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Measuring cooperation and other risks:

Experimental evidence on individual differences

Master`s Thesis in
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Abbreviations

BRET - Bomb Risk Elicitation Task

DG - Dictator Game

JV - Joint Venture

MPL - Holt and Laury Price List

SCT - Social Contract Theory

SHG - Stag-hunt Game

TG - Trust Game

UG - Ultimatum Game

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Abstract

This master's thesis examines how the degree of risk influences the cooperative behavior of individuals to understand how cooperation can be better organized. Explicitly, the individual risk preference as compared to the risk level of the environment in which individuals make their decisions. The effect of a social frame on the classical representation of economic games is investigated experimentally. In general, the understanding and identification of critical success factors enable to indicate the cooperation behavior of individuals, but organizations also benefit from the indicated components that require cooperation. Cooperation's are associated with a high level of risk and pressure. Therefore, it is necessary to carefully study the environmental conditions to get the best result. The aim of this study is to characterize the optimal conditions for the evolution of cooperation and its critical success factors to ensure the success of cooperation and to guarantee operational excellence of the entire process.

This master's thesis is based on an experimental study that collects facts and evidence from different perspectives. This experimental study helps to understand the motives behind cooperation in the Stag-hunt games by comparing different economic gams and two risk preferences elicitation methods with those Stag-hunt games of this study. The Trust game, Ultimatum game, Dictator game, as well as the Holt and Laury price list and the Bomb risk elicitation task, are compared to the Stag-hunt games. Payoffs are manipulated in a two-player one-shot Stag-hunt game. The Payoffs explain the degree of cooperation by combining three motives: Baseline, more efficient, and less risk. In addition, the social framing effect is investigated as a treatment in the experiment. This is implemented as a joint venture scenario. This study helps organizations to better understand how to develop strategies that protect against failure of cooperation. Decision-makers can use the results of this research to carry out cooperation's from planning, through implementation, to a successful conclusion.

On the one hand, payoff dominance and risk dominance are not significant. However, in the game less risk there is a positive influence on the likelihood of cooperation. On the other hand, the treatment business setting is strongly significant which means that cooperation occurs more often in the joint venture scenario than in the classical representation of the economic games. It positively influences cooperation behavior. This appears to be why previous attempts to explain Stag-hunt games' decisions only with risk attitudes have not been successful. In this study, trust does not significantly influence. However, it could be demonstrated that it is a basic requirement for cooperation.

KEYWORDS: Game Theory, Cooperation, Joint Venture, Risk, Risk Attitude, Trust, Social Preferences, Social Framing Effect.

1 Introduction

The growing importance of cooperative relationships can be observed with increasing frequency. The vast majority of such relationships are in the form of collaboration. In the present master's thesis, cooperation in the form of a joint venture is examined. Explicitly, a game-theoretical analysis is used to investigate whether there is a difference in the investigation of cooperation behavior through standard economic games and these games if a social frame is given. The investigation is expanded to include the analysis of equilibrium selection (Harsanyi & Selten, 1988). The selection criteria of payoff and risk dominance are determined. Specifically, a different part of this study is that individuals tend to cooperate more, which can maximize their own and collective profits, or if self-interest dominates and cooperation is rejected due to an increased degree of risk. However, there is the simultaneous existence of cooperation and competition between competitors. These relationships are not necessarily associated with the advantages of these collaborations; collaborations also harbor dangers. For example, the advantages that result from the cooperation are the stimulation of innovations by partners, the development of new technologies, the procurement of additional resources, the entry into new markets, or the creation of new products and services. The disadvantages can be enormous when efforts to cooperate fail.

Expressly, the master's thesis' primary focus is on the stumbling block of cooperation and the social contract theory. There are no societies and communities without social contracts. Every interpersonal cooperation represents a social contract. Most of the actors involved are not aware of these contracts, for example, when a parent asks his child to do the dishes. In business practice, this is mostly different; even if the supervisor asks something to be done, the concluded employment contract represents the social relationship between these two actors. Cooperation means risk; children trust in their parents' care, and employees trust that the work done will be rewarded at the end of the month. The risk of abuse of trust is one of the perspectives this study focuses on. Suppose there is only one-sided trust and the willingness to cooperate. In that case, this one-sided willingness to cooperate is doomed to failure, and the Trustor has to pay a high price for the trust he/she has raised. In other words, the Trustor goes away empty-handed, whereas the Trustee benefits despite the anti-social behavior.

As in the example mentioned above, social contracts of all kinds depend on trust (Skyrms, 2008). If we look at trust through the lens of game theory, the representation is given by the Trust Game (Berg, Dickhaut, & McCabe, 1995). In this study, the TG is used in an extension of the classic form by the strategy method (Selten, 1967), making it possible to examine the participants' preferences more

closely. Trust is also elementary in another economic game, namely the Stag-hunt Game. In the SHG, the players are confronted with decisions related to risk and uncertainty, as in the TG. The difference is that the players do not make their decisions one after the other (Sequential Game), but preferably simultaneously, which is the particular interest of this study. A hitherto neglected question, especially in business administration and economics, is how risk and uncertainty contribute to pro-social behavior and the willingness to cooperate?

On the one hand, people behave prosocial and selfless. On the other hand, they refrain from working with others and act selfishly. How can this contradicting behavior be explained? The center of interest is the evolution of cooperative behavior in humans in a business context. The research questions are answered through individuals contributing to the interaction with computer-aided economic games in an experimental study. These economic games come from game theory and make it possible to examine cooperation in various conflict situations. Therefore, the main emphasis is studying the interaction between environmental structures (i.e., payoffs and framing) and prosocial behavior concerning cooperation. In other words, a key aspect is how risky environments and social framing influence human behavior.

When it comes to the risk assessment of cooperative action, Peter Singer is one of the most frequently cited persons. P. Singer (1972) has referred to international cooperation development and devised the following moral principle:

"If it is our power to prevent something bad from happening, without thereby sacrificing anything morally significant, we ought, morally, to do it."

Risk in business administration and economics literature is usually defined in terms of the variance of possible monetary outcomes. Furthermore, risk-seeking is defined as a preference for a higher variance payoff, holding the expected value constant (Markowitz, 1952). The two economists Knight (1921) and (Keynes, 1921, 1937) differentiate between risk and uncertainty. In *Risk, Uncertainty, and Profit*, Knight (1921) defines uncertainties as a generic term for three types of probability situations: logically obtained (a priori) probabilities, empirically (statistically) ascertained probability, and estimated Probability (probability based on estimates and intuitive judgment). Therefore, the decision-maker knows the objective probability distribution over possible outcomes from a decision under uncertainty. This information is assessed with some degree of vagueness

(Knight, 1921). Apart from simple games of chance, one must make decisions with incomplete information of probability distribution of possible outcomes. Explicitly, the subjective expected utility (Savage, 1972) considers the uncertainty by replacing objective probabilities with subjective probabilities derived from decisions that are believed to agree with the standard axioms of probability theory.

In contrast, when medical professionals and laypeople identify risky behaviors (e.g., drug use, unprotected sex, or mountain climbing), they refer to a broader meaning of the term. Medic usually defines risky behavior as behavior that can harm themselves or others (Schonberg, Fox, & Poldrack, 2011). Interviews with senior managers suggest that they are more likely to see risk in terms of possible adverse outcomes than in terms of changes probabilities or some quantifiable construct (March & Shapira, 1987).

Despite the evidence that suggests pro-social behavior is indispensable for a well-functioning society. To date, however, a reliable scientific assessment and understanding of the underlying structure remain a challenge (Tusche, Böckler, Kanske, Trautwein, & Singer, 2016). Various disciplines such as economics, psychology, neuroscience, and biology have addressed pro-social behavior and explored preconditions, limitations, and foundations of pro-social behavior (Batson, 2011; Boyd & Richerson, 2009; Fowler, 2005; J. Henrich et al., 2006; Martin A Nowak & Sigmund, 2005). However, the methodologies of the individual scientific disciplines are different and focus on various aspects of pro-socialism.

Pro-social behavior is done for the sake of others rather than for the self. Therefore, this often entails risks or costs to oneself, such as providing resources to others, waiting in line, demanding or paying a fair price, or risking their lives in combat. Moreover, it is neither irrational nor self-destructive to carry out such acts (Twenge, Baumeister, DeWall, Ciarocco, & Bartels, 2007). In a nutshell, risk-taking behavior brings potential negative consequences, which are somewhat offset by perceived positive impacts (Aklin, Lejuez, Zvolensky, Kahler, & Gwadz, 2005; Moore, Gullone, & Kostanski, 1997). In particular, the Stag-hunt Game is considered. The efficiency and risk level varying the gains from cooperation by manipulating payoffs and the frame in which this occurs. Moreover, part of this study is the demonstration of the existence of the norm's trust, fairness, reciprocity, and altruism with the help of the Trust Game, Ultimatum Game, and Dictator Game in the center of attention by comparing the standard economic game with this game in a social frame. Two risk preference

elicitation methods are consulted to examine the individual risk preferences and compare this with the cooperation behavior.

This master's thesis consists of six chapters about how individuals protect themselves from risks through non-cooperative behavior or, in return, take the risk of cooperation to achieve even better results. The master´s thesis structure is as follows: Chapter two describes in a detailed literature review the background to this study's considerations and the research gap. Also, the precise objectives and limitations of the study are defined. Chapter three contains the theories and definitions relevant to this research. These are discussed in detail to pave the way for this research. Chapter four reports on the research methodology used. Thereby, the statistical methods used are briefly introduced. Chapter five deals with empirical research and the results are presented. The results are evaluated and connected to the research hypotheses. Chapter six is dedicated to the discussion in which the study is concluded and recommendations for further studies.

2 Literature review

Adam Smith (1994/ original publication 1776) work *An Inquiry into the Nature and Causes of the Wealth of Nations* is believed to be one of the modern economics' origins. The origin of game theory is not attributed to a single book. Still, The *Theory of Games and Economic Behavior* (Von Neumann & Morgenstern, 1944) can be counted as game theory's birth. Von Neumann and Morgenstern adopted the mathematician's research strategy to find a solution to the problem in its simplest form and then expand the solution step by step to more complex and possibly realistic cases. Game theory is used in severe interactions such as politics, business competition, and war. Note, Schelling (1958) and Robert Aumann (2003) received the Nobel Prize in 2005. Both suggested that game theory can be better understood as "interactive decision theory."

Interactive decisions are those with only two decision-makers, i.e., two-person games. Von Neumann and Morgenstern further simplified these games. The consideration of two-person games in which everything won by one must be lost by the other is known as two-person zero-sum games. Von Neumann's and Morgenstern's solution to this most precise class of games that each person chooses the strategy that maximizes their minimum payoff (C. F. Camerer, 1991) is still recognized as the solution to this simple case. In a zero-sum game, however, there is no way for any potential of cooperation, as there is no possibility of a mutual win under the assumption. Nash (1951) revised von Neumann's and Morgenstern's (1944) solution in a form extended to non-constant sum games, i.e., interactions with win-win and loss-loss possibilities. Nash pointed out that every two-person game has such solutions.

Later, the American mathematicians Merrill M. Flood and Melvin Dresher (Surhone, Timpledon, & Marseken, 2010) developed the game theory basis of the prisoner's dilemmas for cooperation and conflict. The prison sentence's interpretation and, therefore, the name gave the game Albert W. Tucker (Surhone et al., 2010). Thus, Albert W. Tucker laid the foundation for the growth of non-cooperative game theory. Nevertheless, game theory splits into two main directions, the cooperative and the non-cooperative game theory. In particular, there is a duality between non-cooperative and cooperative game theory. So far, non-cooperative game theory has had more influence and is considered more successful. The five men who were awarded the Nobel Prize in economics for their work in game theory were all honored primarily for their work in non-cooperative game theory.

Nevertheless, the cooperative game theory literature is extensive and essential and has critical applications in business and other fields. Cooperative game theory is always applicable when the Players of a game can form coalitions. These coalitions' goal is to choose a common strategy to improve the coalition's payoffs (McCain, 2008). Recently, the study of cooperative games has attracted significant interest, focused mainly on the emergence of cooperation. A well-studied framework for this problem is the above-mentioned prisoner's dilemma game. In this study, a complete picture of the behavior of another important social dilemma, the SHG, in which the cooperative behavior grows according to the frame it is played. For these games, two selection criteria, a risk dominance criterion, and a payoff dominance criterion, have been used to explain SHGs' results since they were introduced by Harsanyi and Selten (1988). Schmidt, Shupp, Walker, and Ostrom (2003) point out that changes in the risk dominance parameter affect the Player's choice. However, changes in the payoff dominance parameter show no significant differences. Schmidt's at al. (2003) results may apply to relatively small changes in the payoff dominance parameter. Still, the frame's effect on which the otherwise identical game takes place has not been investigated. Therefore, this study aims to further examine the social framing effect on the SHGs', TG, UG, and DG. In addition, the risk preference elicitation methods MPL and BRET are used to investigate the individual risk preferences of the participants and compare these with the cooperative behavior in the previous exanimated economic games.

As we have seen, cooperation is a widely explored topic in business administration and economics. However, there is a gap between psychological, business administration, and economic literature. While there are some similarities, there is still disagreement in many respects. For example, three different framing effects are considered in psychology. In contrast, business administration and economics only mostly accept two of these effects. The previously minor considered frame in business administration and economics is of increased interest for the master’s thesis. The master's thesis investigates whether it generally makes a difference in which frame decisions are made in favor of or against cooperation. Are individuals influenced by the frame in their decision, or do the framing conditions play a subordinate role? The frameset by the scenario as mentioned earlier will provide information about this (see Appendix A). However, the investigation goes one step further by examining whether the frame plays a decisive role and the degree of risk that the willingness to cooperate entails. First of all, a distinction is made between which types of framing conditions are scientifically illuminated and useful for answering this study's research questions.

The first effect deals with a specific class of games, which is coordination games. In coordination games, several Players decide at the same time. The Prisoner's Dilemma, for example, is none of these games as making the same or different decisions will not result in the highest payoffs for all Players. Matching Pennies is a coordination game, but there are no conflicts of interest in this coordination game as it is in the case of prisoner's dilemma. The second effect focuses on the valence displayed. Valence framing refers to a class of situations in which the same information is presented as either losses or gains. The third effect deals with the provision of differently worded but logically equivalent descriptions of otherwise unchanged games. This effect has recently been hotly debated (Ellingsen, Johannesson, Mollerstrom, & Munkhammar, 2012; Levitt & List, 2007). For example, for non-cooperative games, where Players can decide independently and no third party can force cooperation, this type of framing can affect either the competitive nature of the situation or the possible group advantage of cooperation (Gerlach & Jaeger, 2016). The third effect is the focus of this study. It shows the difference between providing a generally formulated but logical description of the economic games versus a description of the games in a scenario that was formulated as a potential JV. Moreover, it is not uncommon for formalities to be incompatible. Mathematical models that describe individuals' behavior are often formally identical but still only more or less accepted by the neighboring disciplines. Therefore, this study mainly revolves around content-related and theoretical questions about the nature, characteristics, and behaviors of the context or their correlates.

Considerations of rationality also play an essential role in cooperation, equilibrium selection (Harsanyi, 1995) and Social Contract Theory literature (Davoust & Rovatsos, 2020). Therefore, it is all about investigating the deviation of real behavior from the homo economicus paradigm. K. G. Binmore (1994) argued that not only is the homo economicus paradigm compatible with a human capacity for sympathy and engagement, but it is also not difficult to see why evolutionary forces could lead them to be part of his repertoire.

