The Choice for a Punishment Institution in Cooperation Problems

Who is the First to Choose for a Punishment Institution?

Bachelor Thesis Sociology

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Abstract

Punishment is an effective mean for establishing cooperation in cooperation problems. However, when actors get repeatedly the choice between participating within a Punishment Institution or a Punishment Free institution, they initially do prefer the latter one, but later change their preference from a Punishment Free Institution to a Punishment Institution. In this study we explore if three individual characteristics – risk-taking, cognitive empathy and affective empathy – influence the actor's moment of choice for a PI. An actor with a higher degree on risk-taking and cognitive empathy might choose earlier for a PI, whereas for affective empathic actors it is expected they could both choose earlier or later for a Punishment Institution. Hypotheses are tested in an interactive experiment and linear regression is used for the analyses. The results do not confirm that risk-taking, cognitive empathy and affective empathy are predictors for the moment of choice for a PI. The study however could function as a steppingstone to further research that should be conducted to discover if there are other individual characteristics predicting the moment of choice for a PI.

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1. Introduction

Throughout human history people have always been cooperating for the purpose of public goods: a good or service of which the benefits can be enjoyed by all members in a group regardless of their contribution to its provision (Fehr and Gächter, 2002; Yamagishi, 1986). Examples include public defense, dikes, streetlights, judicial protection and a livable environment: everyone benefits from public goods, but they cannot be established individually. However, with the provision and maintenance of public goods come social dilemmas, or cooperation problems (Fehr and Gächter, 2002; Gürerk, Irlenbusch and Rockenback, 2006; Yamagishi, 1986). This is illustrated by reference to the following example: a group of students has to hand in an assignment together. It is important for each group member that the assignment is of good quality, since it influences his grade and it is highly probable that each student would like to achieve a good grade. Contributing does however take time and effort which could otherwise be spent on a private endeavor, for example studying for an exam. In other words, it is likely that individuals will try to get the best grade whilst minimizing costs, i.e. to contribute as little as possible to the assignment but to get the best possible result.

This situation is a typical cooperation problem: the students can take advantage of the effort made by the other students. There is no need for the individual student to contribute to the assignment if others are already making an effort. This behavior is known as free riding, a term used throughout this paper. At the same time, if all students act in this way, there will be no cooperation and the public good – in this case the assignment – will not be established. Students are then worse off compared to when they would all have contributed their share.

For such public goods problems, the possibility of peer punishment can serve as a solution. This implies that students can impose a negative sanction on their fellow group members: whenever one (or more) of the students contribute(s) considerably less than the others, each individual student can decide to report this behavior to the relevant teacher. This possibly negative sanction for free riding might lead to more equal involvement of every student in the assignment, stimulating cooperation positively. Indeed, it has been proven that the mere possibility of punishment increases individual contributions to the public good (Drouvelis and Jamison, 2012; Fehr and Gächter, 2002).

Notice that, before such a punishment institution (PI) is introduced, a process of choice takes place: the possibility of punishment can be implemented endogenously – i.e. the group members choose by themselves that punishment is possible – or exogenously – the possibility of punishment is implemented in advance, the group members do not have a choice – (Sutter,

Haigner and Kocher, 2010). In this paper the focus is on the endogenously chosen PI: in order to prevent potential free riding behavior, the group of students can decide to introduce a PI in which it is possible to punish their peers.

Experiments concerning cooperation problems show that when actors can choose endogenously, they initially do not have a preference for a PI. In their research, Gürerk et al. (2006) have studied what happens when actors get the choice whether they want to cooperate in an institution in which they can punish or reward others or within an institution in which this is not possible (this is by the authors respectively referred to as a sanctioning institution (SI) and a sanctioning free institution (SFI)). The results of this study show that initially actors choose for an SFI rather than an SI, but after a while the entire population migrates to the SI. In another experiment actors could choose whether they wanted to allow punishment of fellow actors in the cooperation problem or not (Ertan, Page and Putterman, 2009). This study shows that initially actors do not allow any punishment, but after several interactions the majority votes for a possibility of punishment of below-average contributors.

According to the above results it is very likely that initially the students in the example do not want to introduce the possibility to punish group members, but after experiencing free riding behavior of other students several times, they might realize that punishment can serve as a solution. However, studies that attempt to explain why actors finally choose for a PI are rare. Thus far, the question of what mechanisms cause actors to switch from a preference for a PFI to a PI receives hardly any attention.

Drouvelis and Jamison (2012) however, found a weak link between individual characteristics and elicited preferences over institutions. Their research suggests, although carefully, that particular individual characteristics affect the choice for a certain institution. In this study therefore we attempt to discover what individual characteristics underlie the switch from a certain institution to another. Specifically, we look at the moment an actor chooses for a PI instead of a punishment free institution (PFI). By answering the question: *what individual characteristics are related to the first interaction an actor chooses for a punishment institution in a cooperation problem?*, we aim to explore who are the first ones changing their preference from a PFI to a PI. We consciously formulate this question in terms of timing. Timing is very important in this context for we expect that actors with certain individual characteristics choose earlier for a PI than other actors, when they repeatedly get this choice.

Drouvelis and Jamison (2012) state that it is important to consider individual attitudes towards risks when studying the choice of actors for a certain institution. Referring to the aforementioned example, a PI may be preferred by risk-taking students. After all, a PI has the potential to have negative consequences for the individual: there is a chance the student gets punished himself.

Besides risk-taking, Drouvelis and Jamison (2012) mention the importance of cognition in choosing for a certain institution. Cognitive empathy enables a person to reason from the perspective of others (Batson, Early and Salvarani, 1997; Lamm, Batson and Decety, 2007). It could be that an early choice for a PI in the cooperation problem of the students requires that a student can reason from the perspective of the others and can predict that the others might free ride when the possibility of punishment is not present.

Finally, a characteristic closely linked to cognitive empathy is affective empathy (Reniers, Corcoran, Drake, Shryane and Völlm, 2011). Affective empathy enables an actor to feel the emotions of others and this gives an impulse to help other people (Batson et al., 1997). With regard to the example, the ability to feel the emotions of their group members might affect the moment of choice of the students for a PI due to altruistic reasons.

