universität wien

MASTERARBEIT

Titel der Masterarbeit:

Ostracism
Enhancing Cooperation in a Public Goods Game

Verfasserin:

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angestrebter akademischer Grad:

Master of Arts (MA)

Wien, 2015

Studienkennzahl lt. Studienblatt:	A 066 905
Studienrichtung lt. Studienblatt:	Soziologie UG2002
Betreuer:	Univ. Prof. Mag. Dr. Bernhard Kittel

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Acknowledgements

I would like to express my gratitude to my supervisor, Professor Bernhard Kittel, for the useful comments and engagement throughout the learning process of this master thesis. I am especially grateful for the opportunity to implement an experimental design in the laboratory. I would further like to thank the Institute of Economic Sociology and the Vienna Center of Experimental Economics for funding my experiment. Finally I would like to thank my colleagues for all useful comments and advice they gave to me.

1. Introduction

The need for cooperation has been present since the dawn of humanity. The existence and usage of public, or common, goods especially requires cooperation. But how can cooperation be sustained and common goods optimally be utilized given the presence of free-riders? To phrase it in Foucault's words (cf. 1976, p. 56): what exclusionary mechanisms does society use in order to function?

Public goods are widely spread across societies in different forms, such as the hunt for food (Hirshleifer & Rasmusen, 1989), voluntary contributions to social dilemmas, such as water conservation (Laffont, 1975), public taxes (Baldry, 1987), voting (Struthers & Young, 1989), and many more. The basic problem, also called the "social dilemma" of a public good is the following: in order to create the desired public good, cooperation is necessary, but it can also be rational to defect. For example, a tribe of hunters can choose to hunt all together for big game in order for them all to be fed for more than one day. On the other hand, a hunter can choose to go fishing and provide for himself just one day. The rational thing for a selfish hunter would be to go fishing in order to cover himself, and then also eat the meat that the big game hunters find. If everyone were to do this, however, no one would hunt for game and everyone would just fish for themselves. On the other hand, if everyone hunts, then everyone can be provided for, with the added benefit of a surplus that could be generated. Clearly cooperation is the ideal situation for a group, but how can it be sustained, if no one can be expelled from the tribe or group (cf. Hirshleifer & Rasmusen, 1989)?

Communication is one possibility to enhance cooperation, punishment (of free-riders) being another. Both mechanisms have been investigated extensively and produced positive results concerning cooperation enhancing effects, and are most effective in combination (Ostrom, Walker, & Gardner, 1992). Both of these mechanisms, however, have downsides. One fundamental assumption of the public goods setting is non-excludability of group members. Critique has been expressed concerning this traditionally fixed composition and size of groups in previous studies. This is due to the fact that "in many of the things we do in life we actually *choose* the people we wish to interact with as when we join religious or social groups, ostensibly because these people have preferences similar to ours" (Chaudhuri, 2011, p. 72). In the real world, however, we do not have total election over the people we interact with (colleagues at work, for example). The absolute freedom to choose whoever we would like to form groups with, it seems, may be as unrealistic as the total inflexibility of the fixed compositions of groups. This approach examines how mobility of some form (which we often experience in life) can enhance cooperation in the utilization of a public good. As a mechanism that enhances cooperation using (monetary) punishment, the size and composition of a group can be determined from an institution outside the group or can be decided from within the group. Various studies have been conducted to test one form or the other, which will be reviewed in the following chapter. Either subjects have been sorted according to previous performance or their expressed opinion by the experimenter (exogenous) or they were given the option to exit from a group, join a group, and also merge separate groups at free will. Groups also had the option to expel group members by voting (endogenous group formation). The here proposed design suggests a mixture of both sorting mechanisms but only one mobility mechanism: ostracism, which can also be viewed as a very specific form of punishment.

The idea of ostracism dates back to the ancient Greek where it was practiced to sustain the integrity and stability of the democratic society (cf. Hirshleifer & Rasmusen, 1989;

Charness & Yang, 2014). It has been noted that ostracism does not necessarily follow rational rules (neither does direct and costly punishment); it can also seemingly strike at random (cf. Kim, 2014).

I attempt to compare the ideas of Masclet (2003), Cinyabuguma, Page, and Putterman (2005) and Maier-Rigaud, Martinsson, and Staffiero (2010), where the first experiment uses short ostracism and the latter use irreversible ostracism in a public goods environment. Maier-Rigaud and colleagues also emphasize the need to extend research concerning the duration of ostracism.

I challenge the proposition of Hirshleifer and Rasmusen (1989) who claim that the duration of ostracism has no impact on behavior. I propose that the duration of the exclusion (i.e. short duration equals exclusion for one period vs. long duration, which equals irreversible exclusion) does have a diverging influence on the behavior of subjects.

The *research questions* are: Can cooperation in a standard public good game can be enhanced with the option to expel other group members? Does the duration of the exclusion make a difference?

The duration of exclusion, or more generally, the harshness of punishment, is a highly relevant topic in the political sphere. Tsebelis (1990, 1993) contributed game-theoretical reflections and analyses to this question. According to that analysis, the harshness of punishment does not change the rate of crime, but rather the probability of the enforcement of punishment. Therefore, information regarding the different crime rates is essential for the enforcer and the law-maker. This translates into the argument that it is not the punishment alone, but also the actual detection of a crime that influences it's rate of commitment. Supplying full information on the detection rate of different crimes can be used to isolate the effect of various degrees of severity with regards to the punishment, which in this particular case is the exclusion from the group.

To so do so and gain control on influencing factors, the theoretical model of Hirshleifer and Rasmusen (1989) will be implemented in a laboratory experiment. The use of (laboratory) experiments in Sociology is controversial and one of the main points of criticism is the nature of their artificiality; but the power of laboratory experiments lies exactly in their artificiality. In a laboratory experiment it is possible to control for most influencing factors and keep complexity to a minimum in order to isolate the effect under investigation. The aim of a laboratory experiment is not to mirror the real world, but to test, extend or enhance a theory (cf. Zelditch, 2014).

In the following Chapter an overview of the existing literature will be given as it pertains to public goods, including mechanisms that enhance cooperation generally and mechanisms of group formation and exclusion specifically. This extensive review is given to show the development of mechanisms that foster cooperation and to emphasize the peculiarities of ostracism.

In Chapter 3, the method used to test the hypotheses will be presented. Chapter 4 holds the theory behind the hypotheses and the theoretical predictions. In Chapter 5 the design and implementation of the experiment will be described. In Chapter 6 results will be presented and Chapter 7 holds the conclusion and discussion of the findings.

2. Literature review

The literature concerned with cooperation in a public goods setting is very rich. The first section of this chapter is concerned with the history of the investigation of public goods in the laboratory. The long history of intensive research on this topic highlights its relevance of it as well as its actuality.

The next section describes the basic setting of a public goods game and its stylized facts. The following sections are concerned with mechanisms that enhance cooperation with a focus on sanctioning institutions and mechanisms, the preferences and beliefs which influence peoples' behavior, and on mechanisms of group formation. Sanctioning mechanisms have an especially rich tradition, while the preferences and beliefs approach gained in establishment over the years as well. The research on group formation is connected to the preferences and beliefs approach and it implies the possibility that groups do not need to be of fixed composition or size. As a consequence the assumption of non-excludability is relaxed and leads to research on exclusion (or ostracism) from the public good or the group. In the last section the topic of ostracism in a public goods setting will be discussed. Ostracism in a public goods game is a relatively new mechanism to be tested in the laboratory, even though the idea dates back several hundreds of years.

2.1. History of Public Good Games

This is a brief section about the history of public goods to understand the basic problem of cooperation in the context of a public goods environment. A basic example of a public goods game will be presented, to have a basis on which different cooperation enhancing mechanisms can be compared.

The opposition of personal interest and group interest has been recognized by economists on a theoretical level as early as 1919 (see Lindahl, 1958). Furthermore, political scientist recognized it as a *problem of collective action* (Olson, 1971) and also as the *tragedy of the commons* (Hardin, 1968). Social psychology recognized the problem as the so-called *social dilemma* (Dawes, 1980). The theoretical debate that emerged went on without data and little agreement about the kind and range of the problem. In the 1970s, the collection of data began and Bohm (1972) is the earliest experiment recognized by theorists. Dawes (1980) was next to investigate the public goods problem as a special form of a social dilemma. At the same time, Marwell and Ames (1979), independent from other experimenters, conducted the first public goods game using a voluntary mechanism and started a systematic experimental research program. They were the first to investigate the question of what could affect the level of contributions. From this time on the discussion about the provision of public goods ceased to be only a theoretical discussion and the groundwork for the research on free-riding started to emerge. Many experiments have been conducted since, often in response to experiments that have come before them. In this way a rich body of experimental data has developed.[1]

[1] Ledyard (1995) offers a detailed description of this and of further development in the experimental research on public goods.Chaudhuri (2011) picks up then to summarize the findings of the experiments that have been conducted since.

2.2. A basic Public Goods Game and Results

The basic concept of a one-shot voluntary public goods game is that in a group of N participants each subject is equipped with an endowment (usually called tokens or Experimental Currency) which she can choose to either allocate to a private or to a public good (under certain prefixed parameters). All decisions are made simultaneously, and without communication. In addition to the tokens kept in the private good, each individual receives a fixed percentage (called the marginal per capita return, MPCR) of the total contributions of the group, the public good. After all group members have decided, subjects get information about their own profit. The profit from the public good calculates from the sum of all group members' contributions multiplied with a growth factor, divided through the size of the group. Each subject receives the same share of the public goods profit in addition to the tokens kept in private. The profit of each individual is the sum of the tokens kept in the private good and the return of the public good.[2] The size of the growth factor is known and usually chosen in a way to keep a subjects personal interest opposed to the group interest. For example a group of 4 has to decide to allocate 1 token to a public or a private good. If the growth factor is 2 for example, a single token invested in the public good returns 0.5 tokes (1 token multiplied with 2 divided through 4 people), therefore it would be better to keep all tokens private if nobody else invests in the public good. On the other hand if for example all 4 members of a group allocate 1 token to the public good, every person earns 2 tokens from the public good. If each individual assumes that everyone else is going to keep all of their tokens to themselves, then no one individual has any incentive to put anything in the public fund (cf. Chaudhuri, 2011).

In a *repeated* public goods game after the payoff at the end of one period, the second period starts with the decision about how to allocate the endowment. Depending on the design of the experiment, subjects get information about the own and others' contributions

[2] Also referred to as a "standard" public goods game.

or earnings between periods. The game is infinite when there is no end to the number of the periods and finite if the number of periods to be played is known.

The individual self-interest and the interest of the group are opposed, according to the economic or game-theoretic prediction (also referred to as the standard prediction of economics), as illustrated by the minimal example above. The contribution to the public good creates more social benefit in earnings compared to a contribution to the private good. Since each individual only gets a fixed share back of the public good (which is usually less than 1), it is rational to exclusively invest into the private good. Assuming this to be common knowledge, nobody allocates anything to the public good. The sociologic-psycologic theory predicts that each subject will allocate something to the public good. As reasons for the allocation are altruism, social norms, or group identification listed. According to this theoretical approach, there is no conflict between individual self-interest and group interest (cf. Ledyard, 1995, p. 112).

Research revealed that neither theory is right. Some subjects contribute more than nothing, but some also contribute nothing. Stylized facts are that subjects contribute 40%–60% on average of their initial endowment to the public good; where the level of contributions ranges from no contribution at all to total contribution to the public good. In finitely repeated games the contributions often start out at the same level as in one-shot games but decline steadily over time. In repeated games more and more subjects decide to free-ride on the others' contributions. Ledyard (1995) identified the following factors discovered until 1995, that can enhance cooperation: communication, the inclusion of a threshold and/or a provision point and the magnitude of the marginal per capita return (MPCR). Factors as gender of the participants, size of the group, reciprocal motivations and beliefs concerning other's contributions were also considered at this time. Communication and the introduction of a threshold can have a positive effect on contribution.The manner in which group size and sex impact contributions had not yet been found. Reciprocal motivations and beliefs will be addressed later in this section.

The work of Chaudhuri (2011) subsequent to Ledyard (1995) emphasizes two major advancements in the field, discovered in the past twenty years: one concerned with the *punishment* of other players and the other with the existence of different *types* of players. In the following section I will review experiments concerned with these two advancements, which are also relevant for the investigation of an exclusionary mechanism, as exclusion can be seen as a form of punishment and the vote for the exclusion can be dependent on the type of player and his beliefs about other players.

2.3. Punishment

As mentioned above, the discovery that subjects are willing to punish other group members was a great accomplishment in the field. The mechanisms of punishment can basically be divided into monetary punishment and non-monetary punishment. Well known papers include Yamagishi (1986, 1988) and Ostrom et al. (1992) who made major contributions to the field. A more recent work is from Fehr and Gachter (2000), whose design is widely replicated and well known.[3]

Fehr and Gächter investigated how the option to punish each other influences cooperation in a public goods game. They designed an experiment where subjects participated in a public goods game for 10 periods in the same group. All received an initial endowment of 20 tokens in the baseline treatment. In the punishment-treatment, subjects first learned after each period how much other group members contributed to the public good. Then they could decide to punish each other simultaneously. When punished, the receiver's payoff was reduced by 10%; the act of punishing is monetary costly for the sender of the punishment as well, to prevent punishment from being a dominant strategy. The authors found a significant rise in average contribution levels (58% of the possible maximum)

[3] Guala (2012) offers an extensive summary of the findings of public good games that use punishment mechanisms.

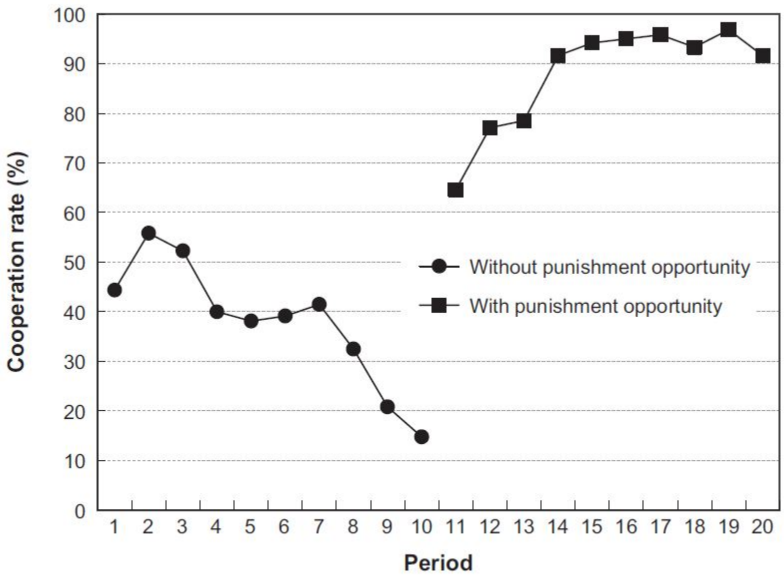

Figure 2.1.: Cooperation in a PGG, with and without costly punishment (figure from Fehr and Gächter 2000).

compared to the treatment without the option to punish each other (19%); even in the last period of the game (subjects were aware of this fact) contributions were significantly higher (see figure 2.1).[4]

Most of the observed punishment was targeted at subjects who contributed less than average to the public good. However, from time to time subjects contributing above the average level got punished as well. In the successive study of Fehr and Gächter (2002) they conducted a similar experiment, varying the punishment mechanism (3 points of punishment at the cost of 1 token for the sender) and used a stranger matching design (the composition of the group is changed after each period), in order to control for effects of reciprocity and reputation. Punishment therefore is even less rational than before, since a subject will only interact once with the same subject and does not profit from sanctioning someone directly. As indicated by the first experiment, the level of

[4]It is not rational to contribute anything in the last period, since there will be no punishment. Even if punishment was available after the last stage of contributing to the public good, there would be no future effect of the punishment. Only irrational and/or angry subjects would choose to punish, for it is costly also for the sender. This indicates, that punishment can be motivated differently. The drop of contributions in the last period is called an "endgame-effect".

contributions was significantly higher when the punishment option was present than in the treatment without. This finding further indicates that punishment can also be altruistic (comparable to donating money to someone without expecting anything in return), as there is no direct effect for of the punishment when each period is played with strangers. These experiments not only answer but also give rise to further questions, such as what may have been the motivations behind the punishment, why high contributing subjects get punished as well, and the different effects of positive sanctions or non-costly sanctions. A wide field of research is concerned with finding answers to these and resembling questions.

Gürerk, Irlenbusch, and Rockenbach (2006) extended the aforementioned experiment and offered to the subjects the opportunity to choose before each period whether they wanted to be in an environment with a sanctioning opportunity or not. When subjects chose the sanctioning-option, they entered a sanctioning-stage after the contribution-stage. In this stage it was then possible to distribute negative *and* positive sanctions on the basis of information about the previous performance of the other group members. Positive sanctions were at the cost of 1 token for +1 token for the receiving subject and negative sanctions were at the cost of 1 token for the sender and -3 tokens for the receiver of the sanction. At the beginning of the experiment, most of the subjects (63%) chose to play in a sanction-free environment; at period 10 (of 30) a total of 90% chose to play in the sanctioning environment. They also found that the average contributions were significantly higher in the first period when the sanctioning option was chosen. The choice of playing in an environment which allows for punishment indicates that subjects prefer to express their feelings about the actions of others, that they like to influence others actions and that they understand the power of punishment. Also Sefton, Shupp, and Walker (2007) compared positive and negative sanctioning with each other, but the participants had no choice whether to be in an environment with or without sanctioning. They were assigned to one treatment or the other. The contributions to the public good were higher, but not as high as in Fehr and Gachter (2000). Further Gächter, Renner, and Sefton (2008) tested whether the effect of an institution which allows for punishment, lasts over long period of time in a voluntary public good game of 50 periods compared to one lasting 10 periods. The contributions under the punishment-condition are high and stable over longer periods of time, on average significantly higher than in the 10 periods game and contributions become stable with only little punishment.

The lower effect of sanctions in the experiment of Sefton et al. (2007) was an allusion to the cost-effectiveness of costly punishment, as punishment was less effective at a cost of 1 token for the deduction of 1 token from the target. Nikiforakis (2008) proved this evidence in a study, systematically varying the cost and effect of punishment. He further found that a rise of contributions due to effective costly punishment does not necessarily lead to higher over-all efficiency. Despite the effects of punishment on contributions, the author of the study advised to handle punishment with care. Not only are its effects on efficiency ambivalent, but also the occurrence of "anti-social punishment", where high contributing subjects also got punished, may prove critical. What does anti-social punishment imply for society? Revenge seems to play a significant role in punishing, demonstrated when already-punished subjects get, and take, the opportunity to punish the sender back. If this option does not exist, punished subjects might punish high contributors who are suspected to be the sender of the punishment. Ertan, Page, and Putterman (2009) found (consoling) evidence that it is not in the sense of the majority, to engage in anti-social punishment. In the experiment of their paper, subjects could vote whether to sanction high, average or low contributors and it was only effective if the majority decided for it. The punishment of a high contributor was never voted on with majority. Anti-social punishment therefore seems to be an individual preference and not a collective one. The decision of the majority may be helpful to target the punishment to subjects harmful to the group and keep antisocial punishing subjects under control.