Referring to the views of Bernoulli (1954/Original publication 1738) who was the first to describe the expected utility hypothesis, which is based on the homo economicus assumption only maximizing utility. The expected utility hypothesis provides an adequate solution concept for many problems, but not for any problem. In some cases, it is a bounded one. For example, the expected utility hypothesis is proposed as a solution to the St. Petersburg Paradox. The paradox can be resolved when decision-makers demonstrate risk aversion. The first application of the theory was that of Von Neumann and Morgenstern (1944). They used this assumption in their formulation of game theory. Hence, the

expected utility as a descriptive model for risk decisions has been replaced by more complex variants. By contrast, bounded rationality represents a concept that individuals' rationality is limited by the available information and time when making decisions. This restricts the cognitive properties. The idea was suggested by Simon (1955) as an alternative basis for mathematical modeling of decision making as used in economics and related disciplines (Kahneman, 2003; Tversky & Kahneman, 1981). The concept complements rationality as optimization, which views decision-making as an entirely rational process to find an optimal choice given the information and time available (Gigerenzer & Selten, 2002; Selten, 1990). As a result, Kahneman (2003) also suggested bounded rationality as a model to overcome the limits of homo economicus in economic literature. Here, prospect theory should be mentioned, which considers irrational deviations from the expected utility model (Tversky & Kahneman, 1979, 1992).

Bounded rationality differs in that since decision-makers do not have the ability and resources to arrive at an optimal solution, they do not apply their rationality until they have greatly simplified the choices available. Therefore, a decision-maker is a satisfactory one looking for an adequate rather than an optimal solution. Individuals with limited cognitive resources can thus be successful by taking advantage of existing structures and regularities in the environment to make a decision (Gigerenzer & Selten, 2002). Gerd Gigerenzer, who, along with Kahneman, is considered to be one of the most influential researchers in heuristics, argues that Simon's ideas were not followed by most scientists who have dealt with bounded rationality. The focus was more on how human decisions can be made sub-optimally due to human rationality limitations or how optimization models can be created. Gigerenzer advocates simple alternatives to a full rationality analysis as a decision-making mechanism. Gigerenzer's research has shown that such simple heuristics often lead to better decisions than the classic models (Gigerenzer & Selten, 2002).

Thematically, the previous conclusions on cooperation must be brought into connection with empathy, trust, fairness, reciprocity, and greed. For this, the boundary conditions for the development and maintenance of gaming behavior are examined. The puzzle of cooperation among unrelated people is not yet fully resolved. Cooperation, which can be described as formal or informal social contracts, involves risks. However, before the risk of interpersonal cooperation comes the individual risk preference. That the individual risk preference is different in a social context and that decisions are made differently than when only consequences for one's own decisions are to be expected is another point investigated in this study.

Further, fairness considerations, comparisons of self-interest and other interests are potent motivators in social interactions. Behavioral research has shown that individuals are not purely rational beings who aim to maximize self-gain and care about their relative advantages over others. One way to examine fairness considerations in asset sharing is to have individuals play economic exchange games like the UG. The UG is a common scenario in which an applicant offers to split the money between themselves and another Player. Suppose the recipient accepts both wins. If he/she does not accept, no person gets anything. Recipients typically decline offers of 20% of the total around half the time, and rejection rates increase as the recipient proportions decrease. Thus, the rejection rates in the UG reflect the recipient's considerations as to which offer is fair and unfair. Given that rejecting an unfair offer means punishing selfish claimants at personal expense, some researchers also alternately describe rejection as altruistic punishment (J. Henrich et al., 2006) or costly punishment (Güth, Schmittberger, & Schwarze, 1982). A social factor that seems to influence such fairness considerations is the group membership of the interaction partners (Y. Wang et al., 2017). Cooperation's represent a group with the same or similar interests.

Empathy, in everyday speech, is understood as sensitivity for others. Therefore, the relevant literature typically distinguishes between cognitive and affective empathy rather than looking at it as a unified concept (Batson, 2011; T. Singer, 2006). T. Singer and Lamm (2009) define cognitive empathy as the ability to understand the emotions and arguments of others without being emotionally involved. M. L. Hoffman (1982), who received attention in the field of psychology, argued that affective empathy is a disposition that promotes altruistic behavior. It has been established that a large part of the work on social skills and cooperation is related. Both the ability to take on affective roles and empathy are sometimes considered to develop interpersonal skills in social interactions (Marsh, Serafica, & Barenboim, 1981). Besides, many researchers see pro-social and cooperative behavior as lying on the same continuum or within the same general behavioral domain. Therefore, assume that the same processes that mediate pro-social behavior play a role in cooperative behavior (Levine & Hoffman, 1975). Cooperative behaviors have traditionally been defined as consequences for the self rather than the other, coordinating one person's behavior to achieve one's goal. It is clear that, by definition, there is a difference between cooperative and altruistic behavior in terms of motive. However, in the broadest sense, pro-social behavior could include cooperative behavior to improve the other's outcomes and one's own (Eisenberg & Miller, 1987). For this reason, empathy is an integral part of the investigation and consequently paves the way for the master's thesis.

Greed, respectively, generosity is measured in a Dictator Game. The social component of giving something is reflected in the DG like in no other economical game. For instance, previous studies have shown that people are not exclusively self-interested (Batson, 2011). Fairness and reciprocity must not be forgotten, as these are the cornerstones for the development and success of fruitful cooperation. Here, the ultimatum game is used in the course of this investigation. Giving plays a decisive role here, but in the UG, even the question of trust is of importance. Suppose the trust placed is not abused and something is returned to the trustor. In that case, the question arises about which extend the amount will be returned. When there is reciprocity, and when it is fair, it is crucial to look at willingness to cooperate from a broader perspective.

Above all, decision-making under risk and uncertainty has yet to be mentioned to attest completeness, especially when it comes to cooperative behavior; there still exists a research gap. For many decades' researchers have been addressing the thrilling question of how people make decisions under risk and uncertainty. However, the question of how people foster trust in cooperation is still unanswered. Till now, numerous studies have demonstrated that human decision-making behavior is characterized by multiple decision paradoxes or judgmental distortions, which are deviations from the actual practice of rational or normative models (Kahneman & Tversky, 1982; Stanovich & West, 1998). Despite the long history of research, the reasons for this discrepancy between actual and normative decision-making behavior are still hotly debated (Baron & Pfeffer, 1994; Cosmides & Tooby, 1994; Kahneman & Tversky, 1996) and needs further investigation.

Once again, people have always lived-in unsafe conditions; they are still facing risks. Especially when it comes to cooperation, there is a high risk, so pro-social behavior is essential to avoid abuse of the trust placed in the cooperation partner. How to deal with uncertainties and how to minimize or even avoid risks depends on various circumstances. Therefore, the master's thesis seeks to predict uncertainties and risks on this issue, as researchers have not grasped this yet (Lee, Song, Kim, & Chae, 2019). Particularly in the confrontation of unknown risks, the attempt to perceive uncertainty as a predictable and cumulative risk was hardly possible (Bonß, 2013). Initially, extensive studies deal with the topic per se and examine the root and therefore provided the perfect starting point for this fundamental literature review. Finally, the continuation of existing studies on pro-social behavior related to cooperation generates further insides contributing to this research topic. Since these research areas have not yet been integrated, this contribution, in addition to the actual research results, will yield another piece of the puzzle to partial contribution to the overall picture.

In this study, the focus is on cooperation in a general setting and a business setting. Namely, the problem of optimization parameters is investigated. With these problems, it can be challenging to coordinate whether cooperation is promising or not. Coordination problems can arise, and Players can be tempted to opt for an individual profit and reject an uncertain higher profit. Often Players are on the verge of the core problem, making cooperation unacceptable for some Players. Typically, the character of duality can exist, and the core of specific assignments can only be reduced to one point and therefore rejected. However, when an individual wants to enter into cooperation, it is generally not easy to accept it without prior consultation if it is not part of the game's core. The verification through a high computational effort is also not a plausible option for practitioners who move outside the theoretical field.

For that, to specify and provide a detailed direction for the master's thesis, research objectives and limitations have been established. These objectives assist in delivering steps to be taken to answer the research questions. Besides, they provide clarity for the reader to understand the underlying topic of the thesis. The background and development have been presented to identify the research gap and define the further need for research.

The topic's importance is seen in society's increasing desire for sustainable business and the resulting ever-growing interest of science in providing answers to how this can be achieved and what factors play a crucial role. Pro-social behavior is increasingly perceived by the annual growth in the number of start-ups of non-profit companies. Still, socially responsible companies reflect the desire for a life that benefits not individuals. The positive behavior of single individuals shows that clearly. There is no doubt that the number of bad examples still dominates. However, it is of overriding interest what constitutes pro-social behavior and how this can be guaranteed. It is essential to know and name the individual factors to counteract the moral and ethical decay of society in the future. There is a need for strategies that can be seen as a tool to make the world of tomorrow a little better for all of us and not just for an elite of managers, politicians, and selected part of society. The building of morality and ethics that strengthens the world and people against greed, recklessness, and lack of scruples is long overdue. There must be instance and reliable networks to prevent the world from being squandered and abused (Hildebrand, 1951). For this, the benefactor and its positive-acting characteristics must be screened and evaluated to explain this role model fact. Therefore, this is not an easy task and has to be a long-term and permanent topic for all those responsible in politics,

business, and society. It is a cumulative process of action that involves much more than traditional approaches.

Given the above, this research aims to assess the degree of risk and uncertainty of a sample regarding cooperation behavior and determine how the perceptions could be related to the individual. Based on the research goals and literature review, the following research questions were developed to guide the investigation. The research questions asked:

Research question 1:
Is there a quantifiable, measurable way to show that individuals foster trust in cooperation?

Research question 2:
What impact does the individual risk attitude have on cooperation?

Research question 3:
Is there a significant relationship between the social framing effect and economic games in the classical representation?

Research question 4:
Which practical implications result from the empirical findings on cooperation?

As we have seen, the breakdown of the individual traits that cause a pro-social behavior is not an easy task. It cannot be archived in one step by a single investigation. While essential have been investigated and published by numerous well-known scientists, further efforts must be done to gain a complete picture of pro-social behavior. Therefore, exposing the influence of risk and uncertainty on cooperative behavior is a further contribution to this important topic. What is more, it is of particular interest to firms because the knowledge of the risks and uncertainties firms a faced with protects the investments regardless of whether it is a monetary or another resource. Businesses need to understand the different causes and effects of the risks and uncertainties faced to succeed in the marketplace. Here, through the effective implementation of such knowledge, strategies could be developed that minimize risky decisions and protect against losses of any kind.

Above all, the master's thesis does not focus on previous approaches, such as motivation for altruistic action or empathy. Instead, the master's thesis attempts to explicitly demonstrate the effects of risk and uncertainty on pro-social behavior related to cooperation rather than shed light on selfless altruism, altruistic heroism, or unconditional altruism. For proceeding and more in-depth understanding of pro-social behavior, an experiment of the role of risk and uncertainty turns out to be expedient to generate new knowledge in addition to the status quo of research in this field.

3 Theoretical setting

The research in this study is focused on both game theory and risk assessment. This chapter introduces the concepts that are used in later chapters and the results of previous research. Game theory is discussed first, followed by an introduction to risk assessment and other important fundamental concepts that underpin this study's research.

3.1 Game theory

Game theory is a mathematical method for decision-making and strategy under differing conditions of uncertainty. Games are defined as strategic interactions between individuals, groups, or institutions, with a design referring to a complete concept of action that lists all potential game options and the player's resulting outcomes (Salkind, 2010). Hence, a player's strategic plan of action needs to consider the expectations of others' actions. The formally predicted strategy for solving a game is not necessarily to maximize utility. The players often opt for solutions that do not provide for a pure maximization of utility but are assigned to social preferences (Carpenter, 2016).

Game theory, among other things, is part of applied mathematics and has many useful applications in practice. For example, studying political science elections, negotiation in diplomacy, evolutionary game theory in biology, or multi-agent systems in computer science, are among the disciplines that game theory deals with. However, the main application of game theory can be found in economics. The economic phenomena such as oligopolies, auctions, and general equilibrium are mainly analyzed using game theory. Economists prefer to use game theory perspectives based on strict payoff matrices and real monetary income to understand concepts such as altruism, e.g., ultimatum game (Güth et al., 1982) generosity, e.g., dictator game (C. Camerer & Thaler, 1995), trust, e.g., trust game (Berg et al., 1995) and coordination, e.g., stag-hunt game (Fang, Kimbrough, Pace, Valluri, & Zheng, 2002).

3.1.1 Stag-hunt Game

"If it was a matter of hunting a deer, everyone well realized that he must remain faithfully at his post; but if a hare happened to pass within reach of one of them, we cannot doubt that he would have gone off in pursuit of it without scruple and, having caught his prey, he would have cared very little about having caused his companions to lose theirs."

(Rousseau, 1984/Original publication 1754)

Skyrms (2001) names the origin and structure of the stag-hunt game and the name from the above story. In 1754 Jean-Jacques Rousseau (Rousseau, 1984/Original publication 1754) described the hunt for a stag in his Book *Discourse on inequality*. Skyrms (2001) shows further examples of the SHG in philosophical works such as *A treatise on human nature* by David Hume (Hume & Macnabb, 1738). Two men are pulling at the oars of a boat. Araujo and Leoneti (2018) consulted the oil and gas industry to create a vivid business example for the SHG. The oil and gas industry is awe-inspiring because of its dynamic business environment, which benefits from corporate partnerships and JV's. Simultaneously, the gas and oil industry must adhere to strict government regulations that are justified in its existence. A significant role is to understand and handle these actors' interests to resolve potential conflicts (Willigers, Bratvold, & Hausken, 2009; Zhu & Singh, 2016). Oliveira, Nunes, Blajberg, and Hamacher (2016) have shown that the oil and gas industry is characterized by a competitive environment with many current challenges such as price volatility, environmental protection, and partnership between large and medium-sized companies.

Furthermore, the industry is also characterized by enormous investment requirements, typically implemented through partnerships and JV´s to share costs and risks (Castillo & Dorao, 2013). The main goal of alliances and JV's between oil and gas companies is to share risks, maximize investment portfolios and optimize short and long-term strategies. Consequently, the process of partnering up for the right portfolio is a critical factor for the oil and gas industry. Not only is the horizontal allocation of resources a potential source of conflict, but also between partnerships that vertically integrate the oil and gas industry. Their suppliers pose an enormous challenge to share their particular risks and costs (Araujo & Leoneti, 2018). The presence of these numerous agents and each strategy's effect on the bottom line makes the oil and gas industry an exciting and illustrative field for game theory applications. Nevertheless, in this study, it is not essential to have a single industry as an example. Therefore, the above example is only exemplary.

The SHG is considered one of the most important games in game theory, alongside the prisoner's dilemma, when it comes to the features and dilemmas of social contracts. The dilemma between making a safe choice and a risky choice can found in both business and real life. In particular, many dynamic corporate interactions have qualities that are similar to the SHG. For example, in JV's, two different companies have to learn to coexist and achieve predefined goals like in the mentioned

example above. While there is a shared interest in making the venture payoff, there is also a conflict of interest when Players have an incentive to evade responsibility. In contrast to the self-centered prisoner's dilemma's egoistic character, the SHG is more in keeping with the diverse business decisions. Significant similarities are reflected in the SHG. These can prove to be potentially fruitful applications of this research.

The game theory encompasses a large number of different types of games. For this master's thesis, it is necessary to classify the specific characteristics of the SHG. Games that two Players play are considered in this work. Each Player has two pure strategies. Only games without communication are considered. The SHG payoffs' character is not constant sum games where each player has complete information about the game. Only one-shot games and first rounds of randomly matching games are considered. Schmidt et al. (2003) found no significant differences between one-shot games and first rounds of a random match. The claim by Schmidt et al. (2003) is supported by Gallice (2007), which was established first years earlier by Guyer and Rapoport (1972). It is argued that random match games are similar to one-shot games. Players cannot strategize on the next games as they face other players each period. Besides, players cannot experience the learning effect as only the first rounds are taken into account. The general structure of the SHG is shown in normal form in Figure 1.