Thus, in this paper we focus on risk-taking, cognitive empathy and affective empathy as possible predictors for the first interaction an actor in a cooperation problem chooses for a PI.

In sum, this study is an attempt to connect the micro level to the macro level in which the problem takes place. In order to explain what happens on the macro level (the moment of choice for a PI), we need to examine the micro level (the individual characteristics predicting such a choice) more deeply to see if there is a connection to be made between the two levels. Hence, the scientific relevance of this study lies in discovering the individual characteristics underlying the moment of choice for a PI. By trying to elicit these underlying individual characteristics we might contribute to the knowledge of institutional structures and how they are established. This also is important regarding the social relevance of our study. It is of great interest to understand how social institutional structures are selected and established and also what factors are contributing to this process, since institutions are an integral part of our social life and economy. Different societies have different rules to govern their institutions and the development of the rules over time affects the nation's economic performance. Therefore, how institutions are selected and shaped also has implications for the evolution of the human culture and societies (Drouvelis and Jamison, 2012).

The link between the micro level and macro level will be further outlined in the next section in which the theoretical framework will be explained. After the theoretical framework, data and methods will be addressed, in which the experiment used for this study will be described in more detail. Thereafter the dataset and obtained results will be elaborated upon. Finally, a conclusion will be drawn and recommendations for future research will be discussed.

2. Theory and hypotheses

In order to understand the decision situation used in this study, cooperation problems and behavior in cooperation problems will be explained first in this section. Then, the three individual characteristics and their assumed relationships with the first interaction an actor chooses for a punishment institution will be further outlined.

2.1. Cooperation problems

In cooperation problems all actors decide whether they want to cooperate (contribute) or defect (not to contribute) to provide a public good. However, every actor does benefit from the good, including those that defect and did not pay any costs of providing the public good (Fehr and Gächter, 2002). To model these cooperation problems, the Public Goods Game (PGG) or Prisoner's Dilemma (PD) are used in experiments. In these games, all actors receive an amount of money units and they can decide whether they contribute their money units to the public good or not. The difference between the PGG and the PD is that the actors in a PD can only decide whether they contribute the total amount of received money units or not, whereas the actors in a PGG can decide the amount of money units they want to contribute to the public good, if they contribute (Fehr and Fischbacher, 2004). In this study however, only repeated one-shot PD's are used in the experiment: the actors were involved in several interactions and in every interaction they encountered different actors. In the following paragraphs we will refer to these one-shot PD's by the term 'cooperation problem'. After the actors decided whether they contribute their money units or not, the total amount of contributed money units to the public good is multiplied by a number which is greater than one but smaller than the group size. Then, that amount is equally divided among all actors in the game, even among those that defected. Thus, the group as a whole receives the highest payoff when all actors contribute, but each individual receives more money units if he defects while others contribute.

2.2. Rationality assumption and selfishness assumption

Because the yield on contributions is equally divided among all actors, the defectors receive a

higher payoff than the contributors. This initiates free riding, which means that defectors benefit from the contributions of other actors (Fehr and Gächter, 2002; Yamagishi, 1986).

The rationality and selfishness assumptions can be applied to analyze cooperation problems. The selfishness assumption implies that an individual only aims to increase his own material gain (Fehr and Gintis, 2007; Gächter, 2013). The rationality assumption implies that the actor possesses the ability to understand the game and thereby how to maximize his own payoffs (Jones, 1999). A selfish and rational actor will only contribute to a public good when the benefits of his contribution will exceed the costs of it (Yamagishi, 1986). As explained above, in the cooperation problems that we consider, actors maximize their individual payoff by defecting. Thus, under these two assumptions, the strategy that yields the highest payoff for an actor is to defect, regardless what others do. This leads to a situation, a Nash equilibrium, in which none of the actors can gain a higher payoff by changing their individual strategy from defecting to contributing. The rationality assumption and the selfishness assumption therefore predict no contribution in a cooperation problem.

However, the rationality assumption and the selfishness assumption are not always empirically validated. Camerer (2003), Chaudhuri (2011) and Ledyard (1995) review evidence that, even in one-shot cooperation problems, there is more contribution than predicted in the Nash equilibrium of the cooperation problem. Typically, in the first interaction, 50% of the actors contributes. This contradicts the expected Nash equilibrium of no contributions. However, when the cooperation problem is repeated, contributions decline steadily as more actors choose to free ride.

2.3. Punishment institutions

In order to enhance cooperation, a PI can be implemented in a cooperation problem (Fehr and Gächter, 2000, 2002; Yamagishi, 1986). The standard cooperation problem is within a PFI, which means that there is no possibility to punish others. A cooperation problem within a PI implies that it is possible to punish other actors. First, in this institution, a standard cooperation problem is played, but after every actor contributed or not, a screen is shown to every actor, displaying which actors contributed and which actors defected in that interaction. Then, all actors receive another amount of money units for which they can decide to invest in order to punish other actors, or they can keep them for their own earnings. Subsequently, actors who were chosen by others to be punished, lose a certain amount of money units as punishment.

Considering the rationality assumption and the selfishness assumption the Nash equilibrium for a cooperation problem within a PI will be to defect and not to punish. Since punishing costs money units and the rationality assumption and the selfishness assumption predict payoff maximizing behavior, actors will not punish. Taking into account that the other actors because of the same rational and selfish payoff maximizing incentives will do so, no punishment is expected and there will be no contribution.

However, several studies show that again the rationality assumption and the selfishness assumption cannot be empirically validated for they do find that people cooperate and punish when a PI is implemented. Moreover, in a PI there is much more cooperation than in a PFI (Chaudhuri, 2011; Fehr and Fischbacher, 2004; Fehr and Gächter, 2000, 2002).

2.4. Choosing for a PI or PFI

Now suppose that actors themselves can decide by a majority vote which institution they want to implement. Considering the rationality assumption and the selfishness assumption, the choice for a PI or PFI would not matter, because in both institutions none of the actors would contribute because of rational and selfish payoff maximizing incentives. Moreover, none of the actors would choose for a PI considering the risks attached to it, i.e. the risk of being punished.

