Heterogeneity and Voting in Intergenerational Common Pool Problems

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Abstract

In order to gain sustainable resources over generations, cooperation amongst present decision makers is a necessity. In this study, we investigate the effect of heterogeneity and voting mechanisms on the cooperation in an intergenerational common pool resource (CPR) dilemma. The central research question is: to what extent affect a voting mechanism and heterogeneous wealth the total group extraction in an intergenerational common pool resource dilemma? Two hypotheses are tested: 1) generations with a publicly known heterogeneous wealth structure extract more from the resource than generations with a publicly known homogeneous wealth structure, and 2) generations whose total extraction is decided by median vote extract less from the resource than generations with an unregulated decision mechanism. The Intergenerational Goods Game has been adopted from Hauser et al. (2014a) as experimental template, and 84 students and ex-students from the Radboud University participated in this experiment. The results show that both heterogeneous wealth and median voting had no significant effect on the total group extractions, implying that these conditions do not alter the sustainability of resources in intergenerational dilemmas.

1. INTRODUCTION AND RESEARCH QUESTION

In recent years, sustainability has become one of the world's main concerns. Overexploitation of public recourses by the present generation has a high cost on the sustainability of these resources for future generations (Hauser, Rand, Peysakhovich & Nowak, 2014a). To become sustainable, it requires us to behave in such a way that we "leave the future generation the option or the capacity to be as well off as we are" (Solow, 1991, p. 181). This means it can also require us to collectively refrain ourselves from public resources (Wade-Benzoni & Tost, 2009). To accomplish this, collective action needs to be undertaken, and cooperation amongst individuals is argued to be a necessity (Andersson et al., 2005; BenDor, Scheffran & Hannon, 2009; Doelle & Sinclair, 2006; Hauser et al., 2014a; Wade-Benzoni & Tost, 2009). For example, BenDor et al. (2009) demonstrate in a fishery management case that competition among fishers leads to a depleted resource of fish, but a cooperative approach, in which fishers jointly decide how much fish they are allowed to catch, ensures a sustainable fish population over time. Therefore, to achieve sustainable resources and pass them on to future generations, cooperative decisions among individuals seem important.

In the context of cooperation, individuals can be distinguished into three types of decision makers. First there are the cooperators, who are defined as "individuals who pay a cost for other individuals to receive a benefit" (Nowak, 2006, p. 1560), or in other terms: someone who voluntarily contributes part of his/hers payoffs to others. Secondly there are the defectors, who want to maximize their individual payoff and not dealing out any benefits for others (Nowak, 2006). The third type of decision makers are the conditional cooperators, who are people that are willing to cooperate for a public good as long as others cooperate as well (Fischbacher, Gächter & Fehr, 2001).

Cooperation can take place *within* a generation – intra-generational cooperation – or can take place *between* generations – intergenerational cooperation. To understand this distinction, it is important to have a clear definition of what a *generation* is. In its traditional application within family and societal contexts, generations usually refer to a 20- to 30-year timeframe (Wade-Benzoni & Tost, 2009). In this study we adopted a broader definition of a generation from Wade-Benzoni and Tost (2009, p. 166), who define a generation as "any individual or group that occupies a role for a limited time period and then transitions out of that role as another individual or group transitions in". For example, past, present and future prime ministers of a specific country can be seen as separate generations in a democratic governmental institution. Future prime ministers apply for elections, then, when elected, one of them transitions into the role as prime minister for the length of that role, and transition out when they finished their term, so another person can occupy the role of prime minister. These individuals or groups do not necessarily have to have any overlap in time with other individuals or groups. Overlap occurs when different generations occupy the same role at the same time. An example of an overlap in generations is when someone refers to his/her kids as a ‘new generation’ when compared to their own generation: the parents and their children might occupy a same role at the same moment in time, such as being a member of the family. To make things more simple, in this research non-overlapping generations will be used, which means that a particular role can only be occupied by one generation at a time. In the next section, the two dimensions of cooperation (intra-generational and intergenerational) will be elaborated in more detail.

1.1 Intra-generational cooperation

In an intra-generational context, individuals have to make trade-offs between themselves and the group they are part of (Brewer & Kramer, 1986; Dawes, 1980). When the interests of individuals are in conflict with the interest of the group, it leads to social dilemmas (Bernard, Dreber, Strimling & Eriksson, 2013; Brewer & Kramer, 1986; Dawes, 1980). Social dilemmas occur whenever the combined result of individually reasonable decisions is detrimental for the group, and thus leading to a situation where all individuals are worse off (Brewer & Kramer, 1986; Kollock, 1998). For example: each farmer does best by taking as much irrigation water as possible to provide his crops with enough water, but the aggregate outcome of these individually reasonable decisions can be disastrous, as the groundwater can get exhausted and any farmer ends up with no water at all (Kollock, 1998)[1]. These dilemmas are characterized by a structure in which a group of cooperators is better off than a group of defectors, but “the highest payoff comes from individuals who unilaterally defect in a group where everyone else cooperates” (Hauser et al., 2014b, p.2). In this case, being the *only* farmer that takes as much irrigation water as possible is the most beneficiary situation, as this provides your crops with enough water, and while the other farmers only take sustainable amounts of irrigation water, the groundwater is kept on a sustainable level too. Therefore, the incentive for a farmer to take as much irrigation water as possible still remains, although the farmers know this could lead to ending up with no water at all if everyone is

[1] Note that after the individual decisions have been made, the individuals stay part of the collective, and experience the consequences of the aggregate outcomes of all individual decisions (Wade-Benzoni & Tost, 2009).

behaving this way. This displays the social dilemma, as the individual rational decision is always to take as much as possible, although this is irrational from the collective perspective (Kollock, 1998).

1.2 Intergenerational cooperation

Cooperation takes place in a different way in an intergenerational context. In intergenerational context, present individuals and groups have to make trade-offs between themselves and *future other* people (Wade-Benzoni & Tost, 2009). This present generation makes decisions with consequences for future generations, *without* benefitting or suffering from the consequences of these decisions themselves (Wade-Benzoni & Tost, 2009). Therefore, an individual's payoff is unaffected by the decisions of the other members of her own generation, and a group of cooperators does not necessarily earn more than a group of defectors (Hauser et al., 2014a). In case of a common pool resource (CPR), when individuals want to maximize their payoffs, they will extract the maximum amount possible from the resource, as they do not reap any benefits themselves from cooperating. Consequences are that future generations might have depleted resources and have no payoff at all. This situation explains intergenerational dilemmas, which are defined as "decisions in which the interests of present decision makers are in conflict with the interests of future others" (Wade-Benzoni & Tost, 2009, p. 166).

In order to pass on sustainable resources to future generations, the present generation has to collectively refrain itself from extracting far more than what is sustainable (Wade-Benzoni & Tost, 2009). Whether a resource is sustained or not depends on the threshold, which is a set boundary between a state of the resource where it can regenerate itself to former levels, and a state of the resource where it is exhausted and cannot meet the former levels even though it tries to regenerate. Cooperating in intergenerational resource dilemmas therefore means collectively extracting amounts below this threshold, ensuring the resource can regenerate to its initial state.