		Player 2	
		L	**R**
Player 1	**U**	**A, a**	**B, c**
	V	**C, b**	**D, d**

Figure 1: General structure of the Stag-hunt Game.

As mentioned above, the general elements of a game, in this case, are two players (player 1 and player 2). There are two pure strategies available for each player in their action set. U and V depict the pure strategies for player 1 in their action set A_1. The pure strategies L and R in action set A_2 represents the possibilities that player 2 has. The payoff function, characterized by lower- and upper-case letters, represents the game's final elements. The payoffs for player 1 are represented by the capital letters A, B, C, and D. The lower-case letters a, b, c, and d are the possible payoffs of player 2. The intersection of the respective selection of players determines the payoffs.

For example, if player 1 is playing U and player 2 is playing R, the intersection of player choices is the top right matrix with payoff B for player 1 and payoff c for layer 2. The SHG is specified as A> C, D> B, D> A, and B ≥ A. Although some games do not meet the specific requirements of B ≥ A, they are still called SHG´s. The requirement for B ≥ A relates to the story of the hunt for a stag, as represented in Figure 1 by V and R. When hunting a hare, as shown in Figure 1 by the options U and L, the same effort is expended when another player is hunting the Stag than in a situation in which another player is also hunting the hare it is safer to hunt the hare when the other player is chasing the stag. Therefore, the payoffs in the SHG should satisfy B ≥ A. The above structural statements apply to lower case letters and upper-case letters since the SHG is symmetric.

For player 1 is the best response to play U (V) if player 2 is playing L (R) as the payoff A (D) is higher than C (B). Player 2 has the same payoffs in the lower cases. There are neither strict nor weak dominant strategies in the SHG. Both players have the same mutual best answers to each other's decisions. Hence, there are two Nash equilibria in pure strategies. The first Nash equilibrium in pure strategies is {U; L}, and the second is {V; R}. According to the Nash equilibrium definition, neither player has an incentive to deviate from their best answer. It holds because A > C and a> c for the first equilibrium {U; L} and D > B and d > b for the second equilibrium {V; R}. There are two Nash equilibria in the SHG that have different payoffs. Thus, the equilibria can be defined as Pareto rank-able equilibria. The equilibrium {V; R} is the payoff-dominant Nash equilibrium since its payoffs D for player 1 and d for player 2 are higher than the payoffs A and a from the equilibrium {U; L}. The inferior Nash equilibrium {U; L} is the risk-dominating Nash equilibrium. However, the list of Nash equilibria is not complete as there is a remaining equilibrium. It is a mixed strategy Nash equilibrium. To maximize one's expected payoff in mixed strategies, one should play their strategies with such probabilities that the other players' expected payoffs are the same regardless of their choice. Therefore, the other player is indifferent between their decisions. In other words, if player 2, taking into account the general structure of the SHG, wishes to make player 1 indifferent between their choices U and V, player 2 must assign probabilities p and 1 - p to their decisions L and R to do so.

There is no consensus on whether players follow the criterion of payoff dominance or risk dominance. Both criteria were introduced in *A general theory of equilibrium selection in games* (Harsanyi & Selten, 1988). Harsanyi and Selten (1988), Schelling (1958), and Anderlini (1999) assume that the player behaves according to the payoff dominance criterion and chooses the Pareto-dominant strategy. In contrast, Carlsson and Van Damme (1993), Harsanyi (1995), and Van Huyck, Battalio,

and Beil (1990) prefer the criterion of risk dominance. Although no conclusion has yet been drawn, there is a broad consensus that a criterion of risk dominance is more important in predicting outcomes (Gallice, 2006). The prevalence of risk-dominating salience is supported by experimental evidence (Straub, 1995; Van Huyck et al., 1990), in which the subjects chose risk-dominant strategies more often than payoff-dominant strategies.

Keser and Vogt (2000) conducted an experiment in which the payoff dominant strategy and the game's risk dominant strategy were identical. Strictly speaking, both selection criteria recommended the same strategy. However, more than 40% of the subjects chose a predominated strategy by both the payoff dominant and the risk dominant of another strategy. It appears that the test subjects did not make their decisions based solely on the given selection criteria. Therefore, it can be stated that parameters contain essential information about the magnitude of a particular selection criterion.

Schmidt et al. (2003) introduced the payoff dominance parameter P as an efficiency loss measurement. Parameter P measures the percentage efficiency loss incurred by successful coordination on the inferior equilibrium compared to successful coordination on the payoff dominant equilibrium. More in detail, Schmidt et al. (2003) examined P and R parameters' predicted power. Figure 2 shows the four different SHG´s suggested by Schmidt et al. (2003). The authors argue that the differences in decisions between games G2 and G3 and the differences between games G1 and G4 are entirely due to the changes in parameter R since parameter P is kept constant.

Similarly, the decision differences between games G2 and G4 and between games G1 and G3 are attributed to the changes in parameter P while R is held constant. Schmidt et al. (2003) conducted their experiments in three different settings: one-shot games, repeated games with random matches, and repeated games with a fixed match. In the authors' conclusion, changing the parameter R led to a change in Player decisions by about 19%, which according to Schmidt et al., represents a significant difference. However, the results of Schmidt et al. (2003) are not in line with the experimental evidence from Battalio et al. (2001).

Battalio et al. (2001) experimented on three different repeated SHG´s with random matching (see Figure 3). Battallio et al. (2001) examined the influence of the optimization parameter on the players' decisions. The results of Battalio et al. (2001) agree with the hypotheses they made about the optimization premium, but they did not consider parameter P in their experiment. According to the

conclusions of Schmidt et al. (2003), there is no significant difference between the games as parameter R is kept constant. There could not show a significant difference between the R and 0.6R games.

G 1

		Player 2	
		A	**B**
Player 1	**A**	**60, 60**	**60, 20**
	B	**20, 60**	**100, 100**

G 2

		Player 2	
		A	**B**
Player 1	**A**	**80, 80**	**80, 20**
	B	**20, 80**	**100, 100**

G 3

		Player 2	
		A	**B**
Player 1	**A**	**80, 80**	**80, 60**
	B	**60, 80**	**100, 100**

G 4

		Player 2	
		A	**B**
Player 1	**A**	**60, 60**	**80, 0**
	B	**0, 80**	**100, 100**

Figure 2: Stag-hunt Games Schmidt et al. (2003).

Still, there was a significant difference between games 2R and R. Furthermore, the difference between games 2R and 0.6R was not significant. Still, there is a trend that as the parameter P increases, players

tend to play more payoff-dominant strategies. It appears that the players may not respond to small changes in parameter P.

		Player 2	
		A	**B**
Player 1	**A**	**40, 40**	**35, 0**
	B	**0, 35**	**45, 45**

2R

		Player 2	
		A	**B**
Player 1	**A**	**20, 20**	**40, 0**
	B	**0, 40**	**45, 45**

R

		Player 2	
		A	**B**
Player 1	**A**	**12, 12**	**42, 0**
	B	**0, 42**	**45, 45**

0.6R

Figure 3: Stag-hunt Games Battalio, Samuelson, and Van Huyck (2001).

Again, Dubois, Willinger, and Van Nguyen (2012) do not agree with (Battalio et al., 2001) conclusions on the optimization premium. Therefore, Dubois et al. (2012) presented an experiment with three repeated SHG´s with random matching (see Figure 4) in which either the parameter RR or the parameter OP was changed. However, the results of Dubois et al. (2012) might explain the use of parameter P. Considering the first rounds of games, there is a noticeable trend in results that with an increase in parameter P, players are more likely to choose the payoff dominant strategies. Even though there is a trend in players' choices between Games 2 and 3, the difference between them is not significant. It seems that players are more likely to choose payoff dominant strategies in games with sufficiently large payoff dominance parameter P.

Game 1

Player 1 \ Player 2	A	B
A	12, 12	42, 0
B	0, 42	45, 45

Game 2

Player 1 \ Player 2	A	B
A	32, 32	37, 20
B	20, 37	40, 40

Game 3

Player 1 \ Player 2	A	B
A	28, 28	38, 4
B	4, 38	44, 44

Figure 4: Stag-hunt Games Dubois et al. (2012).

Figure 5 shows the three different SHG´s investigated in this study, baseline, more efficient, and less risk. The conception from Schmidt et al. (2003) was pursued and applied to the self-developed games. The three games examined in this master's thesis were developed to systematically vary the payoff and risk dominance characteristics of the games. Measures of the dominance concepts should be compared with the original equilibria across all games. The differences to Schmidt et al. (2003) approaches are explained in more detail below.

Player 2

Player 1	A	B
A	40, 40	0, 30
B	30, 0	20, 20

Baseline

Player 2

Player 1	A	B
A	50, 50	0, 30
B	30, 0	20, 20

More efficient

Player 2

Player 1	A	B
A	40, 40	0, 30
B	30, 0	10, 10

Less risk

Figure 5: Stag-hunt Games of this investigation.

Only symmetrical two-player games in which each player has two possible actions, A and B, were considered. The ordered pair (A, B) represents an outcome where player 1 selects A and player 2 selects B. Function u_1 gives player 1 the payoff for an outcome. For example, for the game baseline shown in Figure 5, u_1 (A, B) is 0. All games have two strict Nash equilibria (A, A) and (B, B) and one Nash equilibrium in mixed strategies. In addition, (B, B) is always the payoff dominant equilibrium.

Starting from the game baseline, playing (B, B) leads to an efficiency gain in the more efficient game, but in the less risk game to a lower level of risk, whereby the efficiency level remains the same. Therefore, the loss of efficiency is measured as a percentage of the payoff dominance of the equilibrium (B, B). The measure is calculated as follows: $P = \frac{[u_1(B,B)-u_1(A,A)]}{u_1(B,B)}$.

For more details, see Schmidt et al. (2003).

The exact specification of this measure for the payoff dominance is not important for the purposes of this study. However, the payoff dominance itself is decisive for this study. In contrast to Schmidt et al. (2003), u_1 (B, B) is not identical in all games, but just like Schmidt et al. (2003), the value of u_1 (A, A) is always either 40 or 50. Therefore, every measure of the payoff dominance depends only on u_1 (A, A) and u_1 (B, B). On the one hand, it is evident that (B, B) = 20 has a higher payoff dominance than (B, B) = 10. On the other hand, (B, B) = 10 shows a lower level of risk.

The risk dominance of Harsanyi and Selten (1988) is based on what the two call the tracing procedure; the detailed presentation of this method is beyond the scope of this study. Selten (1995) suggests a more straightforward measure of risk dominance used for the games in this study and the games from Schmidt et al. (2003). The measure is easy to calculate in contrast to the original measure. The weighted average log measure of the risk dominance of equilibrium (A, A) over (B, B) by Selten (1995) is as follows:

$$R = Log\left[\frac{u_1(A,A) - u_1(B,A)}{u_1(B,B) - u_1(A,B)}\right]$$

In the case R is positive, (A, A) is chosen, i.e., (A, A) risk dominant. If R is zero, the mixed strategy Nash equilibrium is risk dominant. If R is negative, (B, B) is risk dominant. It has to be mentioned that risk dominance is not a measure of risk preferences.

In the following, the levels of payoff and risk dominance of the three different SHG´s will be presented as well as evaluated. In the baseline game the level of payoff dominance is -0.5 and the level of risk dominance is ln(0.5). Hence, (A,A) is the payoff dominant as well as the risk dominant equilibrium. In game more efficient game, the level of payoff dominance falls to -1.5 indicating that (A,A) is relatively more payoff dominant than (B,B) compared to the baseline game. The level of risk dominance in game more efficient is zero denoting that the mixed strategy Nash equilibrium is risk dominant. This means that the alternatives A and B are played by both players with equal probabilities. In game less risk the level of payoff dominance further decreases to -3, whereas the level of risk dominance with a value of zero stays constant in comparison to game more efficient. Although the absolute levels of payoff dominance does not have a specific interpretation, the theoretical analysis of the three games show that in game less risk the Nash equilibrium (A,A) is the most payoff dominant, followed by the Nash equilibrium (A,A) in game more efficient and the Nash

equilibrium (A,A) in game baseline. In order to end up in the payoff dominant Nash equilibrium (A,A), which represents the Pareto superior Nash equilibrium (the social optimal decision), cooperation of the two players is required. Therefore, this thesis empirically assesses the extend by which the players are willing to cooperate. Because of the fact that the mixed strategy Nash equilibria are risk dominant in game more efficient and less risk, all theoretical mixed strategy Nash equilibria have been calculated subsequently:

Game baseline: Prob(A) = 2/3 by player 1 which is equal to the probability of player 2 for A.
Game more efficient: Prob(A) = 1/2 by player 1 which is equal to the probability of player 2 for A.
Game less risk: Prob(A) = 1/2 by player 1 which is equal to the probability of player 2 for A.

3.1.2 Trust Game

Trust is essential in almost every economic transaction, and it lowers transaction costs (Kanagaretnam, Mestelman, Nainar, & Shehata, 2009). Arrow (1974) found that higher investment and growth rates are positively associated with higher trust levels.

Berg et al. (1995) developed the Trust Game. The TG is a game theory model to measure trust in economic decisions, also called the "Investment Game." The experimental game shows that trust is just as fundamental to financial transactions as self-interest. Since trust is not part of standard economics, the experiment further develops traditional economics' basic assumption, which tended to ignore trust. One of the differences in comparison with the UG and DG is that initially, only the first Player (Trustor) receives a certain amount of money. The first player can send part or all of the money available to the anonymous second player (Trustee). The first player knows that everything he/she sends will be tripled by the experimenter and transferred to the second player. Then, the second player can decide whether to return a part, all or nothing of the now tripled money to the first player (Brülhart & Usunier, 2012).

The classic economic assumption assumes that a rational player only considers his self-interest. Therefore, the first player's predicted action in the TG is that he/she chooses to send nothing. Even with complete set-up information about the game, the first player's option is not to send anything. This is the Nash equilibrium for the game. Following this, the second player assumes that he/she is not sending anything back (Berg et al., 1995). Nevertheless, Berg et al. (1995) showed that the

assumption of standard economic theory was violated. the first players sent money that averaged just over 5% of their original amount. Only 11% of the first players acted selfishly and did not send anything. The average amount sends back from the second to the first player was greater than the amount originally sent. Only 20% of the second players send nothing back (Berg et al., 1995).

Despite the advantages of cooperation, those responsible often choose competitive strategies. This reduces the expected value that could be achieved through cooperation. This work examines, among other things, the role that trust plays in promoting cooperation. Although trust is a prerequisite for cooperation, a systematic study of how trust is built, sustained, and violated is examined. The goal is to identify those processes that foster trust and cooperation in negotiations. Traditional game theory analysis of trust is usually based on the standard one-shot TG, as shown in Figure 6. In the TG, the rational decision is not to trust. This is a sub-optimal social outcome since trusting is a strict improvement for both the trusted person and the trustee. From this point of view, Figure 6 shows a paradigmatic social dilemma in human society, in which R_1, S_1, P_1 denote the utility of the trustor and R_2, T_2, P_2 denotes the utility of the trustee (R. Y. Wang & Ng, 2015).