In addition to the possible negative sides of punishment (efficiency and anti-social punishment), punishment itself creates a second-order public good, as subjects can also free-ride on the punishment of others without paying for a free-riders punishment (cf. Chaudhuri, 2011, p. 86). If sanctioning each other is non-costly, this fact can be ignored, but this can lead to an over-use of the option, since it is free and therefor no longer irrational in terms of monetary profit. A further limitation to the effectiveness of punishment is mentioned by Guala (2012) and also by Herrmann, Thöni, and Gächter (2008) for they investigated public goods in combination with punishment across cultures and found less confirmation of the aforementioned findings in non-western cultures.

Moreover, it was found that, even without *costly* punishment, cooperation can be sustained at high levels even through non-costly punishment or other mechanisms, such as moral suasion (cf. Ledyard, 1995), psychological discomfort, norms or assortative matching (cf. Chaudhuri, 2011).

Masclet, Noussair, Tucker, and Villeval (2003) compare costly punishment (in design similar to Fehr & Gachter, 2000) directly to non-costly punishment, where subjects can only express their opinion towards the contributions of others in points (which have no effect on the payoff whatsoever). In the first periods of the game contributions started as high as in the punishment treatment, but declined over time. Still, average contributions were significantly higher than in the treatment without punishment. The non-costly punishment in this experiment could also be seen as a form of communication, since the amount of points allocated to another subject communicates the degree of (dis)satisfaction with the previous behavior of the "punished" subject. Communication in general can help to sustain cooperation in a public goods game (Dawes, McTavish, & Shaklee, 1977; Isaac & Walker, 1988 and more recently Bochet, Page, & Putterman, 2006; Chaudhuri & Paichayontvijit, 2006). The most effective form of communication turned out to be face-to-face and in combination with punishment average contributions went up as high as 97% (cf. Ostrom et al., 1992; Bochet et al., 2006).

2.4. Preferences and Beliefs - Conditional Cooperators

Previous research led to the insight that there are different types of players among humans. Those types vary in their social preferences and/or their beliefs about other players (and their actions, preferences and beliefs). Various preferences and beliefs can lead to a change in behavior that deviates from the game-theoretic prediction of free-riding in particular settings (cf. Chaudhuri, 2011, p. 3). Several experimental investigations led to the conclusion that many participants behave as *conditional cooperators* “whose contribution to the public good is positively correlated with their beliefs about the contributions to be made by their group members” (Chaudhuri, 2011, p. 3). The motivation for conditional cooperation can come from different sources.

Fischbacher, Gächter, and Fehr (2001), among others, confirmed the existence of a conditionally cooperating type of player in a public good game empirically. Taking the term literally, the level of contributions would have to settle at some point, if only conditional cooperators played in one group. But Fischbacher and colleagues observed that not all participants who cooperate conditionally reciprocate others actions 100%, but undermine them slightly. They came to the conclusion that some kind of “self-serving bias” exists. The heterogeneity of types in a group can therefore explain the decline of average contributions over time. If only conditional cooperators are matched in a group together but they are not perfect conditional cooperators, the self-serving bias can explain the decline. Sonnemans, Schram, and Offerman (1999) proved that the behavior of conditional cooperators is strategic, as they adjusted their behavior to the expectation that others will contribute less in the last round and do so themselves (when groups are matched as partners, i.e. the same group of people stays in the same group for the entire game). Keser and van Winden (2000) found that conditional cooperators use information about average contributions (if available) to adapt their own contributions to the average of the group; if they contributed above the average, they will lower their contributions in the next period and vice versa. Does this downward correction also hold true for settings with punishment or ostracism? Do players anticipate the self-serving bias of others, even under the the threat of some kind of punishment?

Kurzban and Houser (2005) designed a linear public goods experiment in order to test the robustness of conditional cooperation.[5] In this study participants were classified as the following types: conditional cooperators, unconditional cooperators and free-riders; those qualifications proved to be robust, with unconditional cooperators contributing more than average irrespective of the behavior of others, conditional cooperators about average and free-riders less than average. Also, groups with a higher proportion of cooperators tend to achieve higher than average contributions. The robustness of conditionally cooperating types has also been tested in a broader subject pool and across countries (cf. Kocher, Cherry, Kroll, Netzer, & Sutter, 2008; Herrmann & Thöni, 2009; Brandts, Saijo, & Schram, 2004).

The recognition of the existence of different types of players, especially of conditional cooperators also raises the question of how knowledge about the types of group influences the behavior of conditional cooperators. Chaudhuri and Paichayontvijit (2006) found an increase in contributions to the public good when the existence of conditional cooperators was revealed; the effect is strongest when conditional cooperators learn about the existence of like-minded group members (cf. Chaudhuri, 2011). Kerr et al. (2009) tested the influence of the different types of players on each other to find out how many free-riders are necessary to frustrate conditional cooperators into lowering their contributions drastically. They found that only one free-rider can be a significant threat to a stable level of contributions. Knowledge about the types of players leads to the question about the composition of a group, since players may not only have preferences about their own but also about the behavior of other players.

[5] see also Fischbacher & Gächter, 2009, 2010; Burlando & Guala, 2005

2.5. Group formation

Next to communication and punishment, the composition of the group can play a major role for cooperation (cf. Chaudhuri, 2011, p. 72). In everyday life we often, but not always, have some degree of choice in the people we interact with(as the saying goes, you can choose your friends but not your family). The (group of) people we interact with can be “assigned” to us (happen to us), or be chosen by our will. Experiments have been conducted in which the sorting of a group happens by either exogenous or endogenous means. With an exogenous mechanism groups get sorted by the experiment on basis of rules, which may or may not be revealed to the participants of the experiment. In endogenously sorted groups subjects are allowed to decide about the composition and size of the groups themselves: they can enter, leave or form groups on their own. Combinations of these mechanisms of group formation are also a possibility.

Underlying to the formation of a group is the basic concept of mobility in society. Tiebout (1956) postulated an extreme model of a highly mobile society. According to Tiebout, in a fully mobile society each subject will find the community or environment that is most suitable for him and matches his preferences best (the model includes that the decisions are made on the basis of full information about the performance of all groups). Considering his model and criticizing it, a variation of experiments have been implemented (e.g. Ahn, Isaac, & Salmon, 2009; Charness & Yang, 2014; Ehrhart & Keser, 1999), varying the parameters of the postulated model. In the following I will summarize some of the existing literature which is concerned with group formation in a public goods game.

Gunnthorsdottir, Houser, and McCabe (2007) conducted an experiment in which subjects played 10 periods of a public goods game in groups of 4 subjects. In the baseline treatment the sorting happened randomly. In the sorted treatment subjects were ranked according to their contributions after each period. Based on this ranking, subjects were placed together in new groups. The three highest contributors were put together in one group, the next three in one group, and so on until the three smallest contributors were together in one group. Not later than in the fourth period, the contributions in the high contributing groups were significantly higher in the sorted treatment than in all groups in the random treatment. The authors of the study assume that the high levels of contributions were due to the cooperative subjects mainly experiencing cooperation in interactions with others, since they had no information about the specific type of player but could only react to the actions of the other players.

De Oleveira, Croson, and Eckel (2009) found, that simply the additional information about who is playing with whom does have a notable influence on the behavior of participants. First, the contributions in groups with cooperators were significantly higher than in randomly formed groups. Second, the addition of information about the types of players together in one group again raised the level of contributions. According to Chaudhuri (2011, p. 74), the simple presence of conditional cooperators in one group is not enough, they also need to know about the existence of other like-minded subjects.

Gächter and Thöni (2005) combined exogenous sorting with the option to punish other group members. The authors sorted the groups in their experiment according to a ranking experiment, which was conducted prior to the actual public goods game in order to asses their preferences of contributions in a one-shot public goods game. The authors included the option to punish other group members to the standard public goods game. The sorting of subjects according to their preferences significantly raised the level of contributions in the upper third of the groups, even without the option to punish each other. Interestingly, the punishment-option made no difference in the highest contributing group. Ones and Putterman (2007) also added a punishment mechanism to their public goods experiment and sorted subjects according to contributions *and* allocation of punishment into groups. They found that contributions already started very high, rose further and are significantly higher than in the control treatment without any kind of sorting. They further tested for the stability of preferences and predictability of outcomes of groups with known composition. The authors note that although contributions can be kept high in sorted groups of high contributors, one also has to keep in mind the low contribution levels of the free-riding groups; the efficiency of both groups together is not significantly different from unsorted groups. What does this finding imply for society?

As mentioned above, in endogenously sorted groups subjects are enabled to leave and/or enter and/or form a new group. Page, Putterman, and Unel (2005) use the film industry as a practical (and extreme) example for endogenous group formation: for any film project a company is formed which lasts for the film shooting only and dissolves afterwards. The members of one project then participate in new projects and are given new jobs on the basis on their skills and effort of the last project. The incentive to work less (free-ride on the work of other team members) is relatively small, since they will need a new job eventually; and the associates of the new project only choose workers who are known to work hard and do not free-ride. The composition in projects like film shooting is therefore a real world example for endogenous group sorting (as research projects in science are as well). Page and colleagues performed a lab experiment in which 16 subjects played a linear public goods game in groups of four subjects. At regular intervals the subjects learned about the contributions of all other players and could rank them according to whom they want to be in a group with in the following periods; the four subjects with the highest ranks get placed together in a group and so on. The game continues without information about who was put in a group with whom. This experiment found that there is a significant rise in contributions in the endogenously sorted groups compared to the baseline treatment without endogenous sorting.

Ahn et al. (2009) leave the process of group formation fully endogenous, varying the "boundary rules" (introduced by Ostrom, 2005) to the group and compare the effect of different sets of rules. Therefore not only the composition, but also the size of the group is decided upon solely by its members. The authors let the subjects play a congestible public good[6] with 3 different entry and exit rules: 1.) free entry and free exit 2.) restricted entry and free exit and 3.) free entry and restricted exit. In all treatments subjects play in a population of 12. In the baseline treatment no rules are imposed and subjects can exit and enter groups as they wish. In all treatments moving or voting implies no cost and all choices are made simultaneously. Findings are that contributions are highest in the "restricted entry" design, so is the average per period earning. In the other treatments outcomes were not significantly different from each other, but significantly higher than the theoretical optimum of contributing very little. The significant rise in contributions and efficiency in the restricted entry design are opposed to the findings of Ahn, Isaac, and Salmon (2008), where the same boundary rules are used for a non-congestible public good. The deliberate inclusion of a subject on the basis of information of past performance (i.e. restricted entry rule) does enhance cooperation, but does not lead to higher overall income.

Both Ehrhart and Keser (1999) and Charness and Yang (2014) also allow not only the composition of the group to be determined endogenously but the size as well. The first approach enables subjects to buy themselves out of their original group and form another group. The decision of leaving a group or not is based on information about the average contributions of all existing groups. Parameters are set in a way that it would be most efficient to form one big group, but this is rarely achieved, as efficient groups attract free-riders and high-contributors are always "on the run" (Ehrhart & Keser, 1999), which also is the reason, that no significant increase in contributions or overall efficacy can be found. Charness and Yang (2014) additionally allow to vote on the expulsion of group

[6]Compared to a public good as introduced above, in a congestible public good the cost of investment to the public good rises with the contribution level. For example the first hour of cleaning a public park in a voluntary program is less exhaustive/costly than hour number eight. A further cost is connected with the membership in the group, which rises with the size of the group (=congestion; cf. Ahn et al., 2009).

members. Also Cinyabuguma et al. (2005) gives the participants the opportunity to decide about the size of the group via the exclusion of undesirable group members. This approach to endogenous sorting leads to another specific branch of research: exclusion or ostracism. This mechanism of group formation and punishment will be discussed in a section of its own.

2.6. Exclusion/Ostracism

In the past 10 years the topic of ostracism experienced a real boom in experimental research, even though the first known to use this mechanism were probably the ancient Greek (cf. Charness & Yang, 2014). The mechanism is also common in modern societies and has been found in animal groups and primitive cultures as well. The word ostracism derives from the Greek *ostrakismos*, which was a political device in Athens instituted to protect democracy. A person who threatened the harmony and peace of society was sent to exile for ten years per majority vote (cf. Maier-Rigaud et al., 2010, p. 387). Ostracism in general is defined as

> "the practice of excluding disapproved individuals from interaction with a social group ... If ostracism were a costless way to make threats and promises credible, the social dilemma would be easily solved. But ostracism is usually costly to the group because expelling a member hurts not just the outcast, but indirectly all the remaining members" (Hirshleifer & Rasmusen, 1989, p. 89).

The most important forms of ostracism are imprisonment, enslavement and death according to Masters (1984, in Hirshleifer & Rasmusen, 1989, p. 103). Milder forms of ostracism can be the refusal to talk to the ostracized person or being impolite.

Hirshleifer and Rasmusen (1989) contributed a theoretical paper to the field in which they discuss and analyze the effect of ostracism in a N-person prisoners dilemma.[7] To my

[7] A public goods game is a type of N-person prisoners dilemma; the incentive structure therefore the dilemma is the same in a public goods game and a prisoners dilemma.

knowledge they are the first to approach the problem of cooperation using the mechanism of ostracism. In a prisoner's dilemma, subjects have the choice between cooperation in producing a collective good or defection. By playing cooperate, more of the desired good will be produced, by defecting less is produced, but the personal gain is larger than under cooperation if the other subject defects. Hirshleifer and Rasmusen called the opportunity to expel a member to "blackball" someone. This can happen in each period before participation in the actual prisoner's dilemma. A single vote is enough for the exclusion to be executed, but the exclusion only lasts for one period unless the subject is excluded again in the next period of blackballing (in which the expelled subject also cannot participate). The blackballing itself is not directly costly but being blackballed is costly insofar as there is a cost imposed on non-members for being outside of the group. Therefore, it is always better to be included, even if nobody cooperates in producing the collective good. How, then, one must behave to avoid exclusion? The authors provide several assumptions concerning the dilemma situation and the ostracism mechanism:

> "1.) free rider problem 2.) aggregation economies 3.) no aggregation economies without cooperation 4.) excludability of resources from non-members 5.) costless enforcement of exclusion." Further assumptions are: "6.) ostracism only lasts one period 7.) to be ostracized, a player need be blackballed only by one member 8.) a player can blackball any number of other players." If the cost for being ostracized is large enough, cooperation can be enhanced until the second to last period (cf. Hirshleifer & Rasmusen, 1989, p. 90).

These assumptions have been taken up by several scholars mentioned below and I will also lean on these assumptions to make predictions. Hirshleifer and Rasmusen (1989, p. 93) prove the strategy "banishment" to be a subgame perfect equilibrium in all periods. This strategy comprises of: always cooperating until the second-last period and always blackballing defectors; further do not blackball without , and do not restrain from blackballing if provoked, and blackball those who did not blackball a defector previously. This leads to a subgame perfect equilibrium in a finitely repeated prisoner's dilemma with ostracism. The authors also come to the conclusion that in a N-person prisoners' dilemma using an ostracism mechanism, the exclusion of one or more members will have the same effect, irrespective of the harshness of the exclusion. Varying the duration or the cost imposed on the excluded subject should therefore neither change the individual behavior, nor the efficiency resulting from it.

The experiment of Masclet (2003) leans on the assumptions of Hirshleifer and Rasmusen (1989), but instead of a prisoner's dilemma, a public good game is used. The definition of ostracism according to Masclet (2003, p. 867) is similar to the definition given above, but the emphasis is put on the interaction of the subjects with each other affected by *peer pressure*: "Ostracism is one of the most radical forms of peer pressure. More generally, ostracism is the exclusion of disapproved individuals from interaction with a social group". The concept of peer pressure emphasizes the importance of behavior and preferences which have to be in a way the group approves of. Other than in a prisoner's dilemma, in a public goods game the group norm can assume different degrees of cooperation (or defection for that matter). In a prisoner's dilemma, possible actions are to cooperate or defect. In a public goods game the range of action can extend from full defection (i.e. contribute nothing at all), to full cooperation (i.e. contribute the full endowment), or stay somewhere in between. Where the line between cooperation and defection lies is dependent on the norm established by the group, according to their preferences. Masclet conducted an experiment, following the design of the experiment from Fehr and Gachter (2000), to compare costly exclusion to non-costly exclusion and to measure the effect of the threat of exclusion compared to a public goods game without any option to punish or exclude someone. In their design, the exclusion of a subject was not permanent and lasted only for one period and only one vote was necessary for the exclusion to be executed; there was no direct cost imposed on voting for an exclusion, but the cost of being ostracized was the full endowment (i.e. the expelled subject did not receive anything in this period). The group started with 4 members in one group using partner matching. One period consisted of three stages: a contribution stage, voting for exclusion and another contribution stage for the remaining members. 10 periods were played. The decision whether to exclude a subject was made on the basis of full information about the previous behavior of the other group members. Findings are that in the treatments with the option of ostracism (costly and costless), the level of contributions was higher in the first public good game before the decision to exclude someone is made (compared to the standard game without exclusion) than in the stage following the decision (no threat to be excluded any longer existed). The contributions fall to a similar level as they do in the standard game. In both treatments with ostracism a relative payoff gain can be seen. These findings suggest that the threat of exclusion has an effect strong enough to foster cooperation, since the contributions are higher, but relatively few subjects were excluded. Though the implication of a fee on exclusion has the effect of a reduction in the frequency of exclusion, the contributions remain high. Reasons for the act of exclusion can be either strategic or non-strategic. A strategic exclusion expects a better behavior of the expelled subject. A non-strategic exclusion acts as punishment of the previous behavior. If someone choses to punish in the second to last or last period it is non-strategic punishment, as no future behavior exists. Mainly subjects with lower than average contributions are excluded but sometimes also subjects with higher contributions, as previous findings concerned with pecuniary punishment also indicate (cf. Fehr & Gachter, 2000). But would the exclusion of a higher than average contribution also happen as the result of a majority vote, especially when the maximum group profit is a function of the size of the group?