1.3 Expanding the field of intergenerational dilemmas

Like in social dilemmas, also in intergenerational dilemmas the individual's rational decision is to extract as much as possible from the resource, as this gives the highest individual payoff (Hauser et al., 2014b). Because of this rationality, ego-centric and selfish behavior amongst human beings is traditionally assumed (Coase, 1960; Mueller, 1979; Williamsonn, 1985, in Hauser et al., 2014a). However, more recent studies have found that under a wide variety of conditions, a significant fraction of the population is willing to cooperate both in social dilemmas (Chermak & Krause, 2001; Fischbacher et al., 2001; Ledyard, 1995; Rand, Dreber, Ellingsen, Fudenberg & Nowak, 2009; Ostrom, Walker & Gardner, 1992; Walker, Gardner, Herr & Ostrom, 2000), and in intergenerational dilemmas (Fischer, Irlenbusch & Sadrieh, 2004; Hauser et al., 2014a). Despite the importance of understanding individual and group behavior in intergenerational dilemmas to enhance resource sustainability, the field of intergenerational dilemmas is fairly new. Many conditions tested in intra-generational settings are therefore not yet converted into an intergenerational setting, although they might have a considerable influence (Wade-Benzoni & Tost, 2009).

In intra-generational setting, the public goods game and the common pool resource game are the traditional experimental templates for research in social dilemmas. A typical example of a condition which is tested in these games and has a positive effect on the degree people cooperate is communication (Ledyard, 1995). When the individuals in a game can communicate with each other, it is found that they are more willing to cooperate (Dawes, 1980; Tavoni, Dannenberg, Kallis & Löschel, 2011). Furthermore, a stronger group identity (Kramer & Brewer, 1984) and the inclusion of voting mechanisms (Bernard et al., 2013; Walker et al., 2000) are also found to enhance cooperation. On the other hand, cooperation decreases whenever repetition of the decision-making tasks about the same public good or resource is incorporated (Clark & Sefton, 2001; Ledyard, 1995), or when some forms of heterogeneity within the group are introduced (Anderson, Mellor & Milyo, 2008; Rapoport & Suleiman, 1993). These findings in intra-generational setting could potentially be generalized to intergenerational setting. However, despite some similarities, social dilemmas and intergenerational dilemmas are essentially different. Therefore, to generalize the conditions from intra-generational setting to intergenerational setting, empirical investigation is necessary[2].

Hauser et al. (2014a) recently made an effort to contribute to the conversion of these findings to intergenerational settings, by studying to what extent a resource could be sustainably passed on to the next generations under various conditions. They showed that initially, groups of individuals were not able to pass on a common pool resource to the next generation, as individuals in a generation did not cooperate enough to gain sustainable outcomes. However, Hauser et al. (2014a) also showed that adding a median voting mechanism to the decision-making process does have an effect on the aggregate extractions,

[2] For a more detailed overview of cooperation in social dilemmas and conditions that could affect this cooperation, see Ledyard (1995) and Kollock (1998).

and thus the resource's sustainability. This median voting mechanism increased the cooperation amongst the individuals, resulting in lower group extractions than generations with an unregulated decision-making process, and therefore enhancing the intergenerational sustainability of a resource.

The effect of voting mechanisms on the cooperation amongst individuals has already been tested in intra-generational. Such voting mechanisms can have different forms. For example, it can be binding or non-binding, and based on the median, mean or majority of the votes. In general, studies examining the relationship between voting mechanisms and cooperation in intra-generational settings found that voting increases the cooperation rates in social dilemmas like Public Good Games and Common Pool Resource games (Bernard et al., 2013; Kroll, Cherry & Shogren, 2007; Margreiter, Sutter & Dittrich, 2005; Putterman, Tyran, & Kamei, 2011; Tavoni et al., 2011; Walker et al., 2000). Therefore, the finding of Hauser et al. (2014a) on voting mechanisms in intergenerational dilemmas is consistent with studies about voting mechanisms in social dilemmas.

To further explore the field of intergenerational dilemmas, Hauser et al. (2014b) recommended to expand their research by adding a form of heterogeneity into their experiment. Until now, previous experiments on intergenerational cooperation have only been examined under the condition of homogeneous actors. This limits the implications for global solutions in resource sustainability, as in reality actors are most of the time not equally gifted (Milinski, Röhl & Marotzke, 2011; Wang, Fu & Wang, 2010).

Consider for example the control of environmental damage through restricting global meat production and consumption. Large scale meat production is known for its methane emissions, pollution and unsustainable use of water and food (Carpenter et al., 1998; McMichael, Powles, Butler & Uauy, 2007). Many prosperous countries therefore now emphasize on the importance of reducing this meat production. However, previously poor, and now upcoming economies like China hesitate to cooperate. China has one of the fastest-growing economies, and only recently more citizens in these countries are able to consume meat on a daily basis. Chinese citizens see it as their "fair share" to finally be able to add meat in their diet, as the citizens in western countries already enjoyed eating meat on a daily basis for decades. A global reduction of the production, and thus consumption, of meat by all countries is therefore seen as unfair by the Chinese. The Chinese would rather enlarge their meat production, to enjoy a diet that the citizens of western countries have taken for granted for decades. This example describes how heterogeneity (citizens of wealthy countries who have already consumed a lot of meat in the past decades, versus upcoming economies of which the citizens were previously too poor to consume meat on a daily basis) can impede collective cooperation in an intergenerational sustainability problem.

Several empirical studies in social dilemmas already found significant influences of heterogeneity on the decisions individuals make in a group (Anderson et al., 2008; Chan, Mestelman, Moir & Muller, 1996; Cherry, Kroll & Shogren, 2005; Prediger, 2011; Visser & Burns, 2006). These findings could also be applicable in intergenerational dilemmas. Therefore, it is important to explore how heterogeneity amongst individuals can have an influence on intergenerational dilemmas.

In social dilemmas the effect of heterogeneity on cooperation has already been studied extensively. However, the findings on the direction of the effect are ambiguous (Hofmeyr, Burns & Visser, 2007). Some studies report a *positive* effect of heterogeneity on cooperation, meaning that heterogeneous groups show more cooperation as compared to homogeneous groups (Chan et al., 1996; Visser & Burns, 2006; Prediger, 2011). Others report a *negative* effect, meaning that heterogeneous groups show less cooperation as compared to homogeneous groups (Anderson et al., 2008; Cherry et al., 2005; Rapoport & Suleiman, 1993; Tavoni et al., 2011). Moreover, there are also studies that found no significant difference between homogeneous and heterogeneous groups concerning the collective cooperation amongst individuals (Hofmeyr et al., 2007; Margreiter et al., 2005).

Besides these ambiguous findings on the effects of heterogeneity on cooperation, there are also differences in how heterogeneity has been constructed in studies addressing the social dilemmas**.** Most studies use a difference in endowments for each participant to gain heterogeneity amongst the individuals in a group (Buckley & Croson, 2006; Chan et al., 1996; Cherry et al., 2005; Kingsley, 2016; Milinski et al., 2011; Rapoport & Suleiman, 1993; Tavoni et al., 2011). Furthermore, there is a study that introduces heterogeneity by differing the value of the public good for the individuals in a group (Fischer, Isaac, Schatzberg & Walker, 1995). Moreover, Chan, Mestelman, Moir and Muller (1999) combine the former two constructs of heterogeneity into one single experiment. Finally, Anderson et al. (2008) include an unequal distribution of fixed payments amongst the participants via the show-up fee for the experiment. No particular pattern can be noticed in the effect of heterogeneity on cooperation and the different operationalizations.

