

# Enforcement Behavior of the Dutch Police: A Public Goods Game with Police Students

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## **Abstract:**

Police officers in the Netherlands have the freedom to sanction offenders at their own discretion. This means they do not have to issue a fine for every offense they encounter. In the absence of mandatory sanctioning by law, it is very important that police officers are intrinsically motivated to enforce the law to ensure a functional legal system. In order to examine whether police officers are effective at enforcing the law, we conduct three linear public goods game experiments. We compare police students to regular students to examine how they differ in terms of contribution and sanctioning behavior and how this influences compliance with the law. We observe that police officers are indeed more effective at enforcing the law and have a larger preference to sanction. They are also more willing to bear costs associated with sanctioning than non-police individuals. We also find evidence that the police are initially not perceived by the public as being stricter than non-police individuals, in terms of law enforcement.

## Summary

Police officers in the Netherlands have the freedom to sanction offenders at their own discretion. This means they do not have to issue a fine for every offense they encounter. In the absence of mandatory sanctioning by law, it is very important that police officers are intrinsically motivated to enforce the law to have a functional legal system. In this study we conducted three different linear public goods game experiments to find out how police students differ from regular students in terms of cooperation and enforcement behavior. The first experiment consisted of a public goods game without sanctioning in which police students had to cooperate. We found that the level of cooperation and free riding among police students is not different from regular students as we compare it to the existing literature on cooperative behavior. In the second and third session, we compare police students to regular students to examine how they differ in terms of sanctioning behavior and how this influences compliance with the law. We find evidence that police officers are more effective at enforcing the law and have a larger preference to sanction than non-police individuals. Police enforcers sanctioned 78.95% of the norm violations and student enforcers only sanctioned 37.93% of the violations. In the game with police enforcers, 14.07% of the contributions were below the legal norm. In the game with student enforcers this number was 32.22%. We furthermore found that when sanctions are hidden, investors in these experiments did not believe police students would sanction more severely than regular students. In fact, investors showed initially more free riding in the game with police enforcers than in the game with student enforcers. A limitation of this study that should be considered is that due to monetary and time constraints, the number of subjects in the experiments is limited, and we were not able to collect primary data for a game without sanctioning with non-police students.

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## 1. Introduction

Police officers in the Netherlands have the freedom to sanction offenders at their own discretion. This means they do not have to issue a fine for every offense they encounter. As law enforcement, in a sense, is then no longer required by law, one could question if Dutch police officers have enough intrinsic motivation to enforce the law. Previous studies, for example by Dickinson, Masclet & Villeval (2015) in France, found evidence that police commissioners have a larger preference to sanction and enforce the law than non-police individuals. Furthermore French police commissioners are also more willing to bear costs to enforce the law than regular civilians.

To the best of our knowledge, this thesis is the first to research if this is also the case for Dutch police officers. As the Dutch police officers have this discretionary freedom, it is even more important to examine if they are intrinsically motivated to sanction and if they are effective at enforcing the law. This leads to the following research question: are Dutch police officers effective at enforcing the law and how do they differ from non-police individuals in terms of cooperation and intrinsic motivation to sanction? Another question that rises concerns behavior and believes of the public. Do civilians believe that police officers are adequate law enforcers?

To answer these questions we conduct three linear public goods game experiments in which subjects can choose to invest their capital in a public good, or keep it for themselves. Much like the real society, we set a legal standard level for cooperation that is desired to be met by all players. In two of the public goods experiment enforcers are added to the game. These enforcers are police students in session 2 and student enforcers in session 3. These enforcers monitor contributions by the investors and have to decide whether they want to sanction offenders or not. Sanctioning is costly as it requires time and money to detect offenders. This means enforcers have to be intrinsically motivated to sanction as they are no monetary incentives to sanction. Having two types of enforcers allows us to examine the different behaviors in terms of contribution and sanctioning in these interactive games.

In the Dutch society, like many other civilized societies in the modern world, law enforcement depends on centralized institutions. Experimental evidence has shown that this centralized sanctioning can have a significant impact on behavior (Putterman et al., 2011; Andreoni & Gee, 2012). This study therefore focuses on the Dutch National Police as it is the main organization concerned with law enforcement in the Netherlands. Police officers often find themselves in situations where they have to choose how to enforce the law. Using real police officers in our experiment grants us the opportunity to get as close to reality as possible within the boundaries of

this experiment. Furthermore, it allows us to study the impact on people's behavior when dealing with real police officers.

This study aims to gain more knowledge on how centralized sanctioning can influence economic agents' behavior. We provide information on how economic agents might alter their cooperative behavior when they know they are being monitored by real police students versus non-police students. We find evidence that police students are more inclined to sanction free riders at their own costs than regular students. Police enforcers also turn out to be much more successful at law enforcement than non-police enforcers who fail to enforce the law effectively. Secondly, we find no evidence that police enforcers have a more severe 'sanctioning reputation' than non-police enforcers. Thirdly, we provide some insight in the level of cooperative behavior of police students. We find no evidence that police students are different from non-police individuals in terms of cooperative behavior in a repeated social dilemma game.

This study continues as follows: the next section discusses the relevant theory on law enforcement, police behavior, sanctioning and public goods games. The third section discusses the experimental design. The fourth section generates hypothesis based on the theory. The fifth section discusses the methodological approach. Section six analyzes and interprets the results. Section seven critically reflects our results and discusses some limitations. The final section concludes.

## **2. Theory**

### **2.1 Centralized Enforcement**

The police function as a law enforcement institution that is centrally organized. When the police aim to sanction offenders, they will not always be successful. Two types of errors can occur due to imperfect monitoring. A type I error arises when cooperators are wrongfully sanctioned. The type II error occurs when offenders are left unsanctioned (Grechenig et al., 2010). According to Ambrus & Greiner (2012) both of these errors play a role in reducing cooperation. The most severe effect on cooperation is the case where cooperators are wrongfully sanctioned. Cooperators feel that they have been wronged and drastically reduce their own cooperation (Ambrus & Greiner, 2012). It is also conceivable that these unjustified sanctions may lead to urgency to sanction real free riders themselves. Fisher (2013) also finds that cooperators decrease their cooperation when centralized enforcement institutions appear unsuccessful in enforcing the norms. This change in behavior might function as an alternative for sanctioning free riders. However, when cooperators remain dissatisfied with unassigned sanctions to free riders, they might "take the law into their own hands".

To enforce a norm, one can use sanctioning or rewarding. Quite surprisingly, Vesterlund et al. (2002) find that rewards alone are relatively ineffective in encouraging economic agents to behave cooperative. Sanctioning on the other hand is useful in eliminating extremely selfish behavior and pushes agents towards modest levels of cooperation. Combining sanctions and rewards has a strong positive effect on cooperative behavior. Vesterlund et al. (2000) suggest that the two strengthen each other, where the highest level of cooperation in a game can only be reached when both measures are present. This also implicates that there is more free riding when one of the two is absent. In this study, however, we focus on sanctioning, as that is what the police often do to enforce the law. It is not surprising that the police almost exclusively use sanctioning, as it is rather unnatural to reward those who comply with the law. The police often face situations where the law is deliberately and actively broken (Skolnick & Fyfe, 1995). This active “destruction” may trigger negative emotions that lead to even more sanctioning (Dickinson et al., 2015). Still, sanctioning may be more effective in these kinds of situations than rewards, as it is a better instrument for norm enforcement when norm violation involves the destruction of wealth (Dickinson et al., 2015).

## **2.2 Police Officers’ Decision-making**

Police officers play a major role in legal norm enforcement. They are responsible for ensuring that people comply with the law and they decide how the law is monitored. On an individual level, police officers are also the agents that impose fines to offenders. It is therefore interesting to understand how police officers make their decisions and how they possibly differ from other civilians.

Brown & Daus (2015) studied how police officers make decisions in the field. They use a dual process model to explain the nature of the decision-making process. This model is dichotomous, as it makes a distinction between unconscious and deliberate decision-making. System 1 concerns automatic, principally unconscious, and effortless processing, where system 2 denotes controlled, largely conscious and effortful processing. By using this model Brown & Daus (2015) find that the control of anger of police officers when faced with difficult situations is related to a rational decision-making style. This means that anger control has a rational component as the control of anger involves conscious emotional regulation. Besides, they also find that intuition influences decision-making with a tendency toward higher levels of anger. The interaction between anger control and high intuition has a larger impact on making a decision to shoot, than on issuing a speeding ticket (Brown & Daus, 2015). This means that the cognitive demands of a shooting decision require more complex thinking than those of issuing a speeding ticket. This cognitive demand may be driven by the fact that police officers require evidence to justify their decisions. A situation that requires a shooting decision may place more dependence on the influence of controlled processes to identify justification. These processes may overlap with cognitive efforts required to regulate or suppress the expression of

anger. The observation of high intuitive decision-making style playing a more salient role in more complex situations highlights the value of intuition in organizations and in police work specifically (Brown & Daus, 2015). In the public goods game conducted in this study, police students will be confronted with a situation that shows similarities to issuing a speeding ticket. This means that the police students will not be dealing with a complex situation and might respond intuitively to offenders. They have no immediate reason to control their anger. This means that free riding behavior might cause anger and possibly more sanctioning among police students.

### **2.3 Professional norms**

How the police cope with difficult situations and how they make decisions is not only influenced by the difference between rational or intuitive behavior. Another aspect of how police officers enforce the law is the professional norms they work by. There is little literature examining the actual impact of professional norms on the behavior of police officers, but we can make the comparison with the health care industry that has been covered in a larger body of literature. The police are responsible to enforce the law at certain costs. Enforcing the law increases overall human welfare. Similarly, physicians increase human welfare by providing the right treatment to their patients. These treatments also come at certain costs. Thus, both police officers and physicians incur costs to improve human welfare. In both of these occupations, professional norms play a role to ensure professionals are willing to bear these costs.

Professional norms can be defined as a certain code of ethics or culture that is dominant in an organization. The behavior of the people working in this organization is influenced by these codes and culture. In the healthcare sector, professional norms ensure that physicians reduce their self-interest and increase their altruistic behavior towards their patients (Kesternich, Schumacher & Winter, 2015). The weight in the trade-off between the profits of the physicians and the well-being of the patient shift towards the latter. The professional norms for physicians are very tangible in the oath they take. Much like this, the police have the law and certain rules they have to live by. However, the police culture is much less tangible. Anyhow, this culture can have a great influence on the behavior police officers show during their work. The expression of personal feelings is very limited among police officers. Norms dictate that police officers should constantly control their emotions, making sure their decisions are never fueled by strong emotions. Police officers learn that they should always adopt a professional attitude, where there is no space for sadness, anger or disgust (Pogrebin & Poole, 1991). This professional attitude should both be displayed when in public and when among fellow officers. As a result, the ability of police officers to handle strong emotions is limited. In the short run, this suppression of emotions might increase occupational functionality. However, over time dormant feelings of emotional discontent might lead to serious problems in

police officers' performance (Pogrebin & Poole, 1991). A clear example is that police officers might be hardened in such a way that they are no longer able to show understanding and empathy when interacting with civilians.

The overall impact of professional norms of physicians and police officers is somewhat similar; they are both aimed to serve the society in an altruistic way at their own cost (Kesternich, Schumacher & Winter, 2015). With this knowledge, one expects that police officers might show different decision-making behavior than regular civilians who are not influenced by these professional norms.

## **2.4 Intrinsic motivation**

An important factor in decision-making is intrinsic motivation. Police officers and civilians have a different level of intrinsic motivation to cooperate and to enforce a norm. Dickinson et al. (2015) find that individuals in an occupation responsible for norm enforcement tend to be more cooperative in social dilemmas and are willing to bear more of the costs of the norm enforcement. This is even truer when the enforcement institution uses sanctions to steer behavior. Dickinson et al. (2015) also find that police officers have a larger preference for sanctioning than non-police individuals. In other words, police officers are more motivated to enforce a norm than non-police individuals. This is not surprising as police officers have self-selected in a mission-oriented occupation with the main purpose of deterring crime (Dickinson et al., 2015). People who become police officers have characteristics and beliefs that are aligned with being "good" and they are more willing to comply with and enforce a norm. This also reflects in the higher willingness to bear costs to enforce a norm than an average civilian. Apart from the self-selection into the police occupation, one must also note that the whole training program of police officers is aimed at enforcing the law. This training, and also the police culture can 'indoctrinate' the police officers and change their intrinsic motivation related to enforcing the law.

## **2.5 Reputation of the police**

An organization like the police does not operate in a vacuum, on the contrast, it is dependent on external stakeholders like the government and civilians. The image people have about a certain organization can be described as its reputation. Being a centralized institution for enforcement, reputation is vital to the police. Reputation determines how the society thinks of the police and its overall performance. Having a good reputation means it is easier to attract employees, receive cooperation from civilians and receive information from external sources (Brown & Benedict, 2002).

According to Meijer & Kleinnijenhuis (2006) the reputation of the police among civilians is greatly affected by news stories in the media. For example, the recent revelations on police corruption have damaged the overall reputation of the police. Meijering (2007) adds two more means that influence



police reputation: personal experience and word of mouth. The actual reputation is not determined by the means of information, but by the underlying factors. Police reputation greatly depends on public involvement, approachability, effectiveness and the integrity of its employees. Meijering (2007) also notes that personal experience can seriously change the reputation of the police perceived by that individual. In other words, the behavior police officers show on the streets greatly influences the reputation of the whole organization. Facing a society with more and more social media, this aspect becomes more important as ill behavior by police officers can easily be recorded and shared, reaching many people in a short amount of time.

Reputation might play an important role in this study as well. Police students participating in the experiments might be aware of the reputation issue and change their behavior accordingly. They will most likely want to present themselves as well-trained honest police officers. The reputation of the police can also influence the experiment in another way. As police students have a different reputation than regular students, economic agents might have different perceptions when interacting with police students and could change their behavior accordingly.

Having discussed behavioral aspects of the police organization as a whole and its individuals, let us now move to behavior of economic agents when faced with socio-economic dilemmas.

## **2.6 Deterrence Hypothesis**

Economic theory assumes that when economic agents participate in an activity that provides the opportunity to free ride, they take into account the expected sanction associated with free riding. The two main aspects of enforcement design are the probability that offenders will get detected, and the level of the sanction imposed. The economic theory on law enforcement states that when the regulated agents are risk-neutral, any range of sanctions can be chosen as long as the level of sanctions and probabilities results in the same expected value of the sanction (Becker, 1968; Polinsky & Shavell, 2007). If this is true, any level of probability and sanction that lead to the same expected sanction will lead to the same level of compliance. In this study we examine if the fact that people are being monitored by regular students versus police students impacts the perceived probability of being detected and sanctioned. Dickinson et al. (2015) find that police officers have a larger preference for sanctioning than non-police individuals. This could mean that when people know they are being monitored by police students, they believe to have a higher probability of getting sanctioned and will behave accordingly.

Identifying and monitoring free riders is costly, where the costs of imposing a sanction are largely independent of the actual level. In other words, governments can increase fines without any significant costs. Because of this, governments can reduce their law enforcement costs by

simultaneously reducing their monitor costs and increasing the sanction level such that the expected sanction remains constant.