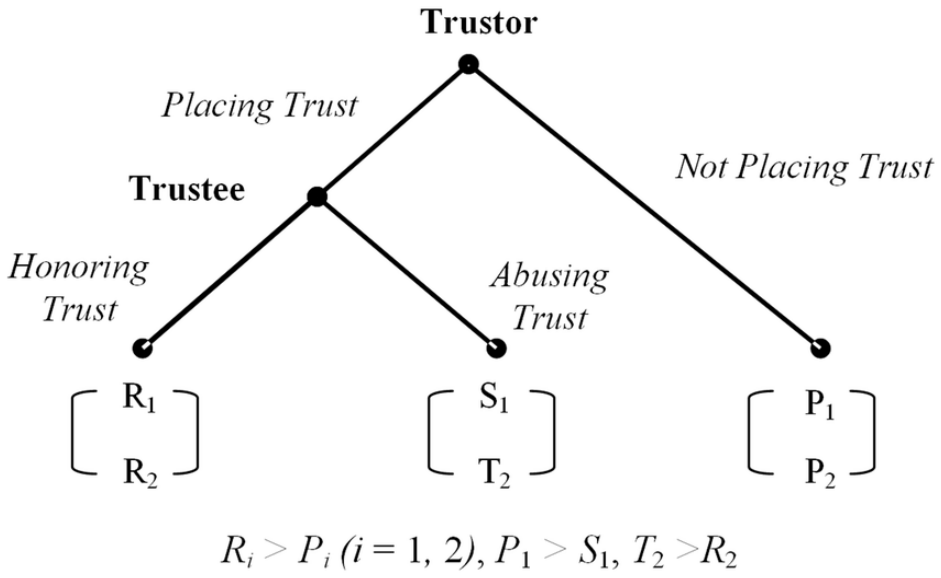


Figure 6: Standard one-shot Trust Game (R. Y. Wang & Ng, 2015).

3.1.3 Ultimatum Game

Güth et al. (1982) developed the ultimatum game (Fang et al.). However, the origin of the game can be found in Stahl (1972). In the original form of the UG, a sum of money in a predetermined and

known amount is made available to two people without either of them having to do anything. If both parties agree on how the amount will be divided, it will be paid out as agreed. If no agreement is reached, neither of the two actors receives anything. Initially, the participants are assigned a fixed role as proposers or responders. The proposer then proposes a particular division of the amount of money, which the responder can only accept or reject. The process, i.e., offer and acceptance, is only carried out once and not repeated. The two parties cannot communicate with each other in any way, and they remain anonymous to their counterparts.

Based on the classic interpretation of homo economicus, the players involved should act according to their interests rather than fairness considerations. Accordingly, a proposer would have to divide the amount of money so that the proposer keeps the largest possible share for himself, i.e., offers the smallest unit of the amount to be divided. Assuming that a responder is also acting completely rationally, a responder would have to accept the proposed division as long as the offer is not zero. There is no payoff if the offer is rejected (Stoetzer, Blass, Grimm, Gwosdz, & Schwarz, 2015). The result of the ultimatum game showed that most proposers offer between 40% and 50% of the amount. The given amount of the proposer is almost always accepted. If the amount is only 20% of the original amount, it will be rejected about half of the time. the rejection rates increase significantly if the amount falls to 10% or less (C. F. Camerer, 2011; Güth et al., 1982).

3.1.4 Dictator Game

The dictator game is based on Kahneman, Knetsch, and Thaler (1986). The DG is a modification of the ultimatum game (Y. Wang et al., 2017). In this game, an amount is made available to two players. The general conditions of the UG are almost entirely adopted. The difference is that the second player no longer has the option to reject the proposed split. Therefore, the proposer is not dependent on the approval of the responder. Based on the standard doctrine of homo economicus, a proposer who maximizes his income should allocate the smallest possible amount in this game variant, i.e., zero (Stoetzer et al., 2015).

The results in DG´s indicate that in the behavior of human beings and selfish motives, altruism, fairness, and reciprocity play a significant role (Diekmann, 2004; Fehr & Gächter, 2000; Ockenfels, 1999). In many cases, the players do not orientate themselves towards the Nash equilibrium, but the players deviate from rational strategies in some cases considerably (Forsythe, Horowitz, Savin, &

Sefton, 1994). The extent of the deviation varies in various experimental studies (J. P. Henrich et al., 2004). It is assumed that social norms are essential for cooperation to occur. Why these standards can lead to cooperation is a key topic of this study.

3.2 Risk Preference Elicitation Methods

3.2.1 Bomb Risk Elicitation Task

The Bomb Risk Elicitation Task is a dynamic method for elicit risk preferences. The method essentially lets individuals choose between a specific payoff and continuing to play a game with a risky payoff. Based on the moment they stop playing the game, one can compute a risk preference range. The BRET lets individuals collect boxes, where the potential payoff increases with the collected boxes, as does the chance of collecting a bomb, resulting in no payoff (Crosetto & Filippin, 2013). The Crosetto and Filippin (2013) showed that with a cumulative distribution of choices in the BRET, the test subjects were 51.3% risk-averse, 14.1% risk-neutral and 34.6% risk-seeking.

In this study, a ready-to-use software module for use with oTree was used (Chen, Schonger, & Wickens, 2016; Holzmeister & Pfurtscheller, 2016), which allowed the BRET to be easily performed in numerous different variations, taking advantage of the potential and benefits of the latest web programming technologies on which oTree based. In a user-friendly and uncomplicated way, predefined and well-documented variables are specified in a separate file that gave complete control over various aspects of the game (Holzmeister & Pfurtscheller, 2016).

3.2.2 Holt and Laury Price List

Numerous methods are used to test individual risk attitudes. One of the most common methods used is the Holt and Laury price list. The method was introduced by Holt and Laury (2002), which will be referred to as MPL (Multiple Price List) in the further course of the thesis. MPL´s are incentives for determining risk preferences. The risk perception of the subjects is to be quantified based on their disclosed preferences. While Details can vary from application to application, the basic idea is simple. It is an ordered list of paired choices. The subjects have to choose a pair. The list is ordered so that one of the two choices gets better and vice versa. One gets worse and worse as you go through the list. There are many variations on the basic scheme: Sometimes, either one or both options is risky,

or one of them gets better or worse. Because of the list's ordered nature, subjects should be given the option to one page up select a certain point, and after that, you should choose the option on the other side of the list. Some experimenters force the participants to have an exact switching point; others let the test subjects jump back and forth on the list.

The methods differ in the changing parameters. As the right-hand side options become more and more attractive from line to line, a subject indicates the line in which to switch from the left to the right option. This switching point then gives an interval for a participant´s risk preference parameter, assuming CRRA ($u(c) = \frac{c^{1-p}}{1-p}$).

To put it more simply, the aim of the MPL is to identify the decision-making situation in which the participant changes from left to right (c.f. Appendix A). A risk-neutral decision maker who prefers the left side with the higher expected value changes in situation 5. In other words, the participant chooses the left side in the first four decision situations and therefore has a value (number of safe choices) of 4. If a change takes place earlier (value <4), the participant shows risk-seeking behavior. If a change is made later (value> 4), risk averse behavior is present (C. A. Holt & Laury, 2002).

In this study, a ready-to-use software module for use with oTree was used (Chen et al., 2016; Holzmeister, 2017), which allowed the MPL to be easily performed in numerous different variations, taking advantage of the potential and benefits of the latest web programming technologies on which oTree based. In a user-friendly and uncomplicated way, predefined and well-documented variables are specified in a separate file that gave complete control over various aspects of the game (Holzmeister, 2017).

3.3 Definitions and Theoretical Foundations

3.3.1 Social Contract Theory

Social Contract Theory believes that people's moral and social obligations depend on a contract or agreement between them to form the society in which they live. For example, the legislation of a country, which defines what the government can and cannot do. Citizens agree to be ruled by the moral and political obligations set out in the social contract (Friend, 1995). However, the SCT is rightly linked to modern moral, political, and economic theory. Hobbes (1914/Original publication

1651) was the first to expounded and defend the SCT fully. Locke (1794) and Rousseau (1964/Original publication 1762) are two other authors who are well known to be proponents of this hugely influential theory. The SCT is one of the most dominant theories within moral, political, and economic theory in modern history. John Rawls gave the moral, political, and economic theory a new impetus. David Gauthier's analyzes have made this even more critical. More recently, game theorists have also developed new social contract theory approaches from different perspectives (K. G. Binmore, 1994; Friend, 1995; Skyrms, 2001, 2008).

Contract models inform about various relationships and interactions between people, from students and teachers to business partners. Because of this, it would be challenging to look for the effects of SCT only within philosophy and culture; the political and economic value can also be attested to social SCT. SCT is undoubted with us for a long time and offers sufficient substance for further research. SCT is ideal for rethinking and optimizing the nature of both ourselves and our relationships with one another (K. G. Binmore, 1994).

3.3.2 Strategy Method

Selten (1967) provided the theoretical basis for the strategy method. The method gathers information about the whole spectrum of possible decisions. The strategy method is also known as "cold treatment" and collects information about the responder's preferences. For example, while the "hot treatment" of the classic UG asks a responder only to state his preference for a particular offer, the strategy method aims to determine preferences for the entire spectrum of possible offers. Thus, the method enables a deeper understanding of the cognitive processes behind decisions to be gained. Asking the minimum amount that a responder would accept allows a clear understanding of the responder's preferences.

3.3.3 Cooperation

Economic individuals or organizations, such as companies, business units, or departments, cooperate to achieve productivity gains through the division of labor and specialization. As a result, Brandenburger and Nalebuff (1996) summed up the resulting problem in one sentence:

"Business is cooperation when it comes to creating a pie and competition when it comes to dividing it up."

In general, Cooperation is understood to mean the purpose-oriented collaboration between at least two people or systems. The aim of this collaboration should be to increase the benefits of the parties involved. However, the selection process implies competition and refuses cooperation if no specification is possible (Martin A. Nowak, 2006).

In business administration, cooperation is a voluntary grouping of companies that remain legally independent and only give up their economic independence in the areas affected by the cooperation. Business cooperation aims to be competitive or to increase competitiveness (Wöhe, 2016). Modern forms of society are characterized by a high degree of labor division between individuals and companies' specialization. The division of labor and specialization contributes significantly to overcoming resource scarcity through the resulting productivity gains. To satisfy their demand or that of customers, specialized companies have to cooperate within or between companies. In the group, various subsidiaries work together. Suppliers, customers, and partners regularly cooperate in the exchange of goods and services. Cooperation must not be misunderstood as an antipole to conflict, either within or between companies. For the characterization of organizational forms, both terms represent different structural features that can indeed be observed in parallel. In networks, for example, cooperation regularly coexists with conflicts (Fromen, 2013).

3.3.4 The Duality of Cooperative and Non-Cooperative Game Theory

The non-cooperative game theory as a branch of microeconomics puts actors' actions in the foreground to pursue individual goals in their environment. The non-cooperative game theory has actions, strategies, amounts of information, and payoffs as central concepts. The best-known solution concept in the non-cooperative game theory is the Nash equilibrium; this consists of a strategy for each Player so that each Player maximizes his expected utility considering the fellow Players' strategies. The non-cooperative game theory, on the other hand, is action and strategy oriented. Hence, the non-cooperative game theory's strategic orientation is replaced by the cooperative game theory's payoff orientation (Wiese, 2015). In an interview with Eric van Damme (1998), Robert Aumann argues for the term's strategy orientation versus payoff orientation.

Cooperative solution concepts differ from those in non-cooperative game theory. This is the case because the two types of the game make different assumptions about the nature of the game or the character of rational human behavior. A common interpretation is that cooperative game theory is applicable when enforceable agreements can be made, for example, by contract (McCain, 2008). This approach is not necessarily useful because making agreements is an action that cannot occur like all other cooperative game theory actions. Only in non-cooperative game theory can be measured, i.e., agreements (Wiese, 2015). The history of game theory can explain the statement that agreements are supposed to be made in a cooperative game. Game theory, both the non-cooperative and the cooperative, go back practically to Von Neumann and Morgenstern (1944). The fathers of game theory derived the so-called characteristic function from a non-cooperative game.

In the practice of cooperative game theory, however, characteristic functions are usually not established with the aid of a non-cooperative game but directly regarding the social situation to be modeled. The above distinction between cooperative and non-cooperative game theory is unfortunate. It suggests a game theory divided into two branches. Despite the emphasized differences, non-cooperative game theory and cooperative game theory can be mutually beneficial.

3.3.5 Opportunities and Risks through Cooperation

"No friendship, foresight, or cognition are necessary for cooperation." (Axelrod & Hamilton, 1981)

In times of dynamic markets, the ability to continuously respond to market requirements with innovative goods and services and improved processes is vital for industrial and service companies. Management is confronted with a multitude of challenges, the solution of which is no longer sought only in one's own company. Entering into cooperation with other companies is seen as a promising option for action.

Together with partner companies, value creation potentials can be developed that would be unattainable for the individual companies alone. In many companies, however, there is an ambivalent attitude towards cooperation. On the one hand, the possible chance or even the need to enter into cooperation in certain situations is seen. On the other hand, there are sometimes fears of too close relationships with other companies and the associated risks, which science and practice often show that these risks must be taken seriously objected to high failure rates in cooperation (Fontanari, 1996).

There are fears of contact, especially with the cooperation related to innovations, as one's own company's future success potential is in danger.

3.4 Framing Effects

Missing or contradicting standards for the description of games can jeopardize experimental reproducibility. For example, deviations in the game descriptions can mean that the participants interpret the task differently and make different decisions (Gerlach & Jaeger, 2016).

In experimental economics, predefined scripts are usually used to describe games. These scripts are either read aloud or presented to the Players in written form. The descriptions often focus on the mathematical details of games, and non-mathematical aspects are presented in simple, abstract, and general language (K. Binmore, 2010; C. F. Camerer & Fehr, 2004). However, there are no explicitly defined standards for the language that is used for the non-mathematical aspects. For example, Players can be referred to as "you and the other," moves can be referred to as "A" and "B," and the game can be referred to as "the situation." Alternatively, labels from the areas of games (e.g., "the Player," "the Game"), finance (e.g., "the Buyer," "the Seller," "the Exchange"), or experimental practice (e.g.," the Participants") are used. Usually, Players are not informed of the purpose of the game before making their decisions. In fact, some experimental economics textbooks directly recommend researchers not to give any real references beyond the game (C. F. Camerer & Fehr, 2004; Friedman & Sunder, 1994). Overall, removing contexts is generally accepted (Gerlach & Jaeger, 2016) and even recommended research practice among economists (C. Holt, 2005).

In contrast, psychologists have less strict conventions for implementing games. It is common practice to create descriptions. Descriptions can vary from experiment to experiment, even from session to session (Hertwig & Ortmann, 2001). However, Kahneman and Tversky argued that framing can significantly affect the assessment between treatment conditions and even cause preference inversions (Kahneman & Tversky, 1984; Tversky & Kahneman, 1979, 1981, 1989). However, one notable exception is valence framing, a term that is often used synonymously with framing in business. The integration of valence framing into economic theories is explained in more detail in chapter 2.3.4.1. Framing effects in games are an empirically well-researched phenomenon (Gerlach & Jaeger, 2016). A theoretical explanation of the observed effects is still lacking. For this study, a

distinction can be made between two types of framing effects: Valence Framing and Context Framing.

3.4.1 Valence Framing Effects

Valence framing effects are often explained by prospect theory. Here it is argued that gains and losses are valued according to various non-linear value functions (Kahneman, Knetsch, & Thaler, 1990; Knetsch, 1989). The loss function is generally steeper than the profit function, which describes that the same amount is weighted more heavily in a loss than in a profit. In particular, the prospect theory is increasingly accepted by economists. A prominent example is a work of Andreoni (1995) who suggested that Players associate positive externalities of their actions with a "warm-glow" and adverse external effects with a "cold-prickle." For example, in games for public goods, the positive give frame emphasizes positive external effects that result from one's contribution. In commons dilemmas, on the other hand, the structure emphasizes adverse external effects that result from withdrawal. Since these external effects are weighted according to different value functions, the given frame and the taking frame can lead to other selection options. For example, in common pool games, valence framing effects depend on several boundary conditions and not only trigger different value functions and choices but entire strategies (Kölle, Gächter, & Quercia, 2014).