Anderson et al. (2008) state that only the operationalization of heterogeneity in their study captures the effect of heterogeneity in isolation, as a variation in the distribution of fixed participation fees does not alter the ability to contribute to a public good and does not change the value of the public goods across subjects. This is opposed to all other studies, that use a variation in the endowments or in the value of the public good and therefore change the Nash equilibrium in some cases, which has the consequence that different factors play a role than just heterogeneity per se[3] (Anderson et al., 2008). Also, not all operationalizations of heterogeneity are applicable in intergenerational setting, because in this case the individuals participate only for one round – their generation – and therefore do not benefit or suffer from the consequences of their own decisions. Any form of repeated endowments are therefore excluded to play a role, as there is just one single decision to be made for an individual in a generation, who also does not experience the actual consequence of that decision. Thus, to actually implement a form of heterogeneity in an intergenerational CPR game, we are restricted to include fixed differences between the individuals in a generation (e.g. heterogeneous starting wealth, heterogeneous show-up fee for the experiment, or heterogeneous rewards for the same behavior). Therefore, in order to capture the effect of heterogeneity in intergenerational dilemmas solely, the operationalization of *heterogeneity of wealth* by Anderson et al. (2008) seems to be the best way to introduce heterogeneity in these intergenerational dilemmas.

1.4 Relevance and research question

This research contributes to the field of intergenerational dilemmas, by converting insights from intra-generational dilemmas to the domain of intergenerational dilemmas. In particular, by testing whether the findings and theoretical notions on heterogeneous wealth in intra-generational cooperation can be generalized to intergenerational cooperation. It builds further on the study of Hauser et al. (2014a), and extents it with the introduction of heterogeneity of wealth. Therefore, this study also tries to gain more insight in the findings on the effect of a median voting mechanism, as shown by Hauser et al. (2014a).

Besides contributing to the scientific field of intergenerational dilemmas, this study could also have implications for solving real world resource problems. Gained insights in the effect of a median voting mechanism can create a better understanding of the coordination mechanisms that can help overcome sustainability issues when implemented. The results of this study therefore contribute to the consideration whether, and under what circumstances, a voting mechanism could be beneficial to implement in decision making processes in order to solve sustainability issues. Furthermore, the gained insights in the effect of heterogeneous wealth show to what extent it is important to take heterogeneity into account when coping

[3] Changes in the Nash equilibrium by introducing heterogeneity means that heterogeneity gives the subjects an in-game incentive to adjust their decisions, as it alters the set of rational decisions to gain the best payoff.

with intergenerational sustainability issues. As heterogeneity is inherent to the real world, and thus to intergenerational resource problems, it is of great value to understand its implications on the decisions actors make.

The objective of this study is to assess to what extent a voting mechanism and heterogeneous wealth affect the group decisions made in an intergenerational common pool resource experiment. The central research question is: to what extent affect a voting mechanism and heterogeneous wealth the total group extraction in an intergenerational common pool resource dilemma? To answer this question, an intergenerational common pool resource experiment is conducted, using 84 students from the Radboud University Nijmegen.

2. THEORETICAL FRAMEWORK

Cooperation amongst individuals is a necessity in order to keep a resource sustainable over generations. Many studies have tried to find solutions for global sustainability problems like climate change, food production for an ever growing population, and fossil fuel resource depletion. What can be noticed is that a large portion of these studies advocate collective action and cooperation of multiple actors in order to accomplish this sustainability (Andersson et al., 2005; BenDor et al., 2009; Doelle & Sinclair, 2006; Godfray et al., 2010; Guest, 2010; Ostrom, Burger, Field, Norgaard & Policansky, 1999). Sustainable behavior of just one individual is not going to have such an impact on the aggregate outcome of a group, as when all the individuals in a group are working together to gain a sustainable outcome (Wade-Benzoni & Tost, 2009). In an intergenerational CPR experiment, the degree to which people cooperate with each other (i.e. collectively extract a sustainable amount of resources from the common pool) reduces the aggregate extraction of the resource in that generation and therefore enhances the sustainability of that resource over generations (Hauser et al., 2014b). Hence, to understand intergenerational cooperation, it is important to know why people are willing to cooperate on behalf of the future in the first place.

2.1 Models Explaining Intergenerational Cooperation in Human Society

Many people are having social preferences: they care to some degree about the well-being of other people, and value fairness and prosocial behavior (Bowles & Gintis, 2011; Hauser et al., 2014b). People with these kinds of social preferences may be willing to set aside their self-interest in favor of the collective, or even the future collective (Hauser et al., 2014b). Key in explaining prosocial preferences in human societies are the theories of altruism and reciprocity (Bowles & Gintis, 2011).

In the theory of altruism, Becker (1974) explains that some people are more or less altruistic. A pure altruist will always try to maximize the 'social income', which is a function of his own income and that of others. This means that he or she finds the interest of the group more important than its own interest, and therefore refrains himself from every decision that would decrease the income of other individuals more than his own income would gain. In social dilemmas, a pure altruist would thus always cooperate on behalf of the collective. The experimental findings of Andreoni and Miller (1993) suggest that many people actually are altruistic to some extent, and are willing to set aside their self-interest.

In the theory of reciprocity, Trivers (1971) explains that individuals also consider the chance that they repeatedly encounter each other and therefore assume a mutual form of helping: when I cooperate today, you might cooperate in the future in return of my prior cooperative behavior. Hence, it might be beneficial to cooperate. This reciprocity can also be *anticipated* (Cherry et al., 2005), when people reciprocate based on the expectation that others in their group will cooperate. This is consistent with the finding of Andreoni and Miller (1993), who found that people are more willing to cooperate when they *believe* that others in their group are altruistic.

These two theories of altruism and reciprocity explain why people are willing to cooperate in a general way. But when intergenerational dilemmas are considered, these mechanisms work are a little different.

2.1.1 Intertemporal- and social discounting

In an intergenerational context, intertemporal and interpersonal distance also play a role in the decision-making process of individuals (Wade-Benzoni & Tost, 2009). In this case, actions and decisions made in the present have an effect on the outcomes in the distant future, which means there is a bridge in time between the actions and the consequences – intertemporal distance. This intertemporal distance leads to intertemporal discounting, which is the effect that people discount the value of a good when it can only be consumed in the future, rather than at this moment (Frederick, Loewenstein & O'Donoghue, 2002; Soman et al., 2005; Wade-Benzoni, 2008; Wade-Benzoni & Tost, 2009)[4]. The greater this intertemporal distance becomes, the more the value of the good will be discounted (Wade-Benzoni, 2008). In intergenerational dilemmas this intertemporal discounting can cause a decrease in

[4] For a more detailed overview of intertemporal discounting, see Soman et al., 2005.

intergenerational cooperation, as people prefer immediate access to goods over postponed, future access to goods (Wade-Benzoni, 1999).

Furthermore, in an intergenerational context the actions and decisions made by individuals or groups only have an effect on the outcomes of *other* individuals or groups, and not on themselves. This means that there is a bridge between the decision-maker and the receiver of the outcomes of the decisions – interpersonal distance. This interpersonal distance leads to social discounting, which is the effect that the value of a good for an individual decreases when it is transferred to others rather than the self (Jones & Rachlin, 2006; Loewenstein, Thompson & Bazerman, 1989). Jones and Rachlin (2006) show that the greater this interpersonal distance between the self and other persons becomes, the higher the degree of social discounting. In intergenerational dilemmas, this interpersonal distance can be quite large, as the recipients of the outcomes of present actions are not easy to identify (e.g. a future cohort of students in a Master of Business Administration who have not yet applied for the course), or might even not exist yet (e.g. future inhabitants of this world who have to deal with depleted fossil fuel resources and climate changes)(Wade-Benzoni & Tost, 2009).

Intertemporal- and interpersonal discounting together form intergenerational discounting, which occurs when “individuals prefer smaller benefits for themselves now as opposed to larger benefits for others in the future” (Wade-Benzoni & Tost, 2009, p. 168). Intergenerational discounting therefore reduces the degree to which individuals in a generation are willing to cooperate on the behalf of future generations. Thus, when applying this theory of intergenerational discounting on an intergenerational CPR problem, individuals tend to extract more resources for themselves right now instead of leaving some resources for future others. As a result, intergenerational discounting assumingly leads to less cooperation and a higher aggregate extraction from the CPR.