However, Schilberg-Hörisch & Strassmair (2012) find evidence that rejects the above statements. They critically discuss the deterrence hypothesis that states that crime decreases in the severity and in the probability of punishment. They propose that deterrence incentives do not function in a linear way. They determine a baseline of cooperation without any deterrence incentives and then increase the deterrence incentives gradually. Schilberg-Hörisch & Strassmair (2012) find that cooperation decreases when deterrence incentives are increased to an intermediary level, compared to a low level. Only in the case of very strong deterrence incentives they find an increase in cooperation. This means size and probability are no longer perfect substitutes and that increasing a sanction as a compensation for lower probabilities of detection is not perceived to be an effective solution (Sunstein et al., 2000). Much like these findings, Gneezy & Rustichini (2000), find that implementing a fine for parents picking up their children late from the daycare, actually increased the number of parents being late as they became to see this fine as a price for a certain service.

Schilberg-Hörisch & Strassmair (2012) make a distinction between two types of subjects: those that are selfish who react to deterrent incentives as predicted by the deterrence hypothesis and those that are fair-minded who become less cooperative when deterrence incentives are implemented. The behavior of the fair-minded subjects can be explained by continuous crowding out of fairness concerns caused by extrinsic incentives. Interestingly, these extrinsic incentives shift the context from an ethical and other-regarding environment to an instrumental and self-regarding one (Kahneman and Tversky, 1986).

Another criticism on the deterrence hypothesis comes from Anderson (2002) who finds that increasing the severity of sanctions is unlikely to provide substantial reductions in crime rates. He suggests that offenders do not have the information or mindset that is required to respond to changes in the probability of getting caught or the severity of the sanction. This means that offenders are unable to effectively determine the expected sanction.

## **2.7 Public Goods Game with Sanctioning**

Social dilemmas are a common tool to study cooperation and compliance to social norms and legal norm enforcement. Social norms are self-enforced, meaning that there are no external factors forcing to comply with this norm. This means cooperation is rather fragile. Legal norm enforcement on the other hand is much stronger. That is why modern states use centralized institutions to enforce legal norms. In order to function properly, these legal rules should be clear, transparent, defensible and unambiguous. In civilized societies a considerable amount of cooperation is due to legal

enforcement rules (Fehr & Fishbacher, 2004). These legal enforcement rules cannot function if there is no consensus about the normative legitimacy of those rules. Fehr & Fishbacher (2004) furthermore state that the very existence of legal enforcement institutions, like the police, is only possible because of prior social norms about what constitutes appropriate behavior. Economic theory defines social norms as standards of behavior that are based on widely shared beliefs on how individual group members ought to behave in a given situation (Fehr & Fishbacher, 2004). The group members might obey the norm voluntarily if their individual goals are in line with the normatively required behavior, or they might be forced to obey the norm because their individual goals differ from the normatively required behavior (Fehr & Fishbacher, 2004). The police functions as a centralized enforcement institution that punishes violations of these legal norms, which have now also become legal norms.

In a linear public goods game group welfare is conflicting with the dominant strategy of selfish free riding behavior. In other words, under the assumption that people behave in a rational and own payoff maximizing way, the maximum group welfare can never be reached. This relates to the real society in such a way that individuals who do not comply with the law may achieve unfair gains that hurt the collective good. For example, tax evasion provides gains for a single individual, but hurts the treasury on a society-wide level. A public goods game allows us to simulate phenomena like tax-evasion and provides insights in the behavior of individuals and how they react to changes if for example a sanction is implemented. Using a public goods game with sanctioning allows us to examine to what extent sanctioning behavior by different type of enforcers push economic agents more towards cooperative behavior. Previous laboratory experiments have shown that initial contributions in cooperative games are considerably above Nash equilibrium (Andreoni, 1988). However, Andreoni (1988) further finds that cooperation steadily declines when games are repeated. To counter this decline, centralized or decentralized sanctioning can be added to the game to provide more cooperation in the long run (Gächter et al., 2008). Sanctioning is typically directed at those individuals that violated the norm of cooperation (Gächter et al., 2008).

Another important aspect of behavior in public goods games is conditional cooperation, as it plays a major role in the contribution decision of individual investors. Conditional cooperation means that people cooperate if they believe others cooperate (Gächter, 2007). Voluntary cooperation is very fragile, but it does exist. Andreoni (1990) finds that explanations for conditional cooperation can be found in the fact that people have 'warm glow' preferences; they feel good if they contribute. Another explanation could be that many people have altruistic preferences, meaning they want to benefit others. A third option is that people make mistakes, resulting in unintentional cooperation (Gächter, 2007). However, a significant amount of people can be characterized as selfish (Gächter, 2014).

Fishbacher et al., (2001) find that in one-shot public goods games 50% of the subjects are conditionally cooperative, where a third can be classified as free riders. This means that people cooperate much more than predicted by standard economic theory, which assumes rational and selfish individuals. Fishbacher et al. (2001) also find that cooperation is declining over time, however. They further propose that some individuals are conditionally cooperative; meaning their level of contribution is determined by the contributions of others. If conditional cooperators observe free riders, they reduce their own contribution as well.

Free riders show a very strong self-serving bias in public goods games and account for a significant number of the subjects. In addition, those who are conditionally cooperative also show some degree of self-serving bias in that they contribute less than the others do on average (Fishbacher et al., 2001). This also strengthens the downward spiral of contributions over time. Since subjects react on average conditionally cooperatively on other subjects' contributions, but with a bias in the selfish direction, positive but deteriorating contributions to the public good are observed. The speed of the decline of contributions depends on the composition of the group. Thus, despite a majority of conditional cooperators, free riding will be pervasive under conditions of anonymous interactions without sanctioning (Fishbacher et al., 2001).

Cooperative behavior has three important determinants: the strength of internalized norms of pro-social behavior, the behavior of other people, and the threat of punishment or the presence of other incentives to curb selfishness (Gächter, 2014). Many people are motivated by their character traits such as trustworthiness and honesty, which increases their willingness to cooperate if other do so as well. They furthermore might believe that free riding is morally wrong and they might feel guilty if they observe that others contribute more to a public good than them. Individuals also show anger towards those who free ride and might experience a warm glow by contributing to the public good themselves (Gächter, 2014). As mentioned above, peoples' behavior is strongly influenced by the behavior of others. Since a sizeable number of people are free riders and many conditional cooperators have a selfish bias, cooperation in linear public goods games is quite fragile (Vyrastekova et al., 2011). Sustainable cooperation can only be achieved when solely highly cooperatively inclined people are matched and able to exclude free riders. As this is very unlikely to happen, stable cooperation requires another tool. This is where sanctioning comes in, as sanctioning can provide the incentives to reduce free riding (Gächter, 2014). In the presence of sanctioning, subjects adjust their behavior in order to avoid being a free rider. The mere knowledge that sanctions might be assigned increases cooperation among subjects as they expect that sanctioning occurs against free riders (Vyrastekova et al., 2011). One must note that sanctioning might be culturally dependent (Vyrastekova et al., 2011), making it very interesting to look at the Dutch case in particular.

We will now further elaborate on the role of sanctioning and how it is important to cooperative behavior. Centralized sanctioning is a legal norm that prescribes which situations call for punishment. It is accompanied by a set of beliefs that correctly predict punishable situations. Sanctions can serve as a tool in social dilemmas to prevent players from free riding. When subjects know that sanctions are not available in their interactions, their behavior can be described as a reversion to the mean (Vyrastekova et al., 2011). This means that subjects increase contributions when below the average contribution of others, and decrease contributions when above the average contribution. Introducing the possibility of assigning costly sanctions to this environment results in a lower tendency to decrease above-average contributions, and a higher tendency to increase below-average contributions (Vyrastekova et al., 2011). However, these sanctions come at a cost and cannot be freely used by the imposer (Vyrastekova et al., 2011). This means that sanctions should be effective and cost-efficient to avoid spending too much on monitoring. Kleiman & Kilmer (2009) find that an efficient way to punish is dynamically concentrated sanctioning at the beginning. This means there are high sanctioning costs at the beginning, but it can actually shift the high-violations equilibrium to its low-violation equilibrium, meaning there are fewer violations and less need to sanction. Kleiman & Kilmer (2009) furthermore find that this concentrated sanctioning is especially useful to reduce violations if it is preceded by warnings. Vyrastekova et al. (2011) also find that the mere risk of being sanctioned can alter behavior. Subjects are inclined to avoid free rider positions in public goods games in which they believe they will be targeted by sanctions if they do free ride (Vyrastekova et al., 2011). Even when actual sanctions are not observed, for example when subjects have no information on the sanction, players become more cooperative under the threat of being sanctioned (Vyrastekova et al., 2011). Vyrastekova et al. (2011) also find that there is little difference in the sanctioning expectations over time. This means that subjects that are contributing less than others on average, increase their contributions in the next period to avoid being targeted by sanctions again. This mechanism provides the environment that is required for cooperation. When there is no exogenous norm level of cooperation, this norm is determined by the average contribution of players in the initial stage.

### **3. Experimental Design**

In this study we conduct three linear public goods game experiments. Session 1 consists of a public goods game without sanctioning with police students as subjects. Session 2 consists of a public goods game with sanctioning, where regular students are investors and police students are punishers. Session 3 is similar to session 2, but now both investors and punishers are regular students.

During the experiment subjects are randomly divided in groups. Within each group subjects are matched for 15 rounds to interact repeatedly in a public goods game. In this game subjects can invest in a public good that generates a payoff that is equally divided among investors. However, they can also choose to keep the initial amount received to themselves. This means that they will benefit from the public good, without bearing any of the costs. In this game free riding is defined as choosing to invest less than a specified level, a level that might be interpreted as a legal norm. In this experiment this legal norm is set at 6. We chose 6 as norm level as it requires quite some cooperation from subjects, but it does not require them to invest their full endowment. Much like investing in the real world, the norm of 6 leaves room to retain some capital themselves as a buffer. Having a norm of 6 steers subjects towards a rather high level of cooperation that could never be achieved without legal enforcement. One could argue that a norm of 10 would actually be more optimal, as it would retrieve the highest public payoff. However, when subjects are forced to invest their full endowment when they want to comply with the law, there is no room for small mistakes. Having a norm of 6 also allows us to observe if subjects are willing to invest above the legal norm. If a player invests less than 6, this means he or she is free riding. The information on the legal norm is shared with all subjects during the instructions of the experiment.

Subjects who are declared investors receive 10 tokens of which they can choose to invest any whole number from 0 to 10. Tokens invested in the public good are multiplied by 1.5 and shared equally among all players. This results in the following payoff functions for the investors per round:

$$P_1 = (E_1 - I_1) + (I_1 + I_2 + I_3) * 1.5/3$$

$$P_2 = (E_2 - I_2) + (I_1 + I_2 + I_3) * 1.5/3$$

$$P_3 = (E_3 - I_3) + (I_1 + I_2 + I_3) * 1.5/3$$

In which  $P$  is the payoff of investor,  $E$  is the endowment, and  $I$  is the investment of every individual player. This means that when all players invest their total endowment, a payoff of 15 can be earned  $((10-10) + (10+10+10) * 1.5/3 = 15)$ . However if all other players invest their total endowment, but 1 player does not, the payoff of this one free riding player is 20  $((10-0) + (0+10+10) * 1.5/3 = 20)$ . The fully cooperative players will only receive a payoff of 10 in this situation. Thus, in an environment where there is no sanctioning, players will try to free ride according to standard economic theory.

In session 2 and 3 an additional subject is added to the game and is allowed to sanction free riders. This subject is called the enforcer. The enforcer receives a fixed amount of 18 tokens per round, and observes the actions of the three investors. When the investments are revealed, the enforcer chooses whether to sanction free riders or not. Sanctioning is hidden to the investors for the first 5

rounds to be able to examine the effect of the initial reputation of police enforcers and student enforcers. Sanctioning imposes a fixed cost of 3 tokens per investor. This cost could be interpreted as the cost of the time spent on the activity to detect a free rider. The payoff function per round of the enforcers is as follows:

$$P_4 = 18 - 3 * x$$

In which  $P_4$  is the payoff of the enforcer and  $x$  is the number of investors the enforcers sanctions this round.

Each free rider that is being sanctioned has to pay a fine of 2 for every unit below the norm. The new payoff function of the investor becomes:

$P_1 = (E_1 - I_1) + (I_1 + I_2 + I_3) * 1.5/3 - (2 * (6 - I_1))$  under the condition that  $I_1 < 6$  and that the enforcer chooses to sanction.

$P_2 = (E_2 - I_2) + (I_1 + I_2 + I_3) * 1.5/3 - (2 * (6 - I_2))$  under the condition that  $I_1 < 6$  and that the enforcer chooses to sanction.

$P_3 = (E_3 - I_3) + (I_1 + I_2 + I_3) * 1.5/3 - (2 * (6 - I_3))$  under the condition that  $I_1 < 6$  and that the enforcer chooses to sanction.

So, the actual fine is calculated by the number of tokens below 6, multiplied by 2. For example, when a player invests 3, the enforcer has to pay 3 tokens to issue a fine of 6 ( $3 * 2$ ). Due to enforcement costs, the enforcer has no pecuniary incentives to sanction free riders. The incentives the enforcer might have are morally driven, namely stimulating investments in the public good and trying to ensure that no investors free ride. Sanctioning out of boredom or spitefulness is also a possible.

In order to examine the impact of having a police student or a non-police student as enforcer on cooperative behavior, the experiment is run with both police students and regular students as enforcers. This is clearly communicated with the subjects in the public goods games. This distinction also allows us to examine whether police students are more inclined to sanction and more willing to bear costs.

To find out if police students are more collaborative as the literature suggested, the public goods game without sanctioning is also conducted with a sample of solely police students. This can be compared to the cooperation levels of non-police students in the existing literature on cooperative behavior.

## 4. Theoretical predictions

We will now formulate 3 hypotheses based on the theory and our experimental design. As described in the theory police officers have a larger preference to sanction than non-police individuals and are also more willing to bear costs associated with sanctioning. This leads to our first hypothesis:

1. Police enforcers have a larger preference to sanction and are more willing to bear costs than student enforcers.

Secondly, police officers are self-selected into a mission oriented occupation with the primary task to enforce the law. Police officers are also trained to become effective law enforcers. This leads to our second hypothesis:

2. Police enforcers are more effective and efficient in law enforcement than non-police enforcers.

The third hypothesis concerns police reputation. Police officers are part of a centralized law enforcement institution that has a certain reputation among the people. Every individual has a certain perception of the police in terms of sanctioning behavior. As the police are the most important organization concerned with law enforcement in the Netherlands, the perception of the public concerning sanctioning behavior by police officers will be different from the perception of non-police enforcers. This leads to our third and final hypothesis:

3. People believe that police officers will sanction more severely than non-police individuals.

## 5. Methods

It is vital to our research that we work with real police officers to be able to accept or reject our hypothesis. As it turned out to be impossible to recruit experienced police officers in a limited amount of time, we chose to use police students instead. Police students were much more approachable as they often reside at the Police Academy in Apeldoorn where multiple police students could participate in the experiments simultaneously. During their time at the Police Academy they also had no executive tasks, meaning there was no risk of them being called away for emergencies. These police students had between 2 and 4 years of field experience and can thus be regarded as real police officers, although lacking long-term experience.