3.4.2 Context Framing Effects

Theories about social preferences provide the most common explanation for cooperation. Social preference theories assume that Players consider their payoffs and the payoffs of their opponents (Bolton & Ockenfels, 2000; Loewenstein, Thompson, & Bazerman, 1989). Social preferences are believed to be stable. Thereby, the Player characteristics are constant over time and context (C. Camerer & Thaler, 1995). Therefore, social preference theories cannot directly take into account context framing effects.

However, theories of social preferences can indirectly consider context-framing effects when first-order beliefs are taken into account (C. F. Camerer & Fehr, 2004). First-order beliefs are the Player's expectations of her partner's decisions. Defining a prisoner's dilemma as "the community game" could increase a conditionally cooperative Player's first-order belief in cooperation. As a result, the contextualization prompts the conditionally cooperative Player to choose differently without

changing her preferences. In this sense, first-order beliefs can fulfill themselves, and contextual frameworks can serve as coordination tools for Players with conditional social preferences similar to focal points (Schelling, 1958). In addition, context framing effects have also been observed in trust games (Al-Ubaydli, Houser, Nye, Paganelli, & Pan, 2013). For that, a social framing effect manifests when changing the description of a social dilemma (or a specific social component in this dilemma) significantly modulates a decision-maker's preference for different options.

4 Research methodology

"Behavior cannot be invented in the armchair. It has to be observed." Selten (1998)

This Master's thesis deals with risk as a normative outcome of cooperation arrangements. Therefore, cooperation among competitors is investigated in terms of a business context. Furthermore, the concept of cooperation and other risks enables the answer to this scientific work's overall research question.

4.1 Experimental design and procedure

oTree (Chen et al., 2016) the Python-based software for experimental economic research, was used for coding. The application was carried out by the experiment participants in a web browser, so physical presence in the laboratory was unnecessary. The experiment was carried out online in mid-September 2020 under the auspices of ViaLab, the laboratory of the Viadrina University in Frankfurt (Oder). In particular, the laboratory experiment was deployed on the cloud application platform Heroku. A total of six sessions with 44 participants were held. The experiment was carried out in German. At the beginning of the experiment, the participants received instructions on the experiment's course and function. The original German text with a translation into English is attached in Appendix A. The experiment's sequence was as follows: Stag-hunt Game, Trust Game, Ultimatum Game, Dictator Game, MPL, BRET, and demographic questions.

The experiment involved a treatment that presented the scenario of a JV. Thereby the social framing effect was tested. The treatment group experimented with the previous reading of the treatment. The control group had the same economic games and Risk preference elicitation methods as the treatment group, only without reading the scenario beforehand, i.e., all economic games and tests in the classic form.

First, each of the participants played all three one-shot variants of the SHG in five consecutive rounds. Every participant was assigned to a different participant after each round. Besides, each participant received the results of the previous round after each round. At the end of each part, the participants saw all payoffs from the rounds. All rounds were added up according to the Player's decisions and taken over for the experiment's further course. The amounts won were not experimental currency units obtained in the SHG´s. The Players interacted with Euro amounts and were paid out at the end

of the experiment in Euros. Nevertheless, before the participants were paid, the TG was completed in the next step of the experiment.

Second, the TG was a one-shot interaction, so a decision had to be made either as Player 1 or Player 2. The respective role was assigned to the participants anonymously and randomly. Here, too, the participants obtained information about their payoff generated by this part of the experiment and the total amount of the last part and this part of the experiment. However, before the participants were paid, the trust game was completed in the next step of the experiment. Here, too, the participants obtained information about their payoff generated by this part of the experiment and the total amount of the last part and this part of the experiment.

The third and fourth parts of the experiment consisted of the UG and DG. The UG was completed first. The strategy method (Selten, 1967) was used to obtain more detailed information about the Player's preferences. The UG was once again carried out in a one-shot interaction, with a randomized and anonymous pairing of the Players. After completing the UG, the DG was completed. The same approach as in the DG was followed, with the only difference that the strategy method was not used in the DG, as this does not make any sense in the DG.

In the fifth and sixth parts of the experiment, the participants were given the tasks of MPL and, afterwards, BRET. These tasks are individual and do not require a partner so that each participant has done the task alone.

Finally, the participants were given a demographics questionnaire. After the participants answered all questions, the final result was shown to the participants. The participants were able to close the application in the web browser they were using.

4.2 Statistical Methodology

Within the empirical analyses, various descriptive statistics and tests have been performed with R-Studio. Due to the limited scope of this thesis, only the more complex tests and regression methods will be introduced theoretically in more detail.

4.2.1 Statistical tests

In order to assess the significance of mean values against certain null hypotheses H0, several one sample t-tests are performed. The general form of the test statistic is given by:

$$t = \frac{Z}{s} = \frac{\bar{X} - \mu}{\hat{\sigma}/\sqrt{n}}$$

This test statistic basically represents a standardization of the estimated mean from a given sample (von Auer, 2017). Thereby, the test statistic follows a student t distribution because the variance has to be estimated from the given sample. In order to assess the significance of the test, one can compare the absolute value of the test statistic with the right-sided critical value from the student t distribution or one can consider the p-value. This value states the probability that the given test statistic based on the estimated mean from the sample has the estimated value under the null hypothesis or a higher value in absolute terms. Hence, if the p-value is smaller than a given significance level, the H0 can be rejected to the given significance level. In this case, the hypothesis which one wants to verify depicted in the alternative hypothesis H1 is statistically significant (von Auer, 2017). If one wants to compare two means from two different subsamples, a Welch two sample t-test is considered (von Auer, 2017). The general form of the test statistic is given by:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{N_1} + \frac{s_2^2}{N_2}}}$$

This test statistic again represents a standardization of the difference of the estimated means from two subsamples. In this case, it is assumed that the estimated variances of the subsamples as well as the sample sizes are different (von Auer, 2017).

4.2.2 Regression analyses

In order to quantify the effect of several explanatory variables x_i on the dependent variable y_i, a multiple regression analysis is considered. The general form of the multiple regression model is given by:

$$y_i = \beta_0 + \beta_1 x_1 + \ldots + \beta_k x_k$$

Therefore, the dependent variable y_i is considered to be metric and at least interval scaled. The explanatory variables x_i can be metric or dichotomous. In order to test the significance of the regression parameters β_i, one sample t-tests can be performed, and the p-values can be assessed (von Auer, 2017). For this, it is assumed that the Gauss-Markov assumptions hold. To be able to evaluate the effects of the several explanatory variables x_i on a binary dependent variable y_i, a logistic regression model (logit model) is considered. The general form of the regression equation is given by:

$$\ell = logit(y_i = 1|x_1, \ldots, x_k) = ln\frac{p}{1-p} = \beta_0 + \beta_1 x_1 + \ldots + \beta_k x_k$$

Since the dependent variable y_i is binary, zero or one, the application of a simple multiple regression model is insufficient since the mathematical expression would allow y_i to be smaller than zero and bigger than one (Verbeek, 2008). Therefore, a mathematical function is applied that constrains the domain of y_i between zero and one and is strictly monotonic increasing. The detailed evaluation of its functional form is beyond the scope of this thesis. The idea is to estimate the effect of the explanatory variables on the probability of the dependent variable to range between zero and one (Verbeek, 2008). The result is the above given logit model. Thereby, the dependent variable $ln\frac{p}{1-p}$ specifies the natural logarithm of the proportion of the probability of y_i to be 1 (p) against the probability of y_i to be 0 (1-p). This is named the log-odds (Verbeek, 2008). Due to the complexity of the model structure, the interpretation of the regression coefficients β_i is not as straightforward as in a simple regression model. For simplicity, one can assume the probability of $y_i = 1$ increases if $\beta_i > 0$, stays constant if $\beta_i = 0$ and decreases if $\beta_i < 0$. When solving the equation for p, one can calculate the estimated probabilities for $y_i = 1$, conditional on the value of the explanatory variables x_i (Verbeek, 2008). This calculation is not shown explicitly at this stage.

5 Results

5.1 Results Economic Games

In the following, the hypotheses based on the previous literature review and the resulting research questions are formed and assigned to the research results. The evaluation of the research results is one of the central parts of this study.

5.1.1 Results Stag-hunt Game

In the following tables 1 and 2, the results of the player's choices for the three stage-hunt games within the business and the normal setting are presented. From these results, one can assume that cooperation occurs more often in the business than in the normal setting of the games' implementation. Moreover, it seems that cooperation appears to be more often in the baseline than in the two other games which is in line with the theory about payoff dominance presented above.

	Baseline		More efficiency		Less risk	
	Defect	Cooperate	Defect	Cooperate	Defect	Cooperate
Defect	0	3	0	6	0	7
Cooperate	3	114	6	108	7	106

Table 1: Stag-hunt Game - Business setting.

	Baseline		More efficiency		Less risk	
	Defect	Cooperate	Defect	Cooperate	Defect	Cooperate
Defect	10	13	12	15	10	11
Cooperate	13	44	15	38	11	48

Table 2: Stag-hunt Game - Normal setting.

So as to assess the effect of the different games, baseline, more efficiency and less risk on the probability for cooperation, a logit regression model is performed which is described in more detail theoretically in chapter 4.2. The regression outputs are in the following figures 1, 2, and 3.

The results for the separate settings show negative but not significant effects of the more efficient and the less risk game on the probability of cooperation compared to the baseline game. When comparing the different settings, the results show a negative and highly significant effect of the normal setting on the probability of cooperation compared to the business setting. By solving the mathematical

function for p, the estimated probability to cooperate is approximately 96.14% in the baseline game in the business setting whereas it decreases to 73.29% in the baseline game in the normal setting.

```
Call:
glm(formula = y ~ dif, family = binomial, data = subset(sg[sg$set ==
    "normal", ]))

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-1.6356  -1.4739   0.7804   0.8234   0.9074

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)    0.9076     0.2470   3.674 0.000239 ***
difeffizienz  -0.2331     0.3419  -0.682 0.495433
diflessrisk    0.1255     0.3544   0.354 0.723328
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 291.50  on 239  degrees of freedom
Residual deviance: 290.39  on 237  degrees of freedom
AIC: 296.39

Number of Fisher Scoring iterations: 4
```

Figure 7: Logistic regression 1.

```
Call:
glm(formula = y ~ dif, family = binomial, data = subset(sg[sg$set ==
    "business", ]))

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-2.7162   0.2250   0.3203   0.3467   0.3467

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)    3.6636     0.5847   6.266 3.71e-10 ***
difeffizienz  -0.7191     0.7192  -1.000    0.317
diflessrisk   -0.8821     0.7026  -1.256    0.209
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 130.91  on 359  degrees of freedom
Residual deviance: 129.07  on 357  degrees of freedom
AIC: 135.07

Number of Fisher Scoring iterations: 6
```

Figure 8: Logistic regression 2.

```
Call:
glm(formula = y ~ dif + set, family = binomial, data = sg)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-2.5512   0.2806   0.2942   0.7883   0.9016

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)   3.21493    0.31873  10.087  < 2e-16 ***
difeffizienz -0.31911    0.30314  -1.053    0.292
diflessrisk  -0.09677    0.31119  -0.311    0.756
setnormal    -2.20548    0.29256  -7.538 4.76e-14 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 496.72  on 599  degrees of freedom
Residual deviance: 421.23  on 596  degrees of freedom
AIC: 429.23

Number of Fisher Scoring iterations: 5
```

Figure 9: Logistic regression 3.

Hypothesis 1: The Social Framing Effect reduces the strategic uncertainty in Stag-hunt games, and therefore more Players decide to play the Payoff dominant strategy.

Result 1: The hypothesis was confirmed, which can be seen in figure 9.

5.1.2 Results Trust Game

The classic economic assumption of rational self-interest in the TG is that the first Player chooses not to send anything. Even if perfect information about the game mechanics is available to the first Player, the Player should not send anything. The same applies to the second Player, who, according to the forecast, should not send anything back. The Nash equilibrium for the game is precisely that prediction. In their experiment, Berg et al. (1995) showed that 30 out of 32 game attempts lead to a violation of the classic economic assumption. In 30 cases, the first Players sent an amount that averaged just over 50 % of their initial available amount. The results of the second players in response to the amount sent by the first players were more variable than those of the first players. Berg et al. (1995) found that the amount returned was highly dependent on the social information the scientists gave the second Player about the first Player. In general, the average amount returned to the second Player by the second was more significant than the amount initially sent. Only 20% of the second Players did not send anything back. In summary, it can be stated that the actual results of both the first and the second Players deviate strongly from the classic economic assumption of pure self-interest.

0	20	30	50	70	80	100
4	4	4	18	2	2	10

Table 3: Trust Game - relative frequencies of the variable offer.

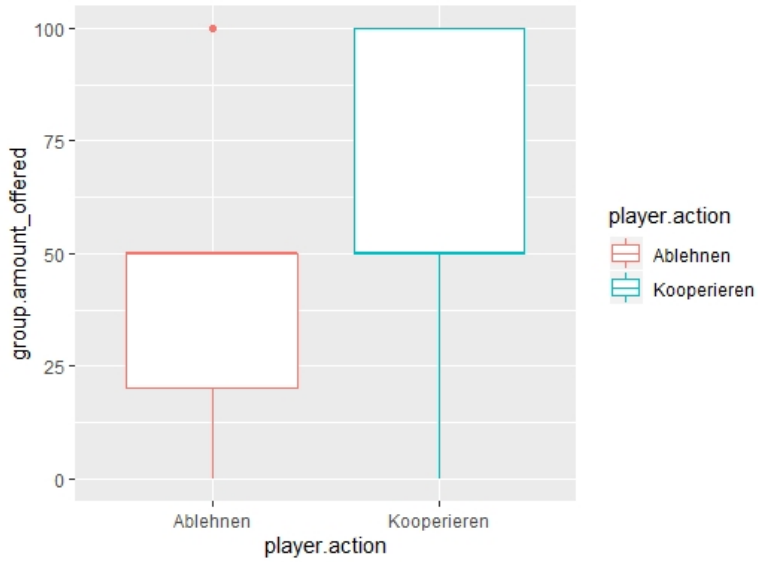


Figure 10: Boxplot Trust Game.

The above boxplot shows the relationship between the cooperation behavior in the SHG and the amount offered in the trust game. It becomes clear that the amount offered is higher for participants who cooperate in the SHG. The mean value of this relationship is 54.55 (c.f. Appendix B).

Hypothesis 2: Higher levels of trust foster cooperation behavior in Stag-hunt games.

Result 2: That can be confirmed as we can see in the boxplot. Furthermore, more in depth researches are recommend.

5.1.3 Results Ultimatum Game

The main results of UG experiments are that most participants offer between 40% and 50% of the initial amount and that the respondents almost always accept this division. If the offer falls to 20% of the possible payoff, it will be rejected about half the time, and rejection rates will increase when the offer falls to 10% and less. As discussed by C. F. Camerer (2011), ultimatum game results are incredibly robust to various manipulations of natural design (e.g., repetition, stake size, level of

anonymity, and a variety of demographic variables). An exception to the robustness results is reported by E. Hoffman and Spitzer (1985). They show that offers are significantly smaller, and rejections are significantly rarer if the participants compete for the right to propose and earn it. One explanation is that this practice changes the perception of "fair" and draws attention to the importance of context in personal exchange settings.