However, several studies show that when there was an option for choosing between an SI and SFI, initially actors chose for an SFI rather than an SI. But, after a while they changed their choice from an SFI to an SI (Gürerk et al., 2006; Sutter et al., 2010). Note that in an SI it was possible to both punish and reward. Only few studies investigated the mere choice for a PI. In one of these studies it is found that actors first did not want to allow punishment of low contributors, but when they got repeated opportunities, they later changed their minds and did allow punishment of low contributors (Ertan et al., 2009). Moreover, when a PI was implemented and punishing was possible, people eventually did contribute more than in a PFI (Chaudhuri, 2011; Fehr and Gächter, 2002; Fehr and Gintis, 2007).

However, the choice between a PFI and PI is not extensively explored. This study therefore aims to gather more information about actors choosing for a PI rather than a PFI when they are repeatedly exposed to this choice.

2.5. Individual characteristics

Since the rationality assumption and the selfishness assumption are not always empirically validated in cooperation problems and actors eventually choose for a PI instead of a PFI, this change of mind will be further investigated in this study.

What causes this change of mind? Who are the first actors that make this switch? Which individual characteristics are necessary in order to make this switch earlier than others? We integrated these questions into one main question: *what individual characteristics are related to the first interaction an actor chooses for a punishment institution in a cooperation problem?* We consider three individual characteristics – risk-taking, cognitive empathy and affective empathy – as possible predictors for the likelihood to choose earlier for a PI. We consciously chose to formulate our main question and our hypotheses in terms of timing. Timing is very important in this context, for we expect that actors with certain individual characteristics choose earlier for a PI than other actors, when they repeatedly get this choice.

2.5.1. Risk-taking

Although Drouvelis and Jamison (2012) state that individual characteristics are significantly related to economic preferences, which in turn affect behavior in public good settings, extensive research regarding this issue is rare. Their study is mainly focused on the concept of risk-taking, which can be defined as "engagement in behaviors that are associated with some probability of undesirable results" (Boyer, 2006, p. 291). Drouvelis and Jamison (2012) mention that it is important to look at individual attitudes towards risk if people choose whether to participate within a PI or PFI. Indeed, there are risks related to choosing for a PI, e.g. the risk of reduction of your amount of money units when you get punished.

Their focus on risk-taking as an interesting personal characteristic predicting the choice for a PI in cooperation problems, is based on previous laboratory studies that proved that people who are more likely to take risks are more likely to enter into competitive situations or a PI (Bartling, Fehr, Maréchal, Schunk, 2009; Dohmen and Falk, 2011). Drouvelis and Jamison (2012) examined to which extent an actor's risk preference influences his preference for a certain institution, i.e. the PI or the PFI. They expected that risk-taking actors preferred the PI because of the potential of the institution to be detrimental, but also possibly beneficial to the welfare of the actors. Although they expected risk-taking to be a good predictor of preference for a certain kind of institution, they did not find significant results to confirm this expectation. They conclude that further research is required to explore the relationships between personal characteristics – such as risk-taking – and choice for a PI or a PFI.

However, while Drouvelis and Jamison (2012) considered only one opportunity for actors to express their preference for a PFI or a PI, we retest their expectation on repeated voting stages, as Gürerk et al. (2006) found that after actors were involved in several

interactions, they started to adjust their choices for a certain institution. Thus, in every interaction actors had the possibility to change their preference.

Because there are risks related to choosing for a PI we expect that people that score higher on risk-taking will choose earlier for a PI. Especially in this context timing is important, since the risk of choosing for a PI is greater in the first couple of voting stages because less is known about if and how much actors will punish. Therefore our first hypothesis is the following:

H1: *The higher an actor scores on risk-taking, the earlier he will choose for a punishment institution.*

2.5.2. Cognitive empathy

The second individual characteristic that might be related to the moment of choice for a PI is empathy. Two kinds of empathy are distinguished: cognitive empathy and affective empathy (Reniers et al., 2011). Let us start by expounding cognitive empathy, which is defined as "the ability to construct a working model of the emotional state of the others" (Reniers et al., 2011, p. 85). This ability goes along with the ability of perspective taking in the sense that one can imagine how another would feel in a certain situation (Batson et al., 1997; Hoffman, 2008). One perceives the situation of the other and can imagine how the other perceives the situation (Batson et al., 1997).

There are reasons to think that cognitive empathy can play a role in social dilemmas. It is said that for reasoning in games, an individual needs to take certain steps in his way of thinking, a process called 'iterated reasoning' (Camerer, 1997). Camerer (1997) describes how the strategy of an actor in a cooperation problem depends on beliefs about how other actors will act. He states that in order to understand the choices and behavior of fellow actors, some notion of iterated reasoning is required. Through the process of iterated reasoning, actors are better able to foresee the behavior of fellow actors and to anticipate on this. Actors that are good at iterated reasoning and at anticipating that other actors also use iterated reasoning, behave more intelligently in a game than actors that are less able to use iterated reasoning. Not all individuals are equally able to make the steps of thinking required for a certain level of reasoning and therefore there are individual differences in terms of the number of iterated steps of thinking they perform. These differences in iterated reasoning abilities might explain behavioral differences between the individuals in a cooperation problem (Devetag and Warglien, 2003). This could also explain differences between individuals in the moment they choose for a PI. An actor that is better at iterated reasoning, probably realizes earlier than his fellow actors that

a PI is more effective, choosing therefore earlier for this institution.