To examine the impact on a decision-makers behavior of having a police student versus a regular student as a punisher and how these enforcers differ, we conduct three public goods games. The reason we use a public goods game experiment is that it is an extremely useful tool to capture behavior of individuals when faced with social dilemmas. It provides a way to study cooperation and compliance to social and legal norm enforcement. Having a dominant strategy of free riding that is conflicting with norm compliance makes it even more interesting to use public goods games.



The public goods games in this study were designed so that they provide information on the level of collaboration of police students, the contribution behavior of investors when interacting with police and non-police enforcers, and the sanctioning behavior of the different enforcers.

The study consists of three sessions. In each session a 15-round repeated public goods game is conducted. Session 1 consists of a public goods game with no sanctioning where police students are subjects (see Table 1 for an overview). Session 2 consists of a public goods game with sanctioning, where police students are enforcers and regular students are investors. Session 3 is similar to session 2, only that it also has regular students as enforcers. In session 2 and 3, the sanctioning is hidden for investors in the first five rounds. In this way we can examine whether the fact that subjects know they are monitored by a police officer is different from being monitored by a regular student. These two sessions furthermore allow us to compare the effects of having a police student or a regular student as enforcer throughout the game. We will examine both the behavior of the investors and the enforcers when they interact in these public goods games. The different sessions allow us to examine if there is significant change in the amount of free riding when sanctioning is added to the game. It also allows us to observe initial cooperative behavior by police students and it provides information on the impact on cooperation of having a police student issuing the sanctions versus a non-police student.

**Table 1: Public Goods Game overview**

	<b>Session 1</b>	<b>Session 2</b>	<b>Session 3</b>
<b>Game</b>	No sanctioning	Sanctioning by Police	Sanctioning by Students
<b>PG Subjects</b>	Police students (27)	Regular students (27)	Regular students (24)
<b>Number of Groups</b>	9	9	8
<b>Enforcers</b>	None	Police students (9)	Regular students (8)
<b>Location</b>	Police Academy	Police Academy & NSM Decison Lab	NSM Decision Lab

The public goods games were created using oTree, an open-source platform and software package for implementing interactive experiments in the lab, online, or in the field (Chen, Schonger & Wickens, 2016). In this study, subjects participated in computerized experiment that was set up in laboratories at the Radboud University in Nijmegen and the Police Academy in Apeldoorn. In total, 36 police students and 59 non-police students participated in the public goods game experiments. Student subjects at the Radboud University were recruited using online recruitment software. This enabled us to exclude students that have a major in economics or business studies. We chose to exclude this group of students as they might have different foreknowledge on public goods games than non-economics students and police students. The subjects were randomly invited from the

remaining subject pool. This procedure ensures that the students participating in the different treatments were similar. The police students in Apeldoorn were recruited from several groups of students that had between 2 and 4 years of field experience. Participation was voluntary and took place in their spare time between classes.

When students arrived at the experiment locations, they were first told not to communicate with each other once the experiment had started. They were also told to raise their hands if they had any questions. Questions would be answered individually. All participating students and police students were then guaranteed anonymity and explicitly told that the experiments complied with strict non-deception policy. Anonymity was especially important for police students as we want to protect them from any reputation damage the results of this study can possibly cause. This also meant that payments to police students were paid individually, but were recorded as a group. Confirmation of receiving the payments was signed by a police coordinator.

The experiments at the Radboud University were conducted in the NSM Decision Lab. This room has all required elements (blinds, dividers, etc.) to make sure subjects cannot communicate or observe each other's decision making. The experiments conducted at the Police Academy could not take place in such a room, but were instead conducted in a regular computer room. Subjects were placed as far apart as possible from each other to create a similar effect. One of the sessions required simultaneous participation at the Radboud University (investors) and the police academy (enforcers). The server was setup so that both subject pools could start at the same time and were able to interact with each other across locations using the internet. At both locations the experiment was led by a researcher involved in this study. The researchers communicated by phone to make sure everything was perfectly aligned.

The experiment started with reading the instructions out loud. These instructions also included information on payment. The participation fee was €3 participation, and every coin earned in the game also resulted in a payoff of €0.03. The experiments lasted for about an hour and average payoff was €9.26 per subject. These amounts should provide enough monetary incentives for subjects to behave as they would normally do.

After the instructions students could start the experiment on the computer, where the instructions were displayed again. After the instructions, a number of control questions were asked, to ensure subjects understand the mechanism of the game. Answering these control questions correctly did not influence payoffs, it was merely an aid to help subjects understand the game. Once the control questions were answered, the actual game started and subjects could start making their decisions for

15 rounds. At the end of round 15, the computer displayed the final payoff and asked subjects to remain seated so that the researcher could start with the payments.

### 5.1 Methodological approach

To find answers to our questions we choose to analyze the data in the following way. First contributions are analyzed for every round in the game. This allows us to observe any clear distinctions among the three sessions. Then we will look at the variable contribution for the first five rounds in particular to make statements about the initial reputation of police enforcers and student enforcers. We will also analyze the contribution for round 6 to 15 to see what happens when sanctions are revealed. Especially round 6 is interesting as it might show abrupt changes in contribution when the sanctioning feedback of the first five rounds has just been revealed.

When contribution patterns have been observed, we start examining sanctioning behavior. We will look at the difference between police enforcers and student enforcers in terms of willingness to sanction and effectiveness. Looking at the percentage of investments below the norm, and the actual number of violations punished provides insight in sanctioning behavior. Additionally, we want to examine if there is significant differences in contribution and number of free riders among the different treatments. To do so, one can either use a permutation test or a Mann-Whitney U test. An important assumption of the permutation test is that it requires equal variance across two samples. As we do not observe equal variance, we choose to conduct a Mann-Whitney U test instead. We will use this test to examine if the populations in the three sessions significantly differ from each other in terms of contribution and number of free riders. One of the main assumptions of the Mann-Whitney U test is that observations should be independent of each other, therefore we use group level data for these tests, instead of individual data.

When we have discussed the contribution and sanctioning statistics, we will delve deeper in the data to find out what factors influence contributions and sanctioning (for an overview of the variables see table 2). As we are using public goods game data, we must recognize we have to deal with this as panel data. Panel data is a dataset in which the behavior of entities (in this case subjects) are observed across time. Panel data allows us to control for variables one cannot observe or measure across individuals, or variables that change over time but not across entities. In other words, it accounts for individual heterogeneity (Torres-Reyna, 2007).

When analyzing panel data, one has to make the choice between using fixed effects analysis or random effects analysis. As we have time invariant variables, fixed effects analysis is not an option as those variables would be absorbed by the intercept. If there is reason to believe that differences across entities have some influence on the dependent variable then one should use random effects.

Random effects assume that the entity's error term is not correlated with the predictors which allows for time-invariant variables to play a role as explanatory variables (Torres-Reyna, 2007). One must be careful with random effects analysis that there are not too many extreme values. When checking for frequencies we found that the number of extreme values is very limited (figure 6, appendix). We therefore choose to run a random effects analysis, which allows us to find out which variables influence contribution and punishment behavior over time.

**Table 2 – Overview variables**

Variable name	Label	Notes
comply	Did investor comply with the norm?	Dummy: 0 = no, 1 = yes
cont	Contribution investor per round	
freeride	Did investor free ride?	Dummy: 0 = no, 1 = yes
freeriders	Number of free riders in group in previous round	
group cont	Average group contribution in current round	
group cont. R-1	Average group contribution in previous round	
sanct1to5	Were investors sanctioned in the first five rounds?	
sanctvsnonsanct	Type of game	Dummy: 0 = no sanctioning, 1 = sanctioning
typepunisher	Type of punisher	Dummy: 0 = student enforcer, 1 = police enforcer
unpunished	Number of unpunished free riders previous round	

## 6. Results

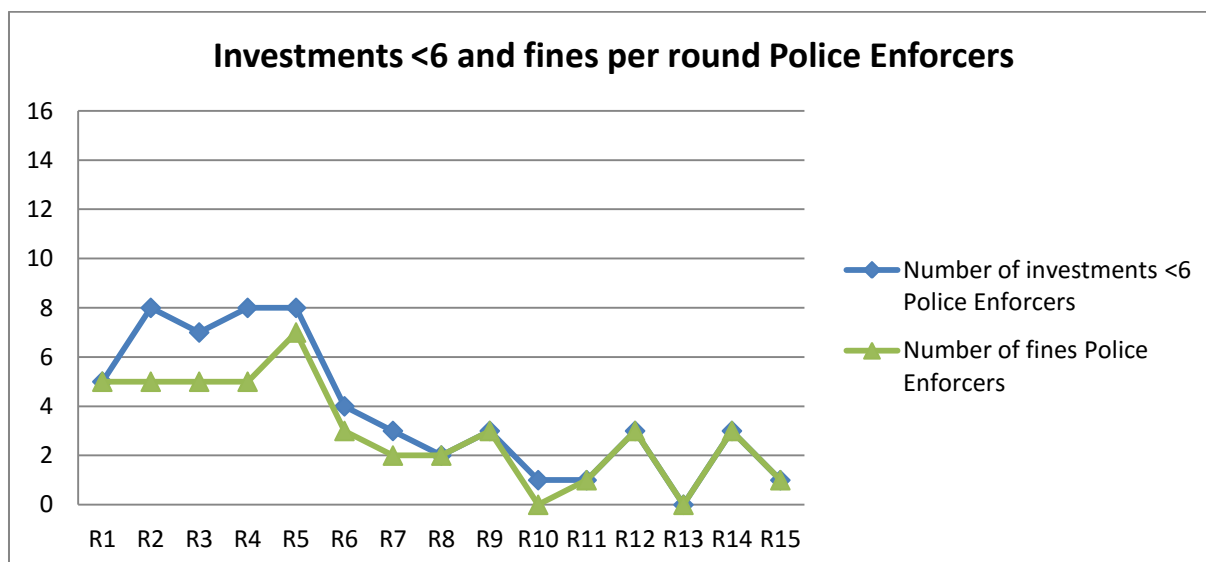
We have conducted three different experiments; a public goods game without sanctioning, a public goods game with police enforcers, and a public goods game with student enforcers. We analyze the obtained data to find answers to our hypotheses.

### 6.1 Preference to sanction and willingness to bear costs

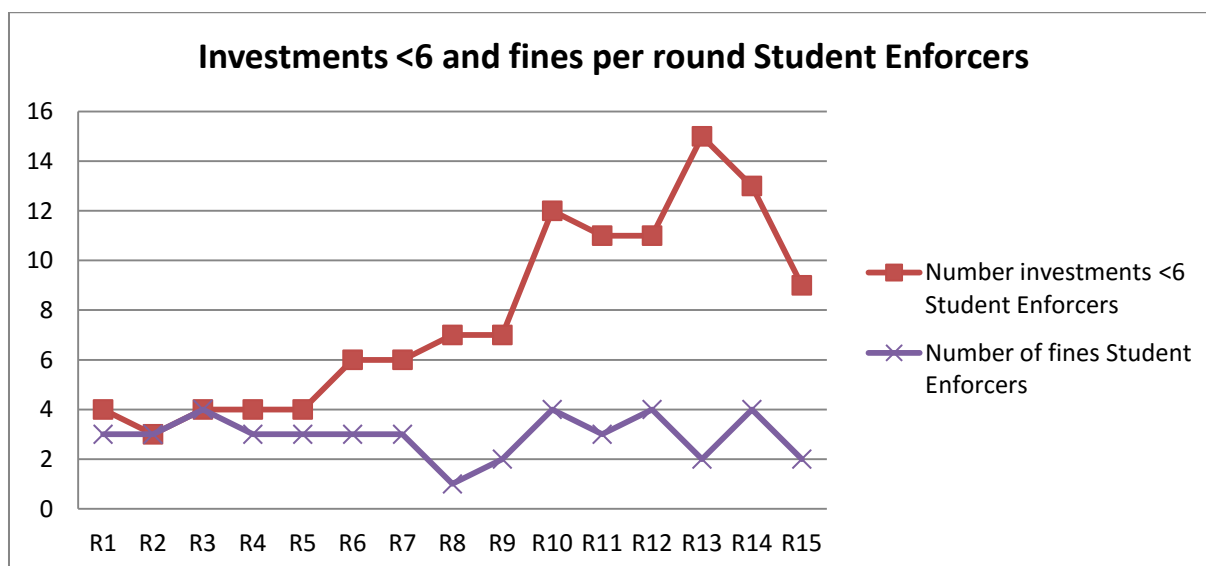
Our first hypothesis states that police students have a larger preference to sanction and are more willing to bear costs. If we look at the number of investments below the norm of 6 and the number of fines issued (figure 1 and 2), we find that initially both type of enforcer choose to sanction free riders quite often. For the first five rounds police enforcers sanction free riders in 75% (27 out of 36) of the cases and student enforcers sanction in 84.2% (16 out of 19) of the cases (table 3). Interestingly, the percentage of free riders being sanctioned in the first 5 rounds is higher for student enforcers than for police enforcers. However the absolute number of free riders sanctioned is much larger in the game with police enforcers. After the first five rounds, police enforcers succeed in reducing the

amount of free riders to a level of 7.78% on average. However, student enforcers fail to reduce free riding and end up with an average level of free riders of 40.42% for the remainder of the game (table 3).