2.1.2 Indirect reciprocity

People try to reciprocate the help they received from others in the past, or are willing to help others when they expect that those others will help them in future situations in return (Trivers, 1971). This is also possible in an intergenerational setting when there is an overlap in generations (e.g. health care insurances, retirement funds). But when there is no overlap in generations, people *cannot* reciprocate the benefits and burdens left to them by the previous generation, as in non-overlapping generations the previous generation is past (Wade-Benzoni, 2002). In this case, people also do not cooperate on the behalf of future generations with the idea that the next generation will do something back for them, because the present decision-makers might not exist or occupy the same role anymore by the time the next generation is able to reciprocate. However, what the present decision-makers *can* do, is making a decision for the *next* generation based on what the previous generation left for them (Wade-Benzoni, 2002). In this case, the actions and decisions made by the *previous* generations might have an influence on the degree of cooperation by the present generation (Wade-Benzoni & Tost, 2009). Theories about *indirect* reciprocity give an explanation for this behavior, in which individuals and groups use the actions and decisions made by previous generations as a reference for their own actions and decisions (Boyd & Panchanathan, 2004; Nowak & Sigmund, 1998; Sugden, 1984; Wade-Benzoni, 2002). Wade-Benzoni (2002) also empirically found that the decisions made by previous generations influence the decisions made by the present generation for the future generation. The greater the amount of resources left by the previous generation for the present generation, the greater the amount of resources the present generation leaves for the future generation. The explanation for this is that present decision-makers search for information on what is appropriate behavior and use the decisions made by the previous generation as a reference (Wade-Benzoni, 2002). In an intergenerational CPR problem, this would suggest that the present generation is more willing to cooperate and extract a sustainable amount of resources, if the previous generation has done this as well.

2.1.3 Two-level intergenerational dilemma

Previous theories explain how people individually make a consideration between themselves and future others. However, in many intergenerational dilemmas it is not just about *one* individual or actor making the decision between the present generation and the future generations, but more actors in the present generation have a stake in the intergenerational dilemma (e.g. depleting of fossil fuel resources, climate change). In order to cope with intergenerational dilemmas like these, there is a need for collective action amongst all the relevant actors in the present generation. These kind of constructs are called *two-level games*, in which an actor first considers his preferences when deciding between himself and future others (first level), and then starts to negotiate about these preferences with the other actors in his generation (second level) (Wade-Benzoni & Tost, 2009). As Wade-Benzoni and Tost (2009) explain, the first level thus involves an intergenerational dilemma, where the individual actors make their own preferences about the allocation of resources between the present generation and the future generations. The second level consists of an intra-generational dilemma, where the individual actors need to negotiate with each other to decide upon the course of collective action. In this case, whenever an individual decides to act on behalf of the future generations, the potential effect of this decision might depend on the other individuals in that generation that also make a decision. Therefore, the decisions available for the individuals in the first level can be restricted by the preferences of the collective in the second level.

An example of a two-level intergenerational dilemma concerns the management of the world's fishery. Fishery companies all over the world are confronted with the dilemma whether to reduce the amount of fish they catch in order to preserve a sustainable fish population in the oceans. This is an intergenerational dilemma, because it confronts the fishery companies with the decision between self-interest (catching all the fish and gain the highest profits) and the interest of future generations (being able to catch fish as well). When just one or a few fishery companies decide to reduce their catch, it will likely have a little or no impact on the total fish population over generations. However, when a substantial portion of all the fishery companies in the present generation cooperates and collectively reduce their catch, it ensures the benefit for the future generations.

The difficulty in these cases is that whenever an individual decides to refrain itself from a benefit on behalf of the future generations and no one else in that generation does this too, then the individual denies its *own* interest but this does still not benefit the future generation (Wade-Benzoni & Tost, 2009). Cooperation of multiple actors in a generation is therefore necessary in order for the future to benefit from this action and to make the efforts of individual cooperators not futile. Because of this requirement, individuals might hesitate to cooperate when they are aware of the possibility that the other actors in their generation will not cooperate. This therefore increases the probability that people are conditional cooperators, as people are only willing to cooperate when others cooperate as well (Fischbacher et al., 2001). Thus, in two-level intergenerational dilemmas, "individuals are dependent on intra-generational cooperation to achieve an intergenerational goal" (Wade-Benzoni & Tost, 2009, p. 180).

2.1.4 Intergenerational Goods Game

An empirical contribution was given to the field of intergenerational dilemmas by Hauser et al. (2014a), who tested the sustainability of a CPR over multiple non-overlapping generations, as a result of cooperation amongst the individuals within each generation. In their study, people individually decided the amount they wanted to extract from a CPR, and when the sum of these amounts – the total group extraction – exceeded a certain threshold, the pool got exhausted and would be unavailable for the next generations. However, when the individuals decided to collectively extract *sustainable* amounts, the aggregate extraction would not exceed the threshold and the pool would regenerate and pass on to the next generation of decision-makers, who then could make a similar decision. In the experiment, Hauser et al. (2014a) found that the CPR was unsustainable over generations when there was no form of regulation. In this case, people did not cooperate enough to gain a sustainable resource and pass this on to the next generation. As Hauser et al. (2014a) mention, these unsustainable outcomes were primarily driven by a minority of individuals who did not cooperate, and extracted far more from the resource than what was sustainable. Possible explanations for this uncooperative behavior of these minorities are that they prefer beneficent outcomes for their 'self' rather than for future others, which is consistent with the theory about intergenerational discounting (Wade-Benzoni & Tost, 2009). Furthermore, because the experiment consisted of a two-level game, intra-generational cooperation was necessary to gain a sustainable intergenerational resource. Conditional cooperators could therefore decide to not cooperate at all, as they consider the risk others in their generation might not cooperate, which would make any individual sacrifice futile. These considerations of conditional cooperators reduce the cooperation even further (Hauser et al., 2014b).

2.2 Heterogeneity of wealth

As intergenerational dilemmas on sustainability consist of a two-level game, intra-generational circumstances (like heterogeneity amongst individuals) can have an influence on the willingness to cooperate on behalf of the future generations (Wade-Benzoni & Tost, 2009). In intergenerational dilemmas where heterogeneity of wealth exists in a generation, the individuals might not only consider the choice between their self-interest and future interest, but also consider the heterogeneity in their generation when determining the course of collective action.

Studies in an intra-generational setting already have constructed different theories about the effect of heterogeneity of wealth on the cooperation of individuals in a group, and groups as a whole. First of all, in social psychology it is argued that heterogeneity has a negative influence on collective action in social dilemmas, as heterogeneity reduces the individual's perception of group cohesion (Hofmeyr et al., 2007; Putnam, 2000, in Anderson et al., 2008). People may be more inclined to cooperate when they have the idea that others in their group are identical to them, which creates a stronger *group identity* (Kramer & Brewer, 1984). Heterogeneity can reduce this strong group identity, since it enhances the differences between individuals in a group. An individual's identification with another individual in that group can therefore be impeded. For example, when a group consists of rich and poor people, it is possible that subordinate group boundaries arise within that group: the rich only identify themselves with the rich and the poor only identify themselves with the poor (Kramer & Brewer, 1984). In this case, collective action in the superordinate group can only happen when the two subordinate groups (rich and poor) are willing to cooperate with each other. But as these subordinate groups do not identify themselves with each other, they might have very different interests and intergroup conflict can arise (Taifel, 1982), resulting in a hinder of collective action.