0	30	40	50	60	70	80	90	<NA>
2	1	4	11	1	1	1	1	0

Table 4: Ultimatum Game - relative frequencies of the variable offer.

0	40	<NA>
2	1	0

Table 5: Ultimatum Game - relative frequencies when the offer was refused.

The research results to date can also be substantiated in this study. Most of the participants offered between 40% and 50% of the initial amount. 4 out of 22 participants offered 40 Eurocents of the initial amount of 100 Eurocents. Eleven participants even made a fair distribution of 50 Eurocents. The relative frequencies of the variable offer are shown in Table 4. A total of only 3 trustees rejected the offer. One participant refused the offered amount of 40 Eurocents, and 2 other participants did not accept the offer of 0 Eurocents, as shown in Table 5. Furthermore, it was checked whether there is a difference in the decision-making pattern about the sexes. Offer-wise contrasts between men's and women's condition revealed significant effects for the offer by men (mean = 52,5) and women (mean =34,3). However, H0 hypothesis is rejected ($p = 0.0154$). In addition, it was checked which gender has rejected the offer. All 3 rejections were from women. In order to test if this difference is statistically significant, a two-sample t-test has been performed. Thereby, the null hypothesis (H0) assumes no difference between the sexes. The result, given in appendix B, shows that the H0 can be rejected ($p = 0.0154$). In addition, it was checked which gender has rejected the offer. All 3 rejections were from women.

5.1.4 Results Dictator Game

In dictator games, the dependent variable is (quasi) continuous. In this study, it is the mean that dictators keep for themself. In the beginning, the dictator (n = 22), "the proposer," was endowed with 100 Eurocents. Dictators could enter any fraction between 0 and 100% of the sum available to them. The mean payoff was 70.68 Eurocents for dictators. 7 Participants offered 0 Eurocents and 1 participant just 1 Eurocent.

Nevertheless, it can be stated that only 6 participants made a fair distribution of fifty-fifty, and just 3 participants gave more to the opponents, "responder" than they kept for themself. The previous experimental results in the DG have often been cited as a conclusive refutation of the rationally selfish individual model (homo economicus) of economic behavior. Table 6 shows the contributions made by the dictators, "the proposers." In the case of this study, too, it could be established that a pure profit maximization, as assumed in the model of homo economicus, can be refuted. The first Player, "the proposer," in the dictator's role was not selfless; only 7 participants behaved according to the classic assumption of the economic model of homo economicus and focused exclusively on individual profit maximization. (Bolton, Katok, & Zwick, 1998). A histogram showing these frequencies is provided in appendix B.

23	30	33	50	60	70	90	99	100
1	1	1	6	2	1	2	1	7

Table 6: Dictator game - relative frequencies of the variable payoff.

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
23.00	50.00	65.00	70.68	100.00	100.00

Table 7: Descriptive statistics - Dictator Game.

Hypotheses 3: Are there differences in individuals' contribution behavior concerning the classic assumption of economic research?

Result 3: A one sample t-test is performed to evaluate if the true mean of the split of the dictator's proposal is unequal to 50, which provides the alternative hypothesis (H1). The result, given in appendix B, shows that the H0 can be rejected on all common significance levels ($p = .0019$). Considering the 95 percent confidence interval, which goes from 58.56 to 82.81, suggests that the amount of the proposal is significantly higher than 50. This supports the classic assumption of homo economicus, at least partly. On average, the dictators gave 29.32 Eurocent. Once again, the dictators, on average kept 70.68 Eurocents for themselves (Table 7).

```
        One Sample t-test

data:  dg$player.payoff[dg$player.id_in_group == 1]
t = 3.5468, df = 21, p-value = 0.001909
alternative hypothesis: true mean is not equal to 50
95 percent confidence interval:
 58.55539 82.80824
sample estimates:
mean of x
 70.68182
```

Figure 11: One sample t-test Trust Game.

In the following, to examine fundamental subject-specific behavioral differences in the game in a reduced approach, only the influence of the subject on the contribution of a Player is taken into account without testing the other personal factors. Table 8 shows the relative frequencies subject-specific behavioral differences (Kulturwissenschaften = cultural studies; Rechtswissenschaften = law studies; Wirtschaftswissenschaften = economics). On average, the participants gave 29.7 Eurocent. There is no significant difference in comparison with students from other fields (economics students, t-value = 1.975, p = 0.0797; other fields, t-value = 3.78, p = 0.036).

	23	30	33	50	60	70	90	99	100
Kulturwissenschaften	0	0	0	2	1	0	2	1	1
Rechtswissenschaften	0	0	0	1	1	1	0	0	1
Wirtschaftswissenschaften	1	1	0	3	0	0	0	0	5

Table 8: Dictator game - relative frequencies by subject.

Previous research has shown that economics students have a high level of self-interest. For example, Marwell and Ames (1981) showed that first year PhD students in economics are much more likely to free-ride than others. Frank, Gilovich, and Regan (1993) also came to the conclusion that economic students tend to be self-interested than consider others.

Descriptive statistics (see Appendix B) provide a different picture. Whereas economics students gave 29.7 Eurocents on average, students from other subjects gave 25.55 Eurocents on average. When testing the mean of the dictator's proposal against the H0, stating that the dictators provide a split of 50 Eurocents, the above given hypothesis cannot be supported. For economics students, the H0 cannot be rejected on a significance level of 5% (p=0.0797). Furthermore, the 95 percent confidence interval covers the value of 50 Eurocents which ends up in the same test decision. On the contrary, for students

from other subjects, H0 can be rejected on all common significance levels (p=0.0036). This is bolstered by the 95 percent confidence interval running from 60.01 to 88.90 meaning that the dictator's proposal is significantly higher than 50 Eurocents. These findings contradict the above given hypothesis that economics students give less than students from other fields, but indeed, they indicate that the opposite is true for the given dataset.

Several researchers gathered and analyzed measures of the number of years of formal schooling subjects. The researchers analyzed Ultimatum Game data; they find that schooling's extent does not account for any significant portion of the variation in offers in multivariate regression. Nevertheless, among the Tsimane, the extent of formal education emerges as marginally significant in multivariate regression. The Tsimane are an indigenous people of lowland Bolivia. More educated Tsimane offers less in the Ultimatum Game. However, they found no effect of formal education on public goods game play in the Tsimane. In a nutshell, while schooling effects may exist in a few cases, they are not particularly strong or consistent across games or societies (J. P. Henrich et al., 2004; Marlowe, 2004). In the DG, therefore, it was only possible to demonstrate the tendency that students from different disciplines make divergent decisions. Further studies are required for a more meaningful result.

5.2 Results Risk Preference Elicitation Methods

5.2.1 Results MPL

The MPL was not investigated in detail for reasons of proportionality. That is beyond the scope of this work. Nevertheless, the risk preferences of the participants were examined without reference to the cooperation behavior. It was found that 38 participants are risk-seeking, and only 6 participants are risk-averse (c.f. Appendix B). Compared to the BRET, the results obtained are nearly similar. On average, the participants are more risk-seeking than risk-averse. This leads to the assumption that an increased level of risk-seeking, generally the cooperation behavior supports, and that cooperation's more often accepted.

5.2.2 Results BRET

The BRET tests the risk preference of individuals in a very simple experimental way. In this study, the BRET was used to investigate whether the participants who cooperated in the SHG were risk averse, risk neutral, or risk seeking. The decisions made by the participants can be seen in Figure 7.

The experiment identified the decisions under uncertainty by showing that high levels of risk were commonly accepted and not characterized by risk aversion. In detail, 23 participants collected more than 50 boxes before leaving the application and thus showed a great willingness to take risks. Exactly 50 out of 100 possible boxes were collected by only 2 participants. Only 15 participants collected fewer than 50 boxes and behaved in a risk-averse manner.

In addition, it was examined whether there is a difference in the risk preference of the participants in the business setting or in the normal setting (c.f. Appendix B). On the one hand, in the normal setting, the participants who refused to cooperate in the SHG have a mean value of 46.89. On the other hand, the participants who cooperated in the SHG have a mean value of 40.93.

A multiple regression analysis has been performed to evaluate if cooperation behavior, setting of the SHG, or the type of the SHG have an effect on the number of boxes collected. Results in appendix B show that only cooperation has a negative and significant effect on a 10 % significant level. Nevertheless, the F-statistic states that the whole model is insignificant. Hence, it is not considered for further research.

Hypothesis 4: Participants who cooperate in the Stag-hunt game are more willing to take risks and collect more boxes in the BRET.

Results 4: The difference indicates that Hypothesis 5 can be confirmed.

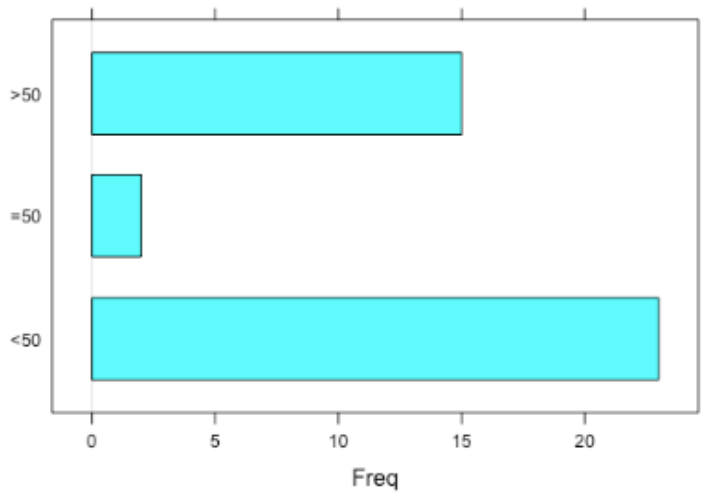


Figure 12: Frequencies Boxes-collected.

6 Critical Evaluation and Conclusion

In this study, a form of a social contract for the cooperation behavior in a business context was systematically modified to question the individual risk preference in economic games influence cooperative behavior and is therefore prosocial.

Standard economic games and two risk preference elicitation methods have been contrasted to examine cooperation and other risks. The Stag-hunt game played a central role in this. The equilibrium selection, according to Harsanyi and Selten (1988) is used to test differences in the three variants of the SHG examined. Explicitly, a further investigation by (Schmidt et al., 2003) is used to examine the three variants of the SHG in this study. No significant differences in the payoff dominance and risk dominance are found. However, in the treatment normal setting in the game less risk, a positive influence on the probability of cooperation could be demonstrated. In general, a significant difference in treatment could be shown. There is significantly more cooperation in the business setting. From this, it can be concluded that the social framing effect makes a significant difference in economic games. The overall research question is answered; there is a significant relationship between the social framing effect and economic games in the classical representation. Derived from it for practice, a social component in cooperative activities of a business, on the horizontal as well as on the vertical level, represents a recommendation.

Furthermore, in the BRET, it could be shown that the individual risk attitude has a positive effect on cooperation behavior. Individuals with a high level of willingness to take risks tend to trust cooperation more. In addition, it was found that economics students deviate from the classic assumption of being self-interested. Finally, it was possible to quantify and measure that trust in cooperation is required of individuals through willingness to take risks and a given social frame.

The scope of the experimental design is pioneering for further research. Significant differences in the parameters could not be demonstrated in all economic games, so it is advisable to isolate individual parts and examine them more closely. For example, the relationship between trust and cooperation behavior in the SHG continues to offer scientists a rich field of research. In future research, the study of trust and cooperative behavior could be expanded by changing the settings of the experiment. Another game, preferably one with fewer variables than the SHG, could also be selected to conduct the research to see if the game itself affects the results. Of course, the size of the sample can also be

expanded to be able to analyze the investigated variants of the SHG´s even more precisely. A final recommendation is to contrast non-cooperative game theory with cooperative game theory.

To conclude, this study discovered that individuals are sensitive to the frame they act. Rousseau (1964/Original publication 1762) sees the solution to the problems relating to a cooperative with one another in that he is in favor of a social contract that guarantees a socially just society. This can only be agreed. This fact could be broken down even further in this master's thesis by showing how important it is for individuals, whether private or in a business context, to behave in a prosocial manner.

References

Aklin, W. M., Lejuez, C., Zvolensky, M. J., Kahler, C. W., & Gwadz, M. (2005). Evaluation of behavioral measures of risk taking propensity with inner city adolescents. *Behaviour research and therapy, 43*(2), 215-228.

Al-Ubaydli, O., Houser, D., Nye, J., Paganelli, M. P., & Pan, X. S. (2013). The causal effect of market priming on trust: An experimental investigation using randomized control. *PloS one, 8*(3), e55968.

Anderlini, L. (1999). Communication, computability, and common interest games. *Games and Economic Behavior, 27*(1), 1-37.

Andreoni, J. (1995). Warm-glow versus cold-prickle: the effects of positive and negative framing on cooperation in experiments. *The quarterly journal of economics, 110*(1), 1-21.

Araujo, F. C., & Leoneti, A. B. (2018). GAME THEORY AND 2x2 STRATEGIC GAMES APPLIED FOR MODELING OIL AND GAS INDUSTRY DECISION-MAKING PROBLEMS. *Pesquisa Operacional, 38*, 479-497. Retrieved from http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0101-74382018000300479&nrm=iso

Arrow, K. J. (1974). *The limits of organization*: WW Norton & Company.

Aumann, R. J. (2003). Risk aversion in the Talmud. *Economic Theory, 21*(2-3), 233-239.

Axelrod, R., & Hamilton, W. D. (1981). The evolution of cooperation. *Science, 211*(4489), 1390-1396.

Baron, J. N., & Pfeffer, J. (1994). The social psychology of organizations and inequality. *Social Psychology Quarterly*, 190-209.

Batson, C. D. (2011). *Altruism in humans*: Oxford University Press, USA.

Battalio, R., Samuelson, L., & Van Huyck, J. (2001). Optimization Incentives and Coordination Failure in Laboratory Stag Hunt Games. *Econometrica, 69*, 749-764. doi:10.1111/1468-0262.00212

Berg, J., Dickhaut, J., & McCabe, K. (1995). Trust, Reciprocity, and Social History. *Games and Economic Behavior, 10*(1), 122-142. doi:https://doi.org/10.1006/game.1995.1027

Bernoulli, D. (1954/Original publication 1738). Exposition of a New Theory on the Measurement of Risk. *Econometrica, 22*(1), 23-36. doi:10.2307/1909829

Binmore, K. (2010). Social norms or social preferences? *Mind & Society, 9*(2), 139-157.

Binmore, K. G. (1994). *Game theory and the social contract: just playing* (Vol. 2): MIT press.

Bolton, G. E., Katok, E., & Zwick, R. (1998). Dictator game giving: Rules of fairness versus acts of kindness. *International Journal of Game Theory, 27*(2), 269-299.

Bolton, G. E., & Ockenfels, A. (2000). ERC: A theory of equity, reciprocity, and competition. *American economic review, 90*(1), 166-193.

Bonß, W. (2013). Risk. dealing with uncertainty in modern times. *Social Change Review, 11*(1), 7-36.

Boyd, R., & Richerson, P. J. (2009). Culture and the evolution of human cooperation. *Philosophical Transactions of the Royal Society B: Biological Sciences, 364*(1533), 3281-3288.

Brandenburger, A., & Nalebuff, B. (1996). Coopetition: kooperativ konkurrieren. *Frankfurt am Main*.

Brülhart, M., & Usunier, J.-C. (2012). Does the trust game measure trust? *Economics Letters, 115*(1), 20-23.

Camerer, C., & Thaler, R. H. (1995). Anomalies Ultimatums, Dictators and Manners. *The Journal of Economic Perspectives (1986-1998), 9*(2), 209. Retrieved from https://search-proquest-com.proxy.uwasa.fi/scholarly-journals/anomalies-ultimatums-dictators-manners/docview/208937901/se-2?accountid=14797

Camerer, C. F. (1991). Does strategy research need game theory? *Strategic Management Journal, 12*(S2), 137-152.

