, the role of secular institutions might act as a substitute to what many consider as an obsolete cultural system. However, it is undeniable that religious beliefs are still nowadays one of the most important cultural elements of the vast majority of the world's population. Religion is able to change people's perspective of the world and how individuals interact with it.

Concluding from the perspective of a student in economics, it would be intriguing to study how economic theory, sociology, and psychology are interconnected. Sometimes, the feeling is that economics wants to be described as an exact science, yet reality contradicts this attitude many times. Also, other topics could be implemented in the study of the discipline, such as philosophy, history, or theology. Economics is made of the people, by the people, and for the people, but it is often forgotten the human component of it.

References

Ahmed, A. M. (2009). Are Religious People More Prosocial? A Quasi-Experimental Study with "Madrasah" Pupils in a Rural Community in India. *Journal for the Scientific Study of Religion, 48*(2), p. 368-374.

Allport, G. W., & Ross, J. M. (1967). Personal religious orientation and prejudice. *Journal of Personality and Social Psychology*, p. 432-443.

Angner, E. (2016). *A Course in Behavioral Economics* (2nd ed.). New York: Palgrave Macmillan.

Aveyard, M. E. (2014). A Call to Honesty: Extending Religious Priming of Moral Behavior to Middle Eastern Muslims. *PLoS ONE, 9*(7).

Baek, S. K., Jeong, H. C., Hilbe, C., & Nowak, M. A. (2016). Comparing reactive and memory-one strategies of direct reciprocity. *Scientific Reports volume, 6*, p. 1-13.

Bargh, J. A. (1994). The Four Horsemen of Automaticity: Awareness, Intention, Efficiency, and Control in Social Cognition. In R. S. Weyer, Jr., & T. K. Srull, *Handbook of Social Cognition* (p. 1-40). Mahwah: Erlbaum.

Bargh, J. A., & Chartrand, T. L. (1999). The Unbearable Automaticity of Being. *American Psychologist, 54*(7), p. 462-479.

Bargh, J. A., Chen, M., & Burrows, L. (1996). Automaticity of Social Behavior: Direct Effects of Trait Construct and Stereotype Activation on Action. *Journal of Personality and Social Psychology, 71*(2), p. 230-244.

Batson, C. D., & Powell, A. A. (2003). Altruism and prosocial behavior. In T. Millon, & M. J. Lerner, *Handbook of psychology: Personality and social psychology* (Vol. 5, p. 463-484). John Wiley & Sons, Inc.

Baumeister, R. F., Bratslavsky, E., Finkenauer, C., & Vohs, K. D. (2001). Bad Is Stronger Than Good. *Review of General Psychology, 5*(4), p. 323-370.

Benjamin, D. J., Choi, J. J., & Fisher, G. (2016). Religious Identity and Economic Behavior. *The Review of Economics and Statistics, 98*(4), p. 617–637.

Bering, J. M. (2004). The evolutionary history of an illusion: Religious causal beliefs in children. In B. J. Ellis, & D. F. Bjorklund, *Origins of the social mind: Evolutionary psychology and child development* (p. 411-437). New York: Guilford Press.

Bernstein, A. E. (1993). *The Formation of Hell: Death and Retribution in the Ancient and Early Christian Worlds.* Ithaca: Cornell University Press.

Bertrand, J. (1883). Review of "Theorie mathematique de la richesse sociale" and of "Recherches sur les principles mathematiques de la theorie des richesses". *Journal des Savants,* p. 499-508.

Boyd, R., & Richerson, P. J. (2002). Group Beneficial Norms Can Spread Rapidly in a Structured Population. *Journal of Theoretical Biology, 215*(3), p. 287-296.

Bshary, R., Grutter, A. S. (2006). Image scoring and cooperation in a cleaner fish mutualism. *Nature, 441*, p. 975-978.

Burnham, T. C., & Hare, B. (2007). Engineering Human Cooperation. *Human Nature, 18*, p. 88–108.

Burnham, T. C., & Johnson, D. (2005). The Biological and Evolutionary Logic of Human Cooperation. *Analyse & Kritik, 27*, p. 113-135.