**Figure 1 – Free riders and sanctioning per round in the game with police enforcers**



**Figure 2 – Free riders and sanctioning per round in the game with student enforcers**



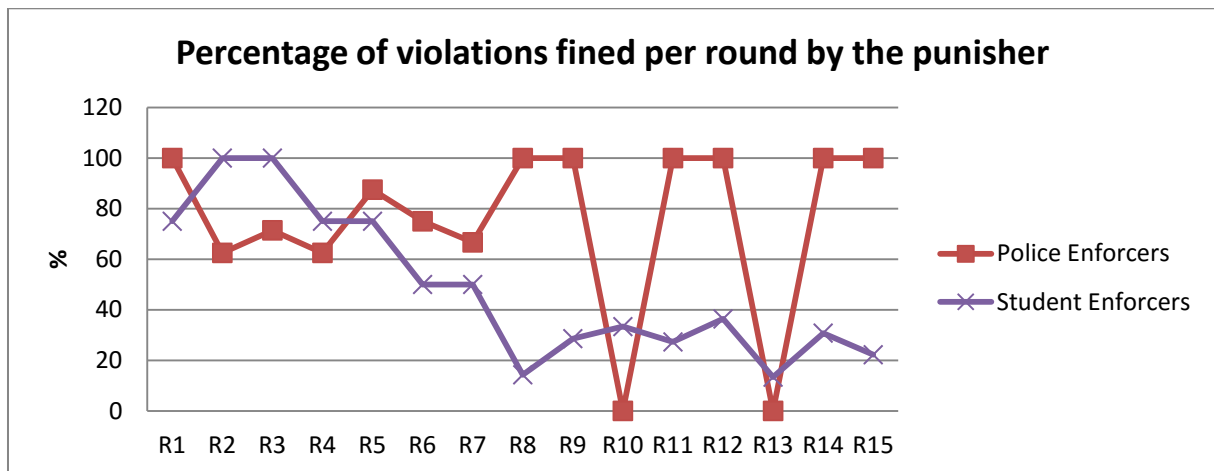
**Table 3 – Summary statistics public goods game**

Punisher type (treatment)	POLICE STUDENT	REGULAR STUDENT	NONE
Average contribution round 1 to 5	6.207407	5.881482	4.9555564
Average contribution round 6 to 15	6.581462	4.840741	3.9555555
Average contribution total game	6.456777	5.187654	4.2888891
Number of investments <6 round 1 to 5	36	19	77
Percentage of investments <6 in round 1 to 5	26.66667	15.83333	57.037037
Number of fines round 1 to 5	27	16	
Percentage of violations fined round 1 to 5	75	84.21053	
Number of investments <6 round 6 to 15	21	97	173
Percentage of investments <6 in round 6 to 15	7.777778	40.41667	64.074074
Number of fines round 6 to 15	18	28	
Percentage of violations fined round 6 to 15	85.71429	28.86598	
Number of investments <6 total game	57	116	250
Percentage of investments <6 total game	14.07407	32.22222	61.728395
Number of fines total game	45	44	
Percentage of violations fined total game	78.94737	37.93103	

Another observation regarding the student enforcers is that the data revealed that out of the 8 enforcers, 3 showed purely selfish behavior and did not sanction at all and one student enforcer punished only once, even though they all faced plenty of free riding. Out of the 9 police enforcers, 7 of them frequently punished free riders. The remaining two police enforcers did not sanction at all, but that was simply because of the fact there was zero free riding in their groups.

Figure 3 presents the percentage of violations that were actually sanctioned. As mentioned earlier, this percentage is higher for student enforcers in the first five rounds. However, after the fifth round is suffers a significant drop. The graph presenting police enforcer sanctioning displays two steep drops at round 10 and round 13. These drops are caused by the fact that there was only 1 violation in round 10, that was left unpunished, and there were zero violations in round 13, both resulting in a percentage of 0. Overall the graph of the police enforcers in figure 3 is quite stable and even increases slightly.

**Figure 3 – Percentage of free riders getting sanctioned per round**



In the entire game, the percentage of investment below the legal norm of 6 was 14.07 for the game with police enforcers and 32.22 for the game with student enforcers. The game without sanctioning saw a level of free riding of 61.73%. The actual percentage of violations fined was 78.95% for police enforcers and 37.93% for student enforcers.

These results clearly suggest that police enforcers are more willing to sanction and to bear the associated costs, and we therefore accept our first hypothesis. The results also suggest that police enforcers are much more effective at sanctioning, as they were able to reduce the level of free riding, and therefore also the costs of sanctioning as sanctioning was no longer required. We will discuss this further in the next section.

## 6.2 Sanctioning effectiveness and efficiency

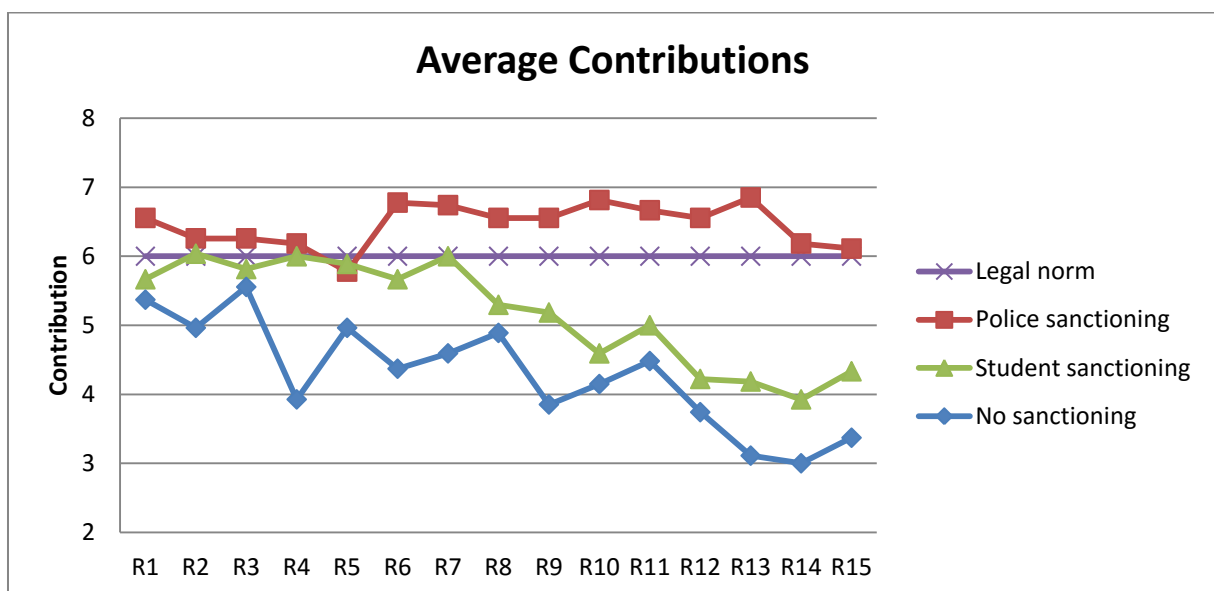
Our second hypothesis states that police enforcers are much more effective and efficient in enforcing a legal norm. To say something about the effectiveness of norm enforcement, we look at the level of contributions and the number of free riders. To examine efficiency, we look at the number of sanctions needed to enforce the norm.

In this study the legal norm is a minimum contribution of 6. Figure 4 graphically presents the average contribution per round for the three different sessions. The graphs show that from the start, the game with no sanctioning has the lowest average contributions, followed by the game with student enforcers. Police enforcers succeed in enforcing the legal norm in almost all rounds. In order to say more about the effectiveness of sanctioning we conduct several Mann-Whitney U tests to examine if contributions and number of free riders significantly differs among treatments. These Mann-Whitney U tests are conducted at group level as they require independent observations.

Let us first examine whether sanctioning is effective at increasing contribution at all. The first Mann-Whitney U test examines the differences in average group contribution per round between the game without sanctioning and the games where sanctioning is present. We find that the games with sanctioning have a significant higher average group contribution than the game without sanctioning ( $p = 0.0000$ , table 6 appendix). If we then also use a Mann-Whitney U test to test the difference between the average group contribution per round between the population being monitored by police enforcers versus student enforcers, we find that contributions in the game with police enforcers are significantly higher ( $p = 0.0020$ , table 7 appendix).

When we graphically look at the average contributions, figure 4 clearly reveals differences in the 3 sessions. In the session without sanctioning, the average contribution is 4.289. The average contributions for the games with sanctioning are 5.188 and 6.457, the latter being the game with the police student enforcers. We can immediately observe that when sanctioning is added to the game, average contribution is higher. This effect is strongest for the game with police enforcers. We can also observe that police enforcers succeed in enforcing the minimum contribution of 6 in all but one round. Student enforcers clearly fail to enforce the legal norm, especially when sanctions are no longer hidden. Thus, in terms of achieving higher contribution, police enforcers are more effective.

**Figure 4 – Average contributions to the public good per round for the three different treatments**



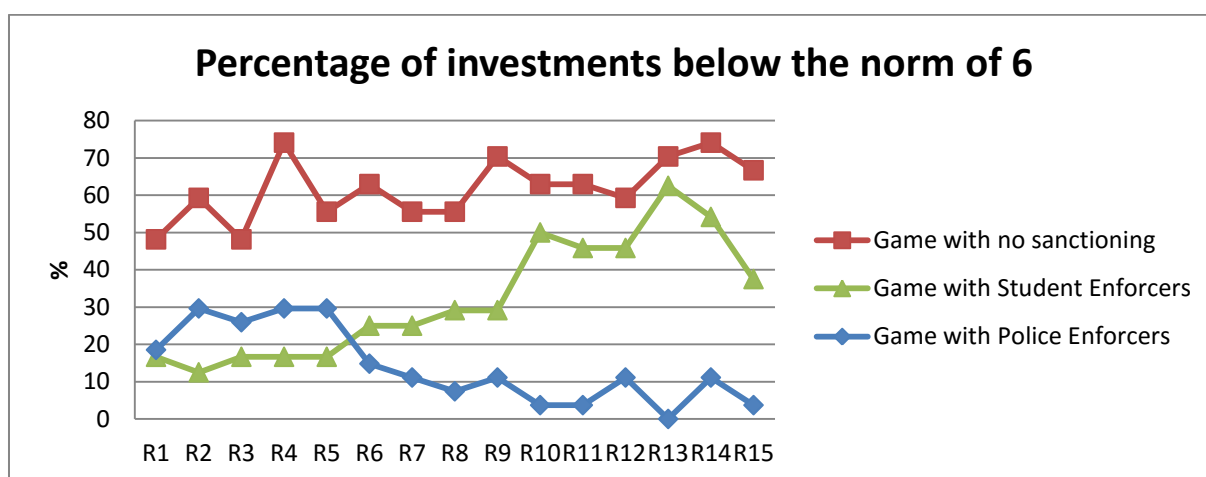
Besides the level of contribution, we also examine the difference in number of free riders across treatments. When conducting a Mann-Whitney U, we find that the number of free riders is significantly higher for the game with student enforcers when we look at the entire data ( $p=0.0001$ ,



table 8 appendix). This indicates that free riding is much less present in the game where police enforcers are monitoring. Figure 5 graphically presents the percentage of free riders per round for the different treatments. Interesting to note is that the number of free riders is initially higher for the game with police enforcers. After round 5 however, when sanctions are revealed, there is a clear drop in the number of free riders in the game with police enforcers. On the contrast, the number of free riders in the game with student enforcers increases after round 5. The total percentage of investors free riding is 14.07% for the game with police enforcers and 32.22% for the game with student enforcers.

This result also suggests that police enforcers are more effective at enforcing the legal norm than student enforcers.

**Figure 5 – Percentage of investors free riding per round**



Observing these different levels of free riding between the sanctioning treatments asks for a more elaborate investigation of what factors can affect norm compliance. Table 4 presents the results of a random effects analysis with norm compliance as dependent variable (see appendix for more detailed results). Apart from the type of enforcer, we also added several control variables (for more information on variables see table 2). The table shows that the type of punisher has significant positive relation with norm compliance (0.0760\*\*), meaning that the presence of police enforcers has a strong positive effect on norm compliance. This is in line with our previous results that looked at the number of free riders and level of contribution across the sanctioning treatments. The random effects analysis also shows that the group contribution in the round before the current round is significantly negatively correlated with norm compliance in the current round (0.0513\*\*\*). This can be explained by the fact that people are conditionally cooperative. The results suggest that if investors observe that the group contribution is low the round before, they reduce their own contribution in the current round and stop complying with the norm. If we look at the number of free

riders the round before, we find a similar significant negative effect on norm compliance (-0.0660\*\*). This indicates that the larger the number of free riders in the previous round, the lower the chance on norm compliance in the current round. The last control variable is the number of unpunished free riders in the round before. This control variable has a significant negative effect on norm compliance (-0.0485\*). This means that when investors observe unpunished free riders in the previous round, they are less likely to comply with the norm in this round. This is typical evidence of the type II error described by Grechenig et al., (2010).

**Table 4**

Do investors comply?	
	Effect on norm compliance
Type of punisher	0.0760** (2.95)
Group cont. R-1	-0.0513*** (-4.35)
Nr. of unpunished players previous round	-0.0485* (-1.96)
number of free riders previous round	-0.0660** (-3.07)
Contribution	0.146*** (22.48)
Constant	0.236** (2.84)
Observations	715
Adjusted R-squared	

t statistics in parentheses  
\* p<0.05, \*\* p<0.01, \*\*\* p<0.001

It is also useful to see whether these factors remain to have a significant effect on norm compliance when we make a distinction for the two sanctioning treatments. Table 5 presents the results of a two random effects analysis with norm compliance as dependent variables for the two sanctioning treatments. It shows the effect of the control variables on norm compliance for the two different treatments. The effects for police enforcers are stronger than student enforcers for the group contribution in the previous round and for the number of free riders in the previous round. This indicates that in the games where police officers were enforcers, low contribution and free riding has a stronger negative effect on norm compliance in the next round. We also observe that the number of free riders in the previous round is not significantly affecting norm compliance for the game with student enforcers.

**Table 5**

Do investors comply?

	Police Enforcers	Student Enforcers
o.Type of punisher	.	.
Group cont. R-1	-0.0497** (-3.00)	-0.0472** (-2.72)
Number of unpunished players previous round	-0.0338 (-0.68)	-0.0639 (-1.79)
number of free riders previous round	-0.0844** (-3.13)	-0.0365 (-1.05)
Contribution	0.143*** (14.99)	0.148*** (16.06)
Constant	0.334** (2.80)	0.179 (1.50)
Observations	378	337
Adjusted R-squared		

t statistics in parentheses

\* p&lt;0.05, \*\* p&lt;0.01, \*\*\* p&lt;0.001

If we look at the difference between police enforcers and student enforcers in term of efficiency, we observe something interesting. The number of investments <6 for the game with police enforcers is 57 and the number of fines is 45 (table 3). If corrected for sample size, the relative number of investments <6 for the game with student enforcers is 131, and the number of fines is 50. This means that police enforcers spend 135 tokens to sanction free riders, where student enforcers spend 150 tokens. This is very interesting, as it shows that student enforcers actually spend more tokens on sanctioning, but achieved much worse results. In other words, police enforcers are much more efficient at sanctioning, as they were able to achieve much better results in terms of reducing free riding and increasing contribution with fewer tokens spend.

Based on our above results we can accept our second hypothesis that police enforcers are more effective and more efficient than regular students in enforcing a legal norm.

### 6.3 Sanctioning reputation

Our third hypothesis states that people believe that police students sanction more severely than non-police individuals. If we look at the first five rounds of figure 5 again, we find an interesting observation. The number of free riders is higher in the game with police enforcers than in the game with student enforcers. Note that sanctions were hidden during these rounds. This is quite interesting as it suggests that investors did not believe that police enforcers sanction more strictly. In contrast, they seemed more willing to accept the risk of being sanctioned in the game with police enforcers. If we test this difference using a Mann-Whitney U test for average group contribution in

the first five rounds, we find no significant difference between the two treatments ( $p = 0.1786$ , *table 12 appendix*). If we then test (Mann Whitney U test) for number of free riders in the first five rounds, we find that the number of free riders is actually significantly higher in the game with police enforcers than in the game with student enforcers ( $p=0.0202$ ). This is an interesting finding as it confirms the graphical indication that investors are initially less concerned about the risk associated with free riding when they are monitored by police students, compared to regular students. Assuming that people behave rationally, they make a tradeoff between level of risk of being sanctioned and the benefits from free riding. This means when they regard the risk of being sanctioned to be low, they will increase free riding. We observe that more free riding is present in the game with police enforcers. Thus, we must reject our hypothesis that people believe police students sanction more severely than non-police individuals. In fact, our results suggest that people believe the risk of being sanctioned is initially higher for non-police individuals.