Cinyabuguma et al. (2005) also examine the effect of ostracism on contributions in a public goods game, but modify the harshness of the exclusion. In their design, exclusion was irreversible, but the cost for being excluded was smaller. In the baseline treatment 16 subjects played a public goods game for 15 periods in the same group. Each member got information about the performance of the other members' previous behavior each period;

the information dated back 2 periods. In the “expulsion treatment” subjects also played in a group of 16 subjects for 15 periods. After the contribution stage, subjects could vote for the expulsion of other group members on the basis of information about their previous behavior. Exclusion is executed by majority vote and costly, if accomplished: if a subject is expelled each voter who voted pro expulsion pays 0.25 tokens (the endowment each period was 10 tokens). The ostracized subject is no longer allowed to participate in the public good, but is part of another public good with half the endowment of the original game and no option to expel other group members. The exclusion from the first group is irreversible and therefore lasts for all remaining periods. Findings are that the threat of exclusion has a positive effect on cooperation and the efficiency is higher in the treatment with exclusion compared to the baseline treatment. The positive effect on contributions can evolve from both the exclusion of free-riders per vote, as conditional cooperators now have the incentive to contribute in order to remain included in the group, but also from the threat of a failed vote. Here, the threatened subject is warned to “behave better” in order to avoid exclusion. Cinyabuguma et al. also noted the importance of the credibility of the threat because “[i]f each individual cared only for her own material outcome without emotions of annoyance at others’ free- riding, and if this were common knowledge, the threat of expulsion would not be credible”(2005, p. 1433).

Imposing a cost on voting highlights the existence of those feelings of annoyance, as rationality would not allow for irrational spending of ones profit. This agrees with previous studies concerned with pecuniary punishment.

Maier-Rigaud et al. (2010) put their focus on ostracism as the result of not following norms established in a group. In their experiment, 6 subjects played a standard public goods game for 10 periods in the baseline treatment. Subjects assigned to the exclusion treatment first entered the contribution stage and then a stage where they could decide to remove group members from the group per majority vote; no cost was imposed on voting. An excluded subject still received the initial endowment of 10 tokens per period, but could not participate in the creation of the public good or receive profit from it, nor participate in the exclusion stage. The parameters were set that a reduction in the size of the group also reduced the potential maximum outcome (MPCR fixed at 0.4). The design of the experiment is similar to the one of Cinyabuguma et al. (2005), except for the size of the group and the cost of being excluded. In this case, the cost of being excluded is only a potential one if the remaining group contributes more than zero to the public good. Findings are in line with aforementioned studies, but the effect of the threat and therefore the effect on efficiency is smaller. The effect of the threat of exclusion is, as expected, not as high, since the punishment of being excluded is financially not as harsh as in the other experiment, but rather an exclusion from *participation* in the group task (reminding of social exclusion). The effect of the threat on contributions is still significant compared to the baseline treatment, the overall efficiency is higher in the exclusion treatment, and the finding that mainly subjects with lower contributions are ostracized is reconfirmed.

Kerr et al. (2009) combined exclusion and verbal exclusion in one experiment and tested "How many bad apples does it take to spoil the whole barrel?" In their design, subjects were vulnerable to two forms of social exclusion: verbal rejection in a group chat and actual exclusion from the group. In the baseline treatment, a standard public goods game with 5 persons per group was played. In the exclusion treatment subjects first participated in the contribution stage, then proceeded to a chat stage where the group discussed about the previous contributions. In the next stage subjects could be expelled; two votes were enough for the exclusion to be executed. The exclusion lasted for one period only (as in Hirshleifer & Rasmusen, 1989). Additionally the amount of "bad apples" (i.e. free-riders) was controlled for exogenously without informing the participants about the change in the composition of the group. Results show that one bad apple can actually spoil the whole barrel if there are no means to sanction the subject(s) in question, but the effect is weakened if the threat of exclusion is added. The experiment further demonstrated that subjects who were already ostracized alter their behavior; therefore the threat has two effects.

The experiment of Charness and Yang (2014) is related to the already above mentioned one of Ehrhart and Keser (1999), but with the additional feature that subjects can expel each other from the group and that groups have the possibility to merge. The authors criticized the already existing discussions and experiments using mechanisms of irreversible ostracism (especially Tiebout, 1956; Cinyabuguma et al., 2005) to be inaccurate in comparison with the real world, as it is unlikely for a subject to be excluded permanently from the society or a group and not be able to reconnect or to connect with another group. Therefore, they allow for reconnection to the same or to another group and thus for redemption in the excluded subjects, as they can show better behavior after being expelled in order to be allowed to participate in another group. Further, they add the economy of scale as a novelty in this kind of experiments and test whether it affects behavior. The design of the experiment consists of 3 treatments: one baseline treatment where subjects in fixed groups of 3, 6 or 9 members played a standard public goods game for 15 periods. In the second treatment, subjects played in fixed groups of 3 subjects 3 periods of a standard public good game in a game population consisting of 9 subjects in total. After the third contribution stage subjects could first decide whether to exit the group they were in or not. Then they could decide whether to expel a group member by majority vote or not. Next, groups could be merged by the approval of at least 60%. If any singles were left after the merger-stage, new groups comprising of three subjects were randomly formed. Then the public good game resumed for three periods of contribution; then the composition of the group could be decided for the next 3 periods. In this treatment contributions were more valuable (10% per additional subject) in larger groups. In the third treatment, the mobility mechanisms were the same, but the MPCR stopped increasing with 4 subjects and thus there was no additional gain of forming bigger groups. The results show that contributions and efficiency are significantly higher in treatments where the groups are not fixed. Also, a restart effect could be observed; this indicates that subjects have expectations about the behavior of others and base their own actions on this expectations. In treatment 2, bigger groups emerged compared to treatment 3, and groups were more stable. Patterns in exclusion show again that the contribution level is an important factor: the higher the contribution is above the average level, the less likely is an exclusion and vice versa. Even in these cases, however, subjects with higher contributions were excluded.

The notion of irreversible exclusion not reflecting the real world is somewhat critical. On the other hand, the aim of an experiment isn't necessarily to provide a perfect copy of the real world. Settings exist, where exclusion can be irreversible, such as group production (e.g. Maier-Rigaud et al., 2010), where irreversible exclusion is an option for the lifetime of one particular project. Another example taken from the real world might be the duration of imprisonment. Consider a criminal of forty years being sentenced to imprisonment for 25 years. At the end of the arrest the criminal would be 65 years old and ready for pension. This person was then irreversibly expelled from the working environment and therefore from contributing anything positive to society.

Several questions remain unanswered by the review of the existing literature and new questions are opened with some experiments. What do experiments using the option to exclude a group member tell us? What is the benefit of excluding members of a society? And on the other side, what is the harm for both the excluded member and the remaining group? Is the threat of being excluded enough to foster cooperation and does the extent of the threat exert a different influence on behavior? To find an answer to these questions, a laboratory experiment has been designed and implemented. The description of the method and the design of the experiment can be found in the next chapter.

3. Method: Experiments in Sociology

Experiments are a useful tool to empirically test a theory or an effect and they are widely used in the natural sciences. The use and conception of experiments in the social sciences has changed since the first was conducted. In the 1950s, effect experiments were used to show one or more effects. Over time, experiments evolved to largely test, extend, or disprove theory (cf. Zelditch, 2014). It seems that experiments in sociology were more common those days than they are now. Nowadays they are more widely used in Psychology and Economics, but are also used by these disciplines to address sociological core questions such as norms, sanctions, social order, altruism, and the like (Diekmann, 2008). For example, Ostrom et al. (1992) used a common good to examine the problem of social order and to test necessity of Hobbes' Leviathan (Hobbes, 1651) and came to the conclusion that a communication and an endogenous sanction mechanism can be a foundation to social order. Exclusion can be a specific form of endogenous sanctioning and it can also be observed in the real world. It may be ethically incorrect, however, to exert a threat of exclusion on someone only for science sake. As Williams (2001) have shown, exclusion does not (only) deny the access to a public good, but also has psychological effects on people (and not only people, but animals as well).[8] Therefore it is less invasive to test the effect of a threat of exclusion in the laboratory, using money as incentive.

[8] see also Williams, Forgas, & von Hippel, 2005; Williams, 2007; Van Beest, Williams, & Van Dijk, 2011

With the experiment I conducted, I contribute to a rich tradition of public goods games in the laboratory (see above). The aim is to test the proposition made by Hirshleifer and Rasmusen (1989) about the effect of the duration of exclusion in the context of subjects creating a public good. According to Webster and Sell (2007, p. 10-14) one salient advantage of laboratory experiments is the high internal validity. Zelditch carries out the advantages of laboratory experiments in great detail: 1.) artificiality: the situation of interest is created and controlled by the experimenter. It mabe difficult in a natural setting to isolate and manipulate the effect of interest, but in an experiment it is possible. An experiment may be a simplification of the real word setting under investigation, but so is a theory. 2.) direct comparison: it is possible to compare two situations which only differ in the deliberately manipulated factors. Assumptions, models, theories can be tested in different settings (does exclusion have the same effect in different cultures, for example) 3.) random assignment: this is, on the one hand, a crucial requirement for conducting an experiment, and on the other hand is a great advantage of it. When people are randomly assigned to treatment conditions, the influencing variables are randomly distributed across treatments as well. According to probability theory, the deviations then sum to zero 4.) Experiments offer the opportunity to work on difficult settings and 5.) they invite and enable replication and comparison across different settings. In an experiment, the control of all factors is very high and therefore the replication is easier than the replication of a natural setting, where most factors cannot be controlled easily (or at all). 6.) This makes experiments a powerful tool to be used in a cumulative research program that tests and develops theory 7.) Further, it is possible to control for temporal and theoretical ordering and disentangle cause from effect.

As with every method, experiments have been criticized as well. The external validity of laboratory experiments is one of the main targets. The artificiality is one crucial point. According to this criticism, experiments do not mirror a real world setting and are therefore not suited for all types of research questions. They also cannot stimulate all complexities of a real word setting and as a result, the application of results to real world is limited.

The aim of a laboratory experiment, however, is not to exactly replicate a real word setting. The critique on external validity, therefore, is not whether real world situations can be applied to the experimental ones, but rather if the experimental design extracts those elements that are crucial for the behavior and decisions of participants (cf. Roth, 1995).

Further criticism has been targeted towards the participant population usually consisting of students only. Public good games (and other laboratory experiments) have been tested in pools different from those only comprising of students and findings indicate little difference.[9]

[9] Druckman and Kam (2011) dedicated a chapter to this point of criticism.

4. Theory & Hypothesis

The following section outlines the theoretical predictions and expectations for the proposed experiment. Hypotheses are derived based on theory and experimental results in the field. They address the topics of cooperation, the threat of exclusion, and over-all efficiency in a public goods game.

First, the influence of the threat of exclusion on individual contributions will be examined. Will subjects behave differently under the threat of short or irreversible exclusion? Economic theory assumes the homo oeconomicus to be the ideal type, in sociology it is the homo sociologicus. According to the first assumption, subjects are rational profit maximizers and care only for their own welfare. A homo oeconomicus will not contribute anything to the public good because he assumes others to be profit maximizers as well. Contributing 1 ECU to the public good only yields a return of 0.4 ECU, but 1 ECU kept in the private account returns 1 ECU (assuming the MPCR to be fixed at 0.4). The rational strategy is to contribute nothing in all periods. The (more) social theory expects humans to have preferences other than solely the maximization of (material) profit. According to this theoretical approach subjects will contribute to the public good (cf. Ledyard, 1995). Installing the option to ostracize group members may be efficient to enhance cooperation without reducing the efficiency of a group.

Hirshleifer and Rasmusen (1989) argue in their theoretical paper that it is possible to enhance cooperation in a social dilemma using ostracism. According to the authors, ostracism could be an effective way to enhance cooperation if it were costless. Ostracism also has the problem of harming both the excluded and the group. When used with care, always used when necessary but only when really necessary, it is possible to find a sub-game perfect equilibrium. Further, they propose that the harshness of exclusion does not influence the behavior. This proposition will be applied to the standard economic theory of rational actors and the concept of conditional cooperation throughout this chapter.

4.1. Cooperation

The standard assumption of the economic theory is that every subject is a profit maximizer and believes so about the other subjects. In a standard public goods game without exclusion, the dominant strategy is to contribute nothing to the public good and keep everything private. The return for one experimental currency unit (ECU) allocated to the group project is 0.4 ECU and therefore smaller than the return for one ECU invested to the private project ($1 \text{ ECU} * 0.4 < 1 \text{ ECU}$). If other group members also contributed to the public good (in the best case) the social optimum of 24 ECU per subject could be achieved. The opposition of personal and group interest makes the situation a *social dilemma*. The behavior of truly rational subjects in a social dilemma situation can be induced backwards from the last to the first period. Even though the return from the social optimum is higher than the return of the private good ($6 * 10 * 0.4 = 24; 24 > 10$), a rational subject will not contribute to the public good in the last period. If everyone behaves this way, nobody will contribute anything and then contributing nothing is the best thing to do individually. This makes the second last period the last period and so forth. Contributing nothing at all is therefore the equilibrium expected by standard economic theory assuming only selfish individuals (as has been shown repeatedly and summarized by Ledyard, 1995).

This logic also holds true for the treatments using exclusion. Under the same assumptions as above, no rational payoff-maximizing individual will contribute to the last stage. The last stage may be seen as a one-shot game, since it is the last and there is no threat of being excluded any longer. In a one-shot game it is always rational to defect. Assuming subjects to be rational profit-maximizers, nobody will vote for the expulsion of another member, since the expulsion of a group member is costly (directly and indirectly) and a rational profit maximizer will not spend her money on the exclusion of somebody. In this way one can calculate his/her way back to the first period as in the standard game (c.f. Masclet, 2003). Even without voting being costly, excluding someone is never rational under another assumption: the possibility that someone might contribute anything, even by accident (consider the for example the trembling-hand refinement of the Nash equilibrium of Selten (1975) as Maier-Rigaud et al. (2010) do). To contribute nothing and to exclude no one is therefore the subgame-perfect equilibrium (cf. Maier-Rigaud et al., 2010, p. 390) under the assumption of a rational and profit-maximizing player who is not annoyed by others actions.

Contrary to this derivation, research has shown that subjects contribute more than nothing *and* are willing to sanction each other, even when sanctioning is financially costly and therefore not rational under standard assumptions (cf. Ostrom et al., 1992; Fehr & Gachter, 2000).Cinyabuguma et al. (2005, p. 1433) argue for the existence of “feelings of annoyance” to be a possible motivator to engage in punishment of others. For any social sanction (regardless of motive) to effectively influence behavior, 3 conditions must be met according to Kerr et al. (2009, p. 605):

1. the potential target of a sanction has to believe that his/her behavior can be monitored by the sender of the sanction
2. the target of sanction has to believe that a sanction actually will be imposed if

(s)he deviates from expected behavior

3. the (social or financial) cost has to be substantial to the target of the sanction

The first condition is met in the second stage, where the individual contributions of all group members are displayed. Considering only rational actors the second condition cannot be met. The cost for sending a sanction (i.e. voting for the exclusion of a member), however, is only 1/20 from each periods endowment, i.e. it is relatively small. Also Fehr and Gachter (2000), among others, have shown that participants are willing to pay for the punishment of others. Participants also do anticipate the threat and contributions have been found to start out higher in a treatment with exclusion than in a treatment without (cf. Cinyabuguma et al., 2005). Therefore, the imposition of the sanction is credible. The third condition is met as the excluded subject only receives half of the in-group endowment and additionally loses the potential earnings from the group public good.

Being excluded, no matter in which period and for how long, is always worse than being in a group. This holds true even if nobody contributed anything, since the the cost for being excluded is 5 ECU and the endowment for an excluded subject then is 10 - 5 =5 ECU. This holds true for both short and irreversible exclusion and in each period of the game.

Apart from standard theory, other explanations for the observed behavior of contributing more than nothing exist. Most prominent is the assumption that different types of players with different preferences do exist and do act in different ways. The homo oeconomicus is not the only type of player, as already mentioned above. So under the assumption that different types of players exist (e.g Fischbacher et al., 2001) there will be contributions exceeding zero and, if possible, subjects deviating from the group norm will be punished. The norm of how much a member has to (or how little a member is allowed to) contribute depends on the group norm[10] and the types of subjects it consists

[10]This is can be seen as an advantage compared with exogenous exclusion via the use of a threshold. The

of. It could range from zero to full contribution.[11]

Attempts have been made to discover and explain the motivation behind the sanctioning behavior (strategic, non-strategic as in Masclet, 2003, revenge and antisocial punishment as for example in Nikiforakis & Engelmann, 2011 or inequality aversion in Charness & Rabin, 2002; Fehr & Schmidt, 1999). Exclusions (or sanctions in general) are a means to get rid of (or discipline) subjects who show behavior the group does not agree with. But what will these norms look like? How can exclusion be avoided? Full contribution might be one way, but this strategy is not compatible with the aims of a purely (or impurely) selfish subject. Previous research has shown, that it is always the lowest contributor to be excluded, or at most the second-lowest, but only together with the lowest contributor (Cinyabuguma et al., 2005). The best strategy to avoid exclusion while not giving up all selfish and profit maximizing goals is to contribute slightly more than the lowest contributor. Assuming this to be common knowledge, contributions will rise higher from period to period in an upward spiral, compared continually sinking contributions in a standard public goods game without exclusion.

As exclusion can be seen as a particular form of punishment, the effects should be similar to the effects of pecuniary punishment. One has to also keep in mind that the threat of exclusion weakens over time compared to pecuniary punishment (cf. Maier-Rigaud et al., 2010, p. 391); this notion holds true only for the irreversible exclusion. Compare being excluded irreversibly in the first period to, say the eighth period. Being excluded in the first period leads to 9 periods of half the endowment and the potential loss of 10 up to 24 ECU per period (90 to 216 ECU in total; see predictions-section for further explanation). Being excluded in the eight period leads to 10 ECU in total (5 ECU each period). Pecuniary punishment exerts full threat up to the penultimate period. How

threshold imposed by an experimenter will always be somewhat arbitrary (cf. Croson, Neugebauer, & Morales, 2010, p. 5).

[11] Zero contribution would correspond to the concept of the homo oeconomicus and full contributions, independent of others actions would correspond to the concept of the homo sociologicus. Neither does exist in this pure form (cf Fehr & Gintis, 2007, p. 44).

long does the threat of exclusion foster cooperation? What is the norm for the minimal amount to contribute to the public good? And most importantly: does the duration of the exclusion have an effect? My hypotheses are:

H1a: Cooperation will be higher in an environment where exclusion for one period is possible compared to an environment without the possibility to exclude others.

H1b: Cooperation will be higher in an environment where irreversible exclusion is possible compared to an environment without the possibility to exclude others.

In the following section, predictions about the behavior of the participants will be made. This will also help to clarify the argumentation of this section. The specific effects that irreversible and short exclusion have on cooperation will be discussed below. Table 4.1 summarizes the calculation of potential outcomes of the game.