Cognitive empathy is closely related to this process of iterated reasoning. Cognitive empathic actors are better able to take the perspective of the other person and to empathize in others (Lamm et al., 2007). By placing oneself in the shoes of others, empathic actors better understand the rational way of thinking and behaving of the other actors. This might enable iterated reasoning and to see the consequences of certain measures (Van Miltenburg, Buskens and Raub, 2010). Cognitive empathic actors can therefore, through the process of iterated reasoning and perspective taking, better imagine how other actors will react to the possibility of punishment. They will realize earlier than their fellow actors that a PI will decrease free riding behavior – because the actors fear punishment – and that a PI will increase contributions and cooperation, leading to higher payoffs. Vice versa, they are more likely to realize that within a PFI fellow actors have an incentive to defect. Thus, actors that are more cognitive empathic, will choose earlier than their less cognitive empathic fellow actors for a PI. Therefore, our second hypothesis reads:

H2: *The higher an actor scores on cognitive empathy, the earlier he will choose for a punishment institution.*

2.5.3. Affective empathy

As mentioned before there are two kinds of empathy. Besides cognitive empathy we take into account affective empathy. Reniers et al. (2011) define affective empathy as "the ability to be sensitive to and vicariously experience the feelings of others" (p. 85). It is about the ability to feel the emotions of others. An affective empathic actor is able to imagine how he would feel if he was in the position of another, giving an impulse to help the other (Batson et al., 1997; Hoffman, 2008).

Studies show that there is a significant relationship between affective empathy and pro-social and cooperative behavior (Eisenberg and Miller, 1987; Hoffman, 2008). Eisenberg and Miller (1987) state that an important type of pro-social behavior is altruistic behavior: voluntary, intentional behavior that results in benefits for another, without expecting to get any reward or to avoid any punishment by it. Altruistic behavior include cooperative behavior, both with the aim to increase one's own outcomes, as well as the other's. An affective empathic actor in a cooperation problem would like everyone to cooperate in order to increase the payoffs of his fellow actors and of the entire group. Since cooperation and payoffs are higher in a PI than in a PFI, an affective empathic actor will earlier choose for a PI due to altruistic reasons.

Moreover, it could be that an actor that is sensitive to the feelings of others, feels bad for the victims of free riders in a PFI and therefore prefers to participate in a PI (Hoffman, 2008). Thus, from an altruistic point of view, the third hypothesis reads:

H3: *The higher an actor scores on affective empathy, the earlier he will choose for a punishment institution.*

On the other hand, being sensitive to the feelings of others could also imply that an actor feels bad for the one who is punished and therefore wants to prevent this situation. Because of this reason they initially will not choose for a PI, but it is plausible that after seeing others being victimized by free riding behavior, they eventually will choose for a PI due to the aforementioned altruistic incentives to maximize everyone's payoffs. In terms of affective empathy we thus do not come to an unique hypothesis and our last hypothesis states:

H4: *The higher an actor scores on affective empathy, the later he will choose for a punishment institution.*

3. Data and methods

3.1. Experimental Design

In our experiment subjects participated in interactive situations based on the PD as described before. Each game was played by six subjects (n=6). In total every subject took part in forty play rounds. After each round the subjects were randomly matched to five other subjects.

As mentioned before the PD involves interactive situations in which each of the six group members decides simultaneously and independently whether or not to contribute an amount of 20 money units to the public good[1]. After that, the total amount of contributions of all six subjects was summed up and multiplied by 2,4. That final amount was then equally divided among the six subjects for their own earnings, including among those that chose to defect. This means that for every invested money unit, every subject earned m/n<1 (Fehr and Gächter, 2002; Van Miltenburg, Buskens, Barrera and Raub, 2014). Because of the fact that the final amount was equally divided, the contributors eventually made less profit than the defectors did. This will be illustrated by the following example: if all subjects decided to

[1] Neutral labels were used in the experiment. 'Public good' was expressed by 'group account' and 'private account' referred to 'own earnings'. Furthermore, 'system A' symbolized a PI, whereas a PFI was called 'system B'. Finally, the term 'reducing earnings' was used as an alternative for 'punishing'.

contribute 20 money units to the public good, the total contributed amount was 120 money units (20x6). This amount was multiplied by 2,4 which means that 288 money units were equally divided among the subjects. Every subject received 48 money units for his own earnings. This was 28 more than the initial endowment. However, if only five subjects decided to contribute 20 money units and one subject decided to defect, the total amount for the public good was 100 money units (20x5) and 240 money units (100x2,4) were divided among the subjects. Every subject then received 40 money units (240÷6), which means that the contributors ended up with 40 money units for their own earnings, while the defector ended up with 60 money units for his own earnings.

In our experimental design an extra dimension to the game was added. Before the subjects decided whether or not to contribute, they had to choose whether they wanted to play the game within a PFI or PI. If a majority of the subjects in a game (n>3) opted for a PFI, a PFI was introduced. If most of the subjects in a game chose a PI, a PI was introduced. If there was an equal number of votes for each kind of institution, the computer randomly decided if the game was played within either a PFI or PI. Regardless of the system the subjects chose, they received 10 additional money units. Within a PFI these were added to their own earnings, whereas in a PI (a part of) these money units could be used to punish fellow players, after they had seen the contributions of each other. There were two kinds of PI's: in both institutions the punisher lost 2 money units by punishing a fellow player, but in PI1 the one being punished lost 6 money units for each person punishing him, while within PI2 the one being punished in this case lost 12 money units for each person punishing him. However, in this paper we will look at the mere choice for PFI or PI, and not at the choice for PI1 or PI2. Note that it was possible to punish every fellow player (2x5=10) and that it was possible to be punished by more than one fellow player. For example if one was punished once by five fellow players or five times by one fellow player, 30 money units (5x6) or 60 money units (5x12) were subtracted from the individual's own earnings. The amount of money units that was not used to punish, was transferred to the individual's own earnings. After having played forty rounds, subjects had to play an additional gambling game and they had to complete a questionnaire consisting of questions related to cognitive and affective empathy.

3.2. Data

78 subjects participated in the experiment (N=78). However, certain subjects – those who did not complete the experiment, those who mentioned not to understand the questions in English or those who never chose a PI – were not considered suitable for our study and therefore filtered

out of our dataset. Eventually, 71 subjects were included in our analysis. 55,8% of the subjects were female and 44,2% were male. The mean age of our subjects was 23,08 years and over 70% of our subjects were Dutch. The other 30% were either from the USA, the UK, Canada, French, Portugal, Brazil, Bulgaria, China, Chile, Germany, Macedonia, Ukraine, Poland, Vietnam or Mexico. 84,4% of the subjects were students. 20,8% of the subjects were studying or had studied economics.