If we observe what happens after round 5 (figure 3 & 5), when sanctioning feedback is revealed, we see a reduction in free riding for the police enforced game and an increase in free riding for the student enforced game. We also observe that even though students sanctioned relatively more in the first five rounds, investors started to free more from round 6 onwards. In the game with police enforcement, initial sanctioning was relatively lower, but now we observe a decrease in free riding from round 5 onwards. This is a very interesting finding. For some reason, even though initially sanctioning less than regular student, police students succeed in reducing free riding later in the game. Regular students on the other hand, fail to reduce free riding when sanctions are revealed. Apparently, the reputation of the police might be playing a role later in the game, where they show consistency in sanctioning. In this case, investors feel that free riding is not beneficial as the risk of being sanctioned is too high.

The reduction in percentage of free riders sanctioned in the game with student enforcers after round 5 is also noteworthy. A possible explanation could be that student enforcers enjoyed secret sanctioning, but did not care to sanction when feedback was given immediately, resulting in unpunished free riding in the later rounds. Another explanation could be that investors were careful in the first 5 rounds, having no idea about the sanctioning behavior of student enforcers. This means that there were few free riders and thus little reason to sanction. When the sanctions were revealed after round 6, investors tried to free ride and possibly found out they would go unpunished. If one investor starts to free ride and remains unpunished, others will follow. This is typical evidence of the type II error described by (Grechenig et al., 2010). In the game with police enforcers, investors showed no urge to try to free ride, as the percentage of free riders sanctioned actually increased

after the first five rounds, meaning that free riding is very costly as the likelihood of being sanctioned was high.

## **7. Discussion**

We formulated our hypotheses based on existing literature. We were able to accept the first two hypotheses concerning police students' willingness to sanction and effectiveness of sanctioning. However, we had to reject our third hypothesis, meaning that initially the public does not believe that police students sanction more severely than non-police individuals. This contradicts the findings in the existing literature. In this study, police enforcers were initially faced with more free riders than student enforcers. A possible explanation is that investors had no idea what to expect from student enforcers, where they might have an expectation of how police officers sanction. For police students, enforcing the law is the main part of their job, where most regular students have no experience in active law enforcement. Possibly, investors believed that regular students, being placed in a position they are unfamiliar with, would initially sanction very strictly as that is what their role required. Police students on the contrast are familiar with discretionary freedom, and might leave some small free riders unpunished. Investor might have initially believed that police students do not sanction every free rider, but only the ones that deviate most from the norm.

To capture the mechanisms driving the perception of the public concerning the sanctioning behavior of police officers and non-police individuals, further research is required. It should aim at finding out why this initial reputation of the police is different compared to non-police individuals. It should also try to find answers why it all changes when sanctioning feedback is revealed. Apparently, the 'police badge' has its influence on investment behavior, but how exactly is still to be answered. Another suggestion for further research is to run the experiments with more experienced police officers. The subjects used in the sample were all police students as they were most approachable. More experienced police officers could behave differently as they might have hardened on the streets, creating an even larger distinction between police and non-police individuals.

We must also consider some limitations of our study. First and most importantly, due to monetary and time constraints, it was not possible to run the experiment with more subjects. Increasing the sample would greatly improve the validity and strength of the results. Secondly, we were not able to run a public goods game without sanctioning with non-police individuals. If we would have done so, we could directly compare police students' cooperative behavior to regular students' cooperative behavior. Now we have to rely on a comparison with existing literature. We find no evidence that police students differ from non-police individuals in terms of cooperative behavior and norm

compliance. We found that police students invest roughly 40% of their endowment, and about 60% of the investments can be classified as free riding. Extensive literature studies of subsequent laboratory experiments show that, on average, subjects contribute between 40 and 60 percent of their endowment to a public good (Keser & Van Winden, 2000). Furthermore, Fishbacher et al. (2001) find that a third of the people can be classified as free riders, and about 50% is conditionally cooperative. If we compare these numbers to our results of the police students, we can carefully conclude that we do not find any evidence that police students are more cooperative than non-police subjects in this environment.

A third limitation of our research is the fact that the police academy had no controlled laboratory computer rooms. Even though the researchers did everything to prevent communication during the experiments, it is not impossible that police students were able to see some information on other subjects' screens or that they communicated non-verbally. Although not witnessed by the researchers, if it did occur it might have had a minor effect on the results.

## **8. Conclusion**

In this paper we conducted three different public goods games to find out if Dutch police students are effective law enforcers and how they differ from regular students in terms enforcement behavior. We also examined the reputation of police students versus regular students among investors concerning their strictness in sanctioning behavior. The first session consisted of a public goods game without sanctioning in which police students cooperated. We found no evidence that the level of cooperation and free riding among police students is different from regular students as we compared it to the existing literature on cooperative behavior.

The second and third sessions consisted of public goods games with sanctioning. In the second experiment police students were enforcers, and in the third experiment regular students were enforcers. We found that police enforcers were more willing to sanction than student enforcers. Police enforcers sanctioned 78.95% of the norm violations and student enforcers only sanctioned 37.93% of the violations. Police enforcers also turned out to be much more effective and efficient in terms of sanctioning. In the game with police enforcers, 14.07% of the contributions were below the legal norm. In the game with student enforcers this number was 32.22%. Police students were able to significantly improve contribution (average of 6.46) compared to student enforcers (average of 5.19). They achieved this successful norm enforcement bearing less cost to sanction than student enforcers. In fact, the student enforcers failed to remain contribution at the norm and contribution decreased throughout the game, even though they incurred relatively more costs to sanction. The

number of people that were left unpunished also increased over the game with student enforcers. Possibly, other investors that were contributing a norm level observed unpunished free rider behavior and also stopped contributing. This is typical evidence of the type II error described by Grechenig et al. (2010).

We also found that initially, investors have a different perception of enforcing behavior of police students and regular students. This means that investors in these experiments did not believe police students would sanction more severely than regular students. This perception turned out to be valid as the sanctioning behavior of student enforcers was stricter than police enforcers in the first five rounds where sanctioning feedback was hidden. We found that once sanctioning feedback is revealed, investors that were monitored by police enforces significantly increased their contributions. The opposite is true for investors that were being monitored by student enforcers. This result is quite surprising as the sanctioning behavior by student enforcers was stricter than police enforcers in the first five rounds.

To sum up, police students have a large preference to sanction and are very effective at enforcing a legal norm, even though their initial reputation does not clearly say so.

## Acknowledgements

The authors are grateful to the Nijmegen School of Management for financial support to be able to conduct this research. We also want to show our gratitude to Jeroen Pijnenburg for assistance in coding the public goods game and Jana Vyrastekova for her excellent supervision. Special thanks go to the Police Academy for facilitating subjects for this research.

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## 9. Appendix

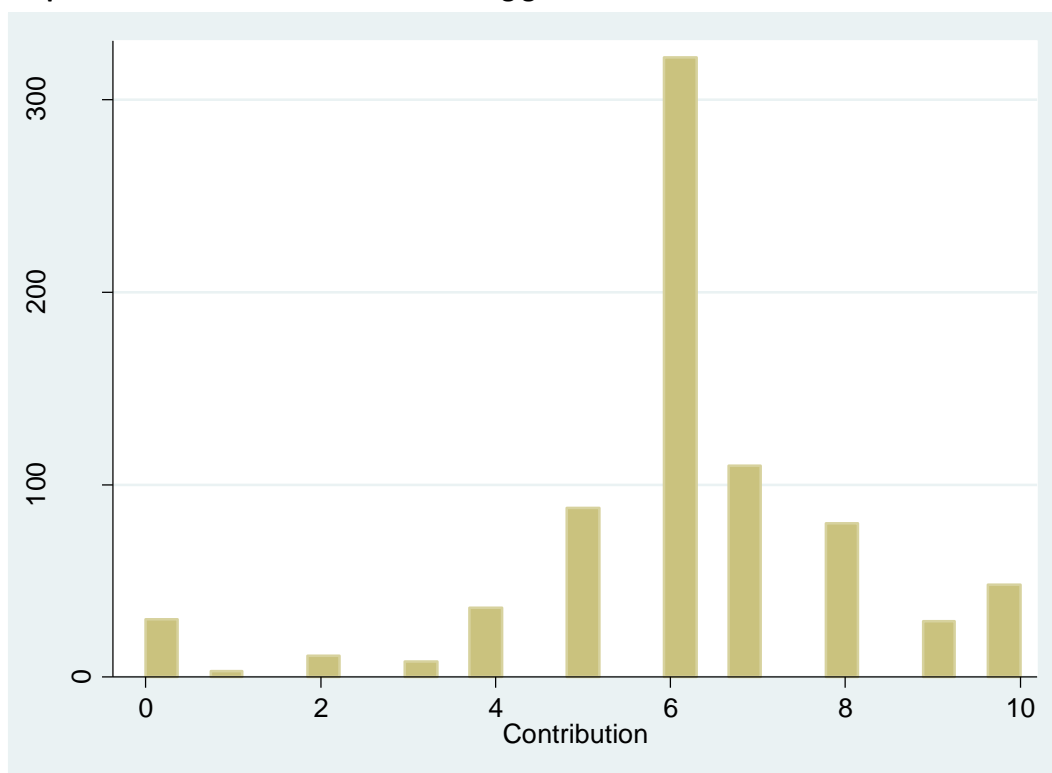
### Planning

Week	Date	Task	Remarks
13	28-mrt	Hand in Research Proposal	30/03 Hand in final draft, 8/04 final deadline
14	4-apr	Exam week	
15	11-apr	Meeting at Police Academy	Finalize research set-up and make appointments for conducting the experiments
16	18-apr	Prepare experiments	Complete the methodological chapter in line with latest setup
17	25-apr	Prepare experiments	Create online tool for the experiments
18	2-mei	Prepare experiments	
19	9-mei	Prepare experiments	
20	16-mei	<b>Conduct experiment</b>	Conduct the experiments at both the Police Academy and Decision Lab
21	23-mei	<b>Conduct experiment</b>	
22	30-mei	<b>Conduct experiment</b>	
23	6-jun	<b>Conduct experiment</b>	
24	13-jun	<b>Conduct experiment</b>	
25	20-jun	Work out results	Statistical analysis of results
26	27-jun	Write the conclusion and discussion section	Provide conclusions and discuss some limitations
27	4-jul	Hand in draft version of complete Thesis	Include remaining feedback
28	11-jul	Hand in final version	
34	22-Aug	Defend Master's Thesis, Aug 25?	

## Additional Figures and Tables

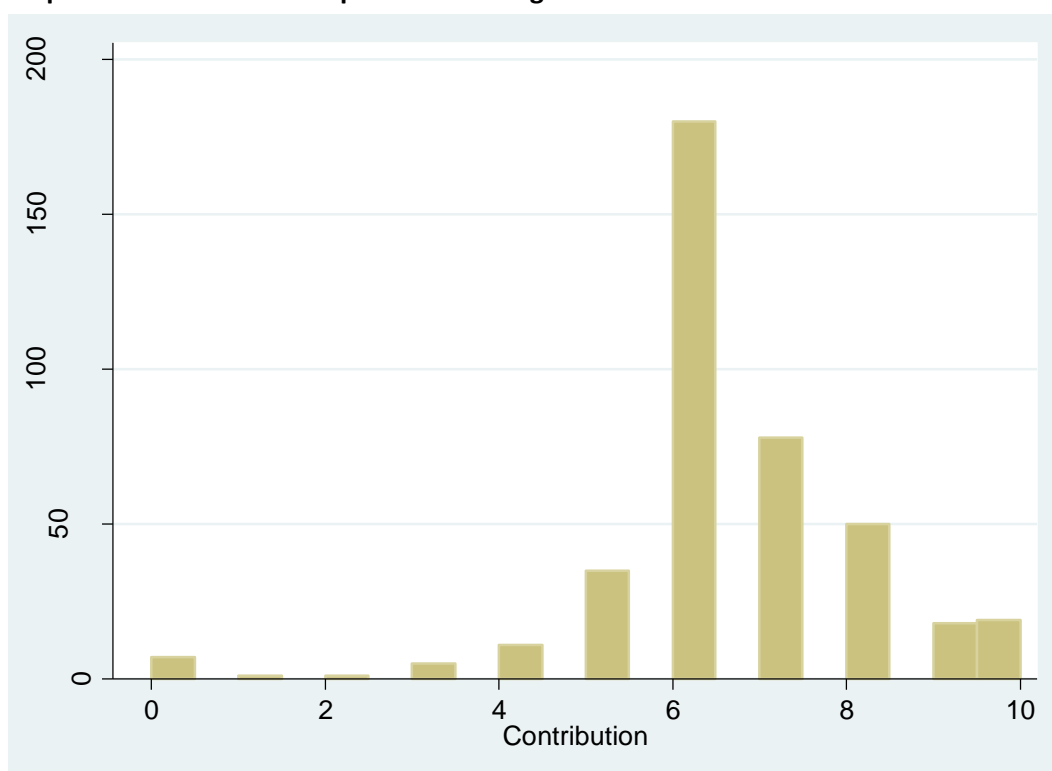
**Figure 6**

Frequencies contribution in all sanctioning games:

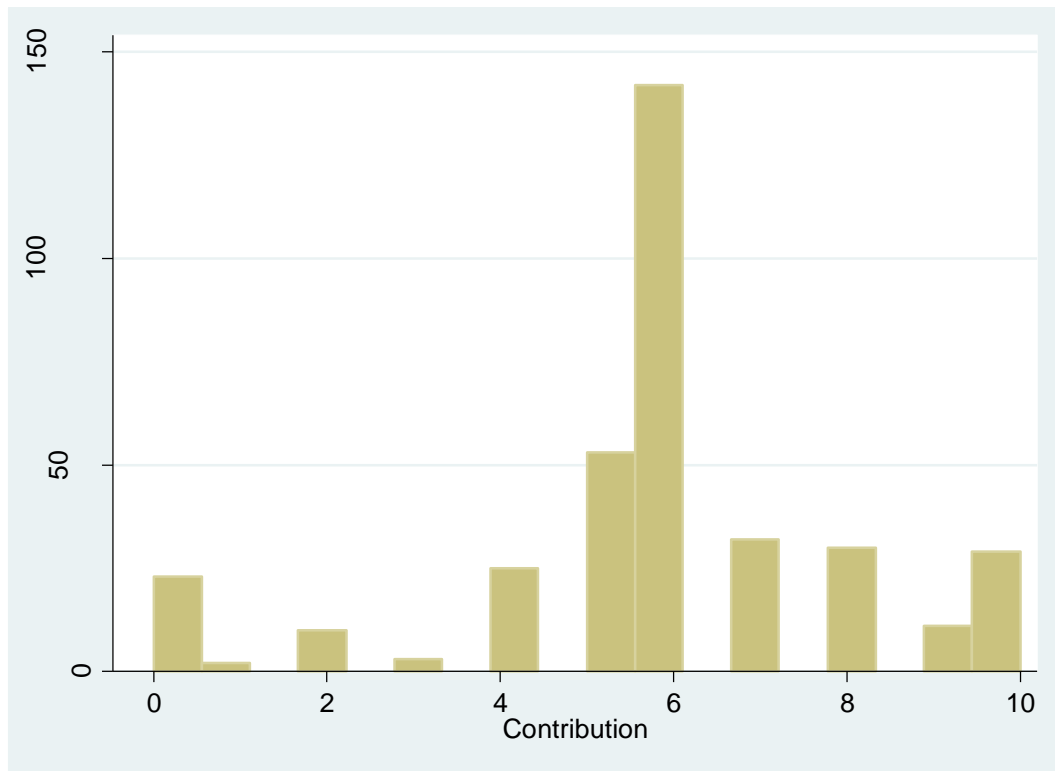


**Figure 7**

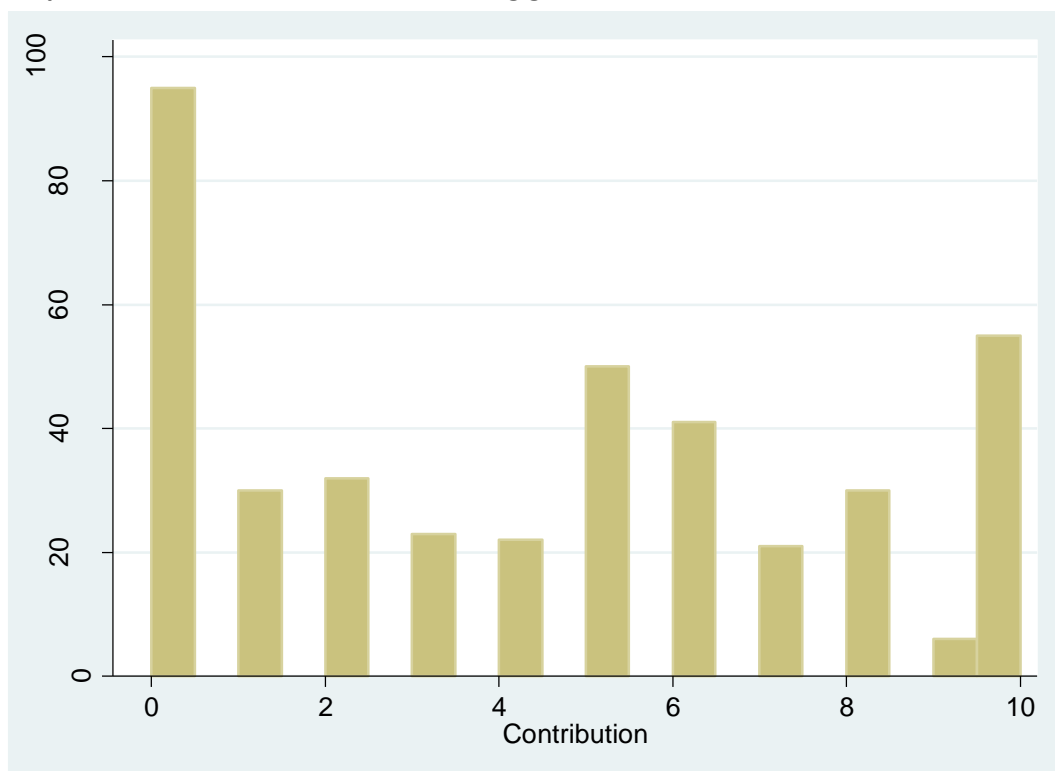
Frequencies contribution in police enforcer game:



**Figure 8**  
**Frequencies contribution in student enforcer game:**



**Figure 9**  
**Frequencies contribution in no-sanctioning game:**



**Table 6****No sanction vs. sanction**

```
ranksum groupcont, by(sanctvsnonsanct)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test
```

Sanct.vs nonsanct.	obs	rank sum	expected
Non-sanction	135	18925	26392.5
Sanction	255	57320	49852.5
combined	390	76245	76245

```

unadjusted variance 1121681.25
adjustment for ties  -6384.77
-----
adjusted variance 1115296.48

Ho: groupc~t(Sanctv~t==0) = groupc~t(Sanctv~t==1)
      z = -7.071
Prob > |z| = 0.0000

```

**Table 7****Police sanction vs. student sanction total game:**

```
ranksum groupcont, by(typesanct)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test
```

Typesanct	obs	rank sum	expected
Student Enforcer	120	13553	15360
Police Enforcer	135	19087	17280
combined	255	32640	32640

```

unadjusted variance 345600.00
adjustment for ties  -4197.32
-----
adjusted variance 341402.68

Ho: groupc~t(typesa~t==0) = groupc~t(typesa~t==1)
      z = -3.093
Prob > |z| = 0.0020

```

**Table 8****Free riders difference total game:**

```
. ranksum freeride, by(typesanct)
Two-sample Wilcoxon rank-sum (Mann-Whitney) test
```

Typesanct	obs	rank sum	expected
Student Enforcer	120	17481	15360
Police Enforcer	135	15159	17280
combined	255	32640	32640

```

unadjusted variance 345600.00
adjustment for ties  -65065.75
-----
adjusted variance 280534.25

Ho: freeride(typepu~r==0) = freeride(typepu~r==1)
      z = 4.004
Prob > |z| = 0.0001

```

**Table 9****All sanctioning data, random effects analysis with dependent variable norm compliance.**

```
xtreg comply typepunisher sanctlto5 groupcontlag1 unpunished freeriders cont, re
```

```
Random-effects GLS regression                Number of obs    =       715
Group variable: i                          Number of groups  =       51

R-sq:                                       Obs per group:
    within = 0.4860                        min =          14
    between = 0.7462                       avg =         14.0
    overall = 0.5386                       max =          15

corr(u_i, X) = 0 (assumed)                 Wald chi2(6)      =     794.95
                                           Prob > chi2       =     0.0000
```

comply	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
typepunisher	.076037	.025753	2.95	0.003	.0255621	.1265119
sanctlto5	-.0708381	.0272978	-2.60	0.009	-.1243408	-.0173353
groupcontlag1	-.0512994	.0117922	-4.35	0.000	-.0744116	-.0281871
unpunished	-.0485358	.0247163	-1.96	0.050	-.0969788	-.0000928
freeriders	-.0659825	.0214814	-3.07	0.002	-.1080853	-.0238797
cont	.1463253	.0065097	22.48	0.000	.1335666	.159084
_cons	.2361743	.083086	2.84	0.004	.0733287	.3990199
sigma_u	.03962739					
sigma_e	.27955147					
rho	.01969823	(fraction of variance due to u_i)				

**Table 10****Police enforcers, total game – random effects analysis with dependent variable norm compliance.**

```
. xtreg comply typepunisher sanctlto5 groupcontlag1 unpunished freeriders cont, re
note: typepunisher omitted because of collinearity
```

```
Random-effects GLS regression                Number of obs    =       378
Group variable: i                          Number of groups  =       27

R-sq:                                       Obs per group:
    within = 0.4207                        min =          14
    between = 0.6437                       avg =         14.0
    overall = 0.4647                       max =          14

corr(u_i, X) = 0 (assumed)                 Wald chi2(5)      =     301.27
                                           Prob > chi2       =     0.0000
```

comply	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
typepunisher	0	(omitted)				
sanctlto5	-.0735674	.0375604	-1.96	0.050	-.1471845	.0000496
groupcontlag1	-.0496829	.0165529	-3.00	0.003	-.0821259	-.0172399
unpunished	-.0338293	.0494161	-0.68	0.494	-.1306831	.0630245
freeriders	-.0843891	.0269732	-3.13	0.002	-.1372556	-.0315226
cont	.1427041	.0095211	14.99	0.000	.1240431	.1613651
_cons	.3340151	.1192929	2.80	0.005	.1002053	.5678248
sigma_u	.05888257					
sigma_e	.2476153					
rho	.05352162	(fraction of variance due to u_i)				

**Student Enforcers, total game – random effects analysis with dependent variable norm compliance**

Random-effects GLS regression	Number of obs	=	337
Group variable: i	Number of groups	=	24
R-sq:	Obs per group:		
within = 0.5272	min =		14
between = 0.6990	avg =		14.0
overall = 0.5492	max =		15
	Wald chi2(5)	=	399.18
corr(u i, X) = 0 (assumed)	Prob > chi2	=	0.0000

comply	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
typepunisher	0	(omitted)				
sanctlto5	-.0693133	.0441399	-1.57	0.116	-.1558258	.0171992
groupcontlag1	-.0471655	.0173507	-2.72	0.007	-.0811722	-.0131589
unpunished	-.063944	.0357603	-1.79	0.074	-.1340329	.006145
freeriders	-.0365333	.034869	-1.05	0.295	-.1048752	.0318086
cont	.1484632	.0092466	16.06	0.000	.1303402	.1665862
_cons	.1793775	.1195015	1.50	0.133	-.0548411	.413596
sigma_u	.03194138					
sigma_e	.31259733					
rho	.01033299	(fraction of variance due to u_i)				

### Police sanction vs student sanction round 1 to 5

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

Typesanct	obs	rank sum	expected
Student Enforcer	40	1872	1720
Police Enforcer	45	1783	1935
combined	85	3655	3655

unadjusted variance	12900.00
adjustment for ties	-128.19
	-----
adjusted variance	12771.81

```
Ho: groupc~t(typesa~t==0) = groupc~t(typesa~t==1)
      z = 1.345
      Prob > |z| = 0.1786
```

**Table 13****Freeriders difference round 1 to 5:**

```
. ranksum freeride, by(typepunisher)
```

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

Typesanct	obs	rank sum	expected
Student Enforcer	40	1485	1720
Police Enforcer	45	2170	1935
combined	85	3655	3655

```
unadjusted variance    12900.00
adjustment for ties    -2658.15
```

```
adjusted variance      10241.85
```

```
Ho: freeride(typepu~r==0) = freeride(typepu~r==1)
      z = -2.322
      Prob > |z| = 0.0202
```



## Experiment Instructions and Aids (In Dutch)

### Sessie 1: 17 mei en 24 mei (Politiacademie – Investeerder)

Bedankt dat je bereidt bent deel te nemen aan dit experiment. Je gaat mee doen in een experiment waarin je individueel beslissingen gaat nemen. Aan het einde van het experiment wordt je betaald. Het uitbetaalde bedrag wordt beïnvloed door de beslissingen die je tijdens het experiment maakt en kan dus verschillen per deelnemer. Je krijgt 3 euro voor deelname, daarnaast is elke munt die je in het spel verdiend uiteindelijk 0,03 euro waard.

In dit experiment ga je mee doen aan een spel waarin je:

- kan investeren in een gemeenschappelijk goed, **of**
- (een deel van) je geld voor jezelf kan houden.

Tijdens dit experiment wordt je gekoppeld aan twee andere deelnemers. Je bent dus met een groep van 3. **De andere deelnemers zijn ook politiestudenten. Je neemt deel aan 15 rondes waarin je elke keer met dezelfde spelers in een groep zit.** Ieder van jullie ontvangt 10 munten per ronde. Deze munten kun je investeren in een gemeenschappelijk goed. Elke munt die je investeert gaat van je eigen voorraad munten af. Je kiest een investering tussen 0 en 10 munten.

Een geïnvesteerde munt in het gemeenschappelijke goed wordt vermenigvuldigd met 1,5. Een investering van 1 munt levert dus 1,5 munt opbrengst. Alle munten die door de 3 deelnemers in het gemeenschappelijke goed worden geïnvesteerd, worden 1,5 keer zoveel waard. De totale opbrengst van de investering wordt dan berekend en gelijk verdeeld over de 3 deelnemers. De munten die je niet hebt geïnvesteerd behouden gewoon de waarde van 1. De sociaal gewenste minimale investering per deelnemer bedraagt 6 munten per ronde. Je bent echter vrij om hier van af te wijken.

## Sessie 2: 31 mei (NSM Decision Lab – Investeerder)

Bedankt dat je bereidt bent deel te nemen aan dit experiment. Je gaat mee doen in een experiment waarin je individueel beslissingen gaat nemen. Aan het einde van het experiment wordt je betaald. Het uitbetaalde bedrag wordt beïnvloed door de beslissingen die je tijdens het experiment maakt en kan dus verschillen per deelnemer. De participatiebeloning is 3 euro, daarnaast is elke munt in het experiment uiteindelijk 0,03 euro waard.

In dit experiment ben jij een investeerder. Je gaat mee doen aan een experiment waarin je:

- kan investeren in een gemeenschappelijk goed, **of**
- (een deel van) je geld voor jezelf kan houden.

Tijdens dit experiment wordt je gekoppeld aan drie ander deelnemers. Twee daarvan zijn investeerders, net als jij. De derde deelnemer is een straffer. Je bent dus met een groep van 4. **Je maakt beslissingen in 15 ronden waarin je elke keer met dezelfde deelnemers in een groep blijft.** Iedere investeerder ontvangt 10 munten per ronde. Deze munten kunnen worden geïnvesteerd in een gemeenschappelijk goed. Elke munt die wordt geïnvesteerd gaat van de eigen voorraad munten af. De investeerder kiest een investering tussen 0 en 10 munten.

Een geïnvesteerde munt in het gemeenschappelijke goed wordt vermenigvuldigd met 1,5. Een investering van 1 munt levert dus 1,5 munt opbrengst. Alle munten die door de 3 deelnemers in het gemeenschappelijke goed worden geïnvesteerd, worden 1,5 keer zoveel waard. De totale opbrengst van de investering wordt dan berekend en gelijk verdeeld over de 3 investeerders. De munten die je niet hebt geïnvesteerd behouden gewoon de waarde van 1. De wettelijke minimale investering per investeerder bedraagt 6 munten. Investerders zijn echter vrij om hier van af te wijken.

De straffer heeft de mogelijkheid investeerders te straffen die minder dan de wettelijke norm van 6 investeren. **Deze straffer is een politiestudent op een andere locatie.** De straffer kan zelf niet investeren en deelt ook niet mee in de opbrengsten uit het gemeenschappelijke goed. De straffer ontvangt wel een vast bedrag van 18 munten die hij kan inzetten om investeerders met een te lage investering te straffen. Nadat alle investeerders hun investering bekend maken gaat de straffer beslissen of en welke investeerders met een te lage investering hij/zij wil straffen. Dit kan alleen als de investering lager is dan de **wettelijke norm van 6**. De hoogte van de resulterende boete is 2 per iedere munt die minder is geïnvesteerd dan de wettelijke norm van 6. Een boete opleggen levert voor de straffer zelf geen geld op. De straffer investeert niet en deelt ook niet mee in de opbrengst van het gemeenschappelijke goed.

Om een boete uit te delen betaalt de straffer 3 munten per investeerder die hij straft. Wanneer de straffer een investeerder straft met een investering van boven de 6 munten negeert het programma deze beslissing. Er wordt geen boete opgelegd en het kost de straffer ook niets.

Gedurende de eerste 5 ronden krijg je na elke ronde de investeringen van alle deelnemers te zien. De investeerders zien echter nog niet of er boetes zijn uitgedeeld. Na ronde 5 krijgen investeerders een overzicht van de investeringen en eventuele boetes in de eerste 5 ronden. Vanaf ronde 6 volgt deze informatie direct na elke ronde.