4.1.1. Predictions

Consider socially optimal behavior: in a highly cooperative group, where everyone contributes 10 ECU to the public good, the profit per person amounts to 24 ECU in one period. Even if nobody contributes anything, the initial endowment is larger than the endowment of 5 ECU for excluded subjects. A free-rider would earn 30 ECU if everybody else contributed fully. The endowment of an excluded subject is smaller than the endowment of a member, which is smaller than the potential maximum from group project (the social optimum), which in turn is smaller than the potential maximum profit one can gain from free-riding ($5 < 10 < 24 < 30$ ECU).

Table 4.1.: Predictions

		Periods	endowm.	contr.	contr. group	Profit	Profit * Per.	Sum
standard PGG	free-rider	1	10	0	(0+10+10+10+10+10)	10-0+50*0.4=30	30	
	social optimum	1	10	10	(10+10+10+10+10+10)	10-10+60*0.4=24	24	
	homo oeconomicus	1	10	0	(0+0+0+0+0+0)	10-0+0*0.4=10	10	
	irrational	1	10	10	(10+0+0+0+0+0)	10-10+4*0.4=4	4	
exclusion	excluded	1	5	-	-	5	5	
	t2 max. time	5	5	-	-	5	25	
	t3 max. time	9	5	-	-	5	45	
t1 / no exclusion	free-rider	10	10	0	(0+10+10+10+10+10)	10-0+50*0.4=30	300	**300**
	social optimum	10	10	10	(10+10+10+10+10+10)	10-10+60*0.4=24	240	**240**
	homo oeconomicus	10	10	0	(0+0+0+0+0+0)	10-0+0*0.4=10	100	**100**
	irrational	10	10	10	(10+0+0+0+0+0)	10-10+4*0.4=4	40	**40**
t2	excluded max. time	5	5			5	25	
excluded every other period	free-rider	5	10	0	(0+10+10+10+10+10)	10-0+50*0.4=30	150	25+150= **175**
(worst case)	social optimum	5	10	10	(10+10+10+10+10+10)	10-10+60*0.4=24	120	25+120= **145**
	homo oeconomicus	5	10	0	(0+0+0+0+0+0)	10-0+0*0.4=10	50	25+50= **75**
	irrational	5	10	10	(10+0+0+0+0+0)	10-10+4*0.4=4	20	25+20= **45**
t3	excluded max. time	9	5	-	-	5	45	
excluded in first period	free-rider	1	10	0	(0+10+10+10+10+10)	10-0+50*0.4=30	30	45+30= **75**
(worst case)	social optimum	1	10	10	(10+10+10+10+10+10)	10-10+60*0.4=24	24	45+24= **69**
	homo economicus	1	10	0	(0+0+0+0+0+0)	10-0+0*0.4=10	10	45+10= **55**
	irrational	1	10	10	(10+0+0+0+0+0)	10-10+4*0.4=4	4	45+4= **49**

Note: The fee for voting is not considered in these calculations.

Under the second treatment, the maximum amount of periods a subject can be excluded is 5 periods (i.e. every other period). An excluded subject does not participate in the voting stage and cannot receive any votes in this stage (an therefore cannot not be excluded in the following period). The endowment for an excluded subject is 5 ECU.

Being excluded for the maximum time, i.e. 5 periods, amounts to a total profit of 25 ECU (5 ECU * 5 periods). In the remaining five periods (where she cannot be excluded), the profit can have a wide range, depending on their own and on the others' decisions.

Assuming this subject is highly irrational and contributes everything, whilst nobody else does, the profit is 10 ECU * 0.4 = 4 ECU per period (4 ECU * 5 periods = 20 ECU in total + 25 ECU from 5 periods in exclusion = 45 ECU). If nobody contributes anything (s)he gains 10 ECU per period (10 ECU endowment * 5 periods = 50 ECU in total + 25 ECU = 75 ECU). If all 6 group members contribute everything, the profit is 24 per Period (120 in total + 25 = 145 ECU); but this scenario is rather counterintuitive as there is no reason to exclude a fully contributing subject. Considering free-riding on others' full contributions, the profit per period can be as high as 30 ECU if everybody else contributed fully (150 ECU in total + 25 = 175 ECU).

Compared to the potential maximum outcome a free-rider can get if everybody else contributes everything (10 - 0 + 5 * 10 * 0.4 = 30 ECU; 30 ECU * 10 periods = 300 ECU), or the potential social maximum of 10 - 10 + 6 * 60 * 0.4 = 24 ECU per period and 240 ECU per person in total. The maximum loss is the difference between the maximum potential profit of a free-rider in a public goods game without being excluded and the hypothetical profit of a subject being excluded the maximum amount of time possible. The maximum loss can therefore amount to 300 - 45 = 255 ECU in a very irrational scenario, where only one subject contributes to the public good in all remaining periods. Considering (more) rational subjects, the loss will be between 300 - 75 = 225 ECU (if nbody contributed anything or 300 - 175 = 125 ECU (fully free riding every period in the group) .

Under the third treatment, using irreversible exclusion, the cost for the excluded subject can rise even higher. Suppose a subject is excluded after the first period in a worst case scenario. (S)he receives 5 ECU for each remaining period 5 ECU * 9 periods = 45 ECU. Depending on the behavior of the first period, where the profit can range from 4 (being the only one who contributes, which is very irrational) to 30 ECU (free-riding on others' full contributions). The total profit of a subject excluded after the first period ranges from 45 + 4 = 49 ECU to 30 + 45 = 75 ECU. The maximum loss then ranges from 300 - 49 = 251 ECU to 300 - 75 = 225 ECU. In a standard public goods game, the potential maximum outcome per person stays at 300 ECU, using the same parameters as above. The motivation or desire to be allowed to stay in the group is therefore a rational one, and it may also be a psychological one.[12]

4.2. Efficiency under the threat of exclusion

Efficiency is the cumulation of all profits of all group members of the entire public goods game. When contributions are higher under the threat of exclusion, efficiency therefore might be higher as well. Considering costly punishment, efficiency does not necessarily rise with contributions, as the sender and the receiver of the punishment lose profit and therefore the overall efficiency can be diminished despite higher contributions (cf. Nikiforakis, 2008). Even though there is a cost imposed on excluded subjects, in Cinyabuguma et al. (2005) and in Maier-Rigaud et al. (2010), efficiency is higher when the profit of all excluded subjects is also considered in the equation. Although the first study includes a cost on voting and halves the endowment of excluded subject, efficiency is still higher in the exclusion treatment compared to the baseline treatment.

[12] Williams and others (Williams, 2001; Williams et al., 2005) also consider psychological effects of social exclusion as well as the neurological impact it can have. Williams (2007) summarizes the existing literature briefly.

Table 4.2.: Maximum Profit in one Period

Group size	Max contr.	Max. profit
6	60	24
5	50	20
4	40	16
3	30	12
2	20	8
1	10	4

As efficiency is a function of the contributions to the public good, and contributions are assumed to be higher under the threat of exclusion, efficiency should be higher in treatment 2 and 3 compared to treatment 1. Unfortunately, it is not that simple, as sanctions tend to have side-effects. To phrase it in Hirshleifer & Rasmusens' words: "ostracism is usually costly to the group because expelling a member hurts not just the outcast, but indirectly all the remaining members" (1989, p. 89).

The cost imposed on voting is relatively small, but the cost for the group may be relatively large. See table 4.2 for the effects of group size on maximum contributions and profit for one period.

An excluded subject cannot contribute to the public good in the period of exclusion. Further, (s)he only receives half the endowment in this period, which also diminishes the earnings of the group and the efficiency of the group. Leaning on the findings of others (see for example Cinyabuguma et al., 2005; Masclet, 2003; Maier-Rigaud et al., 2010) and the assumptions from above, the threat of exclusion enhances contributions and therefore efficiency.

H2a: Efficiency will be higher when it is possible to exclude group members for one period, compared to an environment without exclusion

H2b: Efficiency will be higher when it is possible to irreversibly exclude group members *for all remaining periods, compared to an environment without exclusion*

4.2.1. Predictions

For predictions consult the above section.

4.3. Duration/ Harshness

The following hypotheses are concerned with the diverging effects that exclusion, in regards to it's degree of reversibility, has on cooperation and efficiency.

4.3.1. Contributions & Efficiency

In their theoretical paper, Hirshleifer and Rasmusen (1989) propose that the duration of exclusion is negligible concerning the behavior of all subjects. To my knowledge, no experiment has yet tested the effect of the duration of exclusion or of reversibility vs. irreversibility of exclusion.

Nikiforakis (2008) has shown that the cost-effectiveness of punishment does have an influence, at least on the senders of the punishment. The punishment has to be effective, but affordable. The requirements which must be met in order for punishment to be effective, according to Kerr et al. (2009) are in line with this result (see above).

Considering exclusion as a specific form of punishment, the harshness should therefore make a difference. I suggest that cooperation will be higher in an environment where exclusion is irreversible compared to an environment using exclusion that only lasts for one period. The cost for ostracized subjects is higher (since exclusion is longer) than in an environment using a mechanism of short ostracism, where subjects receive the full endowment and the right to participate after one period of exclusion. A rational subject will anticipate the cost of being excluded irreversibly and, as argued above, raise his or her contributions in order to avoid exclusion. Cinyabuguma et al. (2005, p. 1427) show the existence of an "anticipation effect" in their experiment, where contributions in the treatment using exclusions were significantly higher in the first period, compared to the baseline treatment without exclusion.

A subject has to invest in the *first* period without knowing the preferences of the other group members. Contributing too little can be dangerous facing irreversible exclusion. It would be worse to contribute too little and be expelled in the first period, than contributing too much and not be able to free-ride on the others' contributions.

To avoid exclusion, a subject needs to behave according to the group norm. Since the consequence of being excluded in the irreversible treatment is more costly (i.e. harsher) than in treatment 2, the threat might be perceived to be greater and the contributions therefore start higher. Tsebelis (1990) argues, however, that the harshness of the punishment alone does not prevent the commitment of a crime. According to his game theoretic analyses, it is the probability of detection which influences the crime rate negatively. When the probability of detection is held constant (at 100%), the influence of the harshness of the crime can be isolated. In this case, the threat of a higher punishment, i.e. irreversible exclusion versus short-term exclusion, should have more effect on the behavior of subjects.

H3a: The harsher the consequences of exclusion, the higher cooperation will be. Cooperation will be higher under the threat of irreversible exclusion compared to reversible short-term exclusion

Following this logic, efficiency should also be higher under irreversible exclusion as a consequence of higher contributions. If a subject is excluded irreversibly in an early period, however, she is lost for the group for the remaining periods. She only receives halve of the endowment and cannot contribute to the public good for a longer time than a subject excluded for only one period. This means that in an environment with short exclusion, the potential loss of a contributing subject is smaller/shorter when the excluded subject is admitted to the group again (see section above). Additionally, an excluded subject that is reintegrated can show signs of remorse and alter his or her behavior (cf. Charness & Yang, 2014). According to table 4.2, the potential maximum outcome depends on the size of the group, as the effect of a fixed MPCR. In a group of 6 subjects, the social optimum in one period is 24 ECU, in a group of 5 it is 20 ECU. The potential maximum outcome thus decreases with each excluded subject. When exclusion is irreversible, the potential maximum outcome can only diminish, when exclusion is reversible, it can rise again.

Charness and Yang (2014) explicitly note that remorse and redemption is a natural characteristic of society and argue for reversible over irreversible exclusion. In their study, about 20% of the excluded subjects achieved redemption and were readmitted to the group, based on better behavior outside of the group which was observed by the group. In my experiment, subjects are readmitted to the group automatically after one period of exclusion. They can then show signs of remorse and contribute higher than before the exclusion, or they can choose not to alter their behavior and risk being excluded again. Since they learned that being excluded is more costly than being inside of the group, irrespective of the behavior of the others, “better” behavior (according to the groups norms) will be expected.

Also considering the trembling-hand refinement of the Nash equilibrium (Selten, 1975) it is possible, that a subject accidentally contributed less than (s)he meant to (for example typing 1 instead of 10 and pressing the okay button before the mistake is noticed). Expelling a subject who only accidentally contributed the wrong amount would mean to lose a high contributor “by accident”. Admitting this very subject back to the group after one period of exclusion can repair the damage.

H3b: Efficiency will be lower when subjects are excluded longer compared to efficiency *under short-term exclusion.*

In the following sections predictions of these arguments will be presented. The effects that exclusion has on efficiency will be subsequently discussed.

4.3.2. Predictions

Assume a rational subject who does not contribute anything to the public good (as economic theory predicts). In the treatment with irreversible exclusion, (s)he might be expelled after the first period. The total profit amounts to somewhere between 10 ECU + 5 ECU * 9 periods = 55 ECU (nobody contributing) to 30 ECU + 5 ECU * 9 periods = 75 ECU (one free-rider), depending on the other subjects behavior. In the treatment using short exclusion, the profit will be between 10 ECU * 5 periods + 5 ECU * 5 periods = 75 ECU and 30 ECU * 5 periods + 5 ECU * 5 periods = 175 ECU. Only in the best case scenario (for a free-rider) of the irreversible treatment is the profit equally high as the worst-cast scenario under the treatment using short exclusion. The profit of a subject excluded irreversibly in the first period is substantially smaller than of a subject being excluded in the first period and readmitted to the group in the second period (treatment 2).

Considering irreversible exclusion, the first period is of utmost importance. A subject has to estimate the contributions of the others and adjust his or her own contribution without any information about the others. As shown above, it is even more desirable to avoid exclusion in the treatment with irreversible exclusion. Therefore it is even more important to match the expectations of the other group members in the first period. Speaking in strategies, it is always better to contribute too much than too little in the first period. The best strategy for the entire game is to contribute (at least a little) more than the smallest contributor.

This means for the first period having a profit of maximum 24 ECU (if all contribute everything; the social optimum) compared to the maximum of 30 ECU when free riding. The margin of 6 ECU (30 - 24 = 6) will be compensated not later than in period 3, even if nobody would contribute (receiving 5 ECU in period 2 and 3, when excluded, is less than the initial endowment of 10 ECU inside of the group per period; $2 * 5 < 2 * 10$). Assuming positive contributions due to the threat of exclusion, the margin might as well be compensated in the following period. Therefore, contributions in the first period are expected to start off higher than in the other treatments and rise over periods until the second last period. In the last period it would be rational to contribute nothing, assuming the other subjects follow the same rationality. The drop in the last period is called the end-game effect.

As mentioned above, the over-all efficiency could be higher in treatment 2 compared to treatment 3 under the threat of exclusion. Considering actual exclusions, a subject excluded irreversibly is “lost forever” and the potential maximum output is diminished for all remaining groups.

Also, when a subject is excluded, it only receives an endowment of 5 ECU. The endowment is included in the calculation of the total profit of a subject and hence in the total profit of a group. Considering a worst case scenario where a subject is excluded irreversibly in the first period, he will receive 5 ECU for each remaining period, which is smaller than the endowment of group members (10 ECU). The time, in this case 9 periods, is longer than the maximum possible amount of periods to be excluded in treatment 2 (which is 5 periods, namely every other period). 9 periods * 5 ECU = 45 > 25 = 5 periods * 5 ECU. The damage done to the group by excluding someone in the irreversible treatment before period 6 is larger than the maximum of potential exclusion periods in treatment 2.

The potential maximum profit a subject can receive is 300 ECU if she free-rides all the time on others’ full contributions. The reduction of the potential maximum outcome is larger in treatment 3, allowing for irreversible exclusion, than treatment 2. The potential loss in treatment 2 is between 300 - 175 = 125 ECU and 300 - 45 =255 ECU. In treatment 3 the maximum loss ranges from 300 - 75 = 225 ECU to 300 - 49 = 251 ECU. Considering the potential losses for treatment 2 [125;255] and treatment 3 [225;251], one can see that the interval is higher in treatment 3 and can therefore reduce efficiency more than those in treatment 2.

5. The Experiment

In this section the experimental design and the implementation of the design will be briefly described.

5.1. Experimental Design

The design of the experiment is rather similar to 3 other experiments (Masclet, 2003; Cinyabuguma et al., 2005; Maier-Rigaud et al., 2010), but varies the exclusionary mechanisms over treatments. The chosen design further implements four of the five key assumptions made by Hirshleifer and Rasmusen (1989) and tests the assumptions that there is no difference concerning the exclusionary mechanism in different treatments.

The experiment consists of three treatments. In each treatment subjects are randomly allocated to groups of 6 individuals. I use the mechanism of partner matching, which means that the subjects will stay in the same group for the entire experiment. Partner matching is chosen because the dynamics of exclusion and inclusion in one group needs to have a stable environment to evolve, i.e. a stable pool of potential group members. Further, the threat of exclusion to be credible requires information about the other players' previous behavior (Kerr et al., 2009). An experimental session consists of 10 periods.

The payoff of the participants results from the cumulative earnings across all periods.

The cumulation of all earnings is important, as the decisions in each period are not independent from each other. Previous behavior can affect future outcome (in comparison: the randomized selection of one period for payoff, which is very often used, requires the independence of periods).

Treatment 1: baseline. Under the baseline treatment subjects participate in a standard public goods game. The parameters I used are the same as in Maier-Rigaud et al. (2010), which are based on the design of Fehr and Gachter (2000) that has been described above. The similarity to these experiments allows for a close comparison of the results. In this treatment each period consists of two stages. In the first stage, subjects receive an endowment of 10 experimental currency units (ECU) that they have to divide between a private good and a public good. All decisions are made simultaneously. In the proceeding stage, the subjects learn about their profit from the actual period and about the individual contributions of all members of the group to the public good. They are also informed about their own cumulative profit of all previous periods. In any given period in the baseline treatment, the earnings y_i of a subject i are:

$$y_i = e - C_i + g \sum_{allj} C_j \tag{5.1}$$

Where e=10 is the endowment each subject receives every period. C_i is the amount the subject i contributes to the public good, g=0.4 is the marginal per capita return (MPCR) of the public good and $\sum_{allj}$ is the sum of contributions to the public good by all members, i included. At the end of the experiment the subjects are informed about their cumulative earnings from the experiment.

Treatment 2: short exclusion. This treatment consists of 3 stages. Stage 1 is the same as in the baseline treatment. All subjects receive an endowment of 10 ECU which they can choose to allocate between a private good and a public good. In stage

2, subjects are informed about their earnings from the public and the private good of the actual period and their cumulative profit from the experiment so far. They receive information about the individual contributions of their group members from the previous period to the public good. Further, in this stage each subject can vote on the exclusion of any group member. A vote pro exclusion costs the voter 0.50 ECU for each vote cast and the exclusion is executed if the decision to exclude a subject is made by majority. Cinyabuguma et al. (2005) also impose a small fee on each vote. In their experiment as well as in the one of Maier-Rigaud et al. (2010) at least 50% of votes are necessary for the exclusion of a member. A subject then is excluded from the following period in all stages. In stage 3, subjects are informed about the sum of votes cast against them, whether they will be excluded from the proceeding period, and about the total number of excluded subjects. An excluded subject can neither contribute nor receive anything from the public good, nor participate in voting, nor will she be informed about what happened in this period, and thereafter returns to her original group. In any given period in this treatment, the earnings y_i of a subject i, which is *not excluded* from the group are:

$$y_i(included) = e - C_i - k \sum v_i + g \sum_{allj} C_j \tag{5.2}$$

Where $k \sum v_i$ is the sum of all votes times the fee for casting a vote (k=0.50). g remains fixed at 0.4; this means, that the potential maximum outcome varies with the group size (see table 4.2).