Secondly, the theory about inequality aversion by Fehr and Schmidt (1999) explains how heterogeneity amongst individuals in social dilemmas can influence the decisions made by those individuals. According to Fehr and Schmidt (1999), people tend to be aversive to inequality and therefore behave in such a way that they try to limit the heterogeneity between themselves and others. Thus, people make decisions based on the comparison of their own payoff and the payoff of others and try to become on par with those others. In addition, Loewenstein et al. (1989) found that there is a strong aversion against disadvantageous heterogeneity. But when there is advantageous heterogeneity, this aversion seems to be much weaker (Fehr & Schmidt, 1999). Consistent with these findings, Fehr and Schmidt (1999) predict that in heterogeneous groups disadvantaged people aim for relatively much higher payoffs and advantaged people aim for payoffs that are a relatively little lower, when compared to homogeneous groups. When converting this to group-level outcomes, the aggregate demand of all individuals will likely be higher in a heterogeneous group than in a homogeneous group, because the rich individuals are only willing to lower their payoffs a little, while the poor individuals aim for much higher payoffs when compared to homogeneous groups (Fehr & Schmidt, 1999; Loewenstein et al., 1989) [5].

Another theory suggests that status plays an important role in the effect of heterogeneity of wealth on cooperation (Anderson et al., 2008). Anderson et al. (2008) state that when inequality is made public (i.e. all individuals know their own position in the distribution of wealth *and* the position of the others), it might grant status on some people of the group. This especially occurs if the richer people get publicly awarded in the opposite of the poorer (Ball, Eckel, Grossman & Zame, 2011). As a result, this status difference might decrease the poor peoples' willingness to cooperate as a means of protest to the rich. Moreover, if the richer people already assume this behavior of the poor, they might

[5] Note however, that this is based on the assumption that there is an equal number of rich and poor people. A change in the group composition between rich and poor can lead to another prediction.

reciprocate to this and also tend to cooperate less[6]. Also, the richer people may believe their status implies they deserve a higher reward than others, and therefore show more demanding and egocentric behavior (Anderson et al., 2008). Anderson et al. (2008) empirically tested this theory and concluded a negative effect of heterogeneity on cooperation, but only when the heterogeneity between the individuals was made public. Anderson et al. (2008, p. 1024) state that in this case, inequality has “important ‘psychological’ effects that reduce the tendency for cooperation in collective action problems”.

These theories about group identity, inequality aversion and status differences might even have a greater impact on heterogeneous groups in intergenerational dilemmas than in social dilemmas. In social dilemmas, individuals experience the consequences of their decisions themselves when they try to cope with the heterogeneity issue. For example: a poor individual extracts high amounts from a public resource to become on par with the rich individuals, but this results in a depleted resource and thus no more possibilities for that same individual and the rest of the collective to extract more from the resource later on. Thus instead of cooperating, coping with heterogeneity (e.g. reverse the inequality, gain/maintain status) has a cost for the group in the long run. However, in intergenerational dilemmas the present decision makers do not experience the consequences of their decisions themselves. In this case, individuals make a tradeoff between the possibility to cope with the heterogeneity in their generation, or let this opportunity forgo and cooperate on behalf of the future. The latter option is not as attractive as cooperating in social dilemmas, as the individual’s perception of the value of the goods being left for future generations will be discounted by the concepts of intertemporal- and interpersonal discounting (Wade-Benzoni & Tost, 2009). Thus people might find the intra-generational heterogeneity a bigger issue than the intergenerational sustainability of a resource, of which the present value is discounted.

For example: rich individuals might extract high amounts from a public resource more easily in intergenerational dilemmas, as keeping up their rich status is now at the expense of future individuals, instead of their own generation. Therefore, in this study it is assumed that the negative effects of heterogeneity on cooperation in social dilemmas also occur in intergenerational dilemmas, or are even more present. This suggests that in an intergenerational CPR, heterogeneous wealth amongst individuals negatively affects the degree to which groups of individuals want to cooperate on the behalf of the future

[6] This is an example of the “anticipated-reciprocity” effect found by Cherry et al. (2005), where the contributions of rich players in heterogeneous groups are small because they know the poor players cannot or will not contribute at all, making it disadvantageous for them to contribute solely.

generations, and therefore increase the aggregate group extraction from a common pool resource. This brings us to the first hypothesis:

Hypothesis 1: Generations with a publicly known heterogeneous wealth structure extract more from a common pool resource than generations with a publicly known homogeneous wealth structure.

2.3 Voting mechanisms

Previous studies found a positive relation between a voting mechanism and cooperation in social dilemmas. The theory behind this lies in the essential structure of social dilemmas, which is that a group of cooperators earns more than a group of defectors, but unilaterally defecting in a group of cooperators is the most profitable (Hauser et al., 2014b). Whenever a binding voting mechanism is included into this structure, it is not possible anymore to solely defect, while all others cooperate. Self-interested individuals therefore choose to cooperate, as a group of cooperators earns more than a group of defectors.

In intergenerational setting however, a group of cooperators does *not* earn more than a group of defectors, as the beneficial consequences of cooperation are passed on to the future generations (Hauser et al., 2014b). Self-interested individuals would therefore never cooperate, as they choose for the option with the maximum payoff for themselves. Besides, according to the theory of intergenerational discounting (Wade-Benzoni & Tost, 2009), individuals value goods for future others less than goods for themselves right now. So the theory about voting mechanisms derived from social dilemmas does not apply to intergenerational dilemmas. Nevertheless, in an intergenerational common pool resource experiment, Hauser et al. (2014a) found that if the amount of extractions of resources is democratically decided by *median vote* instead of unregulated decisions, the aggregate extraction per generation is significantly lower, and the resource is consistently sustained over generations. This suggests that a median voting mechanism also promotes cooperation in intergenerational dilemmas. Hauser et al. (2014a) give two main reasons for this. First of all, using the system of median voting allows a majority of cooperators to restrain the defectors. A majority of cooperators can be present because of prosocial preferences, suggesting that many people care to some degree about the well-being of others, and value fairness and prosocial behavior (Bowles & Gintis, 2011; Hauser et al., 2014b). If this majority of cooperators is present, it is impossible to solely defect, as the median value is binding for all individuals. Secondly, a binding voting system reassures conditional cooperators that their efforts are not futile. A strong conditional cooperator would essentially only cooperate on behalf of the future whenever he expects *all* other individuals in his generation to cooperate as well (Hauser et al., 2014b; Fischbacher et al., 2001). But when a binding median voting mechanism is included in the decision-making process, the conditional cooperator would cooperate as long as he expects more than half of the individuals in the present generation to cooperate. For example: if a generation consist of 5 individuals, a conditional cooperator would vote for cooperation when he expects 2 or more others to vote for cooperation. This sums up to 3 or more cooperative votes in total, resulting in a median value coming from one of the cooperators, and thus reassuring that a cooperative vote isn't futile. Hence, a binding median voting mechanism can enhance cooperation in a generation where some individuals are future-oriented conditional cooperators (Hauser et al., 2014b). In addition, Hauser et al. (2014b) mentions that a median voting mechanism lowers the number of cooperators *needed* in order to gain a sustainable resource. All individuals need to cooperate to some degree in an unregulated situation, whereas only half of the population needs to vote for cooperation in a situation with median vote.[7]

In summary, a binding median voting mechanism creates a situation where conditional cooperators are more inclined to cooperate and where less cooperators are needed in order to gain a sustainable intergenerational resource. Our second hypothesis can be derived from this, which suggests that a binding median voting mechanism can positively influence the degree to which a group of individuals cooperate on the behalf of the future generations, and therefore decreases the aggregate group extraction from a common pool resource.