## Sessie 2: 31 mei (Politieacademie – Straffer)

Bedankt dat je bereidt bent deel te nemen aan dit experiment. Je gaat mee doen in een experiment waarin je individueel beslissingen gaat nemen. Aan het einde van het experiment wordt je betaald. Het uitbetaalde bedrag wordt beïnvloed door de beslissingen die je tijdens het experiment maakt en kan dus verschillen per deelnemer. De participatiebeloning is 3 euro, daarnaast is elke munt in het experiment uiteindelijk 0,03 euro waard.

In dit experiment ben jij een straffer. Je gaat mee doen aan een experiment waarin 3 andere deelnemers:

- kunnen investeren in een gemeenschappelijk goed, **of**
- (een deel van) het geld voor zichzelf kunnen houden.

Tijdens dit experiment wordt je gekoppeld aan drie andere deelnemers. Zij zijn allemaal investeerders. Deze investeerders zijn studenten van de Radboud Universiteit. De vierde deelnemer is een straffer, dat ben jij. Je bent dus met een groep van 4. **Je maakt beslissingen in 15 rondes waarin je elke keer met dezelfde deelnemers in een groep blijft.** Iedere investeerder ontvangt 10 munten per ronde. Deze munten kunnen worden geïnvesteerd in een gemeenschappelijk goed. Elke munt die wordt geïnvesteerd gaat van de eigen voorraad munten af. De investeerder kiest een investering tussen 0 en 10 munten.

Een geïnvesteerde munt in het gemeenschappelijke goed wordt vermenigvuldigd met 1,5. Een investering van 1 munt levert dus 1,5 munt opbrengst. Alle munten die door de 3 de deelnemers in het gemeenschappelijke goed worden geïnvesteerd, worden 1,5 keer zoveel waard. De totale opbrengst van de investering wordt dan berekend en gelijk verdeeld over de 3 investeerders. De munten die niet zijn geïnvesteerd behouden gewoon de waarde van 1. De wettelijke minimale investering per investeerder bedraagt 6 munten. Investeerders zijn echter vrij om hier van af te wijken.

De straffer heeft de mogelijkheid investeerders te straffen die minder dan de wettelijke norm van 6 investeren. Jij bent in dit experiment een straffer. Als straffer kan je niet investeren en deel je ook niet mee in de opbrengsten van het gemeenschappelijke goed. De straffer ontvangt wel een vast bedrag van 18 munten die hij kan inzetten om investeerders met een te lage investering te straffen. Nadat alle investeerders hun investering bekend maken gaat de straffer beslissen of en welke investeerders met een te lage investering hij/zij wil straffen. Dit kan alleen als de investering lager is dan de **wettelijke norm van 6**. De hoogte van de resulterende boete is 2 per iedere munt die minder is geïnvesteerd dan de wettelijke norm van 6. Een boete opleggen levert voor de straffer zelf geen geld op. De straffer investeert niet en deelt ook niet mee in de opbrengst van het gemeenschappelijke goed. Om een boete uit te delen betaalt de straffer 3 munten per investeerder die hij straft. Wanneer de straffer een investeerder straft met een investering van boven de 6 munten negeert het programma deze beslissing. Er wordt geen boete opgelegd en het kost de straffer ook niets.

Gedurende de eerste 5 rondes krijg je na elke ronde de investeringen van alle deelnemers te zien. De investeerders zien echter nog niet of er boetes zijn uitgedeeld. Na ronde 5 krijgen investeerders een overzicht van de investeringen en eventuele boetes in de eerste 5 rondes. Vanaf ronde 6 volgt deze informatie direct na elke ronde.

### Sessie 3: 16 juni en 21 juni (NSM Decision Lab – Investeerder & Straffer)

Bedankt dat je bereidt bent deel te nemen aan dit experiment. Je gaat mee doen in een experiment waarin je individueel beslissingen gaat nemen. Aan het einde van het experiment wordt je betaald. Het uitbetaalde bedrag wordt beïnvloed door de beslissingen die je tijdens het experiment maakt en kan dus verschillen per deelnemer. De participatiebeloning is 3 euro, daarnaast is elke munt in het experiment uiteindelijk 0,03 euro waard.

In dit experiment ben je een investeerder of een straffer. Als investeerder ga je mee doen aan een experiment waarin je:

- kan investeren in een gemeenschappelijk goed, **of**
- (een deel van) je geld voor jezelf kan houden.

Als straffer kun je mensen straffen die te weinig investeren.

Tijdens dit experiment wordt je gekoppeld aan drie ander deelnemers. Je bent dus met een groep van 4. Drie daarvan zijn investeerders en 1 iemand is een straffer. **Je maakt beslissingen in 15 ronden waarin je elke keer met dezelfde deelnemers in een groep blijft.** Iedere investeerder ontvangt 10 munten per ronde. Deze munten kunnen worden geïnvesteerd in een gemeenschappelijk goed. Elke munt die wordt geïnvesteerd gaat van de eigen voorraad munten af. De investeerder kiest een investering tussen 0 en 10 munten.

Een geïnvesteerde munt in het gemeenschappelijke goed wordt vermenigvuldigd met 1,5. Een investering van 1 munt levert dus 1,5 munt opbrengst. Alle munten die door de 3 deelnemers in het gemeenschappelijke goed worden geïnvesteerd, worden 1,5 keer zoveel waard. De totale opbrengst van de investering wordt dan berekend en gelijk verdeeld over de 3 investeerders. De munten die je niet hebt geïnvesteerd behouden gewoon de waarde van 1. De wettelijke minimale investering per investeerder bedraagt 6 munten. Investerders zijn echter vrij om hier van af te wijken.

De straffer heeft de mogelijkheid investeerders te straffen die minder dan de wettelijke norm van 6 investeren. **Deze straffer is een medestudent in deze ruimte.** De straffer kan zelf niet investeren en deelt ook niet mee in de opbrengsten uit het gemeenschappelijke goed. De straffer ontvangt wel een vast bedrag van 18 munten die hij kan inzetten om investeerders met een te lage investering te straffen. Nadat alle investeerders hun investering bekend maken gaat de straffer beslissen of en welke investeerders met een te lage investering hij/zij wil straffen. Dit kan alleen als de investering lager is dan de **wettelijke norm van 6**. De hoogte van de resulterende boete is 2 per iedere munt die minder is geïnvesteerd dan de wettelijke norm van 6. Een boete opleggen levert voor de straffer zelf geen geld op. De straffer investeert niet en deelt ook niet mee in de opbrengst van het gemeenschappelijke goed.

Om een boete uit te delen betaalt de straffer 3 munten per investeerder die hij straft. Wanneer de straffer een investeerder straft met een investering van boven de 6 munten negeert het programma deze beslissing. Er wordt geen boete opgelegd en het kost de straffer ook niets.

Gedurende de eerste 5 ronden krijg je na elke ronde de investeringen van alle deelnemers te zien. De investeerders zien echter nog niet of er boetes zijn uitgedeeld. Na ronde 5 krijgen investeerders een

overzicht van de investeringen en eventuele boetes in de eerste 5 rondes. Vanaf ronde 6 volgt deze informatie direct na elke ronde.

## Hulpmiddel

### Opbrengsten Tabel Investerings

		Opgetelde investering andere spelers																				
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Eigen investering	0	10	11	11	12	12	13	13	14	14	15	15	16	16	17	17	18	18	19	19	20	20
	1	10	10	11	11	12	12	13	13	14	14	15	15	16	16	17	17	18	18	19	19	20
	2	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16	17	17	18	18	19	19
	3	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16	17	17	18	18	19
	4	8	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16	17	17	18	18
	5	8	8	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16	17	17	18
	6	7	8	8	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16	17	17
	7	7	7	8	8	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16	17
	8	6	7	7	8	8	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16
	9	6	6	7	7	8	8	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16
	10	5	6	6	7	7	8	8	9	9	10	10	11	11	12	12	13	13	14	14	15	15

Player Nummer:

.....

Aantal punten verdiend in experiment:

.....

## Screenshots Public Goods Game oTree

Below follows a number of screenshots to provide insight in how the public goods game was designed using oTree. The screenshots do not cover the whole game as that would require roughly 50 more pages. They give however a good impression of the most important parts of the game.

### Public Goods Game without sanctioning:

#### Introductie

##### Instructies

In dit experiment word je willekeurig aan 2 andere deelnemers gekoppeld. Je speelt vervolgens in dit experiment 15 rondes met deze groep. Elke deelnemer in de groep krijgt 10 munten in elke ronde. De deelnemers kunnen deze munten investeren in een gemeenschappelijk goed. Iedere deelnemer bepaalt individueel hoeveel hij of zij wil investeren. De munten die niet worden geïnvesteerd houdt de deelnemer zelf. De investering moet een heel getal bedragen van 0 tot 10 munten (0,1,2,...10). De sociaal gewenste investering bedraagt minimaal 6 munten, je bent echter vrij om hier van af te wijken en zelf te kiezen hoeveel je investeert.

De opbrengst voor iedere deelnemer wordt als volgt berekend: de investering van alle 3 de deelnemers wordt opgeteld. De totale investering wordt vermenigvuldigd met 1.5. Het bedrag dat daaruit komt wordt gelijk verdeeld over alle deelnemers. De uiteindelijke individuele opbrengst is het uitgekeerde deel van het gemeenschappelijke goed plus het aantal munten dat niet was geïnvesteerd.

Let op, het bovenstaande betekent dat:

- Hoe meer andere spelers investeren, hoe hoger jouw opbrengst.
- Hoe meer jij zelf investeert, hoe lager jouw opbrengst. De opbrengst van het gemeenschappelijke goed gaat echter wel omhoog.

Deze instructies zullen tijdens het hele experiment zichtbaar blijven op het scherm.

Er volgen nu eerst een aantal vragen om te controleren of je de instructies begrijpt.

Next

#### Controlevraag 1

Stel twee spelers investeren samen 10. De derde speler investeert 0. Wat is de totale opbrengst voor de derde speler in deze ronde?

Opbrengst derde speler:

 munten

Next

##### Instructies

In dit experiment word je willekeurig aan 2 andere deelnemers gekoppeld. Je speelt vervolgens in dit experiment 15 rondes met deze groep. Elke deelnemer in de groep krijgt 10 munten in elke ronde. De deelnemers kunnen deze munten investeren in een gemeenschappelijk goed. Iedere deelnemer bepaalt individueel hoeveel hij of zij wil investeren. De munten die niet worden geïnvesteerd houdt de deelnemer zelf. De investering moet een heel getal bedragen van 0 tot 10 munten (0,1,2,...10). De sociaal gewenste investering bedraagt minimaal 6 munten, je bent echter vrij om hier van af te wijken en zelf te kiezen hoeveel je investeert.

De opbrengst voor iedere deelnemer wordt als volgt berekend: de investering van alle 3 de deelnemers wordt opgeteld. De totale investering wordt vermenigvuldigd met 1.5. Het bedrag dat daaruit komt wordt gelijk verdeeld over alle deelnemers. De uiteindelijke individuele opbrengst is het uitgekeerde deel van het gemeenschappelijke goed plus het aantal munten dat niet was geïnvesteerd.

Let op, het bovenstaande betekent dat:

- Hoe meer andere spelers investeren, hoe hoger jouw opbrengst.
- Hoe meer jij zelf investeert, hoe lager jouw opbrengst. De opbrengst van het gemeenschappelijke goed gaat echter wel omhoog.

Deze instructies zullen tijdens het hele experiment zichtbaar blijven op het scherm.

## Uitwerking controlevraag 1

Jouw antwoord 15 munten is correct

Stel twee spelers investeren samen 10. De derde speler investeert 0. Wat is de totale opbrengst voor de derde speler in deze ronde?

**Oplossing: 15 munten**

**Uitleg:** Er zijn in totaal 10 munten geïnvesteerd in het gemeenschappelijk goed. Deze worden vermenigvuldigd met 1,5. Dit levert dus 15 munten op. Verdeeld over 3 spelers is dit 5 munten per speler. Je hebt 10 munten zelf gehouden.  $10 + 5 = 15$

Naar vraag 2.

Next

### Instructies

In dit experiment word je willekeurig aan 2 andere deelnemers gekoppeld. Je speelt vervolgens in dit experiment 15 rondes met deze groep. Elke deelnemer in de groep krijgt 10 munten in elke ronde. De deelnemers kunnen deze munten investeren in een gemeenschappelijk goed. Iedere deelnemer bepaalt individueel hoeveel hij of zij wil investeren. De munten die niet worden geïnvesteerd houdt de deelnemer zelf. De investering moet een heel getal bedragen van 0 tot 10 munten (0,1,2,...10). De sociaal gewenste investering bedraagt minimaal 6 munten, je bent echter vrij om hier van af te wijken en zelf te kiezen hoeveel je investeert.

De opbrengst voor iedere deelnemer wordt als volgt berekend: de investering van alle 3 de deelnemers wordt opgeteld. De totale investering wordt vermenigvuldigd met 1.5. Het bedrag dat daaruit komt wordt gelijk verdeeld over alle deelnemers. De uiteindelijke individuele opbrengst is het uitgekeerde deel van het gemeenschappelijke goed plus het aantal munten dat niet was geïnvesteerd.

Let op, het bovenstaande betekent dat:

- Hoe meer andere spelers investeren, hoe hoger jouw opbrengst.
- Hoe meer jij zelf investeert, hoe lager jouw opbrengst. De opbrengst van het gemeenschappelijke goed gaat echter wel omhoog.

Deze instructies zullen tijdens het hele experiment zichtbaar blijven op het scherm.

## Investering

Hoeveel wil je investeren in dit gemeenschappelijke goed (van 0 tot 10)?

munten

Next

### Instructies

In dit experiment word je willekeurig aan 2 andere deelnemers gekoppeld. Je speelt vervolgens in dit experiment 15 rondes met deze groep. Elke deelnemer in de groep krijgt 10 munten in elke ronde. De deelnemers kunnen deze munten investeren in een gemeenschappelijk goed. Iedere deelnemer bepaalt individueel hoeveel hij of zij wil investeren. De munten die niet worden geïnvesteerd houdt de deelnemer zelf. De investering moet een heel getal bedragen van 0 tot 10 munten (0,1,2,...10). De sociaal gewenste investering bedraagt minimaal 6 munten, je bent echter vrij om hier van af te wijken en zelf te kiezen hoeveel je investeert.

De opbrengst voor iedere deelnemer wordt als volgt berekend: de investering van alle 3 de deelnemers wordt opgeteld. De totale investering wordt vermenigvuldigd met 1.5. Het bedrag dat daaruit komt wordt gelijk verdeeld over alle deelnemers. De uiteindelijke individuele opbrengst is het uitgekeerde deel van het gemeenschappelijke goed plus het aantal munten dat niet was geïnvesteerd.

Let op, het bovenstaande betekent dat:

- Hoe meer andere spelers investeren, hoe hoger jouw opbrengst.
- Hoe meer jij zelf investeert, hoe lager jouw opbrengst. De opbrengst van het gemeenschappelijke goed gaat echter wel omhoog.