A cost d is incurred on the endowment of an excluded subject. In this experiment d=5 ECU. The earnings for an *excluded* subject are:

$$y_{i(excluded)} = e - d \tag{5.3}$$

Imposing a direct cost on being excluded makes the treatment very similar to Cinyabuguma et al. (2005), who also halve the original endowment of the excluded subjects. Maier-

Rigaud et al. (2010), on the other hand, pay the excluded subject the full endowment. Hirshleifer and Rasmusen (1989) also impose a cost on being excluded in their theoretical model. They, and also Kerr et al. (2009) note that the cost of being excluded needs to be substantial in order to make the threat of exclusion credible. Imposing a direct cost on being excluded does so.

The cumulative earnings of a subject from the experiment are the sum of all earnings of all periods. P_t stands for the total number of periods to be played and P_{in} for the periods a subject is included in a group.

$$y_i = (e - C_i - k \sum v_i + g \sum_{allj} C_j) * P_{in} + (e - d) * (P_t - P_{in}) \tag{5.4}$$

Treatment 3: irreversible exclusion This treatment differs from the second treatment in only one aspect: the duration of the exclusion. If a subject is excluded, the exclusion is irreversible. In Cinyabuguma et al. (2005) and Maier-Rigaud et al. (2010) the exclusion from the group is irreversible as well. Excluded subjects receive 5 ECU for every remaining period of the session. The calculation of cumulative earnings is the same as in treatment 2 (see equation 5.4).

The instructions of all treatments as well as screen-shots from the experiment can be found in the Appendix.

5.2. Limitations

The findings of this experiment will be limited to the western culture. Punishment is perceived very differently across societies and the effects it has on cooperation therefore vary substantially between cultures (cf. Herrmann et al., 2008). Experiments need to be replicated in other cultures in order to widen their relevance for other cultural backgrounds, since there is no reason to assume that ostracism bears the same meaning in Austria that it does in Thailand. The design of the laboratory experiment does offer the opportunity to replicate it.

Another limitation may be that subjects in the third treatment anticipate that they will be sitting in front of an empty computer monitor with nothing to do if they are excluded from the group. I cannot control if subjects show higher cooperation in order to stay in the group because of monetary incentives or because of the aversion of boredom if excluded irreversibly. To keep potential boredom to a minimum, only 10 periods were played in one session and subjects were informed about the number of periods to be played. They could, therefore, estimate the duration of one period (max. 2 minutes) and the duration of the public goods game. The assumption that subjects cooperate more when they have to sit in the lab without participating in the game than they would do if they just could leave unnoticed cannot be refuted entirely. As the duration of the experiment is relatively short, subjects are expected to behave as they naturally would.

5.3. Implementation of the experiment

The experiment was run at the Vienna Center of Experimental Economics (VCEE). A total of 90 subjects participated. A total of 4 sessions were run (1 session for treatment 1 and treatment 3, 2 sessions for treatment 2). Depending on their own and others' actions, subjects could earn experimental money (ECU). The payoff was cumulative over all periods. The earned experimental dollars were exchanged to the rate of 1EC =0.05€. On average participants earned 17.50€ (minimum: 13.00€ and maximum: 20€). Participants were recruited from the VCEE pool using the ORSEE system (Greiner, 2004). The VCEE pool comprises of (mostly) student volunteers across all fields and academic institutions situated in Vienna. The experiment was programmed and executed using the z-Tree software (Fischbacher, 2007).

One session lasted for approximately an hour. The recruited participants were allocated randomly to computer cubicles. The instructions were handed out in print and read aloud (see Appendix). The subjects had to fill in 4-6 control questions (depending on the treatment) concerning payoff mechanics and 2-5 control questions concerned with the parameters of the experiments in order to make sure they understood the instructions correctly. The purpose of the control questions was not to exclude participants, but to get them acquainted with the payoff mechanism and to estimate their understanding of the experiment. Subsequent to these questions, participants had to complete a short questionnaire comprising of 6 questions taken from the European Social Survey[13] to elicit their attitudes towards distribution of welfare, punishment of criminals, and the like (all questions can be found in the Appendix). After all subjects completed the control questions and the questionnaire, the actual experiment started. Participants played for 10 periods in the same group. After participating in the 10 periods of the public goods game, participants were informed about their payoff in Euro (including a show-up fee of 8€) and asked to complete another short questionnaire containing socio-demographic questions and three further questions from the ESS. Before leaving, each participant was paid individually in Euro.

[13]All questionnaires can be accessed at www.europeansocialsurvey.org

6. Results

In the following section the results of the experiment will be presented. In treatment 1 all subjects participated in 10 periods of the public goods game. In treatment 2 and 3 not all subjects participated in 10 periods, since some were excluded for one or more periods. Therefore, I have 876 observations of individual allocation decisions and voting behavior. The groups were matched as partners (i.e. remained the same during the whole experiment) and the exclusion was irreversible in treatment 3. Therefore, it makes sense to also consider the dynamics over all 10 periods played in one session by one group. Each group comprises of 6 subjects and therefore I have 15 independent observations on a group level. The amount of observations on the group level has consequences for the validity of the applied statistical tests.

This chapter is organized as follows: the first section contains a summary of the data by presenting descriptive statistics and simple tests for contributions, efficiency, voting behavior and the answers to both questionnaires. In the second section I will present results from regression-analysis, in order to find an explanation for contribution behavior with data from the experiment and the questionnaire.

6.1. Descriptive Statistics and Simple Tests

Contributions and total profits of all treatments will first be discussed. The voting behavior and exclusions will then be described.

The results of the descriptive analysis show that one of the 4 groups of treatment 1 deviated considerably in its behavior from the other groups and also from the findings of other studies.[14] It is a stylized fact that contributions in a public goods game without any additional mechanism (i.e. communication, punishment, exclusion) start out between 60% and 40% and decline steadily with time (Ledyard, 1995; Chaudhuri, 2011). I replicated the design of the experiment conducted by Maier-Rigaud et al. (2010), who replicated the design of Fehr and Gachter (2000). In both studies the authors report the same behavior on average in the baseline treatment. In my experiment, the sample is relatively small and I have only 4 observations on group level in treatment 1. The behavior of the deviating group changes the average contributions of treatment 1 upwards. If this group is dropped from the analysis, the line of average contributions takes the characteristically downward course (see figure 6.1, solid line). To represent the differences of the data from the experiment and the findings reported in other studies, I will report results for both situations (all groups included, and without the deviating group in parenthesis).

6.1.1. Contributions

In the *baseline treatment* (treatment 1), subjects contributed on average 5.94 ECU (4.97 ECU) per period to the public good. Individual contributions to the public good range from 0 to 10 ECUs. In the first period, contributions start off at approximately 62% (62%) and decline to 37% (21%) in the last period. As mentioned above, compared to other experiments using the exact same parameters (e.g. Maier-Rigaud et al., 2010), the mean of contributions in the standard public goods game is unusually high. This can be explained, however, by examination of the contributions at group level, which shows

[14]See Appendix for average contributions by groups

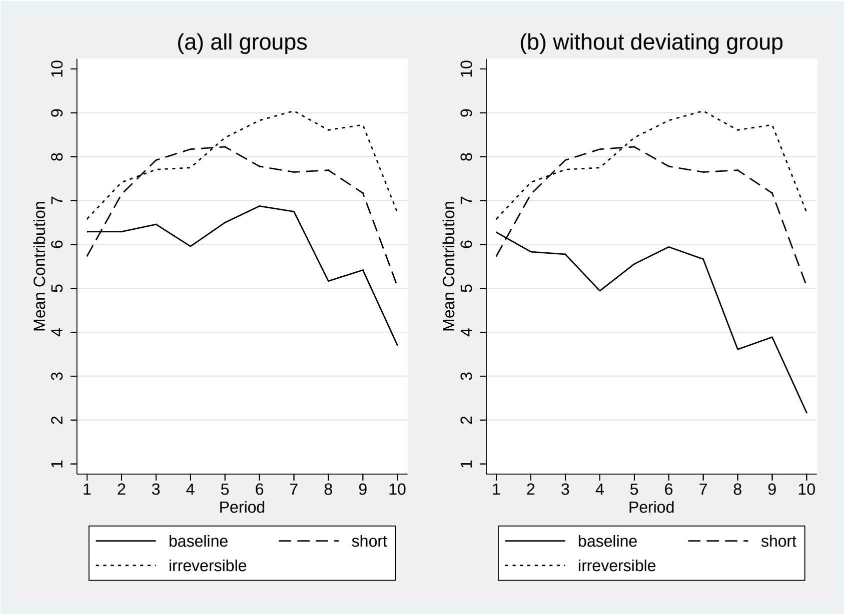

Figure 6.1.: Average contributions of all treatments

one highly cooperative group and three groups behaving as they do on average in other experiments[15]

In the *short exclusion treatment* (treatment 2), the average contribution over all periods was 7.28 ECUs. Individual contributions also varied from 0 to 10 ECUs. In the first period, the average contribution lies at 57% and drops to approximately 50%. The lower than average first and last period indicate a hunchbacked distribution (Kurtosis=2.20).

In the *irreversible exclusion treatment* (treatment 3), the average contributions over all periods were at 7.79 ECUs. Individual contributions also varied from 0 to 10 ECUs. In the first period, the average contribution was at 66% and increased to 67%. The higher than first and last periods' average contribution indicates a hunchbacked distribution of contributions under this treatment as well (Kurtosis=3.97), even more than in treatment 2. The standard deviation is the smallest in treatment 3 and largest in treatment 1. An endgame-effect can be observed in every treatment.

[15]Means according to groups under treatment 1: group1 = 4.8334, group2 = 3.15, group3 = 8.8667 and group4 = 6.9167

Table 6.1.: Average Contributions

Treatment	Obs.	Mean	Std. Dev.	Minimum	Maximum
1 "baseline"	240	5.941667 (4.97)	3.998527 (4.01)	0	10
2 "short"	404	7.247525	3.252503	0	10
3 "irreversible"	232	7.974138	2.605227	0	10

Note: Observations are counted without excluded subjects.

The average contributions in the third treatment are comparable to the results of Maier-Rigaud et al. (2010) and also Cinyabuguma et al. (2005). The contributions could have been slightly higher than those in the first experiment, since in my experiment the cost of being excluded was higher than in Maier-Rigauds experiment. Higher contributions in the experiment of Cinyabuguma and colleagues may be due to the duration of the experiment (16 periods in their case). An experiment with more periods means a longer time of potential exclusion and the threat lasts longer, i.e. weakens later than it does with 10 periods. Further, contributions needed a few periods to spiral up and could stay there longer when more periods were played.

To test the difference between groups a Wilcoxon rank-sum test was used. As already described above, the contributions to the public good vary considerably between treatments. The difference between treatment 1 and 2 and also the difference between 1 and 3 is significant ($p<0.0000$ for both). The H_0 hypothesis of no difference between the contributions of treatment 1 and 2 can be rejected and the H_1 of a significant difference of contributions between treatment 1 and 2 be assumed at a level of $\alpha<0.001$. This also holds true between the contributions of treatment 1 and 3. The same can be assumed when the deviating group of treatment 1 is dropped from the analysis. The difference of contributions is more modest between treatment 2 and 3, but marginally fails at conventional significance levels ($p=0.071$). The H_0 of no difference between these two treatments can be rejected and the H_1 be assumed. All three treatments are different from each other in terms of contributions, at least on a level of α=0.10.

Therefore, the data does not support the rejection of *H1a*. Cooperation is higher in an environment where exclusion for one period is possible compared to an environment without the possibility to exclude others. The data also does not support the rejection of *H1b*. Cooperation is higher in an environment where irreversible exclusion is possible compared to an environment without the possibility to exclude others. This means that a higher threat of exclusion leads to higher contributions.

The rank-sum test between treatment 2 and 3 indicates that *H3a* cannot be rejected. In treatment 3, where the exclusion is irreversible and therefore the threat of exclusion is harsher, contributions are significantly higher.

6.1.2. Total Profit & Efficiency

The total profit is the cumulation of all received profits of all periods together, minus cost for voting and cost for being excluded. The efficiency is calculated from the sum of individual profits in a group. In treatment 1, the average of the total profit earned by all subjects amounts to 183.2 ECU (169.5 ECU). The maximum lies at 238.8 ECU (233 ECU) and the minimum at 93.6 ECU (93.6 ECU). In treatment 2, the average total profit is 187.8 and in the third treatment 200.9 ECUs; on average subjects' total profit was highest in this treatment. Treatment 1, therefore, shows the lowest average, treatment 2 is in the middle and treatment 3 shows the highest average (see table 6.2).

Table 6.2.: Total Profit

Treatment	Obs.	Mean	Std. Dev.	Minimum	Maximum
1 "baseline"	24	183.1 (169.5)	36.76245 (31.77628)	93.6 (93.6)	238.8 (233)
2 "short"	42	187.7	25.89295	146.4	231.4
3 "irreversible"	24	200.9	34.65206	104	235.4

The maximum of total profits lies in treatment 1, if all groups are included and if the deviating group of treatment 1 is dropped from the analysis, the maximum profit is achieved in treatment 3. The lowest maximum profit can be observed in treatment 2, but also the highest minimum profit can be observed in this treatment. The standard deviation is also lowest in treatment 2. It seems that profits are distributed "more equally" across participants in this treatment.

The most efficient group can be found in treatment 3, with 1370.9 ECU in total. The mean of efficiency in treatment 1 is 1099.1 ECU (1017.2 ECU), in treatment 2 it is 1126.6 ECU and in treatment 3 is is 1205 ECU. This means that in treatment 1 on average 76.53% (70.64%) of the maximum possible outcome are achieved. In treatment 2 it is 78.24 % and in treatment 3 it is 83.68%. The most efficient group (in treatment 3) achieved 95.21 %. From a welfare state perspective, the third treatment is the most efficient, but the second treatment is more equal concerning profit.

To test the difference of total profit between treatments, a Wilcoxon rank-sum test was used. There is no significant difference between treatment 1 and 2 (p=0.8467); the H_1 cannot be assumed. As mentioned above, if the deviating group is dropped from the analysis, the H_0 of no difference of the total profit between treatments needs to be rejected and the H_1 assumed (p=0.0671); there is a significant difference in profits between treatment 1 and 2.

The difference between treatment 1 and 3 is significant with and without the deviating group. When all groups are included, the H_1 can be assumed (p=0.0928) and when the deviating group is excluded, the difference between total profits can be assumed on a higher level of significance (p=0.0050).

The difference between treatment 2 and 3 is also statistically significant (p=0.0278) and the H_0 can be rejected. This means that the efficiency is higher in treatments with the option to exclude others than a treatment without this option. The data does not support the rejection of $H2a$ and $H2b$. The expectation of efficiency being higher in treatment 2 than in treatment 3 is not fulfilled. The data does not support $H3b$, but suggests that the harsher the threat of exclusion, the higher efficiency will be.

From a welfare perspective this means that even though voting is costly and being excluded is costly, the average profit in treatments with the option to exclude other group members is higher; as in Cinyabuguma et al. (2005) and Maier-Rigaud et al. (2010).

Votes and exclusions (which will be discussed in the next section) are costly and therefore have an influence on the total profit of a subject and on the efficiency of the group. Table 6.3 displays the actual efficiency, hypothetical efficiency if voting was free and hypothetical efficiency if voting, and being excluded was free. Pecuniary punishment can reduce the efficiency of a group, even if it raises contributions at the same time (cf. Nikiforakis, 2008). The cost incurred on voting and on exclusion does reduce efficiency, but the main reduction in profit results from the cost incurred on exclusion. Note that these are only hypothetical numbers, as voting behavior may change when voting is free and the threat may be less when the cost of being excluded is less. In the experiment of Maier-Rigaud et al. (2010) neither voting nor exclusion were costly; 80% efficiency could be observed on average in their experiment.

Table 6.3.: Efficiency and & hypothetical Profit

treatment	**profit**		**voting fee**		**hypoth. profit**	
1	1099.1(1017.2)	76.53%(70.64%)				
2	1126.6	78.24%	1136.3	78.91%	1216.3	84.47%
3	1205.7	83.68%	1208.2	83.90%	1258.2	87.38%

6.1.3. Voting Behavior & Exclusions

In treatment 2 and 3, after the contribution stage, a stage to vote on the exclusion of group members was entered. Each vote was at a cost of 0.5 ECU (1/20 of each periods' endowment) and an exclusion was only executed if at least half of the group voted for the exclusion of a member.

In *second treatment*, using short exclusion, a total of 119 votes were cast and 16 exclusions effectively executed, at a total cost of 59.5 ECUs. In 3 of 7 groups nobody was excluded at all. In the remaining 4 groups 4 subjects were excluded on average. The maximum was 2 subjects excluded at once (in one period), so the minimal group size was 4 subjects. In 80% groups consisted of 6 subjects, in 17.14% of 5 subjects and in 2.86% of 4 subjects. The contribution of the excluded subject was always lower than the group average and the excluded subject was always the smallest contributor. When two subjects were excluded in one period, they were the two smallest contributors. Even in the last period subjects were excluded. According to standard economic theory this is irrational behavior, as the exclusion of a member for the last period is costly to voters and cannot have any effect in the period after the exclusion. This indicates that exclusions are not only used to discipline other subject (which can be rational on the long run). Some "feeling of annoyance" (Cinyabuguma et al., 2005) is necessary for this behavior. Preferences to see deviating behavior punished may exist. This or other motivations do exist in half of the group or more.

In the *third treatment*, using irreversible exclusion, a total of 26 votes for the exclusion of a group member were cast. Only 2 exclusions were actually executed; one after the third period and one after the seventh. The excluded subjects' contributions was the lowest in the group in the period prior to the exclusion.