Camerer, C. F. (2011). *Behavioral game theory: Experiments in strategic interaction*: Princeton university press.

Camerer, C. F., & Fehr, E. (2004). Measuring social norms and preferences using experimental games: A guide for social scientists. *Foundations of human sociality: Economic experiments and ethnographic evidence from fifteen small-scale societies, 97*, 55-95.

Carlsson, H., & Van Damme, E. (1993). 12 Equilibrium Selection in Stag Hunt Games. *Frontiers of game theory*, 237.

Carpenter, J. (2016). Social Preferences. In *The New Palgrave Dictionary of Economics* (pp. 1-5). London: Palgrave Macmillan UK.

Castillo, L., & Dorao, C. (2013). Decision-making in the oil and gas projects based on game theory: Conceptual process design. *Energy Conversion and Management, 66*, 48–55. doi:10.1016/j.enconman.2012.09.029

Chen, D. L., Schonger, M., & Wickens, C. (2016). oTree—An open-source platform for laboratory, online, and field experiments. *Journal of Behavioral and Experimental Finance, 9*, 88-97. doi:https://doi.org/10.1016/j.jbef.2015.12.001

Cosmides, L., & Tooby, J. (1994). Better than rational: Evolutionary psychology and the invisible hand. *The american Economic review, 84*(2), 327-332.

Crosetto, P., & Filippin, A. (2013). The "bomb" risk elicitation task. *Journal of Risk and uncertainty, 47*(1), 31-65.

Davoust, A., & Rovatsos, M. (2020). *Social Contracts for Non-Cooperative Games.* Paper presented at the Proceedings of the AAAI/ACM Conference on AI, Ethics, and Society.

Diekmann, A. (2004). The power of reciprocity: Fairness, reciprocity, and stakes in variants of the dictator game. *Journal of Conflict Resolution, 48*(4), 487-505.

Dubois, D., Willinger, M., & Van Nguyen, P. (2012). Optimization incentive and relative riskiness in experimental stag-hunt games. *International Journal of Game Theory, 41*(2), 369-380.

Eisenberg, N., & Miller, P. A. (1987). The relation of empathy to prosocial and related behaviors. *Psychological bulletin, 101*(1), 91.

Ellingsen, T., Johannesson, M., Mollerstrom, J., & Munkhammar, S. (2012). Social framing effects: Preferences or beliefs? *Games and Economic Behavior, 76*(1), 117-130.

Fang, C., Kimbrough, S. O., Pace, S., Valluri, A., & Zheng, Z. (2002). On Adaptive Emergence of Trust Behavior in the Game of Stag Hunt. *Group Decision and Negotiation, 11*(6), 449-467. doi:10.1023/A:1020639132471

Fehr, E., & Gächter, S. (2000). Fairness and retaliation: The economics of reciprocity. *Journal of Economic perspectives, 14*(3), 159-181.

Fontanari, M. (1996). *Kooperationsgestaltungsprozesse in Theorie und Praxis*: Duncker & Humblot.

Forsythe, R., Horowitz, J. L., Savin, N. E., & Sefton, M. (1994). Fairness in simple bargaining experiments. *Games and Economic Behavior, 6*(3), 347-369.

Fowler, J. H. (2005). Altruistic punishment and the origin of cooperation. *Proceedings of the National Academy of Sciences, 102*(19), 7047-7049.

Frank, R. H., Gilovich, T., & Regan, D. T. (1993). Does studying economics inhibit cooperation? *Journal of Economic perspectives, 7*(2), 159-171.

Friedman, D., & Sunder, S. (1994). Experimental methods. *Cambridge Books*.

Friend, C. M. (1995). *Trust and the Limits of Contract*: Dissertation.

Fromen, B. (2013). *Faire Aufteilung in Unternehmensnetzwerken: Lösungsvorschläge auf der Basis der kooperativen Spieltheorie*: Springer-Verlag.

Gallice, A. (2006). Predicting one Shot Play in 2x2 Games Using Beliefs Based on Minimax Regret.

Gallice, A. (2007). Some equivalence results between mixed strategy Nash equilibria and minimax regret in 2x2 games. *Economics Bulletin, 3*(28), 1-8.

Gerlach, P., & Jaeger, B. (2016). *Another frame, another game? Explaining framing effects in economic games*.

Gigerenzer, G., & Selten, R. (2002). *Bounded rationality: The adaptive toolbox*: MIT press.

Güth, W., Schmittberger, R., & Schwarze, B. (1982). An experimental analysis of ultimatum bargaining. *Journal of Economic Behavior & Organization, 3*(4), 367-388. doi:https://doi.org/10.1016/0167-2681(82)90011-7

Guyer, M. J., & Rapoport, A. (1972). 2× 2 games played once. *Journal of Conflict Resolution, 16*(3), 409-431.

Harsanyi, J. C. (1995). A new theory of equilibrium selection for games with complete information. *Games and Economic Behavior, 8*(1), 91-122.

Harsanyi, J. C., & Selten, R. (1988). A general theory of equilibrium selection in games. *MIT Press Books, 1*.

Henrich, J., McElreath, R., Barr, A., Ensminger, J., Barrett, C., Bolyanatz, A., . . . Henrich, N. (2006). Costly punishment across human societies. *Science, 312*(5781), 1767-1770.

Henrich, J. P., Boyd, R., Bowles, S., Fehr, E., Camerer, C., & Gintis, H. (2004). *Foundations of human sociality: Economic experiments and ethnographic evidence from fifteen small-scale societies*: Oxford University Press on Demand.

Hertwig, R., & Ortmann, A. (2001). Experimental practices in economics: A methodological challenge for psychologists? *Behavioral and Brain Sciences, 24*(3), 383-403.

Hildebrand, G. H. (1951). The Open Society and its Enemies. In: JSTOR.

Hobbes, T. (1914/Original publication 1651). *Leviathan*: JM Dent.

Hoffman, E., & Spitzer, M. L. (1985). Entitlements, rights, and fairness: An experimental examination of subjects' concepts of distributive justice. *The Journal of Legal Studies, 14*(2), 259-297.

Hoffman, M. L. (1982). Development of prosocial motivation: Empathy and guilt. In *The development of prosocial behavior* (pp. 281-313): Elsevier.

Holt, C. (2005). a.(2005). Markets, games, and strategic behavior: Recipes for interactive learning. *Draft version*.

Holt, C. A., & Laury, S. K. (2002). Risk aversion and incentive effects. *American economic review, 92*(5), 1644-1655.

Holzmeister, F. (2017). oTree: Ready-made apps for risk preference elicitation methods. *Journal of Behavioral and Experimental Finance, 16*, 33-38.

Holzmeister, F., & Pfurtscheller, A. (2016). oTree: The "bomb" risk elicitation task. *Journal of Behavioral and Experimental Finance, 10*, 105-108. doi:https://doi.org/10.1016/j.jbef.2016.03.004

Hume, D., & Macnabb, D. G. C. (1738). *A Treatise of Human Nature: Being an Attempt to Introduce the Experimental Method of Reasoning Into Moral Subjects*: Collins.

Kahneman, D. (2003). Maps of bounded rationality: Psychology for behavioral economics. *American economic review, 93*(5), 1449-1475.

Kahneman, D., Knetsch, J. L., & Thaler, R. H. (1986). Fairness and the Assumptions of Economics. *Journal of Business, 59*(4), S285-S300. doi:10.1086/296367

Kahneman, D., Knetsch, J. L., & Thaler, R. H. (1990). Experimental tests of the endowment effect and the Coase theorem. *Journal of political Economy, 98*(6), 1325-1348.

Kahneman, D., & Tversky, A. (1982). The psychology of preferences. *Scientific American, 246*(1), 160-173.

Kahneman, D., & Tversky, A. (1984). Choices, values, and frames. *American Psychologist, 39*(4), 341-350. doi:10.1037/0003-066X.39.4.341

Kahneman, D., & Tversky, A. (1996). On the reality of cognitive illusions.

Kanagaretnam, K., Mestelman, S., Nainar, K., & Shehata, M. (2009). The impact of social value orientation and risk attitudes on trust and reciprocity. *Journal of Economic Psychology, 30*(3), 368-380.

Keser, C., & Vogt, B. (2000). *Why do experimental subjects choose an equilibrium which is neither payoff nor risk dominant?* : CIRANO.

Keynes, J. M. (1921). *A treatise on probability*: Macmillan and Company, limited.

Keynes, J. M. (1937). The general theory of employment. *The quarterly journal of economics, 51*(2), 209-223.

Knetsch, J. L. (1989). The endowment effect and evidence of nonreversible indifference curves. *The american Economic review, 79*(5), 1277-1284.

Knight, F. H. (1921). *Risk, uncertainty and profit* (Vol. 31): Houghton Mifflin.

Kölle, F., Gächter, S., & Quercia, S. (2014). *The ABC of cooperation in voluntary contribution and common pool extraction games*. Retrieved from

Lee, Y.-S., Song, H.-S., Kim, H., & Chae, Y. (2019). Altruistic decisions are influenced by the allocation of monetary incentives in a pain-sharing game. *PloS one, 14*(3), e0213104.

Levine, L. E., & Hoffman, M. L. (1975). Empathy and cooperation in 4-year-olds. *Developmental Psychology, 11*(4), 533.

Levitt, S. D., & List, J. A. (2007). What do laboratory experiments measuring social preferences reveal about the real world? *Journal of Economic perspectives, 21*(2), 153-174.

Locke, J. (1794). *The Works of John Locke* (Vol. 6): T. Longman, B. Law.

Loewenstein, G. F., Thompson, L., & Bazerman, M. H. (1989). Social utility and decision making in interpersonal contexts. *Journal of personality and social psychology, 57*(3), 426.

March, J. G., & Shapira, Z. (1987). Managerial perspectives on risk and risk taking. *Management science, 33*(11), 1404-1418.

Markowitz, H. (1952). PORTFOLIO SELECTION*. *The Journal of Finance, 7*(1), 77-91. doi:https://doi.org/10.1111/j.1540-6261.1952.tb01525.x

Marlowe, F. W. (2004). What explains Hadza food sharing? In *Socioeconomic aspects of human behavioral ecology*: Emerald Group Publishing Limited.

Marsh, D. T., Serafica, F. C., & Barenboim, C. (1981). Interrelationships among perspective taking, interpersonal problem solving, and interpersonal functioning. *The Journal of Genetic Psychology, 138*(1), 37-48.

Marwell, G., & Ames, R. E. (1981). Economists free ride, does anyone else?: Experiments on the provision of public goods, IV. *Journal of public economics, 15*(3), 295-310.

McCain, R. A. (2008). Cooperative games and cooperative organizations. *The Journal of Socio-Economics, 37*(6), 2155-2167. doi:https://doi.org/10.1016/j.socec.2008.02.010

Moore, S. M., Gullone, E., & Kostanski, M. (1997). An examination of adolescent risk-taking using a story completion task. *Journal of Adolescence, 20*(4), 369-379.

Nash, J. (1951). Non-Cooperative Games. *Annals of Mathematics, 54*(2), 286-295. doi:10.2307/1969529

Nowak, M. A. (2006). Five Rules for the Evolution of Cooperation. *Science, 314*(5805), 1560. doi:10.1126/science.1133755

Nowak, M. A., & Sigmund, K. (2005). Evolution of indirect reciprocity. *Nature, 437*(7063), 1291-1298.

Ockenfels, A. (1999). *Fairneß, Reziprozität und Eigennutz: Ökonomische Theorie und experimentelle Evidenz* (Vol. 108): Mohr Siebeck.

Oliveira, F., Nunes, P., Blajberg, R., & Hamacher, S. (2016). A framework for crude oil scheduling in an integrated terminal-refinery system under supply uncertainty. *European Journal of Operational Research, 252*. doi:10.1016/j.ejor.2016.01.034

Rousseau, J.-J. (1964/Original publication 1762). The social contract (1762). In: Londres.

Rousseau, J.-J. (1984/Original publication 1754). *A discourse on inequality*: Penguin.

Salkind, N. J. (2010). Encyclopedia of Research Design. *SAGE Publications*. doi:10.4135/9781412961288

Savage, L. J. (1972). *The foundations of statistics*: Courier Corporation.

Schelling, T. C. (1958). The strategy of conflict . Prospectus for a reorientation of game theory. *Journal of Conflict Resolution, 2*(3), 203-264. doi:10.1177/002200275800200301

Schmidt, D., Shupp, R., Walker, J. M., & Ostrom, E. (2003). Playing safe in coordination games:: the roles of risk dominance, payoff dominance, and history of play. *Games and Economic Behavior, 42*(2), 281-299.

Schonberg, T., Fox, C. R., & Poldrack, R. A. (2011). Mind the gap: bridging economic and naturalistic risk-taking with cognitive neuroscience. *Trends in cognitive sciences, 15*(1), 11-19.

Selten, R. (1967). Die strategiemethode zur erforschung des eingeschräncht rationalen verhaltens in rahmen eines oligopolexperiments', in beitraägge zur experimentellen wirtschaftforschung, ed. by h. sauermann, tübingen: Jcb mohr.

Selten, R. (1990). Bounded rationality. *Journal of Institutional and Theoretical Economics (JITE)/Zeitschrift für die gesamte Staatswissenschaft, 146*(4), 649-658.

Selten, R. (1995). An axiomatic theory of a risk dominance measure for bipolar games with linear incentives. *Games and Economic Behavior, 8*(1), 213-263.

Selten, R. (1998). Features of experimentally observed bounded rationality. *European Economic Review, 42*(3-5), 413-436.

Simon, H. A. (1955). A behavioral model of rational choice. *The quarterly journal of economics, 69*(1), 99-118.

Singer, P. (1972). Famine, affluence, and morality. *Philosophy & public affairs*, 229-243.

Singer, T. (2006). The neuronal basis and ontogeny of empathy and mind reading: review of literature and implications for future research. *Neuroscience & Biobehavioral Reviews, 30*(6), 855-863.

Singer, T., & Lamm, C. (2009). The social neuroscience of empathy. *Annals of the New York Academy of Sciences, 1156*(1), 81-96.

Skyrms, B. (2001). The Stag Hunt. *Proceedings and Addresses of the American Philosophical Association, 75*(2), 31-41. doi:10.2307/3218711

Skyrms, B. (2008). Trust, risk, and the social contract. *Synthese, 160*(1), 21-25.

Smith, A. (1994/ original publication 1776). *An inquiry into the nature and causes of the wealth of nations*: New York : Modern Library, ©1994.

Stahl, I. (1972). Bargaining Theory (Stockholm School of Economics). *Stockholm, Sweden*.

Stanovich, K. E., & West, R. F. (1998). Individual differences in rational thought. *Journal of experimental psychology: general, 127*(2), 161.

Stoetzer, M., Blass, T., Grimm, A., Gwosdz, R., & Schwarz, J. (2015). *Was ist fair? Echte und strategische Fairness in einem sequentiellen Ultimatum- und Diktatorspiel*. Retrieved from https://EconPapers.repec.org/RePEc:zbw:fhjbwf:20151

Straub, P. G. (1995). Risk dominance and coordination failures in static games. *The Quarterly Review of Economics and Finance, 35*(4), 339-363.

Surhone, L. M., Timpledon, M. T., & Marseken, S. F. (2010). Prisoner's Dilemma: Game Theory, Merrill M. Flood, Melvin Dresher, Albert W. Tucker, Framing Device. *Experimental Economics, Betascript Publishing*.

Tusche, A., Böckler, A., Kanske, P., Trautwein, F.-M., & Singer, T. (2016). Decoding the charitable brain: empathy, perspective taking, and attention shifts differentially predict altruistic giving. *Journal of Neuroscience, 36*(17), 4719-4732.