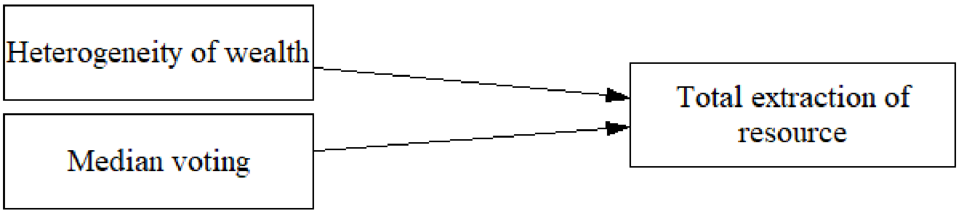
Hypothesis 2: Generations whose total extraction is decided by median vote extract less from a common pool resource than generations with an unregulated decision mechanism.

Figure 1 shows the conceptual model corresponding to this research.

[7] This is also applicable to the defectors, as only more than half of the population needs to defect in order to bind all individuals of that generation to defect.

Figure 1

Conceptual model.



3. METHOD

In order to answer the research question, a decision-making experiment has been conducted based on the Intergenerational Goods Game used by Hauser et al. (2014a).

3.1 Participants

Participants were invited to the laboratory via online recruitment system ORSEE, which is specifically designed for economic experiments (Greiner, 2003). Everyone registered in ORSEE received an invitation and was able to enroll to the experiment. Therefore, the sample was based on voluntarily participation of individuals within the ORSEE cluster. Participants received a compensation for their participation, and this was communicated in advance through the invitation.

In total, 84 participants had been recruited for this experiment, all being student or ex-student at the Radboud University Nijmegen. The participants consisted of 36 males and 48 females. The mean age of the individuals in the sample was 21.78 years (*SD* = 2.04), varying between 18 and 27 years. One candidate was denied access to the laboratory, as he wasn’t familiar with the Dutch language in the questionnaire. This person was replaced by a reserve candidate. There was no non-response, and all participants completed the experiment without skipping questions. No participants were therefore excluded from analysis.

3.2 Materials

3.2.1 Experimental template

To measure group extractions and sustainability in an intergenerational common pool resource dilemma under various conditions, a modified version of the Intergenerational Goods Game was adopted from Hauser et al. (2014a) as experimental template. This game consists of subsequent groups of individuals participating in a common pool resource game with a threshold. Groups of individuals have to decide between extracting resources from the pool and potentially depleting it, or refraining themselves from the pool to pass it on to the next group of individuals. The game is specifically designed to measure resource extractions of groups of individuals, in a setting where these group extractions have consequences for the next groups of individuals.

The essential structure of the game is that groups of people individually and without communication decide the amount they want to extract from a CPR. The individual amounts are then summed up and treated as an aggregate group decision. When this aggregate group decision exceeds a certain threshold, the pool gets exhausted and will be unavailable for the next groups. However, when individuals decide to collectively extract *sustainable* amounts, the aggregate extraction will not exceed the threshold. If this is the case, the pool will regenerate to its initial amount and pass on to the next generation of decision-makers, who can make a similar decision.

3.2.2 A pot of gold and a pot of silver

In this experiment, the groups consisted of three randomly assigned individuals. To measure the effect of heterogeneity on the group extractions, all groups were introduced to two different cases: a case about a pot of silver coins and a case about pot of golden coins (see Appendix A). In each case, the group members started with a standard fee in coins and then had to make a decision about how many extra coins they would like to take from the pot of coins. Each pot included 30 coins, and every member of the group had the option to take a maximum of one third of the coins out of the pot. This option had a scale from 0 (zero coins) to 10 (ten coins). The participants were told that when their total group extraction was 15 coins or less, the experimenters would refill the pot to 30 coins and pass it on to the next group who then had the option to make a similar decision. But when their total group extraction was more than 15 coins, the experimenters would take the pot away and the next groups would have *no* pot to take extra coins from. Also, the participants were told that the previous group of participants had chosen to extract 15 coins or less from both pots, meaning that the pots were refilled and passed on to the present group, which now also had the option to take extra coins from the pots[8].

The groups of participants had to make a decision about each of the two pots, but the context of the two pots were not identical. In the case about the pot of silver coins, the starting

[8] This implies it was also possible that some groups received no pots of coins as a consequence of the behavior of the previous group, which is something that contributed to the intergenerational ambiance the participants experienced. However, in the experiment all groups actually received two pots to prevent any loss in data and there was no real order of groups nor "passing on of pots" between groups.

fees were *homogeneous*, and set at 4 coins for each participant in a group. In the case about the pot of golden coins, the starting fees were *heterogeneous*, and therefore differed for each participant in a group between 1, 4 and 7 coins[9]. Before making the actual decision in both the homogeneous case and the heterogeneous case, each group member was informed about the positions of all group members in the distribution of starting fees. Therefore, it was publicly known who received which starting fee in the group.

3.2.2 Median voting mechanism

To measure the effect of different decision mechanisms on the group extractions, the groups were split into two treatments, consisting of 14 groups each. In the first treatment, the total group extraction per group was based on the sum of the individual decisions of its group members. All three group members individually decided how many coins they wanted to extract from each pot. Then the individual amounts were summed up, showing the total aggregate extraction of that group. There was no form of democracy or whatsoever, so the decision-making process was *unregulated*.

In the second treatment, the total group extraction per group was based on a *median voting* mechanism (see Appendix B). All three group members had to individually decide (vote) how many coins they wanted to extract from each pot. The three decisions were then lined up, from the lowest extraction value to the highest. Subsequently the median was determined. The value belonging to the median represented the binding decision for all the members of that group. As there were three members in each group, the total extraction of one group consisted of three times this median value. Furthermore, because there was a form of binding democracy added to the decision making process, the initial decisions (votes) a group member made could have differed from the real extractions of that group member.

The participants in both decision mechanism treatments were abundantly informed about the establishment of the total group extractions. This information was particularly important for the participants in order to determine the value they individually would like to extract, based on the consideration between self-interest and the interest of subsequent groups.

3.2.3 Additional background questions

The questionnaire also included questions about the background characteristics of the participants, regarding their gender, age, education, marital status and political preference.

[9] Note that the mean starting fee was 4 coins for both distributions.

Also questions about intergenerational attributes were asked, like family size, having children, long-term thinking, and charity giving (see Appendix A).

3.3 Procedure

3.3.1 Tasks

Testing happened in a distraction-free laboratory setting. On arrival, the participants were divided into groups of 3, which represented a generation. Each of the three group members received a paper with a membership number on it (1, 2 or 3). This number was read aloud, so all the group members knew each other's membership number. Then each group member was assigned to a computer. On the computer, the online survey program Qualtrics was opened. Participants first had to read the instructions carefully, and were then presented to the two cases. In each case a distribution of starting fees was given, showing the starting fee for each membership number. After reading each case, the participants were instructed to make a decision about how many coins the participants wanted to extract from the pot of coins. Finally, the participants were instructed to fill in the additional questionnaire with background questions.

When the experiment was finished, the subjects received a compensation for their participation based on the decisions they made in the experiment. Both the silver and golden coins represented a value of €0,50 per coin. The total amount of silver *or* golden coins possessed by a participant by the end of the experiment determined what he or she could take home as payment. The total amount of silver or golden coins consisted of the standard fee plus the extra extracted coins from the pots. The participants were told that the type of coin (silver or gold) that counted for the payment was randomly chosen by a game of heads or tails. However, to give all participants equal chances in compensation, only the silver coins (with homogeneous starting fees) counted for the actual payment. On average, participants earned €5,27.