In the second treatment, 3 subjects cast 4 votes at one time (i.e. in one single period; less than 1% of all voting stages per person) and 5 subjects cast 3 votes at one time. 3.17% cast 2 votes in one period in treatment 2 and in treatment 3 only 0.93%. In treatment 2, 22.75% cast one vote in one period, and in treatment 3, 10.09% cast one single vote in one period. This means that under treatment 2, 28.01% cast at least one vote for the exclusion of a group member; in treatment 3 it was only 11.11% on average. Note that groups not only show different patterns of voting across treatments, but also

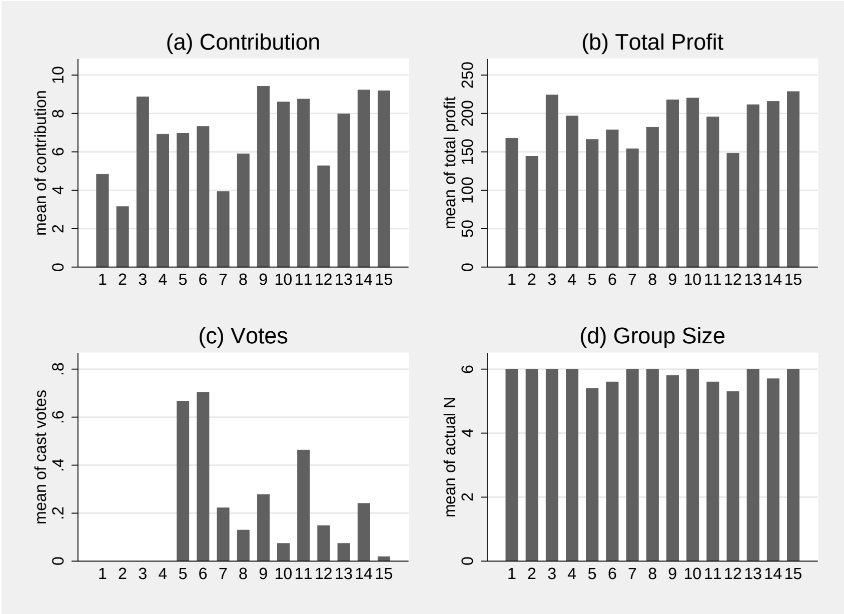

Figure 6.2.: Behavior on Average

across groups within treatments. This holds especially for treatment 2: in the group with the highest voting activity 55.56% of subjects cast at least one vote, in the group with the lowest voting activity it was only 7.41%.

In graph 6.2 the averages of (a) contributions (b) total profit (c) cast votes and (d) number of individuals in the group according to groups are displayed. Groups 1 to 4 were in treatment 1, groups 5 to 11 in treatment 2 and groups 12 to 15 in treatment 3. Groups with group size lower than 6 (d) show a higher bar in votes (c); especially groups 6, 7, 11, 12 and 14. These groups with more votes show lower contributions and a lower profit.

6.1.4. Questionnaire: ESS and demographics

In this subsection I will describe the sociodemographic features of participants and summarize the answers to the questions of the ESS.

Social Demograhpics

90 subjects participated in the experiment. The mean age was 25 years, with a standard deviation of 4.37. The youngest person was 18 years old and the oldest 47. The median is situated at 24 years. 39% of the participants were male and 61% female.

About 22% of the participants claimed not to work currently. 38% claimed to be working up to 10 hours per week, 27% between 10 and 20 hours per week. 5% claimed to work between 20 and thirty hours and 8% more than 30 hours per week. The field of study was also asked for. Only 2 cases are missing here, the remaining cases were recoded roughly into fields of sciences. 27% study in the field of humanities, 28% in the field of economics, and 23% in the technical fields. 6% study in the field of social sciences and the remaining 18% in various other disciplines.

Pre- and Post-Treatment Questionnaire

Six questions from the ESS were posed prior to the actual public good game and five were asked after the participants had finished playing the public good game. The questions asked before were concerned with the topics of general trust towards people, punishment of lawbreakers and political attitude on a left - right scale (see Appendix A for the full questionnaire). The questions after the game were concerned with the attitude towards redistribution and social preferences (for frequency distribution see table 6.4).

The first three questions asked whether one thought it is either possible to trust people or that one cannot be careful enough on a scale from 0 indicating to be careful up to 10, being trustful. In the same manner, subjects were asked whether one thinks that people only want to exploit others or if they try to be fair. The third question asked asked if other people are intentionally selfish or if they try to be helpful. These questions were taken together to establish an index of general trust in people.

Table 6.4.: Questionnaire Summary

Question	Categories	Distribution %
general social trust index	0	11.11
	1	24.44
	2	27.78
	3	26.67
	4	10.00
punish harder	agree strongly	5.56
	agree	20.00
	neither	45.56
	disagree	24.44
	disagree strongly	4.44
type of sentence	prison sentence	43.33
	suspended prison	7.78
	fine	7.78
	community sentence	40.00
state should reduce inequality	agree strongly	20.00
	agree	40.00
	neither	24.44
	disagree	13.33
	disagree strongly	2.22
inequality is justified	agree strongly	6.67
	agree	37.78
	neither	33.33
	disagree	14.44
	disagree strongly	7.78
not cheat at tax return	agree strongly	36.67
	agree	36.67
	neither	45.56
	disagree	15.56
	disagree strongly	6.67
taxes and social welfare	less taxes and welfare	13.33
	keep as is	53.33
	raise taxes and welfare	33.33
redistribution example	dependent on income	48.89
	redistribution	44.44
	equity, no redistribution	6.67

6.2. Regression Analysis

In the previous section the behavior in treatments with and without a threat of exclusion was investigated and the threat was found to significantly influence behavior. In this section, additional information on possible influencing factors will be added to the analysis, to gain deeper insight in the contribution behavior of subjects under the threat of short and irreversible exclusion.

How, then, does the threat affect decisions? Others' actions, others' contributions, cast and received votes shall be considered to answer this question. A further interesting question is how subjects differ in social demographics, attitudes towards trust in people, the welfare state, and towards punishment in general. Regressions on individual contributions will be run to find out which of these factors determine contribution behavior.

In a first step, only game related variables will be regressed on individual contributions. In a second step, sociodemographic features will be added, and the attitudes of participants will be included in a third step. In the previous section, all test were run with and without the one deviating group. Regressions were also run with and without this group. Models 1, 3 and 5 include all groups. In models 2, 4 and 6 the aforementioned deviating group of treatment 1 is dropped from the analyses (see table 6.5).

6.2.1. Game related Variables

In model 1 and 2, only game related variables were regressed on individual contributions (i.e. variables influenced or created during the experiment by the behavior of other group members or own behavior).[16]

The results of model 1 and 2 confirm the findings of the rank-sum test described in the section above. The addition of the option to exclude other group members has a positive influence on contribution behavior. The treatment variables are only significant

[16] The own profit of the previous periods had to be dropped from the regression analysis, as the assumption of no multicollinearity was violated (VIF=20), even though significant on a level of α<0.05.

in model 2 (deviating group excluded) on a level of $\alpha<0.10$, but all other treatment related variables are significant in both models. Subjects who participated in treatment 2 and 3 contribute more than subjects who participated in the baseline treatment. The mean of contributions of the previous period, the actual size of the group, and the exclusion (if it occurred) in the previous period have a significant positive influence on individual contributions on a level of $\alpha<0.001$. The votes received in the period prior to the contribution decision are significant on a level of $\alpha<0.10$. The mean of group contributions has, as expected, a positive coefficient for individual contribution decisions, as dos the experience of exclusion for one period (only in treatment 2). Subjects who were excluded contributed significantly more in the following period. The size of the group and previously received votes show a negative coefficient. Concerning the size of the group, this is not surprising, as the maximum possible output decreases with group size and subjects then contribute less to a smaller group. The negative coefficient of received votes is unexpected. A failed attempt to be excluded could or should be seen as a warning sign, and the reaction to it should subsequently be a rise in contributions to the public good. Charness and Yang (2014) found this to be the case in their study. The data of model 1 and 2 suggest otherwise. The mean contributions of the group members does have a great influence and seems to overpower the influence of warning votes.

Dummies were included in each model period. The coefficients were all negative and significant on a level of $\alpha<0.001$. The coefficients of later periods are higher than of early periods. This confirms others' findings of an endgame effect and the assumption of a weakening of the threat towards the end of the game. Model 1 has an adjusted R-squared of 0.4208 and model 2 of 0.4069. For both models, the null-hypothesis of all regression parameters being equal to zero can be rejected (using an F-test).

6.2.2. Social Demographics and Contributions

Models 3 and 4 contain social demographic variables (field of study, employment status, age and sex) from the post-treatment questionnaire in addition to the game related variables described in the section above. The game related variables do not change significance or direction in these models, compared to 1 and 2. The size of the influence of previous exclusion and group size decreases slightly. In this section I will first describe model 3, which includes all groups.

In model 3, which includes all groups, the treatment variables do not show a influence on a conventional level of significance. The treatment does not influence the contributions in this model. The field of study is connected to the allocation decision. The field of humanities, technical studies and the field of natural sciences show a negative coefficient. Students of these fields contributed less than students of other fields. A negative influence of economic related studies was expected and not found to be significant. The negative coefficient of technical studies and natural sciences is not unexpected. Both include mathematics and analytical knowledge. The negative coefficient of the field of humanities is surprising, but weak compared to the one of natural sciences. Employment status does not show any significant influence, nor do age and sex of participants in this model. Model 3 has an adjusted R-squared of 0.4164 and the F-test rejects the null-hypothesis of all regression parameters being zero.

Model 4 shows a positive and significant coefficient for both treatments 2 and 3 on a level of $\alpha<0.05$. Subjects under treatment 2 and 3 contributed more than those who participated in the baseline treatment. The game related variables remain significant, as they do in model 1 and 2. Mean group contributions and exclusion have a positive influence, and received votes and group size have a negative influence on contributions. The higher the contributions of others, and the bigger the group, the more subjects contributed. In the fields of study, only the technical ones are significant (on a level of $\alpha<0.10$) compared to all other fields. Students of technical sciences contributed significantly less than students of other fields. Employment status and age of participants are not significant.

Surprisingly, the sex of participants has a significant influence on individual contribution levels (α<0.05). This suggests that men contribute less than women. Period dummies were included in both models. The coefficients were all negative and significant on a level of α<0.001. The coefficients are higher in later periods as in model 1 and 2. Model 4 has an adjusted R-squared of 0.4124 and the F-test rejects the null-hypothesis, which was that all regression parameters were zero.

6.2.3. Social Demographics, Attitudes and Contributions

Model 5 and 6 contain all already described variables and some variables form the pre- and post-treatment questionnaire. The general trust in people index, the attitude towards the harshness of punishment of criminals in general and attitudes towards redistribution were added to the analysis.

Model 5 is very similar to model 3 pertaining to game related variables and sociodemographic variables. The treatment variables do not show a significant influence in this model. The newly added variable of general social trust is significant on a level of α<0.001. People who have more trust in other people contribute more to the public good than less trustful people. The attitude towards punishment and redistribution do not show a significant influence. The model has an adjusted R-squared of 0.4244 and thus is the highest of all 6 models. The F-test rejects the null-hypothesis, which was that all regression parameters were zero.

Model 6 is rather similar to model 4. The chief difference is that the level of significance of treatment 2 drops to α<0.10. Treatment 3 has a positive influence on contributions on a significance level of α<0.01. This means that contributions were higher when subject participated in treatment 2 and 3 compared to the baseline treatment. In the fields of study, the humanities now have a negative influence on a significant level (α<0.10);

the field of technical studies remains negative and significant at $\alpha<0.05$. Students of this fields contributed significantly less to the public good than those of other fields. The sex of participants shows a significant influence in this model on a level of $\alpha=0.05$. Men contributed significantly less than women. Trust in people also positively affects contributions significantly on a level of $\alpha<0.01$. More trustful people contributed more to the public good. Other variables do not show a significant influence on contribution decisions. Period dummies were included in both models. The coefficients were all negative and significant on a level of $\alpha<0.001$. The coefficients are higher in later periods as in all other models. Contributions were affected by the number of periods towards the end of the game. The model has an adjusted R-squared of 0.4171 and thus being second highest of all 6 models. The F-test rejects the null-hypothesis, which was that all regression parameters were zero.

Table 6.5.: Regression Results

	(1) contribution	(2) contribution	(3) contribution	(4) contribution	(5) contribution	(6) contribution
Treatment 2	0.164	$0.446^{\dagger}$	0.189	0.576^{*}	0.218	$0.523^{\dagger}$
	(0.71)	(1.64)	(0.80)	(2.08)	(0.93)	(1.88)
Treatment 3	0.187	$0.491^{\dagger}$	0.305	0.767^{*}	0.398	0.751^{*}
	(0.71)	(1.63)	(1.12)	(2.38)	(1.46)	(2.34)
Mean group contr.	0.953^{***}	0.911^{***}	0.944^{***}	0.885^{***}	0.912^{***}	0.869^{***}
	(21.29)	(18.36)	(20.95)	(17.61)	(20.05)	(17.28)
Received votes	$-0.441^{\dagger}$	$-0.454^{\dagger}$	$-0.433^{\dagger}$	$-0.445^{\dagger}$	$-0.397^{\dagger}$	$-0.412^{\dagger}$
	(-1.87)	(-1.88)	(-1.83)	(-1.85)	(-1.68)	(-1.70)
Group size	-0.950^{***}	-0.932^{***}	-0.914^{***}	-0.873^{***}	-0.834^{***}	-0.812^{**}
	(-3.83)	(-3.69)	(-3.69)	(-3.46)	(-3.37)	(-3.21)
Exclusion	2.942^{***}	2.891^{***}	2.841^{***}	2.720^{***}	2.819^{***}	2.718^{***}
	(4.10)	(3.95)	(3.95)	(3.72)	(3.94)	(3.72)
Humanities			$-1.592^{\dagger}$	-1.286	-1.759^{*}	$-1.529^{\dagger}$
			(-1.88)	(-1.42)	(-2.05)	(-1.66)
Economic s.			-0.744	-0.531	-1.072	-0.914
			(-0.87)	(-0.58)	(-1.23)	(-0.97)
Technical s.			$-1.545^{\dagger}$	-1.468	$-1.713^{\dagger}$	-1.664
			(-1.72)	(-1.58)	(-1.88)	(-1.74)
Natural s.			-2.584^{*}	$-2.436^{\dagger}$	-3.022^{*}	-2.869^{*}
			(-2.05)	(-1.88)	(-2.35)	(-2.15)
No employment			0.723	0.796	0.865	0.864
			(1.06)	(1.09)	(1.26)	(1.17)
Age			0.0152	0.0208	-0.00663	0.00366
			(0.71)	(0.95)	(-0.30)	(0.16)
Sex			-0.326	-0.519^{*}	-0.290	-0.457^{*}
			(-1.73)	(-2.58)	(-1.55)	(-2.27)
General trust					0.0302^{***}	0.0254^{**}
					(3.68)	(2.90)
Punishment					-0.0703	-0.0531
					(-0.69)	(-0.50)
Redistribution d1					-0.247	-0.127
					(-0.21)	(-0.10)
Redistribution d2					-0.928	-0.882
					(-1.56)	(-1.40)
Constant	8.744^{***}	8.434^{***}	9.694^{***}	9.208^{***}	9.634^{***}	9.266^{***}
	(4.96)	(4.66)	(4.92)	(4.56)	(4.73)	(4.41)
Observations	876	816	876	816	876	816
Adj. R-Squared	0.4132	0.4069	0.4164	0.4124	0.4244	0.4171
F-Test	42.08	38.28	29.38	27.00	25.81	23.43

t statistics in parentheses
† $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Period dummies included in every model

6.3. Summarized Results and Relevance for existing Findings

The findings of my experiment are in line with the results of others in this field, when cooperation under a standard public goods game is compared to those using ostracism. Contributions are significantly higher in both treatments using ostracism. In the short-term exclusion treatment, subjects contributed on average 72.2% of their endowments. In the irreversible exclusion treatment, subjects contributed 80% of endowments on average to the public good, and in the baseline treatment, 60% (50%) of the endowment were contributed. Efficiency is also significantly higher in both exclusion treatments compared to the baseline treatment. Subject's efficiency reached 78.4% in the short and 83.7% in the irreversible exclusion treatment. In the baseline treatment, the efficiency amounted to 76.5%(70.6%). Masclet (2003), Cinyabuguma et al. (2005) and Maier-Rigaud et al. (2010) found similar effects of the threat of exclusion on contributions, but all of them used different parameters concerning the mechanism of exclusion.

I contribute to the existing literature by comparing short exclusion to irreversible exclusion in a public goods game. My findings of this comparison disagree with the predictions of Hirshleifer and Rasmusen (1989), who proposed that the harshness of the exclusion does not influence cooperation. Short- and long-term exclusion should have the same effect on contributions, according to their argument. I found that subjects behave differently under the threat of short and irreversible exclusion. The findings also add information to the game-theoretic predictions of Tsebelis (1990). When the probability of detecting a crime is held constant, the harshness of the punishment has an influence on behavior. Less subjects were excluded in the treatment with irreversible exclusion. This finding is in line with Tsebelis' argument, that the enforcement of punishment is less when the punishment is higher. Even though exclusion was used far less in the irreversible treatment, the results of my experiments suggest that a harsher threat leads to higher contributions and efficiency. Contributions in the irreversible exclusion treatment are higher than in the short-term exclusion treatment. Efficiency is also higher in the irreversible exclusion treatment. As only a few subjects were excluded, the stronger negative effect of actual irreversible exclusion (and not only the effect of the threat) on efficiency cannot be compared to efficiency under short term exclusion.

The regression analysis on contributions suggest that subjects that were excluded for one period learned from this experience and raised their own contributions substantially. Surprisingly, the expected warning effect of received votes does not show a positive influence, but instead a negative. Even though it is very small, it is opposed to the findings of Cinyabuguma et al. (2005), who found a significant positive effect of received votes on contributions. In my experiment it seems that the contributions of others are the main point of orientation. The actions of others do have an influence on subjects behavior and the threat of exclusion is anticipated. The expected upwards spiral in contributions is found in both exclusion treatments, but it is stronger under the threat of irreversible exclusion. The anticipation of the "grim-trigger" of irreversible exclusion enhances cooperation faster and higher than short-term exclusion. Cinyabuguma et al. (2005) and Maier-Rigaud et al. (2010) also came to the conclusion that irreversible exclusion is an effective way to enhance cooperation and still achieve higher welfare than in a standard environment.

7. Conclusion

This thesis deals with the effect that the threat of ostracism has on cooperation in a public goods game. I add to the existing body of literature by comparing short and irreversible exclusion in a laboratory experiment. The design of the experiment is chosen very similar to the existing ones, but offers the possibility to compare the effect of different types of exclusions, with all remaining parameters being equal. Until this point, both the influence of the threat of irreversible and short-term exclusion have been tested in the laboratory, but only under different settings. By combining I challenged the theoretical proposition of Hirshleifer and Rasmusen (1989), who claimed that the harshness of exclusion does not make a difference. The data of my experiment suggests that the harshness of exclusion does have a different influence on the behavior of subjects.