Bushman, B. J., Ridge, R. D., Das, E., Key, C. W., & Busath, G. L. (2007). When God Sanctions Killing: Effect of Scriptural Violence on Aggression. *Psychological Science, 18*(3), p. 204-207.

Camerer, C. F. (1999). Behavioral economics: Reunifying psychology and economics. *Proceedings of the National Academy of Sciences, 96*(19), p. 10575-10577.

Camerer, C. F. (2003). Behavioural studies of strategic thinking in games. *Trends in Cognitive Sciences, 7*(5), p. 225-231.

Camerer, C. F., & Weigelt, K. (1988). Experimental Tests of a Sequential Equilibrium Reputation Model. *Econometrica, 56*(1), p. 1-36.

Carpenter, T. P., & Marshall, M. A. (2009). An Examination of Religious Priming and Intrinsic Religious Motivation in the Moral Hypocrisy Paradigm. *Journal for the Scientific Study of Religion, 48*(2), p. 386–393.

Cason, T. N., & Mui, V. L. (1998). Social Influence in the Sequential Dictator Game. *Journal of Mathematical Psychology, 42*(2-3), p. 248-265.

Chuah, S. H., Gächter, S., Hoffmann, R., & Tan, J. H. (2016). Religion, discrimination and trust across three cultures. *European Economic Review, 90*, p. 280-301.

Clifford, S., & Gaskins, B. (2016). Trust Me, I Believe in God: Candidate Religiousness as a Signal of Trustworthiness. *American Politics Research, 44*(6), p. 1066–1097.

Clutton-Brock, T. (2009). Cooperation between non-kin in animal societies. *Nature, 462*, p. 51–57.

Cournot, A. A. (1838). *Récherches sur les principes mathématiques de la théorie des richesses*. Paris: Hacette.

Darwin, C. (1871). *The Descent of a Man, and Selection in Relation to Sex*. London: J. Murray.

Dijksterhuis, A., Preston, J., Wegner, D. M., & Aarts, H. (2007). Effects of Subliminal Priming of Self and God on Self-Attribution of Authorship for Events. *Journal of Experimental Social Psychology, 44*(1), p. 2-9.

Doucouliagos, C. (1994). A Note on the Evolution of Homo Economicus. *Journal of Economic Issues, 28*(3), 877-883.

Dovidio, J. F. (1984). Helping Behavior and Altruism: An Empirical and Conceptual Overview. *Advances in Experimental Social Psychology, 17*, p. 361-427.

Duffy, J., & Ochs, J. (2006). Cooperative behavior and the frequency of social interaction. *Games and Economic Behavior, 66*, p. 785–812.

Dunbar, R. I., Marriott, A., & Duncan, N. D. (1997). Human conversational behavior. *Human Nature, 8*, p. 231–246.

Eckel, C. C., & Grossman, P. J. (1996). Altruism in Anonymous Dictator Games. *Games and Economic Behavior, 16*(2), p. 181-191.

Edgell, P., Gerteis, J., & Hartmann, D. (2006). Atheists As "Other": Moral Boundaries and Cultural Membership in American Society. *American Sociological Review, 71*(2), p. 211-234.

Engel, C. (2011). Dictator games: a meta study. *Experimental Economics, 14*, p. 583–610.

Fazio, R. H., & Olson, M. A. (2003). Implicit Measures in Social Cognition Research: Their Meaning and Use. *Annual Review of Psychology, 54*, p. 297-327.

Fehr, E., & Fischbacher, U. (2003). The nature of human altruism. *Nature, 425*, p. 785–791.

Fehr, E., & Gachter, S. (2002). Altruistic punishment in humans. *Nature, 415*, p. 137-140.

Fehr, E., & Schmidt, K. M. (1999). A Theory of Fairness, Competition, and Cooperation. *The Quarterly Journal of Economics, 114*(3), p. 817-868.

Forsythe, R., Horowitz, J. L., Savin, N., & Sefton, M. (1994). Fairness in Simple Bargaining Experiments. *Games and Economic Behavior, 6*(3), p. 347-369.

Freud, S. (1927). *The Future of an Illusion*. London: Hogarth Press.