3.3.2 Design and analysis

The experiment was conducted in four separate sessions, lasting approximately 20 minutes each. The 84 participants were evenly divided over the four sessions, resulting in 21 participants per session. Each session had its own specific treatment and a mixed design was used. In the first two sessions the decision-making process was *unregulated*; in the last two sessions the decision-making process was subject to a *median voting* mechanism. Furthermore, to reduce any order effects, the order in which the two cases were submitted to the groups was alternated. So for both types of decision mechanisms, there was one session where the groups started with a *homogeneous* starting fee, and one session where the groups started with a *heterogeneous* starting fee. In order to preserve discretion about the content of the survey, all session were carried out on the same day. Table 1 summarizes the experimental design.

Table 1

Mixed subject design

Session	Type of decision mechanism	Case 1	Case 2	Number of participants	Number of groups
1	Unregulated	Homogeneous	Heterogeneous	21	7
2	Unregulated	Heterogeneous	Homogeneous	21	7
3	Median voting	Homogeneous	Heterogeneous	21	7
4	Median voting	Heterogeneous	Homogeneous	21	7
Total:				84	28

The data were collected in four experimental treatments for 2x2 mixed-model ANOVA. This design was chosen to enlarge the observable data with an even amount of participants. In total, it generated 56 group decisions for the analysis. To test for significant differences between group extractions in the various treatments, a repeated-measures ANOVA has been conducted. The decision mechanism (unregulated, median voting) was the between-subject variable and the distribution of wealth (homogeneous, heterogeneous) was the within-subject variable. The group extraction per case was the dependent variable and represented the extent to which individuals in a group were willing to cooperate on behalf of the future.

Furthermore, the division of gender per group (majority male, majority female) was added as a control variable. Gender could have had an impact, as previous studies are still inconclusive about the effect of gender on the extent to which people cooperate in social dilemmas. One of these studies (Andreoni & Vesterlund, 2001) found that males tend to be either completely selfish or completely selfless, and that females are more inclined to equalize payoffs amongst all others. The latter made gender particular important to control for, as it could have an influence on the way females react on the intergenerational aspect, where decisions have to be made between the self now or unknown others in the future. In this case it may be that females try to equalize payoffs between their own generation and future other generations. This control variable does *not* adjust the effect of heterogeneity of wealth, because heterogeneity of wealth is the within-subject variable. Within-subject variables are already controlled for personal specific traits, as these scores come from the same individuals.

Because we are not interested in a possible interaction effect of the division of gender with any of the independent variables, the repeated-measures ANOVA was conducted two times. The first repeated-measures ANOVA tested the effect of the within-subject variable (heterogeneous wealth) and a possible interaction effect between heterogeneous wealth and median voting. In this case, the control variable (division of gender) was not included in the analysis, as control variables “cannot be used to adjust interaction terms with variables that are repeated measures or within-subjects” (Gilmore, 2007, p. 370). Only the results of the within-subjects output was therefore observed.

The second repeated-measures ANOVA was conducted to test for the effect of the between-subject variable (median voting), while controlling for the division of gender. And as between-subject variables *can* be adjusted for the effect of control variables (Gilmore, 2007), the division of gender was included for this test. Only the results of the between-subjects output was observed in this test.

For all analyses, $\alpha = .05$ was used. The data were analyzed by using the Statistical Package for Social Scientists (IBM SPSS, standard version 23.0, 2016). Before running the repeated-measures ANOVAs, it was checked if the data complied with the corresponding assumptions.

First of all, the assumption of sphericity was automatically met, because the within-subject factor distribution of wealth consisted of only two levels. Therefore, no adjustments in the degrees of freedom were required before the analysis.

The assumption of normality was tested by using the Kolmogorov-Smirnov test. It was conducted on all treatments separately. The group extraction scores in the unregulated decision making treatment with homogeneous cases, $D(14) = .144$, $p = .200$, and heterogeneous cases, $D(14) = .158$, $p = .200$, did not deviate significantly from normal. However, the scores in the median voting mechanism treatment did differ significantly from normal in both the homogeneous cases, $D(14) = .398$, $p < .001$, and the heterogeneous cases, $D(14) = 0.41$, $p < .001$. Different kinds of transformations were conducted in a vain attempt to meet the assumption of a normal distribution in these treatments. Also more conservative estimates were applied. Both adjustments made no real difference in the results of the main analysis, and therefore no adjustments were made to the data.

Furthermore, one outlier was found, located in the heterogeneous cases in the median voting treatment. This outlier was thought to be a legitimate score (30), as it was one of the possible scores given by the experimental game. Besides, this group of respondents scored the same in the homogeneous case, and deleting this outlier had no effect on the levels of significance in the main analysis. Therefore there was no reason to delete the outlier.

A Levene's test was conducted to check for homogeneity of variances across the groups. The Levene's test was conducted in both repeated-measures ANOVAs. In the repeated-measures ANOVA without the control variable, the assumption of homogeneity of variance was met in both the homogeneous cases, $F(1, 26) = 1.272$, $p = .270$, and heterogeneous cases, $F(1, 26) = 0.620$, $p = .438$. In the repeated-measures ANOVA including the control variable, the assumption of homogeneity of variance was met only in the heterogeneous cases, $F(3, 24) = 2.243$, $p = .109$. In the homogeneous cases the variance of scores significantly differed across the groups, $F(3, 24) = 3.404$, $p = .034$. But as the assumption for homogeneity of variance is irrelevant if the model doesn't incorporate unequal groups (Field, 2013), and excluding the control variable from the analysis made no differences in significance levels, no adjustments were made in the data.

Lastly, despite precautions in the design to prevent any order effects, it was tested if participants made any significant different decisions when they were first presented to the homogeneous case and secondly to the heterogeneous case, as opposed to participants who were first presented to the heterogeneous case and secondly to the homogeneous case. To test this, the differences between the individual decisions in the homogeneous cases and heterogeneous cases were compared to whether participants were first presented to the homogeneous case, or first presented to the heterogeneous case. An univariate ANOVA was conducted with the individuals' score differences between homogeneous cases and heterogeneous cases as dependent variable, and the order in which the cases were presented to the participants as fixed variable. As expected, no significant order effect was found, $F(1, 82) = 1.13$, $p = .291$.

4. RESULTS

As no order effect was found, the data of the group extractions per treatment were pooled from both cases 1 and 2. The means and standard deviations of all group extraction scores per treatment are shown in Table 2. In the fourth column, the results of the unregulated decision making treatment and the median voting mechanism treatment combined are shown. Here the data suggests that the differences in extractions between homogeneous groups

(18.96) and heterogeneous groups (18.86) are small. On average, heterogeneous groups extracted 0.10 coins less than homogeneous groups. In the bottom row, the results of the homogeneous groups and heterogeneous groups combined are shown. Here the average group extractions between unregulated decision making (19.71) and median voting mechanism (18.11) are compared. On average, groups in the median voting treatment extracted 1.60 coins less than groups in the unregulated treatment. Furthermore, what can be noticed is that the means of all treatments are above the set threshold of 15.