The design of my experiment combines the designs from the experiments of Masclet (2003), Cinyabuguma et al. (2005) and Maier-Rigaud et al. (2010) with the theoretical proposition of Hirshleifer and Rasmusen (1989). My findings confirm the ones of the first experiment. The threat of short-term exclusion has a positive effect on contributions and efficiency compared to a standard public goods game. They confirm the positive effects a threat of irreversible exclusion has on contributions and on efficiency of the latter two experiments. The chosen design allows the direct comparison of these two mechanisms under same conditions. The effect of irreversible exclusion, and the threat of it, is stronger than the effect short-term exclusion has on contributions and efficiency.

The findings have to be viewed with care, as there are some limitations to my experiment. Some of the limitations were drawn from the sample size per treatment, while others were drawn from the design itself. The effect of actual irreversible exclusion cannot be estimated, as only two exclusions in total occurred. The limitation of the sample size is also highlighted by the baseline treatment in which one of the four groups raised the mean contribution level above the normally observed levels.

I conclude that the exclusion of subjects from a public good game can be a fruitful way to enhance cooperation, and that the harshness of the exclusion does have a different influence on cooperative behavior.

References

Ahn, T., Isaac, R. M., & Salmon, T. C. (2008). Endogenous group formation. *Journal of Public Economic Theory*, *10*(2), 171–194.

Ahn, T., Isaac, R. M., & Salmon, T. C. (2009). Coming and going: Experiments on endogenous group sizes for excludable public goods. *Journal of Public Economics*, *93*, 336–351.

Baldry, J. (1987). Income tax evasion and the tax schedule. *Public Finance*, *42*, 357–383.

Bochet, O., Page, T., & Putterman, L. (2006). Communication and punishment in voluntary contribution experiments. *Journal of Economic Behavior and Organization*, *60*(1), 11–26.

Bohm, P. (1972). Estimating demand for public goods: An experiment. *European Economic Review*, *3*, 111–30.

Brandts, J., Saijo, T., & Schram, A. (2004). How universal is behavior? A four country comparison of spite and cooperation in voluntary contribution mechanisms. *Public Choice*, *119*(3-4), 381–424.

Burlando, R. M., & Guala, F. (2005). Heterogeneous agents in public goods experiments. *Experimental Economics*, *8*(1), 35–54.

Charness, G., & Rabin, M. (2002). Understanding social preferences with simple tests. *The Quarterly Journal of Economics*, *117*, 817– 869.

Charness, G., & Yang, C.-L. (2014). Starting small toward voluntary formation of efficient large groups in public goods provision. *Journal of Economic Behavior & Organization*, *102*, 119–132.

Chaudhuri, A. (2011). Sustaining cooperation in laboratory public goods experiments: a selective survey of the literature. *Experimental Economics*, *14*(1), 47–83.

Chaudhuri, A., & Paichayontvijit, T. (2006). Conditional cooperation and voluntary contributions to a public good. *Economics Bulletin*, *3*(8), 1–14.

Cinyabuguma, M., Page, T., & Putterman, L. (2005). Cooperation under the threat of expulsion in a public goods experiment. *Journal of Public Economics*, *89*(8), 1421–1435.

Croson, R., Neugebauer, T., & Morales, A. J. (2010). *A laboratory study on forced ranking in team production A laboratory study on forced ranking in team production* (Vol. 6285).

Dawes, R. (1980). Social Dilemmas. *Annual Review of Psychology*, *31*, 169–193.

Dawes, R., McTavish, J., & Shaklee, H. (1977). Behavior, communication, and assumptions about other people's behavior in a commons dilemma situation. *Journal of Personality and Social Psychology*, *35*(1), 1–11.

De Oleveira, A., Croson, R. T., & Eckel, C. C. (2009). *One bad apple: uncertainty and heterogeneity in public good provision.*

Diekmann, A. (2008). Soziologie und Ökonomie: Der Beitrag experimenteller Wirtschaftsforschung zur Sozialtheorie. *KZfSS Kölner Zeitschrift für Soziologie und Sozialpsychologie*, *60*(3), 528–550.

Druckman, J. N., & Kam, C. D. (2011). Students as Experimental Participants. A Defense of the Narrow Database. In J. Druckman, D. P. Green, J. H. Kuklinski, & A. Lupia (Eds.), *Cambridge handbook of experimental economics* (pp. 41–57). Cambridge: Cambridge University Press.

Ehrhart, K.-M., & Keser, C. (1999). *Mobility and cooperation: On the run.* Montréal.

Ertan, A., Page, T., & Putterman, L. (2009). Who to punish? Individual decisions and majority rule in mitigating the free rider problem. *European Economic Review*, *53*(5), 495–511.

Fehr, E., & Gachter, S. (2000). Cooperation and punishment in public goods experiments. *American Economic Association*, *90*(4), 980–994.

Fehr, E., & Gächter, S. (2002). Altruistic punishment in humans. *Nature*, *415*, 137–140.

Fehr, E., & Gintis, H. (2007). Human motivation and social cooperation: Experimental and analytical foundations. *Annual Review of Sociology*, *33*(1), 43–64. doi: 10.1146/annurev.soc.33.040406.131812

Fehr, E., & Schmidt, K. (1999). A theory of fairness, competition and co-operation. *Quarterly Journal of Economics*, *114*, 917–898.

Fischbacher, U. (2007). z-Tree: Zurich Toolbox for Ready-made Economic Experiments. *Experimental Economics*, *10*(2), 171–178.

Fischbacher, U., & Gächter, S. (2009). *On the behavioral validity of the strategy method in public good experiments. Discussion Paper No. 2009-25.*

Fischbacher, U., & Gächter, S. (2010). Social preferences , beliefs , and the dynamics of free riding in public goods experiments. *The American Economic Review*, *100*(1), 541–556.

Fischbacher, U., Gächter, S., & Fehr, E. (2001). Are people conditionally cooperative? Evidence from a public goods experiment. *Economics Letters*, *71*(3), 397–404.

Foucault, M. (1976). *Überwachen und Strafe.* Frankfurt am Main: Surkamp.

Gächter, S., Renner, E., & Sefton, M. (2008). The long-run benefits of punishment. *Science*, *322*(5907), 1510.

Gächter, S., & Thöni, C. (2005). Social learning and voluntary cooperation among like-minded people. *Journal of the European Economic Association*, *3*(2), 303–314.

Greiner, B. (2004). *The Online Recruitment System ORSEE 2.0—A Guide for the Organization of Experiments in Economics.*

Guala, F. (2012). Reciprocity: weak or strong? What punishment experiments do (and do not) demonstrate. *Behavioral and Brain Sciences*, *35*, 1–59.

Gunnthorsdottir, A., Houser, D., & McCabe, K. (2007). Disposition, history and contributions in public goods experiments. *Journal of Economic Behavior and Organization*, *62*(2), 304–315.

Gürerk, O., Irlenbusch, B., & Rockenbach, B. (2006). The competitive advantage of sanctioning institutions. *Science*, *312*(5770), 108–111.

Hardin, R. (1968). The tragedy of the commons. *Science*, *162*, 1243–1248.

Herrmann, B., & Thöni, C. (2009). Measuring conditional cooperation: A replication study in Russia. *Experimental Economics*, *12*(1), 87–92.

Herrmann, B., Thöni, C., & Gächter, S. (2008). Antisocial punishment across societies. *Science*, *319*(5868), 1362–1367.

Hirshleifer, D., & Rasmusen, E. (1989). Cooperation in a repeated prisoner's dilemma with ostracism. *Journal of Economic Behavior & Organization*, *12*(1), 87–106.

Hobbes, T. (1651). *Leviathan.* New York: Penguin.

Isaac, R. M., & Walker, J. M. (1988). Group size effects in public goods provision: the voluntary contributions mechanism. *The Quarterly Journal of Economics*, *103*(1), 179–199.

Kerr, N. L., Rumble, A. C., Park, E. S., Ouwerkerk, J. W., Parks, C. D., Gallucci, M., & a.M. van Lange, P. (2009). "How many bad apples does it take to spoil the whole barrel?": Social exclusion and toleration for bad apples. *Journal of Experimental Social Psychology*, *45*(4), 603–613.

Keser, C., & van Winden, F. (2000). Conditional cooperation and voluntary contributions to public goods. *Scandinavian Journal of Economics*, *100*(1), 23–39.

Kim, P. (2014). A simple model of ostracism formation. *PloS one*, *9*(4), 1–6.

Kocher, M. G., Cherry, T., Kroll, S., Netzer, R. J., & Sutter, M. (2008). Conditional cooperation on three continents. *Economics Letters*, *101*(3), 175–178.

Kurzban, & Houser. (2005). An experimental investigation of cooperative types in human groups: a complement to evolutionary theory and simulations. *Proceedings of the National Academy of Sciences*, *102*(5), 1803–1807.

Laffont, J.-J. (1975). Macroeconomic onstraints, economic efficiency and ethics: An introduction to Kantian economics. *Economica*, *42*(168), 430–437.

Ledyard, J. O. (1995). Public goods: A survey of experimental research. In J. H. Kagel & A. E. Roth (Eds.), *Handbook of experimental economics* (pp. 111–194). Princeton: Princeton University Press.

Lindahl, E. (1958). Just taxation - a positive solution (1919). In R. Musgrave & A. Peacock (Eds.), *Classics in the theory of public finance.* London: Mcmillan.

Maier-Rigaud, F. P., Martinsson, P., & Staffiero, G. (2010, March). Ostracism and the provision of a public good: experimental evidence. *Journal of Economic Behavior & Organization*, *73*(3), 387–395.

Marwell, G., & Ames, R. E. (1979). Experiments on the provision of public goods. Resources, interest, group size, and the free-rider problem. *American Journal of Sociology*, *84*, 1335–13360.

Masclet, D. (2003). Ostracism in work teams: a public good experiment. *International Journal of Manpower*, *24*(7), 867 – 887.

Masclet, D., Noussair, C., Tucker, S., & Villeval, M. C. (2003). Monetary and nonmonetary punishment in the voluntary contributions mechanism. *American Economic Review*, *93*, 366–380.

Masters, R. (1984). Ostracism, voice and exit: The biology of social participation. *Social Science Inforamtion*, *23*, 877–893.

Nikiforakis, N. (2008). Punishment and counter-punishment in public good games: can we really govern ourselves? *Journal of Public Economics*, *92*, 91–112.

Nikiforakis, N., & Engelmann, D. (2011, May). Altruistic punishment and the threat of feuds. *Journal of Economic Behavior & Organization*, *78*(3), 319–332.

Olson, M. (1971). *The logic of collective action. Public goods and the theory of groups* (2. ed.). Cambridge; Massachusetts: Harvard University Press.

Ones, U., & Putterman, L. (2007, April). The ecology of collective action: A public goods and sanctions experiment with controlled group formation. *Journal of Economic Behavior & Organization*, *62*(4), 495–521.

Ostrom, E. (2005). *Understanding institutional diversity.* Princeton: Princeton University Press.

Ostrom, E., Walker, J., & Gardner, R. (1992). Covenants with and without a sword: Self-governance is possible. *The American Political Science Review*, *86*(2), 404–417.

Page, T., Putterman, L., & Unel, B. (2005). Voluntary association in public goods experiments: Reciprocity, mimicry and efficiency. *The Economic Journal*, *115*(506), 1032–1053.

Roth, A. E. (1995). Introduction to experimental economics. In J. H. Kagel & A. E. Roth (Eds.), *Handbook of experimental economics* (pp. 3–110). Princeton: Princeton University Press.

Sefton, M., Shupp, R., & Walker, J. M. (2007). The effect of rewards and sanctions in provision of public goods. *Economic Inquiry*, *45*(4), 671–690.

Selten, R. (1975). Re-examination of the perfectness concept for equilibrium in extensive games. *International Journal of Game Theory*, *4*, 22–25.

Sonnemans, J., Schram, A., & Offerman, T. (1999). Strategic behavior in public good games: when partners drift apart. *Economics Letters*, *62*(1), 35–41.

Struthers, J., & Young, A. (1989). Economics of voting: theories and evidence. *Journal of Economic Studies*, *16*(5).

Tiebout, C. M. (1956). A pure theory of local expenditures. *The ournal of political economy*, *64*(5), 416–424.

Tsebelis, G. (1990). Penalty has no impact on crime: A game-theoretic analysis. *Rationality and Society*, *2*(3), 255–286.

Tsebelis, G. (1993). Penalty and crime: further theoretical considerations and empirical evidence. *Journal of Theoretical Politics*, *5*(3), 349–374.

Van Beest, I., Williams, K. D., & Van Dijk, E. (2011, February). Cyberbomb: effects of being ostracized from a death game. *Group Processes & Intergroup Relations*, *14*(4), 581–596.

Webster, M., & Sell, J. (2007). Why do Experiments? In *Laboratory experiments in the social sciences* (pp. 6–24).

Williams, K. D. (2001). *Ostracism: The power of silence.* New York: Guilford Press.

Williams, K. D. (2007). Ostracism. *Annual review of psychology*, *58*, 425–52.

Williams, K. D., Forgas, J. P., & von Hippel, W. (2005). *The social outcast: Social exclusion, rejection, and bullying.* New York: Cambridge University Press.

Yamagishi, T. (1986). The provision of a sanctioning system as a public good. *Journal of Personality and Social Psychology*, *51*(1), 110–116.

Yamagishi, T. (1988). The provision of a sanctioning system in the United States and Japan. *Social Psychology Quarterly*, *51*(3), 265.

Zelditch, M. (2014). Laboratory experiments in sociology. In *Laboratory experiments in the social sciences* (2nd ed., pp. 183–197). London: Elsevier.

A. Appendix - Graphs

Graph of average contributions of all groups individually

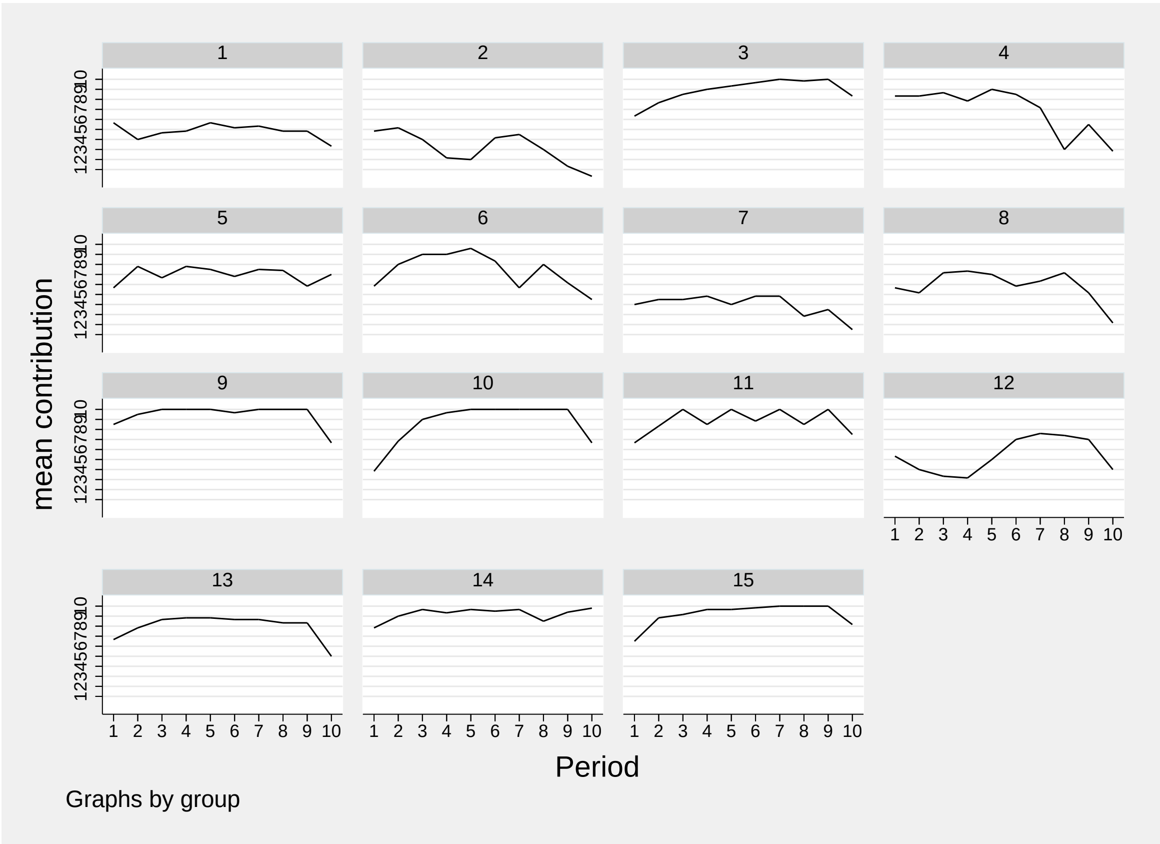

Figure A.1.: Average contributions of all groups

treatment 1: group 1 - 4

treatment 2: group 5 - 11

treatment 3: group 12 - 15

B. Appendix - Questionnaire (German)

Pre-Experimental Questionnaire

The questions used in the pre- and post-experimental questionnaire are taken from the European Social Survey (ESS), from different years. Each questions origin is marked individually. All questionnaires can be viewed and downloaded at www.europeansocialsurvey.org. As the experiment was conducted in German, I used the German translation of the questionnaire.

1. Ganz allgemein gesprochen: Glauben Sie, dass man den meisten Menschen vertrauen kann, oder dass man im Umgang mit anderen Menschen nicht vorsichtig genug sein kann? Bitte sagen Sie es mir anhand dieser Skala von 0 bis 10. 0 bedeutet, dass man nicht vorsichtig genug sein kann, und 10 bedeutet, dass man den meisten Menschen vertrauen kann. (ESS German 2008 – Welfare Attitudes, question A8)

2. Glauben Sie, dass die meisten Menschen versuchen, Sie auszunutzen, wenn sie die Gelegenheit dazu haben, oder versuchen die meisten Menschen, sich fair zu verhalten? 0 Bitte sagen Sie es mir anhand dieser Skala von 0 bis 10. 0 bedeutet, dass die meisten Menschen versuchen, Sie auszunutzen, und 10 bedeutet, dass die meisten Menschen versuchen, sich fair zu verhalten. (ESS German 2008 – Welfare Attitudes, question A9)

3. Und glauben Sie, dass die Menschen meistens versuchen, hilfsbereit zu sein, oder dass die Menschen meistens auf den eigenen Vorteil bedacht sind? 0 Bitte sagen Sie es mir anhand dieser Skala von 0 bis 10. 0 bedeutet, dass die Menschen meistens

nur auf ihren eigenen Vorteil bedacht sind, und 10 bedeutet, dass die Menschen meistens hilfsbereit sind. (ESS German 2008 – Welfare Attitudes, question A19)

4. Menschen, die das Gesetz brechen, sollten viel härter bestraft werden, als sie heute bestraft werden. Stimme stark zu (1) – lehne stark ab (5)

   (ESS Germany 2010 – Justice, question D33)

5. Es gibt unterschiedliche Vorstellungen darüber, welche Strafen Täter bekommen sollten. Stellen Sie sich beispielsweise einen 25-Jährigen vor, der zum zweiten Mal wegen Einbruch verurteilt wird. Welche der folgenden Strafen sollte er Ihrer Ansicht nach bekommen? 1.) Gefängnisstrafe 2.) Freiheitsstrafe auf Bewährung 3.) Geldstrafe 4.) Gemeinnützige Arbeit 5.) Eine andere Strafe

   (ESS Germany 2010 – Justice, question D38)

6. In der Politik spricht man manchmal von "links" und "rechts". Wo auf der Skala würden Sie sich selbst einstufen, wenn 0 für links steht und 10 für rechts?