Galen, L. (2012). Does Religious Belief Promote Prosociality? A Critical Examination. *Psychological Bulletin, 138*(5), p. 876-906.

Gebauer, J. E., Sedikides, C., & & Schrade, A. (2017). Christian self-enhancement. *Journal of Personality and Social Psychology, 113*(5), p. 786–809.

Gervais, W. M., Shariff, A. F., & Norenzayan, A. (2011). Do You Believe in Atheists? Distrust Is Central to Anti-Atheist Prejudice. *Journal of Personality and Social Psychology, 101*(6), p. 1189 –1206.

Ginges, J., Hansen, I., & Norenzayan, A. (2009). Religion and Support for Suicide Attacks. *Psychological Science, 20*(2), p. 224-230.

Gintis, H. (2000). Beyond Homo economicus: evidence from experimental economics. *Ecological Economics, 35*(3), p. 311-322.

Gintis, H. (2001). *The Puzzle of Prosociality [online]*. Santa Fe: Santa Fe Institute. From https://www.santafe.edu/research/results/working-papers/the-puzzle-of-prosociality

Gintis, H. (2003). Solving the Puzzle of Prosociality. *Rationality and Society, 15*(2), p. 155–187.

Gintis, H., Smith, E., & Bowles, S. (2001). Costly Signaling and Cooperation. *Journal of Theoretical Biology, 213*(1), p. 103-119.

Gore, R., Galen, L., Zuckerman, P., Pollock, D., & LeRon Shults, F. (2019). *Good Without God? Connecting Religiosity, Affiliation And Pro-sociality Using World Values Survey Data And Agent-based Simulation*. From https://osf.io/preprints/socarxiv/jnpe9/

Grafen, A. (1990). Biological signals as handicaps. *Journal of Theoretical Biology, 144*(4), p. 517-546.

Guala, F., & Mittone, L. (2010). Paradigmatic experiments: The Dictator Game. *The Journal of Socio-Economics, 39*(5), p. 578-584.

Güth, W., Schmittberger, R., & Schwarze, B. (1982). An experimental analysis of ultimatum bargaining. *Journal of Economic Behavior & Organization, 3*(4), p. 367-388.

Haley, K. J., & Fessler, D. M. (2005). Nobody's watching? Subtle cues affect generosity in an anonymous economic game. *Evolution and Human Behavior, 26*, p. 245–256.

Hamilton, W. D. (1963). The Evolution of Altruistic Behavior. *The American Naturalist, 97*(896), p. 354-356.

Hamilton, W. D. (1964a). The genetical evolution of social behaviour. I. *Journal of Theoretical Biology, 7*(1), p. 1-16.

Hamilton, W. D. (1964b). The genetical evolution of social behaviour. II. *Journal of Theoretical Biology, 7*(1), p. 17-52.

Handgraaf, M. J., Dijk, E. V., Vermunt, R. C., Wilke, H. A., & De Dreu, C. K. (2008). Less power or powerless? Egocentric empathy gaps and the irony of having little versus no power in social decision making. *Journal of Personality and Social Psychology, 95*(5), p. 1136–1149.

Henrich, J., Ensminger, J., McElreath, R., Barr, A., Barrett, C., Bolyanatz, A., . . . Ziker, J. (2010). Markets, Religion, Community Size, and the Evolution of Fairness and Punishment. *Science, 327*(5972), p. 1480-1484.

Hobson, N. (2013). *The binding and blinding effects of collective ritual: Intergroup biases and processes*. Master's Thesis. University of Toronto.

Hobson, N. M., Norton, M. I., Gino, F., & Inzlicht, M. (2015). *Mock ritual leads to Intergroup Biases in Behavior and Neurophysiology*. Paper presented at the annual meeting of the Association for Psychological Science, New York.

Hoffman, E., McCabe, K., Shachat, K., & Smith, V. (1994). Preferences, Property Rights, and Anonymity in Bargaining Games. *Games and Economic Behavior, 7*(3), p. 346-380.

Holt, C. A., & Roth, A. E. (2004). The Nash equilibrium: A perspective. *Proceedings of the National Academy of Sciences, 101*(12), p. 3999-4002.