3.3. Variables

3.3.1. Dependent variable

We created a numeric variable that indicated the first round in which the subject chose for a PI. This is our dependent variable. To measure this variable, the chosen institution per subject per round was checked. The round in which the subject first chose for a PI is the value of this variable.

3.3.2. Independent variables

The independent variables used for testing our hypotheses were the scores of the subjects on risk-taking, cognitive empathy and affective empathy. Risk-taking indicates a subject's risk preferences and was measured by the additional gambling game. This gambling game involved seven rounds in which each subject received 10 money units per round. In every round, the subject had to decide whether he wanted to keep these 10 money units or whether he wanted to gamble to earn 20 money units under condition of a certain chance. The chance of earning 20 money units rose from 30% in gambling round one, till 70% in gambling round seven. The total number of times a subject chose to gamble is used as a measurement of risk-taking. The more often a subject chose to gamble, the stronger his preference to take risks (Drouvelis and Jamison, 2012).

Cognitive and affective empathy were measured by the questionnaire. The questions were based on the Questionnaire of Cognitive and Affective Empathy (QCAE) designed by Reniers et al. (2011). The questionnaire contained 31 propositions using a 7-point Likert scale with the response options from *strongly agree* to *strongly disagree*. 19 of these items were identified by Reniers et al. (2011) as measuring cognitive empathy and 12 items were identified as measuring affective empathy.

3.3.3. Factor analysis

In order to see if we could deduce components from the above questionnaire, we used a Principal Components Analysis of all 31 questions of the original questionnaire (Reniers et al.,

2011). The Kaiser-Meyer-Olkin value (KMO) of sampling adequacy was 0.691 and exceeds the recommended value of 0.6. The Bartlett's Test of Sphericity reached statistical significance (p <.001). Both values thus supported that the data were suitable for factor analysis. Further inspection of the matrices indicated nine components with eigenvalues exceeding one. However, a scree test indicated that only three components represented non-random covariance in the data.

Since the factors are correlated, we used oblique rotation in order to make the pattern of loadings clearer. Direct oblimin rotation was used and revealed a simple structure of the three components where they each had a number of strong loading items and where all items loaded substantially on only one component (Appendix A, Table A1). The Cronbach's alphas for the resulting three components were 0.906, 0.832 and 0.823 respectively. Compared to the factor analysis done by Reniers et al. (2011), the question items loaded at the same components. According to Reniers et al. (2011) both component 1 and 3 measured cognitive empathy. However, they made a distinction between the components in the way cognitive empathy is measured. They labelled component 1 as 'Perspective Taking' and it involved intuitively putting oneself in another person's shoes to see things from his or her perspective. Component 3, on the other hand, encompassed a strong attempt to put oneself in another person's position by imagining what that person is feeling. They labelled it as 'Online Simulation' which is likely to be used for future intentions. Component 2 indicates affective empathy. All three components were saved as variables used for the regression analyses which will be elucidated further in this section. In the models these variables are named as CE (Perspective Taking), CE (Online Simulation) and AE.

3.3.4. Control variables

As control variables we added dummy variables that indicated whether someone is female or not, whether someone is blood donor or not and whether someone has experience with game theory or not, assuming that these variables could influence the test results. Firstly, women might differ from men in certain aspects and these differences, rather than the three individual characteristics, could influence the moment of choice for a PI. Also, the degree of risk-taking and affective and cognitive empathy might be influenced by sex. Secondly, subjects who are blood donor might be more altruistic, influencing the moment of choice for a PI regardless his degree of affective empathy. Finally, a subject that already has some experience with game theory, might be better able to understand cooperation problems and the behaviour of other subjects in such games. This could influence the moment of choice for a PI through other

factors than the three individual characteristics. Moreover, the experience could affect the cognitive empathic abilities of the subjects in the game.

In Table 1 descriptive statistics of the used variables are demonstrated. The table shows that the mean of the first round a subject chooses for a PI is 5.44, meaning that on average the subjects chose for the first time for a PI in round 5 or 6. The subjects that chose for a PI the earliest made this choice immediately in round 1, whereas the subject choosing the latest for a PI made this choice in round 30.

Table 1. Descriptive Statistics Dependent and Independent Variables

Variable	N	Minimum	Maximum	Mean	Std. Deviation
First Round Subject Chooses for PI	71	1.00	30.00	5.44	5.92
Risk-taking	71	0.00	7.00	3.44	1.94
CE (Perspective Taking)	63	-2.62	2.61	0.00	1.00
CE (Online Simulation)	63	-2.85	2.05	0.00	1.00
AE	63	-3.39	2.92	0.00	1.00
Female	71	0.00	1.00	0.52	0.50
Blood Donor	71	0.00	1.00	0.30	0.46
Game Theory Experience	71	0.00	1.00	0.44	0.50

3.4. Regression analyses

With the linear regression analyses, including both bivariate and multiple regression analyses, we want to interpret whether there is a significant relationship between risk-taking, cognitive empathy and affective empathy and the first round a subject chooses for a PI.

Firstly, in model 1, a bivariate regression analysis is conducted to explore if there is a significant relationship between risk-taking and the first round a subject chooses for a PI. The second model includes a multiple regression analysis of the dependent variable and the independent variables CE (Perspective Taking) and CE (Online Simulation). Then, in model 3, we employed a bivariate regression analysis to explore if there is a significant relationship between the dependent variable and affective empathy (AE). Model 4 consists of a multiple

regression analysis of the dependent variable and all the independent variables. Finally, we conducted a multiple regression analysis including the dependent variable, all the independent variables and the control variables female, blood donor and experience with game theory.

4. Results

In order to test the first hypothesis that actors who score high on risk-taking will choose earlier for a PI, a linear regression analysis is employed. A negative relationship between risk-taking and the first round a subject chooses for a PI is found (model 1). However, this relationship is not significant (*B*= -0.495, *S.E.*= 0.363, *p/2*= 0.088). Therefore H1: *the higher an actor scores on risk-taking, the earlier he will choose for a PI,* has not been confirmed.