Deze instructies zullen tijdens het hele experiment zichtbaar blijven op het scherm.

## Resultaten

Eigen investering:	7 munten
Investering overige spelers:	
Speler 1	4 munten
Speler 2	6 munten
Totale investering van de groep:	17 munten

Totale opbrengst gemeenschappelijke goed:	26 munten
Individuele opbrengst gemeenschappelijke goed:	9 munten

Zelf gehouden:	3 munten
Verdiend aan gemeenschappelijke goed:	9 munten

In totaal ontvang je in deze ronde:	12 munten
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Next

## Public Goods Game with sanctioning:

### Introductie

Bedankt dat je bereidt bent om deel te nemen aan dit experiment. Je gaat mee doen in een experiment waarin je individueel beslissingen gaat nemen. Aan het einde van het experiment word je betaald. Het uitbetaalde bedrag wordt beïnvloed door de beslissingen die je tijdens het experiment maakt en kan dus verschillen per deelnemer.

#### Instructies

In dit experiment word je willekeurig aan 3 andere deelnemers gekoppeld. Je werkt in 15 rondes steeds samen met dezelfde deelnemers. De groep bestaat uit 3 investeerders en 1 straffer. Elke investeerder in de groep krijgt 10 munten. De investeerders kunnen deze munten investeren in een gemeenschappelijk goed. Iedere deelnemer bepaalt individueel hoeveel zij willen investeren. De munten die niet worden geïnvesteerd houdt de investeerder zelf. De investering moet een heel getal bedragen van 0 tot 10 munten (0,1,2,...10). **De wettelijke norm voor de minimale investering in dit experiment is 6, je bent echter vrij om van deze wettelijke norm af te wijken.**

Let wel op: indien je er voor kiest om lager dan 6 te investeren aanvaard je het risico dat je een boete krijgt. De boete kan worden opgelegd door de straffer die een observerende rol heeft. **Deze straffer is een politiestudent.** De straffer ontvangt aan het begin van elke ronde 18 munten. Indien de investering van een investeerder lager is dan 6, kan de straffer ervoor kiezen een boete uit te delen. Een boete opleggen kost de straffer 3 munten per investeerder. De hoogte van de resulterende boete is 2 per iedere munt die minder is geïnvesteerd dan de wettelijke norm van 6. Een boete opleggen levert voor de straffer zelf geen geld op. De straffer investeert niet en deelt ook niet mee in de opbrengst van het gemeenschappelijke goed.

De opbrengst voor iedere investeerder wordt als volgt berekend: de investeringen van alle investeerders wordt opgeteld. De totale investering wordt vermenigvuldigd met 1.5. Het bedrag dat daaruit komt wordt verdeeld over alle investeerders. De uiteindelijke individuele opbrengst is het uitgekeerde deel van het gemeenschappelijke goed plus het aantal munten dat niet was geïnvesteerd. Vervolgens wordt bij deze totale opbrengst nog een eventuele boete in mindering gebracht. De opbrengst per ronde kan nooit lager worden dan 0.

De opbrengst voor de straffer wordt elke ronde berekend door 18 munten te verminderen met de kosten van eventuele boetes.

Gedurende de eerste 5 rondes krijg je na elke ronde de investeringen van alle investeerders te zien. De investeerders zien echter nog niet of er boetes zijn uitgedeeld. Na ronde 5 krijgen investeerders een overzicht van de investeringen en eventuele boetes in de eerste 5 rondes. Vanaf ronde 6 volgt deze informatie direct na elke ronde.

Deze instructies zullen tijdens het hele experiment zichtbaar blijven op het scherm.

Er volgen nu eerst een aantal vragen om te controleren of je de instructies begrijpt.

Next



## Controlevraag 6

Stel twee investeerders investeren samen 18. Een derde investeerder investeert 2. Wat is de opbrengst voor de derde speler als hij een boete krijgt?

Totale opbrengst voor de speler:

munten

Next

### Instructies

In dit experiment word je willekeurig aan 3 andere deelnemers gekoppeld. Je werkt in 15 rondes steeds samen met dezelfde deelnemers. De groep bestaat uit 3 investeerders en 1 straffer. Elke investeerder in de groep krijgt 10 munten. De investeerders kunnen deze munten investeren in een gemeenschappelijk goed. Iedere deelnemer bepaalt individueel hoeveel zij willen investeren. De munten die niet worden geïnvesteerd houdt de investeerder zelf. De investering moet een heel getal bedragen van 0 tot 10 munten (0,1,2,...10). **De wettelijke norm voor de minimale investering in dit experiment is 6, je bent echter vrij om van deze wettelijke norm af te wijken.**

Let wel op: indien je er voor kiest om lager dan 6 te investeren aanvaard je het risico dat je een boete krijgt. De boete kan worden opgelegd door de straffer die een observerende rol heeft. **Deze straffer is een politiestudent.** De straffer ontvangt aan het begin van elke ronde 18 munten. Indien de investering van een investeerder lager is dan 6, kan de straffer ervoor kiezen een boete uit te delen. Een boete opleggen kost de straffer 3 munten per investeerder. De hoogte van de resulterende boete is 2 per iedere munt die minder is geïnvesteerd dan de wettelijke norm van 6. Een boete opleggen levert voor de straffer zelf geen geld op. De straffer investeert niet en deelt ook niet mee in de opbrengst van het gemeenschappelijke goed.

De opbrengst voor iedere investeerder wordt als volgt berekend: de investeringen van alle investeerders wordt opgeteld. De totale investering wordt vermenigvuldigd met 1.5. Het bedrag dat daaruit komt wordt verdeeld over alle investeerders. De uiteindelijke individuele opbrengst is het uitgekeerde deel van het gemeenschappelijke goed plus het aantal munten dat niet was geïnvesteerd. Vervolgens wordt bij deze totale opbrengst nog een eventuele boete in mindering gebracht. De opbrengst per ronde kan nooit lager worden dan 0.

De opbrengst voor de straffer wordt elke ronde berekend door 18 munten te verminderen met de kosten van eventuele boetes.

Gedurende de eerste 5 rondes krijg je na elke ronde de investeringen van alle investeerders te zien. De investeerders zien echter nog niet of er boetes zijn uitgedeeld. Na ronde 5 krijgen investeerders een overzicht van de investeringen en eventuele boetes in de eerste 5 rondes. Vanaf ronde 6 volgt deze informatie direct na elke ronde.

Deze instructies zullen tijdens het hele experiment zichtbaar blijven op het scherm.

## Uitwerking controlevraag 6

Jouw antwoord 10 munten is correct

Stel twee investeerders investeren samen 18. Een derde investeerder investeert 2. Wat is de totale opbrengst voor de derde investeerder als hij een boete krijgt?

**Oplossing: 10 munten**

**Uitleg:** De opbrengst voor het gemeenschappelijke goed is  $30 ((18+2) \times 1,5)$ . Dit verdeeld over drie investeerders is 10 munten per investeerder. De derde speler heeft 8 munten gehouden. De opgelegde boete is  $4 \times 2 = 8$ . In totaal heeft de derde investeerder dus  $10 + 8 - 8 = 10$  munten verdiend in deze ronde.

### Het experiment gaat nu beginnen.

Next

### Instructies

In dit experiment word je willekeurig aan 3 andere deelnemers gekoppeld. Je werkt in 15 rondes steeds samen met dezelfde deelnemers. De groep bestaat uit 3 investeerders en 1 straffer. Elke investeerder in de groep krijgt 10 munten. De investeerders kunnen deze munten investeren in een gemeenschappelijk goed. Iedere deelnemer bepaalt individueel hoeveel zij willen investeren. De munten die niet worden geïnvesteerd houdt de investeerder zelf. De investering moet een heel getal bedragen van 0 tot 10 munten (0,1,2,...10). **De wettelijke norm voor de minimale investering in dit experiment is 6, je bent echter vrij om van deze wettelijke norm af te wijken.**

Let wel op: indien je er voor kiest om lager dan 6 te investeren aanvaard je het risico dat je een boete krijgt. De boete kan worden opgelegd door de straffer die een observerende rol heeft. **Deze straffer is een politiestudent.** De straffer ontvangt aan het begin van elke ronde 18 munten. Indien de investering van een investeerder lager is dan 6, kan de straffer ervoor kiezen een boete uit te delen. Een boete opleggen kost de straffer 3 munten per investeerder. De hoogte van de resulterende boete is 2 per iedere munt die minder is geïnvesteerd dan de wettelijke norm van 6. Een boete opleggen levert voor de straffer zelf geen geld op. De straffer investeert niet en deelt ook niet mee in de opbrengst van het gemeenschappelijke goed.

De opbrengst voor iedere investeerder wordt als volgt berekend: de investeringen van alle investeerders wordt opgeteld. De totale investering wordt vermenigvuldigd met 1.5. Het bedrag dat daaruit komt wordt verdeeld over alle investeerders. De uiteindelijke individuele opbrengst is het uitgekeerde deel van het gemeenschappelijke goed plus het aantal munten dat niet was geïnvesteerd. Vervolgens wordt bij deze totale opbrengst nog een eventuele boete in mindering gebracht. De opbrengst per ronde kan nooit lager worden dan 0.

# Investing

Hoeveel wil je investeren in dit gemeenschappelijke goed (van 0 tot 10)?

  
munten

Next

## Instructies

In dit experiment word je willekeurig aan 3 andere deelnemers gekoppeld. Je werkt in 15 rondes steeds samen met dezelfde deelnemers. De groep bestaat uit 3 investeerders en 1 straffer. Elke investeerder in de groep krijgt 10 munten. De investeerders kunnen deze munten investeren in een gemeenschappelijk goed. Iedere deelnemer bepaalt individueel hoeveel zij willen investeren. De munten die niet worden geïnvesteerd houdt de investeerder zelf. De investering moet een heel getal bedragen van 0 tot 10 munten (0,1,2...10). **De wettelijke norm voor de minimale investering in dit experiment is 6, je bent echter vrij om van deze wettelijke norm af te wijken.**

Let wel op: indien je er voor kiest om lager dan 6 te investeren aanvaard je het risico dat je een boete krijgt. De boete kan worden opgelegd door de straffer die een observerende rol heeft. **Deze straffer is een politiestudent.** De straffer ontvangt aan het begin van elke ronde 18 munten. Indien de investering van een investeerder lager is dan 6, kan de straffer ervoor kiezen een boete uit te delen. Een boete opleggen kost de straffer 3 munten per investeerder. De hoogte van de resulterende boete is 2 per iedere munt die minder is geïnvesteerd dan de wettelijke norm van 6. Een boete opleggen levert voor de straffer zelf geen geld op. De straffer investeert niet en deelt ook niet mee in de opbrengst van het gemeenschappelijke goed.

De opbrengst voor iedere investeerder wordt als volgt berekend: de investeringen van alle investeerders wordt opgeteld. De totale investering wordt vermenigvuldigd met 1.5. Het bedrag dat daaruit komt wordt verdeeld over alle investeerders. De uiteindelijke individuele opbrengst is het uitgekeerde deel van het gemeenschappelijke goed plus het aantal munten dat niet was geïnvesteerd. Vervolgens wordt bij deze totale opbrengst nog een eventuele boete in mindering gebracht. De opbrengst per ronde kan nooit lager worden dan 0.

De opbrengst voor de straffer wordt elke ronde berekend door 18 munten te verminderen met de kosten van eventuele boetes.

Gedurende de eerste 5 rondes krijg je na elke ronde de investeringen van alle investeerders te zien. De investeerders zien echter nog niet of er boetes zijn uitgedeeld. Na ronde 5 krijgen investeerders een overzicht van de investeringen en eventuele boetes in de eerste 5 rondes. Vanaf ronde 6 volgt deze informatie direct na elke ronde.

Deze instructies zullen tijdens het hele experiment zichtbaar blijven op het scherm.

## Straffen

Je kunt er nu voor kiezen om spelers te bestraffen die te weinig hebben geïnvesteerd (lager dan de wettelijke norm van 6). **let op: dit kost 3 munten per speler en levert voor jou zelf geen geld op. Wel kun je er mogelijk voor zorgen dat spelers meer investeren in een volgende ronde.** Wanneer je een boete geeft aan iemand die 6 of meer heeft geïnvesteerd, wordt dit genegeerd door het programma. Er wordt dus geen boete opgelegd en het kost ook niets.

Investing overige spelers:

Speler 1	6 munten
Speler 2	8 munten
Speler 3	4 munten

Wil je speler 1 straffen?

- ☐ Yes  
☒ No

Wil je speler 2 straffen?

- ☐ Yes  
☒ No

Wil je speler 3 straffen?

- ☒ Yes  
☐ No

Next

## Resultaten

Eigen investering:	6 munten
Investering overige investeerders:	
Investerder 2	8 munten
Investerder 3	4 munten
Totale investering:	18 munten

Totale opbrengst project:	27 munten
Individuele opbrengst project:	9 munten

Uitgedeelde boetes:	Verborgen voor deze ronde
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Next

### Instructies

## Resultaten

Eigen investering:	4 munten	Boete:	4 munten
Investering overige investeerders:			
Investerder 1	6 munten	Boete:	0 munten
Investerder 3	7 munten	Boete:	0 munten
Totale investering:	17 munten		

Totale opbrengst project:	26 munten
Individuele opbrengst project:	9 munten

Zelf gehouden:	6 munten
Verdiend aan project:	9 munten
Oplegde boete:	-4 munten

In totaal ontvang je:	11 munten
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Next

## Resultaten

Deze pagina geeft een overzicht van de investeringen en boetes in de eerste 5 rondes. Je kunt nu dus zien of de straffer boetes heeft uitgedeeld.

### Investering ronde 1 t/m 4:

Eigen investering:	6 munten	Boete:	0 munten
Eigen investering:	3 munten	Boete:	6 munten
Eigen investering:	5 munten	Boete:	0 munten
Eigen investering:	4 munten	Boete:	4 munten

### Investering overige investeerders ronde 1 t/m 4:

Investeerder 2 ronde 1:	8 munten	Boete:	0 munten
Investeerder 2 ronde 2:	10 munten	Boete:	0 munten
Investeerder 2 ronde 3:	5 munten	Boete:	0 munten
Investeerder 2 ronde 4:	8 munten	Boete:	0 munten
Investeerder 3 ronde 1:	4 munten	Boete:	4 munten
Investeerder 3 ronde 2:	3 munten	Boete:	6 munten
Investeerder 3 ronde 3:	8 munten	Boete:	0 munten
Investeerder 3 ronde 4:	7 munten	Boete:	0 munten

### Resultaten ronde 5:

Eigen investering:	6 munten	Boete:	0 munten
Investering overige investeerder:			
Investeerder2	7 munten	Boete:	0 munten
Investeerder3	8 munten	Boete:	0 munten
Totale investering:	21 munten		

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Totale opbrengst project:	32 munten
Individuele opbrengst project:	11 munten

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Zelf gehouden:	4 munten
Verdiend aan project:	11 munten
Oplegde boete:	-0 munten

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In totaal ontvang je:	15 munten
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