Iannaccone, L. R. (1992). Sacrifice and Stigma: Reducing Free-riding in Cults, Communes, and Other Collectives. *Journal of Political Economy, 100*(2), p. 271-291.

Iannaccone, L. R. (1994). Why Strict Churches Are Strong. *American Journal of Sociology, 99*(5), p. 1180-1211.

Irons, W. (2001). Religion as a hard-to-fake sign of commitment. In R. Nesse, *Evolution and the capacity for commitment* (p. 292–309). New York: Russell Sage Foundation.

Johnson, D. D. (2005). God's Punishment and Public Goods: A Test of the Supernatural Punishment Hypothesis in 186 World Cultures. *Human Nature, 16*(4), p. 410-446.

Johnson, D. D., & Krüger, O. (2004). The Good of Wrath: Supernatural Punishment and the Evolution of Cooperation. *Political Theology, 5*(2), p. 159-176.

Johnson, M. K., Rowatt, W. C., & LaBouff, J. (2010). Priming Christian Religious Concepts Increases Racial Prejudice. *Social Psychological and Personality Science, 1*(2), p. 119-126.

Johnson, N. D., & Mislin, A. A. (2011). Trust games: A meta-analysis. *Journal of Economic Psychology, 32*(5), p. 865-889.

Kahneman, D., Knetsch, J. L., & Thaler, R. H. (1986). Fairness and the Assumptions of Economics. *The Journal of Business, 59*(4, Part 2), p. S285-S300.

Laurin, K., Shariff, A. F., Henrich, J., & Kay, A. C. (2012). Outsourcing punishment to God: beliefs in divine control reduce earthly punishment. *Proceedings of the Royal Society B, 279*, p. 3272-3281.

Le Rossignol, E., Lowes, S., & Nunn, N. (2022). Traditional Supernatural Beliefs and Prosocial Behavior. *NBER working paper 29695*.

Lomas, T. (2016). Towards a positive cross-cultural lexicography: Enriching our emotional landscape through 216 'untranslatable' words pertaining to well-being. *The Journal of Positive Psychology, 11*(5), p. 546-558.

Lomas, T. (2021). The dimensions of prosociality: a cross-cultural lexical analysis. *Current Psychology, 40*, p. 1336–1347.

Luce, R. D., & Raiffa, H. (1957). *Games and decisions: Introduction and critical survey*. New York: Wiley.

McFarland, S. G. (1989). Religious Orientations and the Targets of Discrimination. *Journal for the Scientific Study of Religion, 28*(3), p. 324-336.

McKelvey, R. D., & Palfrey, T. R. (1992). An Experimental Study of the Centipede Game. *Econometrica, 60*(4), p. 803-836.

Melzer, A. M. (1996). The Origin of the Counter-Enlightenment: Rousseau and the New Religion of Sincerity. *The American Political Science Review, 90*(2), p. 344-360.

Mendoza, S. A., Lane, S. P., & Amodio, D. M. (2014). For Members Only: Ingroup Punishment of Fairness Norm Violations in the Ultimatum Game. *Social Psychological and Personality Science, 5*(6), p. 662-670.

Monsma, S. V. (2007). Religion and Philanthropic Giving and Volunteering: Building Blocks for Civic Responsibility. *Interdisciplinary Journal of Research on Religion, 3*, p. 1-28.

Murnighan, J. K., & Roth, A. E. (1983). Expecting Continued Play in Prisoner's Dilemma Games: A Test of Several Models. *The Journal of Conflict Resolution, 27*(2), p. 279-300.

Nash, J. F. (1950). Equilibrium points in n-person games. *The Proceedings of the National Academy of Sciences, 36*(1), p. 48-49.

Norenzayan, A., & Shariff, A. F. (2008). The Origin and Evolution of Religious Prosociality. *Science, 322*, p. 58-62.

Norenzayan, A., Shariff, A. F., Gervais, W. M., Willard, A. K., McNamara, R. A., Slingerland, E., & Henrich, J. (2016). The cultural evolution of prosocial religions. *Behavioral and Brain Sciences, 39*, p. 1-65.