For our second hypothesis, a linear regression analysis is also employed. CE (Perspective Taking) and CE (Online Simulation are included in model 2 as predictor variables. For CE (Perspective Taking) a positive non-significant relationship is found (*B*= 0.631, *S.E.*= 0.807, *p/2*= 0.219). However, for CE (Online Simulation) a negative relationship is found, but also non-significant (*B*= -0.245, *S.E.*= 0.805, *p/2*= 0.381). Thus, also H2: *the higher an actor scores on cognitive empathy, the earlier he will choose for a PI,* has not been confirmed.

Both our third and fourth hypothesis concern the relationship between affective empathy and the first round choosing for a PI. We include AE in the analysis as the predictor variable. Also between affective empathy and the first round a subject chooses a PI, a positive relationship is found (model 3). Though, this relationship is also non-significant (*B*= 0.08, *S.E.*= 0.777, *p/2*= 0.459).

This means that both H3: *the higher an actor scores on affective empathy, the earlier he will choose for a PI* and H4: *the higher an actor scores on affective empathy the later he will choose for a PI,* have not been confirmed.

We then conducted another analysis in which we added all independent variables in one model (model 4). In model 4, risk-taking, cognitive empathy and affective empathy account for a non-significant 4,8% of the variance in the first round a subject chooses for a PI (R^2= 0.048, $F(4, 58)$= 0.735, p= 0.572). In model 5 the control variables were added and accounted for an additional non-significant 3,2% of the variance in the first round a subject chooses for a PI (ΔR^2= 0.032, $\Delta F(3, 55)$= 0.646, p= 0.589).

In sum, our hypotheses are not statistically validated by our data. There is no statistical

evidence that the three individual characteristics are predictors for the first interaction an actor chooses for a PI.

The unstandardized (*B*) and standardized (β) regression coefficients, the standard error (*S.E.*) and significance value (*p*) for each variable on each model of the regression analyses predicting the first round a subject chooses for a PI are reported in Table 2.

Table 2. *Unstandardized and Standardized Regression Coefficients, Standard Errors and Significance Value For Each Variable on Each Model of Multiple Regression Predicting Choosing For a PI the First Time.*

Variable	*B*	*S.E.*	β	*p*
Model 1				
Constant	7.139	1.429		
Risk-Taking	-0.495	0.363	-0.162	0.088
Model 2				
Constant	5.558	0.780		
CE (Perspective Taking)	0.631	0.807	0.104	0.219
CE (Online Simulation)	-0.245	0.805	-0.040	0.381
Model 3				
Constant	5.556	0.778		
AE	0.080	0.777	0.013	0.459
Model 4				
Constant	7.773	1.653		
Risk-Taking	-0.646	0.426	-0.201	0.134
CE (Perspective Taking)	0.347	0.826	0.057	0.676
CE (Online Simulation)	-0.034	0.816	-0.006	0.967
AE	0.016	0.779	0.003	0.983
Model 5				
Constant	7.080	2.195		
Risk-Taking	-0.631	0.430	-0.197	0.148
CE (Perspective Taking)	0.284	0.842	0.047	0.737
CE (Online Simulation)	-0.116	0.843	-0.019	0.757
AE	-0.272	0.875	-0.045	0.891
Female	2.114	1.771	0.174	0.238
Blood Donor	-0.974	1.754	-0.075	0.581
Game Theory Experience	-0.369	1.779	-0.030	0.837

4.1. Alternative specifications

Since the analyses show that our hypotheses have not been confirmed, we can conclude that the three individual characteristics we assumed to be predictors are in fact not predicting the first interaction an actor chooses for a PI. Thus, considering we have not found significant results, we included two other dependent variables in the analyses. We tested if the three individual characteristics are related to the frequency a subject chooses for a PI in the first ten rounds and in all forty rounds. These variables basically measure the same, but testing our analyses with these variables could ensure whether the three individual characteristics are predictors for choosing for a PI or not. It could be that subjects choose for a PI once in the first few rounds but later in the game not anymore. It also could be that a subject chooses for a PI only in the last few rounds, though more frequently. Whereas the former subjects are better represented in the dependent variable choosing for the first time for a PI, the latter subjects are better represented in the dependent variables measuring how often a subject chooses for a PI.

In model 6, we neither find significant relationships between the individual characteristics and the frequency an actor chooses for a PI in the first ten rounds. Risk-taking, cognitive empathy and affective empathy account for a non-significant 4,4% of the variance in the frequency of choosing for a PI in the first ten rounds (R^2= 0.044, F(4, 58)= 0.670, p= 0.615).
However, we have found a negative significant relationship between 'female' and how often a subject chooses for a PI in the first ten rounds (B= -2.584, $S.E.$= 0.994, p= <0.05). We can therefore conclude that women choose significantly less for a PI in the first ten rounds than men. 'Female' accounts for a significant 14,1% of the variance in how often a subject chooses for a PI in the first ten rounds (R^2= 0.141, F(1, 61)= 10.004, p= <0.05).

In model 7, we neither have found significant relationships between the individual characteristics and the frequency a subject chooses for a PI in all forty rounds. Risk-taking, cognitive empathy and affective empathy account for a non-significant 5,7% of the variance in how often a subject chooses for a PI in all forty rounds (R^2= 0.057, F(4, 58)= 0.874, p= 0.485).

This indicates that the individual characteristics are also no predictors for how often a subject chooses for a PI in the first ten rounds and in all forty rounds. The significant relationship we found before between 'female' and the frequency a subject chooses for a PI is not found for the frequency a subject chooses for a PI in all forty rounds, which indicates that women do not choose significantly less for a PI in all forty rounds than men. However, as the results do not

arise from our initial hypotheses, they need to be reconsidered and further research needs to be conducted.

The unstandardized (*B*) and standardized (β) regression coefficients, the standard error (*S.E.*) and significance value (*p*) for each variable on each model of the regression analyses predicting how often a subject chooses for a PI in the first ten rounds and how often a subject chooses for a PI in all forty rounds, are reported in Appendix B, Table B2.