Tversky, A., & Kahneman, D. (1979). Prospect Theory: An Analysis of Decision under Risk. In. St. Louis: Federal Reserve Bank of St Louis.

Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science, 211*(4481), 453-458.

Tversky, A., & Kahneman, D. (1989). Rational choice and the framing of decisions. In *Multiple criteria decision making and risk analysis using microcomputers* (pp. 81-126): Springer.

Tversky, A., & Kahneman, D. (1992). Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and uncertainty, 5*(4), 297-323.

Twenge, J. M., Baumeister, R. F., DeWall, C. N., Ciarocco, N. J., & Bartels, J. M. (2007). Social exclusion decreases prosocial behavior. *Journal of personality and social psychology, 92*(1), 56.

van Damme, E. (1998). On the State of the Art in Game Theory: An Interview with Robert Aumann. *Games and Economic Behavior, 24*(1), 181-210. doi:https://doi.org/10.1006/game.1997.0612

Van Huyck, J. B., Battalio, R. C., & Beil, R. O. (1990). Tacit coordination games, strategic uncertainty, and coordination failure. *The american Economic review, 80*(1), 234-248.

Verbeek, M. (2008). *A guide to modern econometrics*: John Wiley & Sons.

von Auer, L. (2017). *Ökonometrie*: Springer.

Von Neumann, J., & Morgenstern, O. (1944). Theory of games and economic behavior, .

Wang, R. Y., & Ng, C. N. (2015). Can centralized sanctioning promote trust in social dilemmas? A two-level trust game with incomplete information. *PloS one, 10*(4), e0124513.

Wang, Y., Zhang, Z., Bai, L., Lin, C., Osinsky, R., & Hewig, J. (2017). Ingroup/outgroup membership modulates fairness consideration: neural signatures from ERPs and EEG oscillations. *Scientific Reports, 7*(1), 39827. doi:10.1038/srep39827

Wiese, H. (2015). *Kooperative Spieltheorie* (Vol. 4): Walter de Gruyter GmbH & Co KG.

Willigers, B., Bratvold, R., & Hausken, K. (2009). A Game Theoretic Approach to Conflicting and Evolving Stakeholder Preferences in the E&P Industry. *SPE Economics & Management, 1*, 19-26. doi:10.2118/124178-PA

Wöhe, G. (2016). *Einführung in die Allgemeine Betriebswirtschaftslehre*: Verlag Franz Vahlen.

Zhu, Q., & Singh, G. (2016). The impacts of oil price volatility on strategic investment of oil companies in North America, Asia, and Europe. *Pesquisa Operacional, 36*, 1-21. doi:10.1590/0101-7438.2016.036.01.0001

Appendix A

Scenario:

German version:

Sie vertreten Ihr Unternehmen im folgenden Szenario:

Die Firma, die Sie vertreten, ist auf innovative Technologien angewiesen, um am Markt zu bestehen. Ihr Unternehmen investiert deshalb beträchtliche Summen in Forschung und Entwicklung. Da die Kosten für Forschung und Entwicklung enorm sind und Ihr Unternehmen seit langem keine wirklichen Innovationen mehr entwickelt hat, haben Sie erwogen, Verhandlungen mit anderen Unternehmen in Ihrem Bereich aufzunehmen, um möglicherweise den Rest der Wettbewerber zu übertreffen.

Sie verhandeln mit mehreren potenziellen Partnern und prüfen die Ihnen zur Verfügung stehenden Angebote. Ein Joint Venture kann für Sie äußerst attraktiv sein, da es Ihnen Zugang zum technischen Know-How des potenziellen Partners gewähren würde. Durch eine Kooperation könnte Ihr Unternehmen sicher sein einen Vorsprung gegenüber Ihrer Konkurrenz zu schaffen.

Ein Joint Venture birgt jedoch auch einige Gefahren. Ohne einen Partner könnten Sie Ihren Gewinn steigern, aber nur minimal. Unter der Annahme, dass das Joint Venture erfolgreich zusammenarbeitet, würde doch der zu erwartende Gewinn erheblich höher ausfallen, als wenn Sie weiterhin versuchen, selbst neue Innovationen zu entwickeln und diese am Markt zu etablieren. Falls Ihr zukünftiger Partner jedoch nicht ernsthaft an einer Zusammenarbeit interessiert ist und nur darauf aus ist, Ihr Vertrauen auszunutzen, laufen Sie Gefahr, überhaupt keinen Gewinn zu erzielen.

Wenn Sie alles verstanden haben, drücken Sie bitte Weiter.

English version:

You represent your company in the following scenario:

The company you represent relies on innovative technologies in order to survive in the market. Your company, therefore, invests considerable sums in research and development. Since the cost of research and development is enormous and your company has not been innovating in a long time, you have considered entering into negotiations with other companies in your field in order to potentially outperform the rest of the competition.

You negotiate with several potential partners and check the offers available to you. A joint venture can be extremely attractive for you as it would give you access to the technical know-how of the potential partner. Through a cooperation, your company could be sure to create an edge over your competition.

However, a joint venture also has some dangers. Without a partner, you could increase your bottom line, but only minimally. Assuming that the joint venture works together successfully, the expected profit would be considerably higher than if you continued to try to develop new innovations yourself and establish them on the market. However, if your prospective partner is not seriously interested in working together and is only looking to take advantage of your trust, you run the risk of not making any profit at all.

If you have understood everything, please press Next.

Experiment instructions:

Hallo und vielen Dank, dass Sie an diesem Experiment teilnehmen!

Bitte schalten Sie Ihr Handy aus und beseitigen Sie alle Störfaktoren, die Ihre Konzentration beeinträchtigen könnten.

Angesichts des Online-Setups der Untersuchung, die Sie erwartet, läuft auf jeder Entscheidungsseite eine Uhr rückwärts. Sie haben auf jeder Seite nur 2 Minute Zeit, sich zu entscheiden. Bitte unterlassen Sie es deshalb im Internet zu surfen oder eine Pause vom Computer einzulegen. Die Untersuchung kann nur reibungslos und erfolgreich durchgeführt werden, wenn alle Teilnehmer der Untersuchung von Anfang bis Ende im gegeben Zeitfenster miteinander interagieren und alle geforderten Aufgaben erledigt werden.

Im Folgenden bitten wir Sie, einige Entscheidungen zu treffen und ein paar Fragen zu beantworten. Sie werden sich heute insgesamt 8 Aufgaben gegenübersehen. In den ersten 6 Aufgaben werden Sie mit einem anderen Teilnehmer der Studie interagieren. Sie werden in jeder Runde eines Spiels einem neuen Teilnehmer anonym zugeteilt. Die Identität, der Ihnen zufällig zugeordneten Person wird Ihnen unbekannt bleiben. Ihre Identität bleibt Ihrem Gegenüber während der ganzen Untersuchung ebenfalls verborgen. Einer von Ihnen wird zufällig als Firma 1 und der/die Andere als Firma 2 spielen. Bevor Sie eine Entscheidung treffen müssen, werden Sie erfahren, welche Rolle Sie einnehmen.

Ihre Entscheidungen in den Spielen werden Ihnen Geld einbringen. Der Geldbetrag, den Sie in jeder Runde erhalten, hängt von Ihrer Wahl und der Wahl Ihres Mitspielers ab. Im Anschluss an jede Runde wird Ihnen Ihr vorläufiges Ergebnis angezeigt. Nachdem dem Sie die ersten 6 Aufgaben erledigt haben, folgen 2 weitere Aufgaben, die Sie alleine bearbeiten müssen. Nachdem Sie alle Aufgaben erledigt und die letzten Fragen beantwortet haben, wird Ihnen angezeigt, wie viel Sie insgesamt verdient haben.

Ihre Bezahlung wird Ihnen per PayPal überwiesen. Hierfür benötigen Sie einen PayPal-Account (E-Mail-Adresse), den Sie bitte am Ende der Studie in das dafür vorgesehene Feld eintragen. Wenn Sie keinen PayPal-Account besitzen, dann klicken Sie bitte Alternative anstatt PayPal und geben ein Pseudonym an, in dem dafür vorgesehenen Feldern. Wir werden Sie dann unter der angegeben E-Mail-Adresse kontaktieren und Ihnen den Ablauf Ihrer Bezahlung mitteilen. Das von Ihnen gewählte Pseudonym dient hierbei nur, um weiterhin Ihre Anonymität zu gewährleisten. **Bitte vergessen Sie nicht, auf Speichern zu drücken, wenn Sie sich entschieden haben, welche Zahlungsoption Sie bevorzugen!**

Auf der folgenden Seite werden Ihnen genaue Anweisungen für das erste Spiel gegeben. Jedes weitere Spiel wird gesonderte Anforderungen haben. Lesen Sie sich bitte jedes Mal konzentriert und aufmerksam jede neue Anleitung durch. Achten Sie bitte besonders auf die Auszahlungsmatrix, diese spiegeln Ihre möglichen Auszahlungen wider.

Wenn Sie etwas nicht verstanden haben oder sonst irgendwelche Probleme haben, melden Sie sich bitte umgehend beim **Experimentalleiter:** Whats App: +49 176 708 716 70 oder Skype: theskyismyway. Die Kontaktdaten können Sie sich auch während der Studie anzeigen lassen, indem Sie links oben auf den Button mit der Aufschrift Hilfe drücken.

Drücken Sie Weiter, um zur Anleitung zu gelangen.

MPL:

Option A		Option B	
	200 Cent mit einer Wahrscheinlichkeit von **1/10**, 160 Cent anderenfalls	385 Cent mit einer Wahrscheinlichkeit von **1/10**, 10 Cent anderenfalls	
	200 Cent mit einer Wahrscheinlichkeit von **2/10**, 160 Cent anderenfalls	385 Cent mit einer Wahrscheinlichkeit von **2/10**, 10 Cent anderenfalls	
	200 Cent mit einer Wahrscheinlichkeit von **3/10**, 160 Cent anderenfalls	385 Cent mit einer Wahrscheinlichkeit von **3/10**, 10 Cent anderenfalls	
	200 Cent mit einer Wahrscheinlichkeit von **4/10**, 160 Cent anderenfalls	385 Cent mit einer Wahrscheinlichkeit von **4/10**, 10 Cent anderenfalls	
	200 Cent mit einer Wahrscheinlichkeit von **5/10**, 160 Cent anderenfalls	385 Cent mit einer Wahrscheinlichkeit von **5/10**, 10 Cent anderenfalls	
	200 Cent mit einer Wahrscheinlichkeit von **6/10**, 160 Cent anderenfalls	385 Cent mit einer Wahrscheinlichkeit von **6/10**, 10 Cent anderenfalls	
	200 Cent mit einer Wahrscheinlichkeit von **7/10**, 160 Cent anderenfalls	385 Cent mit einer Wahrscheinlichkeit von **7/10**, 10 Cent anderenfalls	
	200 Cent mit einer Wahrscheinlichkeit von **8/10**, 160 Cent anderenfalls	385 Cent mit einer Wahrscheinlichkeit von **8/10**, 10 Cent anderenfalls	
	200 Cent mit einer Wahrscheinlichkeit von **9/10**, 160 Cent anderenfalls	385 Cent mit einer Wahrscheinlichkeit von **9/10**, 10 Cent anderenfalls	
	200 Cent mit einer Wahrscheinlichkeit von **10/10**, 160 Cent anderenfalls	385 Cent mit einer Wahrscheinlichkeit von **10/10**, 10 Cent anderenfalls	

BRET:


Anzahl der gesammelten Boxen: 5
Anzahl der verbleibenden Boxen: 95
Start
Stopp
Auflösen

Appendix B

Trust Game:

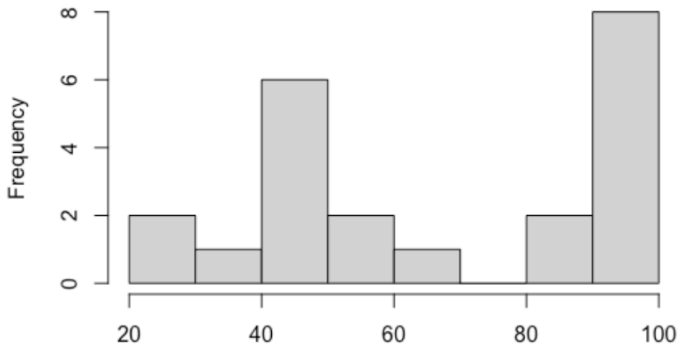
```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
   0.00   30.00   50.00   54.55   80.00  100.00
```

Ultimatum Game:

```
        Welch Two Sample t-test

data:  player.payoff by player.gender
t = -2.7421, df = 14.621, p-value = 0.0154
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -32.404453  -4.024118
sample estimates:
mean in group Frau mean in group Mann
          34.28571           52.50000
```

Histogram Dictator Game:



One-sample t-test Dictator Game:

```
        One Sample t-test

data:  dg$player.payoff[dg$player.id_in_group == 1]
t = 3.5468, df = 21, p-value = 0.001909
alternative hypothesis: true mean is not equal to 50
95 percent confidence interval:
 58.55539 82.80824
sample estimates:
mean of x
 70.68182
```

MPL:

```
Not risk-averse     risk-averse
             38               6
```

BRET – Normal Setting:

```
  player.action min Q1 median Q3 max     mean       sd   n missing
1      Ablehnen  26 27     53 60  70 46.85915 13.43694  71       0
2   Kooperieren   4 22     48 55  70 40.93491 21.40153 169       0
```

BRET – Business Setting:

```
  player.action min Q1 median Q3 max    mean       sd   n missing
1      Ablehnen   7 13   34.0 70  70 39.5625 29.26880  16       0
2   Kooperieren   6 40   44.5 55  70 43.3343 15.78856 344       0
```

```
Call:
lm(formula = player.boxes_collected ~ player.action + set + dif,
    data = bret_sg)

Residuals:
    Min      1Q  Median      3Q     Max
-39.683  -9.727   2.808  13.341  28.469

Coefficients:
                          Estimate Std. Error t value Pr(>|t|)
(Intercept)               46.71971    2.55635  18.276   <2e-16 ***
player.actionKooperieren -3.66084    2.20823  -1.658   0.0979 .
setnormal                -1.39946    1.58572  -0.883   0.3778
difeffizienz             -0.12813    1.78412  -0.072   0.9428
diflessrisk              -0.03661    1.78258  -0.021   0.9836
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 17.82 on 595 degrees of freedom
Multiple R-squared:  0.004771,  Adjusted R-squared:  -0.001919
F-statistic: 0.7131 on 4 and 595 DF,  p-value: 0.5832
```

Eigenständigkeitserklärung/ Declaration of Authenticity

Ich erkläre, dass ich die Masterarbeit selbständig abgeschlossen und nur die aufgeführten Materialien verwendet habe. Alle verwendeten Materialien aus veröffentlichten und unveröffentlichten Quellen, ob direkt zitiert oder umschrieben, werden ordnungsgemäß aufgeführt.

Darüber hinaus erkläre ich, dass die Masterarbeit oder eine Abkürzung davon nicht für einen anderen Abschluss verwendet wurde als den Doppelabschluss an der Europa-Universität Viadrina Frankfurt (Oder) und der Universität von Vaasa (Finnland).

I declare that I completed the master´s thesis independently and used only these materials that are listed. All materials used, from published as well as unpublished sources, whether directly quoted or paraphrased, are duly reported.

In addition, I declare that the master´s thesis or an abbreviation of it was not used for a degree other than the double degree at the European University Viadrina Frankfurt (Oder) and the University of Vaasa (Finland).

Berlin, 08.03.2021 Ralph Wachter