Nowak, M. A. (2006). Five Rules for the Evolution of Cooperation. *Science, 314*, p. 1560-1563.

Ostrom, E., Gardner, R., & Walker, J. (1994). *Rules, Games, and Common-Pool Resources*. Ann Arbor: The University of Michigan Press.

Ostrom, E., Walker, J., & Gardner, R. (1992). With and Without a Sword: Self-Governance is Possible. *The American Political Science Review, 86*(2), p. 404-417.

Paulhus, D. L. (1984). Two-component models of socially desirable responding. *Journal of Personality and Social Psychology, 46*(3), p. 598–609.

Paulhus, D. L. (2001). Social desirable responding: The evolution of a construct. In H. I. Braun, & D. N. Jackson, *The Role of Constructs in Psychological and Educational Measurement* (p. 49-69). Lawrence Erlbaum Associates Publishers.

Pfattheicher, S., Nielsen, Y. A., & Thielmann, I. (2022). Prosocial behavior and altruism: A review of concepts and definitions. *44*, p. 124-129.

Putnam, R. D. (2010). *American Grace*. From https://tannerlectures.utah.edu/_resources/documents/a-to-z/p/Putnam_10.pdf

Rabin, M. (1998). Psychology and Economics. *Journal of Economic Literature, 36*(1), p. 11-46.

Rand, D. G., & Nowak, M. A. (2013). Human cooperation. *Trends in Cognitive Sciences, 17*(8), p. 413-425.

Rapoport, A., & Chammah, A. M. (1965). *Prisoner's Dilemma: A Study in Conflict and Cooperation.* Ann Arbor: The University of Michigan Press.

Resnick, P., Zeckhauser, R., Swanson, J., & Lockwood, K. (2006). The value of reputation on eBay: A controlled experiment. *Experimental Economics, 9*, p. 79-101.

Richerson, P. J., & Boyd, R. (2005). *Not by Genes Alone: How Culture Transformed Human Evolution.* Chicago: The University of Chicago Press.

Roth, A. E., & Murnighan, J. (1978). Equilibrium behavior and repeated play of the prisoner's dilemma. *Journal of Mathematical Psychology, 17*(2), p. 198-198.

Rounding, K., Lee, A., Jacobson, J. A., & Ji, L. J. (2012). Religion Replenishes Self-Control. *Psychological Science, 23*(6), p. 635–462.

Ruffle, B. J., & Sosis, R. (2007). Does It Pay To Pray? Costly Ritual and Cooperation. *The B.E. Journal of Economic Analysis & Policy, 7*(1), p. 1-37.

Rutchick, A. M. (2010). Deus Ex Machina: The Influence of Polling Place on Voting Behavior. *Political Psychology, 31*(2), p. 209-225.

Sagioglou, C., & Forstmann, M. (2013). Activating Christian religious concepts increases intolerance of ambiguity and judgment certainty. *Journal of Experimental Social Psychology, 49*(5), p. 933-939.

Schumann, K., McGregor, I., Nash, K. A., & & Ross, M. (2014). Religious magnanimity: Reminding people of their religious belief system reduces hostility after threat. *Journal of Personality and Social Psychology, 107*(3), p. 432–453.

Schurter, K., & Wilson, B. J. (2009). Justice and Fairness in the Dictator Game. *Southern Economic Journal, 76*(1), p. 130–145.

Selten, R., & Stoecker, R. (1986). End behavior in sequences of finite Prisoner's Dilemma supergames: A learning theory approach. *Journal of Economic Behavior & Organization, 7*(1), p. 47-70.

Shariff, A. F., & Norenzayan, A. (2007). God Is Watching You: Priming God Concepts Increases Prosocial Behavior in an Anonymous Economic Game. *Psychological Science, 18*(9), p. 803-809.

Shariff, A. F., & Norenzayan, A. (2011). Mean Gods Make Good People: Different Views of God Predict Cheating Behavior. *The International Journal for the Psychology of Religion, 21*(2), p. 85-96.