5. Conclusion and discussion

In this paper we studied the moment of choice for a Punishment Institution (PI) in cooperation problems. In cooperation problems actors need to cooperate in order to establish a public good, but since actors would like to make use of the good whilst minimizing costs, it often happens that they profit from the contributions of other actors. Punishment can serve as a solution for this so called free rider behavior. Implementing a PI in a cooperation problem means that actors can punish fellow actors, whereas they do not have this possibility within a Punishment Free Institution (PFI). When actors participating in a cooperation problem get the choice whether they want to participate within a PI or a PFI, they initially prefer a PFI over a PI. However, after several interactions they prefer a PI over a PFI. Although, the first interaction an actor chooses for a PI differs between the actors, possibly because of differences in individual characteristics.

The aim of this study was to answer the question: *what individual characteristics are related to the first interaction an actor chooses for a punishment institution in a cooperation problem*? We studied whether the first interaction an actor chooses for a PI can be explained by risk-taking – "the engagement in behaviors that are associated with some probability of undesirable results" (Boyer, 2006, p. 291) –, cognitive empathy – "the ability to construct a working model of the emotional state of the others" (Reniers et al., 2011, p. 85) – and affective empathy – "the ability to be sensitive to and vicariously experience the feelings of others" (Reniers et al., 2011, p. 85).

Firstly, there are risks associated with choosing for a PI, since an actor can be punished himself. We therefore expected actors with a higher score on risk-taking to choose for a PI earlier (H1). Secondly, actors who score higher on cognitive empathy are likely to be able to reason more extensively as to how the other players in the game will behave. Subsequently, they realize that

in a PI the average contribution will be higher and hence, the earlier the choice for this option (H2). Finally, actors scoring higher on affective empathy are better able to feel the emotions of others. These actors may exhibit either of two likely behavioral options. On the one hand, they want the group to cooperate in order to help their fellow actors to receive the highest possible payoff and they could better experience the negative feelings of the contributors towards the defectors in the PD, which could accelerate the choice for a PI (H3). On the other hand, they want to prevent actors from being punished and thus choose later for a PI (H4).

For testing the hypotheses, actors took part in interactive situations based on the Prisoners Dilemma (PD). During forty rounds they chose at the start of each interaction whether they wanted to participate in a cooperation problem within a PI or PFI.

For the first hypothesis: *the higher an actor scores on risk-taking the earlier he will choose for a punishment institution,* we found a negative relationship between risk-taking and the first period someone chooses for a PI. However, this relationship is not significant.

The second hypothesis: *the higher an actor scores on cognitive empathy, the earlier he will choose for a punishment institution*, also cannot be confirmed. Both the positive relationship between cognitive empathy (Perspective Taking) and the first interaction an actor chooses for a PI and the negative relationship between cognitive empathy (Online Simulation) and the first interaction an actor chooses for a PI are not significant.

For both the third hypothesis: *the higher an actor scores on affective empathy, the earlier he will choose for a punishment institution*, and the fourth hypothesis: *the higher an actor scores on affective empathy, the later he will choose for a punishment institution*, no evidence was found. The positive relationship between affective empathy and the first interaction an actor chooses for a PI is not significant.

In conclusion, none of our hypotheses has been confirmed. No evidence has been found for any of the characteristics – i.e. risk-taking, cognitive empathy and affective empathy – to be a predictor for the first interaction an actor chooses for a PI.

To ensure if the three individual characteristics do not predict the moment of choice for a PI, we repeated our analyses with two other dependent variables, which basically measured the same. These variables measured the frequency of choosing for a PI in the first ten interactions and in all forty interactions. Also, when testing the relationship between our initial predictors and these dependent variables, no significant results were found. Nevertheless, an interesting result has been derived from the study. Although ‘female’ was not included as a predictor in

our initial hypotheses, we found a significant relationship between 'female' as a variable and *the frequency* of actors' choices for a PI in the first ten interactions. In the first ten interactions, women chose significantly less often for a PI than men.

Although Drouvelis and Jamison (2012) found a weak link between individual characteristics and the choice for a certain institution, we have to conclude that risk-taking, cognitive empathy and affective empathy are not the right predictors for the first interaction an actor chooses for a PI in a cooperation problem. However, since no further research is done concerning this topic, we can only speculate about why our results turned out to be non-significant.

Because we filtered out actors that we did not consider suitable for our analyses and for we used acknowledged tools for assessing risk-taking, cognitive empathy and affective empathy – an additional gambling game replicated from Drouvelis and Jamison (2012) and the Questionnaire of Cognitive and Affective Empathy by Reniers et al. (2011) –, we can assume that our dataset is valid for testing our hypotheses.

The study however has several limitations. First of all, the data used for our analyses are taken from a dataset that was originally meant for another study. Therefore the dataset was not specifically meant to answer our main question. A dataset better directed on this question might contain more diverse and precise measures of risk-taking, cognitive empathy and affective empathy, possibly leading to different results. Also other characteristics, as will be mentioned later, could be included in this dataset.

Moreover, our sample size is relatively small (N=78). A small N has some disadvantages. Generally, there should be at least 100 participants for a reliable factor analysis. Although our N was big enough to conduct a factor analysis, the sample size does not reach the amount of 100 participants. This could negatively influence the reliability of our factor analysis, indirectly affecting the results.

Furthermore, smaller sample sizes get increasingly further away from the entire population. For example, the vast majority of our actors were young people between 18 and 30 years old and most of the participants were students. The results can therefore not be generalized to present more diverse population. Notice that in society people of 30 years and older and people that are not studying anymore but working, also play an important role in establishing institutions. Thus, more ages should be taken into account when studying the relationship between personal characteristics and the moment of choice for a PI, since this moment might differ for age or your position in society, e.g. student or worker.