   (ESS German 2008 – Welfare Attitudes, question B23)

Post-Experimental Questionnaire

1. Der Staat sollte Maßnahmen ergreifen, um Einkommensunterschiede zu verringern

   Stimme stark zu (1) – lehne stark ab (5)

   (ESS German 2008 – Welfare Attitudes, question B30)

2. Große Einkommensunterschiede sind gerechtfertigt, um unterschiedliche Begabungen und Leistungen angemessen zu belohnen Stimme stark zu (1) – lehne stark ab (5)

   (ESS German 2008 – Welfare Attitudes, question D1)

3. Man sollte bei der Steuererklärung nicht schwindeln. Stimme stark zu (1) – lehne stark ab (5)

(ESS Germany 2004 – Economic Morality, question E3)

4. Viele Sozialleistungen werden aus Steuergeldern finanziert. Wenn sich der Staat zwischen zwei Alternativen entscheiden müsste, was sollte er wählen? Entweder die Steuern erhöhen und mehr für Sozialleistungen ausgeben oder die Steuern senken und weniger für Sozialleistungen ausgeben? 0-10 Steuern senken und weniger Sozialleistungen (0) Steuern erhöhen für mehr Sozialleistungen (10)

   (ESS German 2008 – Welfare Attitudes, question D34)

5. Stellen Sie sich nun bitte zwei Personen vor. Eine verdient doppelt so viel wie die andere. Auf dieser Liste stehen drei Aussagen darüber, was diese Personen an Steuern bezahlen sollten. Welche kommt Ihrer Ansicht am nächsten?

   1.) Beide sollten den gleichen Anteil(den gleichen Prozentsatz) ihres Einkommens an Steuern bezahlen. Dies bedeutet, dass die Person, die doppelt so viel verdient, doppelt so viel Steuern bezahlt. 2.) Die Person, die mehr verdient, sollte einen höheren Anteil (den höheren Prozentsatz) ihres Einkommens an Steuern bezahlen. Dies bedeutet, dass die Person, die doppelt so viel verdient, mehr als doppelt so viel Steuern bezahlt. 3.) Beide sollten den genau gleichen Betrag an Steuern zahlen, unabhängig von der unterschiedlichen Höhe ihres Einkommens.

   (ESS German 2008 – Welfare Attitudes, question D35)

6. Sind Sie... männlich weiblich

7. Wie alt sind Sie?

8. Was studieren Sie?

9. Wie viele Stunden arbeiten Sie neben dem Studium? 0 1-10 11-20 21-30 30 und mehr

C. Appendix - Instructions (German)

Here you can find the instructions which were handed to the participants. This are the instructions for treatment 2, using short exclusion. The instructions to the third treatment vary only in the time of exclusion. Participants in treatment 1 recieved a shorter sheet of instructions, without any information about exclusion.

Herzlich Willkommen!
Die Instruktionen für das Experiment erhalten Sie auf den folgenden Seiten. Für Ihr Erscheinen erhalten Sie 8€ , wenn Sie die Instruktionen genau lesen, können Sie bis zu 15€ zusätzlich verdienen. Die experimentellen Geldeinheiten (mit $ beschriftet) werden zu einem bestimmten Kurs in Euro gewechselt. Der Kurs: 1$ = 0,05€. Der von Ihnen verdiente Betrag aus den Experimenten wird am Ende in Euro an Sie ausbezahlt. Alle Ihre Entscheidungen sind anonym und der Ihnen ausbezahlte Betrag ist nur Ihnen bekannt.

Während des Experiments ist es nicht erlaubt, mit anderen Teilnehmern zu kommunizieren. Wenn Sie Fragen haben, heben Sie bitte die Hand. Die Fragen werden dann individuell beantwortet. Es ist wichtig, dass Sie sich an diese Regel halten, ansonsten werden Sie ohne Auszahlung vom Experiment ausgeschlossen.

Eine schnelle Entscheidung bringt keinen Vorteil. Sie können durch eine schnelle Entscheidung die Dauer des Experiments nicht verkürzen.

Das Experiment Sie befinden sich zu sechst in einer Gruppe. Alle Mitglieder Ihrer Gruppe erhalten exakt die gleichen Informationen. Für die nächsten 10 Runden bleiben Sie mit diesen Personen in einer Gruppe. Am Beginn jeder Runde erhält jedes Mitglied 10$ (experimentelle Geldeinheiten) als Anfangsausstattung. Von diesen 10$ können die Spieler einen ganzzahligen Betrag ihrer Wahl von 0 bis 10€ in ein gemeinsames Projekt mit den anderen Spielern investieren. Der nicht-investierte Rest verbleibt im Besitz des Spielers. Nachdem alle Spieler ihre Entscheidung getroffen haben, wird der von der Gruppe in das Projekt investierte Gesamtbetrag zusammengezählt. Sie und jedes andere Gruppenmitglied erhalten je 40% der Summe aller Beiträge. Ihr Profit aus dem Gruppenprojekt entspricht 40% aller Investitionen der gesamten Gruppe in das gemeinsame Projekt. Die Berechnung ist wie folgt:
Profit aus dem Gruppenprojekt = (Summe aller Beiträge der Gruppe) * 0.4
Ihr gesamter Profit aus einer Runde beträgt damit:
Profit = Ausstattung - eigens investierter Beitrag + (Summe aller Beiträge) * 0.4
Am Ende des Experimentes werden die Profite aus den Runden aufsummiert. Auf der folgenden Seite werden Sie ein paar Beispiele rechnen, damit Sie sich ein besseres Bild davon machen können, wie Ihr Profit zustande kommt. Sie finden auch auf dem Bildschirm noch einmal die wichtigsten Informationen.

Bitte beantworten Sie die Fragen auf dem Bildschirm. Durch klicken auf das Taschenrechner-Symbol öffnet sich ein Rechner auf Ihrem Bildschirm. Auf der nächsten Seite finden Sie die Lösungen.

Zweiter Teil der Runde: Die Möglichkeit des Ausschlusses anderer Gruppenmitglieder Im zweiten Teil jeder Runde können Sie darüber entscheiden, ob ein Gruppenmitglied für eine Runde aus der Gruppe ausgeschlossen werden soll. Ein ausgeschlossenes Mitglied kann nicht in das Gruppenprojekt investieren, erhält keinen Profit aus dem Gruppenprojekt und kann nicht über den Ausschluss anderer Mitglieder abstimmen. Am Bildschirm erhalten Sie Information über die individuellen Beiträge aller Gruppenmitglieder zum Gruppenprojekt. Neben den Beiträgen der Anderen befinden sich zwei Kästchen. Diese dienen dazu, abzustimmen, ob ein anderes Gruppenmitglied ausgeschlossen werden soll. Eines ist beschriftet mit "soll in der Gruppe bleiben", das andere mit "soll ausgeschlossen werden". Hier können Sie Ihre Stimme abgeben. Ein Gruppenmitglied wird dann ausgeschlossen, wenn mindestens die Hälfte der Gruppe für den Ausschluss stimmt. Wenn also 5 Personen in einer Gruppe über den Ausschluss des sechsten Mitglieds entscheiden, sind 3 Stimmen notwendig. Wenn sich nur noch 5 Personen in einer Gruppe befinden und 4 Personen abstimmen, dann genügen zwei Stimmen, um das fünfte Mitglied auszuschließen.

Die ausgeschlossene Person erhält 5$ Ausstattung. Nach einer Runde wird die ausgeschlossene Person wieder in die Gruppe aufgenommen. Jede abgegebene Stimme für den Ausschluss eines Gruppenmitgliedes kostet den Wähler bzw. die Wählerin 0.50$.

Der Ausschluss eines Gruppenmitgliedes hat aber nicht nur Auswirkungen auf die ausgeschlossene Person. Bitte beantworten Sie die Fragen auf dem Bildschirm. Durch klicken auf das Taschenrechner-Symbol öffnet sich ein Rechner auf Ihrem Bildschirm. Auf der nächsten Seite finden Sie die Lösungen.
Bitte beantworten Sie auch die Verständnisfragen auf der nächsten Seite. Die Lösungen finden Sie auf der darauffolgenden Seite. Danach bitten wir Sie noch, einen kurzen Fragebogen zu beantworten. Klicken Sie bitter auf den „Weiter“-Button am Bildschirm, wenn Sie die Fragen beantwortet haben. Das Experiment beginnt, wenn alle Teilnehmer die Fragen beantwortet haben.

D. Appendix - Screenshots

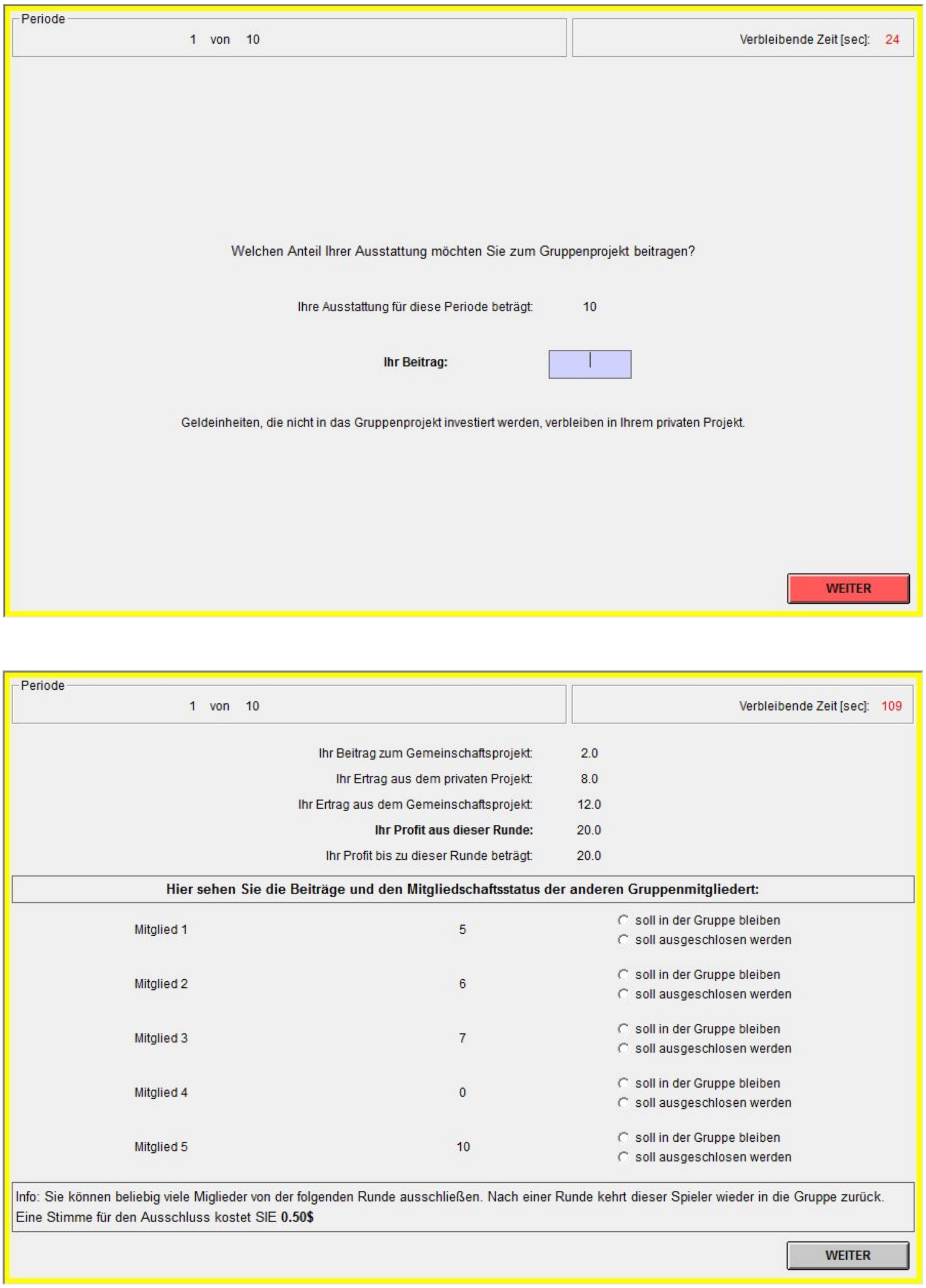

Figure D.1.: Screenshots: Contribution Stage (1) & Voting Stage (2)

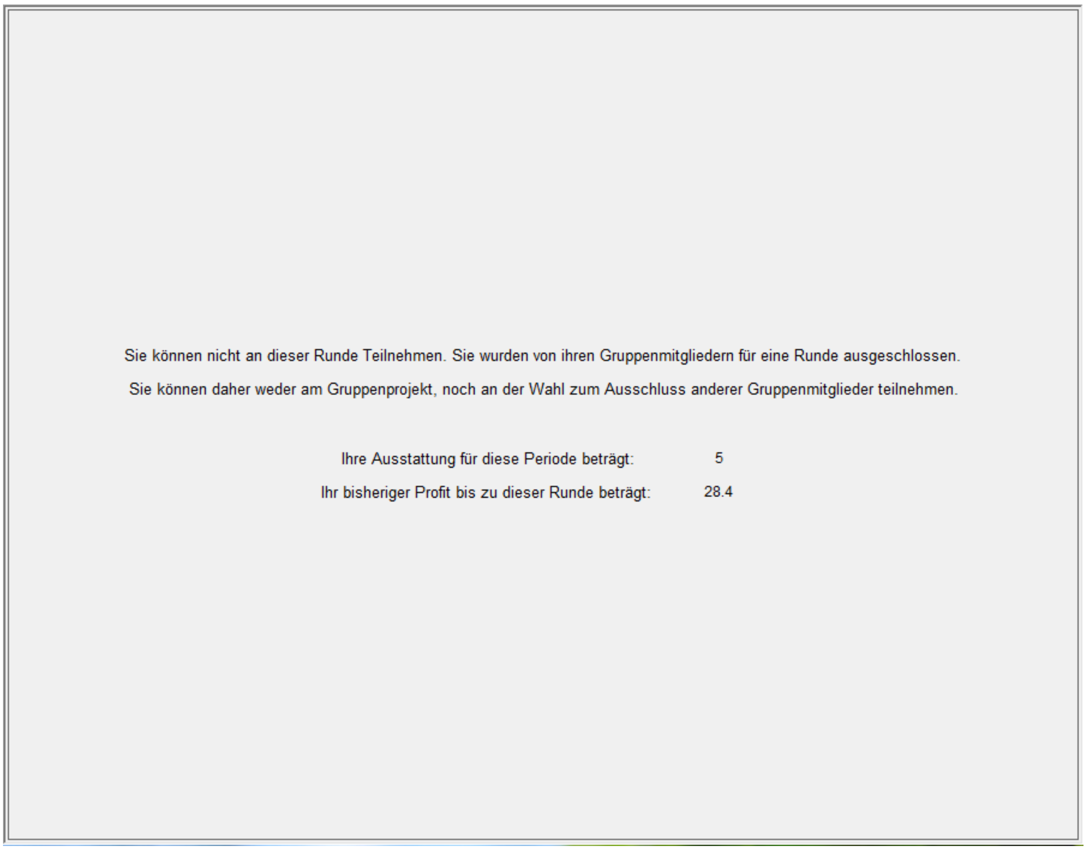

Figure D.2.: Screenshots: Received Votes (3) and Screen of Excluded Subject

Abstract

This thesis examines the effect of short and irreversible exclusion on cooperation in a public goods game. The starting point is the proposition of Hirshleifer and Rasmusen (1989), that claims that the duration of the exclusion does not have an effect on contributions. In this thesis, an economic experiment is used to test the above mentioned proposition. Findings are, that in a public goods game using short exclusion, subjects contributed more and the efficiency was higher than in a standard public goods game. In a public goods game using irreversible exclusion, the contributions and efficiency were even higher. The findings of this experiment support the idea, that ostracism, and the threat of it, is an effective way to enhance cooperation in a public goods environment and that the duration has a different effect on contributions and efficiency.

Abstract

Die vorliegende Masterarbeit untersucht den Einfluss von kurzer und irreversibler Exklusion auf das Verhalten von Personen in einem Public Goods Spiel. Als Ausgangspunkt wurde die theoretische Analyse von Hirshleifer und Rasmusen (1989) gewählt. Dieser zufolge hat die Dauer der Exklusion keinen Einfluss auf das Beitragsverhalten der teilnehmenden Personen. Um die Annahme zu testen, verwende ich ein ökonomisches Laborexperiment. Die Analyse der Daten, im Vergleich zu jenen des Baseline Treatments, lieferten folgende Ergebnisse: 1. Teilnehmer in einem Public Goods Spiel mit kurzer Exklusion tragen mehr dazu bei. 2. Die Gruppen sind effizienter. Noch höhere Beiträge und Effizienz wurden im Public Goods Spiel mit irreversibler Exklusion erzielt. Diese Ergebnisse unterstützen die Idee, dass Ausgrenzung eine effektive Möglichkeit ist, die Kooperation in einem Public Goods Spiel zu steigern und auf einem hohen Level zu halten. Des Weiteren hat sich gezeigt, dass die Dauer der (angedrohten) Exklusion einen unterschiedlichen Einfluss auf das Verhalten der Personen hat.

Curriculum Vitae

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Education

1996-2000	Primary school in Wels, Upper Austria
2000-2008	High school with focus on natural sciences, Anton-Bruckner in Wels
2008-2012	Bachelor of Arts, Sociology, University of Vienna. Theme Bachelor-thesis: Mental illness and poverty in Austria (in German)
2012-2015	Master studies in Sociology, University of Vienna. Specialization: social structure studies, Sociology of health, and organization.

Work Experience

9/2010 - 7/2014	Teaching Assistant at the Department of Economic Sociology, University of Vienna
9/2014 - 1/2015	Research Assistant at the Department of Economic Sociology, University of Vienna

Scientific Interest

Experimental social science, exclusionary mechanisms, poverty research