Shariff, A. F., Willard, A. K., Andersen, T., & Norenzayan, A. (2015). Religious Priming: A Meta-Analysis With a Focus on Prosociality. *Personality and Social Psychology Review, 20*(1), p. 27-48.

Smith, H. (1991). *The World's Religions, Revised and Updated.* San Francisco: HarperOne.

Smith, J. (1964). Group Selection and Kin Selection. *Nature, 201*, p. 1145-1147.

Sober, E., & Wilson, D. S. (1998). *Unto Others: The Evolution and Psychology of Unselfish.* Cambridge: Harvard University Press.

Soler, M. (2012). Costly signaling, ritual and cooperation: evidence from Candomblé, an Afro-Brazilian religion. *Evolution and Human Behavior, 33*(4), p. 346–356.

Sosis, R., & Alcorta, C. (2003). Signaling, solidarity, and the sacred: The evolution of religious behavior. *Evolutionary Anthropology, 12*(6), p. 264–274.

Sosis, R., & Bressler, E. R. (2003). Cooperation and Commune Longevity: A Test of the Costly Signaling Theory of Religion. *Cross-Cultural Research, 37*(2), p. 211-239.

Sosis, R., & Ruffle, B. J. (2003). Religious Ritual and Cooperation: Testing for a Relationship on Israeli Religious and Secular Kibbutzim. *Current Anthropology, 44*(5), p. 713-722.

Spence, M. (1973). Job Market Signaling. *The Quarterly Journal of Economics, 87*(3), p. 355-374.

Srull, T. K., & Wyer, R. S. (1979). The Role of Category Accessibility in the Interpretation of Information About Persons: Some Determinants and Implications. *Journal of Personality and Social Psychology, 37*(10), p. 1660-1672.

Staub, E. (1978). *Positive Social Behavior and Morality*. New York: Academic Press, Inc.

Tan, J. H., & Vogel, C. (2008). Religion and trust: An experimental study. *Journal of Economic Psychology, 29*(6), p. 832-848.

Thaler, R. H. (1988). Anomalies: The Ultimatum Game. *Journal of Economic Perspective, 2*(4), p. 195-206.

Traulsen, A., & Nowak, M. A. (2006). Evolution of cooperation by multilevel selection. *Proceedings of the National Academy of Sciences, 103*(29), p. 10952-10955.

Trivers, R. L. (1971). The Evolution of Reciprocal Altruism. *The Quarterly Review of Biology, 46*(1), p. 35-57.

Tsang, J. A., Al-Kire, R. L., & Ratchford, J. L. (2021). Prosociality and religion. *Current Opinion in Psychology, 40*, p. 67-72.

van den Bergh, J. C., & Gowdy, J. M. (2009). A group selection perspective on economic behavior, institutions and organizations. *Journal of Economic Behavior & Organization, 72*, p. 1-20.

Van Tongeren, D. R., DeWall, C. N., Chen, Z., Sibley, C. G., & Bulbulia, J. (2020). Religious residue: Cross-cultural evidence that religious psychology and behavior persist following deidentification. *Journal of Personality and Social Psychology, 120*(2), p. 484–503.

van Veelen, M., Allen, B., Hoffman, M., Simon, B., & Veller, C. (2017). Hamilton's rule. *Journal of Theoretical Biology, 414*, p. 176-230.

Venter, J. J. (2018). Voltaire's satirical catechisms: secular confessionalism. *Phronimon, 19*(1), p. 1-19.

von Neumann, J., & Morgenstern, O. (1944). *Theory of Games and Economic Behavior*. Princeton: Princeton University Press.

Williams, G. C. (1966). *Adaption and Natural Selection*. Princeton: Princeton University Press.

Xygalatas, D. (2013). Effects of religious setting on cooperative behavior: a case study from Mauritius. *Religion, Brain & Behavior, 3*(2), p. 91-102.

Zelmer, J. (2003). Linear Public Goods Experiments: A Meta-Analysis. *Experimental Economics, 6*(3), p. 299-310.

Zizzo, D. J., & Oswald, A. J. (2001). Are People Willing to Pay to Reduce Others' Incomes? *Annales d'Économie et de Statistique, 63/64*, p. 39-65.

This thesis is 9988 words long.