The last, and maybe the greatest, limitation of our study is that the study is very explorative. Little is known about the relationship between individual characteristics and the moment of choice for a PI, for which we had to formulate hypotheses based on own speculations. It could be that certain relationships are not as unambiguous as we thought. Concerning risk-taking and affective empathy for example we can think of more reasons why they are not significantly related to the first interaction an actor chooses for a PI. It could be that there are not only risks related to choosing for a PI, but also to choosing for a PFI. Choosing for a PFI in fact is associated with a risk of free riding behavior by other people, while they profit from the actor's contribution. Also, if the actor decides to free ride in a PFI and the others also decide to free ride, he will not gain any additional money units to his initial 20 money units. Consequently, actors with a high score on risk-taking might take different kinds of risk, i.e. choosing for a PI can be seen as a risk, as well as choosing for a PFI. In this way, risk-taking is not a significant predictor for the choice for a PI. Regarding affective empathy it could be that actors chose earlier or later for a PI due to different motives deriving from affective empathy as stated in H3 and H4. If indeed affective empathy works through both ways, it is logical to assume that the relationship between affective empathy and the first interaction an actor chooses for a PI is not significant.

It is likely that the non-significant results are due to incorrect assumptions. As mentioned before, little is known about the relationship between individual characteristics and the moment of choice for a PI. We have therefore been forced to partly base our hypotheses on speculations. Although reasons exist to expect risk-taking, cognitive empathy and affective empathy to be predictors for the first interaction an actor chooses for a PI, it is apparent that there are other mechanisms or other individual characteristics that cause actors to choose earlier for a PI.

For example, if we take a closer look at the motives given by the actors in an open question for why they ever chose for a PI, most of the answers were that the actors wanted to earn more money and that they thought they would if they chose for a PI. From this motive we presume that their incentives were payoff maximizing and self-regarding. We have to question if these motives really are associated with risk-taking, cognitive empathy and affective empathy, or if they are influenced by unaccounted for individual characteristics. For example, egoism and greed could encourage this payoff maximizing and self-regarding incentives.

Considering that we have found a negative significant relationship between 'female' and how often an actor chose for a PI in the first ten interactions, we can presume that also other

individual characteristics related to differences between men and women might be significant predictors concerning the choice for a PI. Women might be less egoistic and greedy than men, as well as more caring and kind and hesitant.

Concluding, the micro-macro link for which an explanation was attempted in this paper cannot be explained by the results of our study. We attempted to explain the first interaction in which an actor chooses for a PI (the macro level) by individual characteristics predicting this choice (the micro level). Further research is required in order to find out if it is actually possible to connect these levels and should be focused both on other mechanisms and individual characteristics.

Deriving from the aforementioned possible explanations for the non-significant results, future research should focus on other individual characteristics than risk-taking, cognitive empathy and affective empathy. This could imply characteristics concerning differences between men and women in a broader context but also more specific individual characteristics that reflect payoff maximizing and self-regarding behavior.

Payoff maximizing and self-regarding incentives might be more present for actors that are more egoistic and greedy, resulting in an earlier choice for a PI. Regarding differences between women and men, a future hypothesis could be that women might be less egoistic and greedy than men, therefore choosing later for a PI. Furthermore women might be more caring and kind than men, looking for a peaceful solution for the cooperation problem instead of punishment, hence choosing later for a PI. Finally, women might be more hesitant than men, waiting longer before choosing for a PI.

The relationship between these characteristics and the first interaction choosing for a PI could be tested. Our study has just been an early attempt to connect individual characteristics with the moment an actor chooses for a PI and every future study that is in a sense related to this topic will be helpful to fill the knowledge-gap between individual characteristics and the moment of choice for a certain institution and to establish a more characterized link between the micro and macro level.

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Appendix A

Table A1. Pattern Matrix.

Direct Oblimin Rotation of Three Factor Solution for QCAE Items				
Item No.	Item Content	Component 1 (CE)	Component 2 (AE)	Component 3 (CE)
3	I try to look at everybody's side of a disagreement before I make a decision.			0.630
5	When I am upset at someone, I usually try to "put myself in his shoes" for a while.			0.850
6	Before criticizing somebody, I try to imagine how I would feel if I was in their place.			0.812
7	I often get emotionally involved with my friends' problems		0.645	
9	People I am with have a strong influence on my mood.		0.726	
10	It affects me very much when one of my friends seems upset.		0.767	
12	I get very upset when I see someone cry.		0.741	
13	I am happy when I am with a cheerful group and sad when the others are glum.		0.776	
14	It worries me when others are worrying and panicky.		0.709	
15	I can easily tell if someone else wants to enter a conversation.	0.691		
16	I can pick up quickly if someone says one thing but means another.	0.751		
19	I am good in predicting how someone will feel	0.860		
20	I am quick to spot when someone in a group is feeling awkward or uncomfortable.	0.670		
21	Other people tell me I am good at understanding how they are feeling and what they are thinking.	0.629		
22	I can easily tell if someone is interested or bored with what I am saying.	0.732		
24	I can sense if I am intruding, even if the other person does not tell me.	0.710		
25	I can easily work out what another person might want to talk about.	0.738		
26	I can tell if someone is masking their true emotion.	0.761		
27	I am good at predicting what someone will do.	0.712		
30	I always try to consider the other fellow's feelings before I do something.			0.764

Appendix B

Table B1. *Unstandardized and Standardized Regression Coefficients, Standard Errors and Significance Value For Each Variable on Each Model of Multiple Regression Predicting the Frequency of Choosing For a PI the First Ten Rounds (Model 6) and the Frequency of Choosing For a PI in all Forty Rounds (Model 7).*

Variable	*B*	*S.E.*	β	*p*
Model 6				
Constant	6.535	1.232		
Risk Taking	0.114	0.241	0.060	0.638
CE (Perspective Taking)	-0.379	0.472	-0.105	0.426
CE (Online Simulation)	0.303	0.473	0.084	0.524
AE	-0.072	0.491	-0.020	0.884
Female	-2.584	0.994	-0.357	0.012
Donor	0.830	0.107	0.985	0.403
Game Theory Experience	0.639	0.999	0.088	0.525
Model 7				
Constant	37.275	3.014		
Risk Taking	-0.395	0.591	-0.087	0.507
CE (Perspective Taking)	-0.643	1.156	-0.075	0.580
CE (Online Simulation)	0.544	1.157	0.064	0.640
AE	-1.070	1.202	-0.125	0.377
Female	-4.683	2.432	-0.274	0.059
Blood Donor	-1.083	2.409	-0.059	0.655
Game Theory Experience	-0.776	2.444	-0.045	0.752