Table 2

Means and standard deviations of all group extraction scores, sorted by form of decision making and wealth distribution (N = 56)

Distribution of wealth	Unregulated decision making	Median voting mechanism	Unregulated and median voting combined
Homogeneous	19.29 (4.73), n = 14	18.64 (5.29), n = 14	18.96 (4.93), n = 28
Heterogeneous	20.14 (3.72), n = 14	17.57 (4.83), n = 14	18.86 (4.43), n = 28
All	19.71 (4.20), n = 28	18.11 (5.00), n = 28	18.91 (4.65), n = 56

First, the repeated-measures ANOVA for the within-subjects effects was conducted. It was found that heterogeneous wealth did not significantly affect the group extractions, $F(1, 26) = 0.039$, $p = .846$, $\eta_p^2 = .001$. This means that there is no significant difference in group extractions between the homogeneous groups and the heterogeneous groups. Therefore, no statistical support was found for the hypothesis that generations with a heterogeneous wealth structure extract more from a common pool resource than generations with a homogeneous wealth structure. The effect size of heterogeneous wealth on the group extractions was negligible.

Furthermore, no significant interaction effect was found between heterogeneous wealth and median voting, $F(1, 26) = 3.125$, $p = .089$, $\eta_p^2 = .107$. What can be noticed however, is the large effect size of this interaction effect. In the unregulated treatment, heterogeneous wealth positively affected the group extractions, while in the median voting treatment, heterogeneous wealth negatively affected the group extractions.

Then the second repeated-measures ANOVA was conducted for the between-subjects effects, while controlling for the division of gender. The median voting mechanism did also not significantly affect the group extractions, $F(1, 25) = 0.584$, $p = .452$, $\eta_p^2 = .023$. This means that there is no significant difference in group extractions between unregulated decision making and median voting mechanism. Thus, no statistical support was found for the hypothesis that generations whose total extraction is decided by median vote extract less from a common pool resource than generations with an unregulated decision making mechanism. Although the effect size is rather small, the direction of the effect shows that a median voting mechanism *does* lower the group extractions, which is consistent with the direction stated in the hypothesis.

These results incorporate the controlling of the division of genders in the groups. This division of gender seemed to have no significant impact on the group extractions, $F(1, 25) = 1.684$, $p = .206$, $\eta_p^2 = .063$. A moderate effect size was found, and showed that groups consisting of a majority of males extracted more than groups consisting of a majority of females.

Table 3 gives an overview of the results of the two repeated-measures ANOVAs combined.

Table 3

Results from repeated-measures ANOVAs of group extractions by heterogeneous wealth, median voting and gender

Variable	*df*	*SS*	*MS*	*F*	*p*	η_p^2
Within-subjects						
Heterogeneous wealth	1	0.161	0.161	0.039	.846	.001
Heterogeneous wealth*Median voting	1	13.018	13.018	3.125	.089	.107
Error	26	108.321	4.166			
Between-subjects						
Median voting	1	22.514	22.514	0.584	.452	.023
Gender	1	64.935	64.935	1.684	.206	.063
Error	25	963.958	38.558			

5. DISCUSSION

This study is conducted to answer the research question: to what extent affect a voting mechanism and heterogeneous wealth the total group extraction in an intergenerational common pool resource dilemma? Using the Intergenerational Goods Game (Hauser et al., 2014a) as experimental template enabled us to precisely track the decisions groups of people make in an intergenerational dilemma under different conditions. To be able to answer the research question, the total group extractions were observed while variations in wealth distribution and variations in the decision mechanism were added.

The first hypothesis stated that generations with a publicly known heterogeneous wealth structure extract more from a common pool resource than generations with a publicly known homogeneous wealth structure. However, the data of this study revealed no significant difference between the group extractions of an intergenerational common pool resource in the homogeneous cases and the heterogeneous cases. The direction of the effect was even negative, but the found effect size was negligible ($\eta_p^2 = .001$). This result contradicts the hypothesis, and is therefore unexpected.

As heterogeneity of wealth has not been tested yet in intergenerational settings, this conclusion does not directly oppose any other study in this field. However, when comparing these results with findings in intra-generational studies, it is remarkable that these results contradict the findings of Anderson et al. (2008), as in their study a similar operationalization of heterogeneous wealth is used. Anderson et al. (2008) found a negative effect of publicly known heterogeneous wealth distributions on the contributions individuals made to a public good.

There are two possible explanations for the difference in results between the study of Anderson et al. (2008) and this study. The first explanation could be that the heterogeneous wealth distribution was not made public *enough* to the participants, resulting in a lower influence of status differences on the decisions the participants made. In this study, group members were first publicly informed about each other’s membership number. Then later on, they were in private presented to the wealth distribution, which had to be linked to the previously communicated membership numbers by the participants themselves. Therefore, group members with high starting fees were not ‘awarded’ with their position in front of the other group members (Anderson et al., 2008; Ball et al., 2001), but only when the participants linked their membership number to the given wealth distribution in private. Because of this, status differences might not have had the predicted influence on the individual decision making. Further research into the effect of heterogeneous wealth distributions in intergenerational dilemmas should therefore be extra careful how to introduce heterogeneity to the participants in their experiment, and consider if the participants are publicly aware enough of the heterogeneity.

The second possible explanation for the difference in results between the study of Anderson et al. (2008) and this study, is that in this study a threshold was included, whereas in the study of Anderson et al. (2008) no threshold or provision point was included. According to Abele and Stasser (2005), thresholds and provision points in public good experiments tent to be focal points for coordinating contributions by the participants. The consequence of this is that experiments addressing social dilemmas with a threshold provide reduced opportunities to observe the effects of other factors (Abele & Stasser, 2005). The participants are likely to choose for the given easy solution (i.e. the set threshold), without considering the other factors that much (Abele & Stasser, 2005). This was also observed in the data of this study, as the value of the threshold was the most chosen extraction amount by the individuals in all treatments, except for the homogeneous cases in the median voting treatment. Further research into the effect of heterogeneous wealth distributions in intergenerational dilemmas could be conducted without using a threshold. This assures the choices participants make will not be coordinated by the set provision point, giving more opportunity to observe the effect of a heterogeneous wealth distribution itself.

The second hypothesis in this study stated that generations whose total extraction is decided by median vote extract less from a common pool resource than generations with an unregulated decision mechanism. However, the introduction of a median voting mechanism also showed no significant effect on the group extractions. Whether the decision making process was unregulated or subject to a median voting mechanism made no statistically significant difference. This is contradicting the findings of Hauser et al. (2014a), who show the threshold isn't exceeded as much with median vote, but also show the extraction itself becomes significantly lower, when compared to unregulated decision making procedures. Although no significant effect was found, the direction of the effect of a median voting mechanism on the group extractions was negative ($\eta_p^2 = .023$), which is consistent with the stated direction in the hypothesis. On average, groups with a median voting mechanism extracted less than groups with an unregulated decision mechanism.

There are three possible explanations for the difference in results between the study of Hauser et al. (2014a) and this study. First of all, it may be a consequence of a difference in group sizes. To force cooperation, a majority of cooperators is necessary (Hauser et al. 2014a). The experiment of Hauser et al. (2014a) included groups of five individuals, meaning that in order to gain a majority of cooperators, 3 out of 5 group members needed to cooperate. In this study, groups of three individuals were used, meaning 2 out of 3 group members needed to cooperate in order to gain a majority of cooperators. Therefore, mathematically seen, a lower percentage of cooperators are needed to gain a majority of cooperators in the experiment of Hauser et al. (2014a) than in the experiment used in this study (i.e. the fractional part of 3/5 of a group equals 60%, and is slightly less than the fractional part of 2/3 of a group, which equals 66.7%). Hence, it is also important to keep the group size in mind when interpreting the effectiveness of a median voting mechanism to enhance cooperation. Further research could investigate the effect of median voting on intergenerational cooperation under various group sizes, to test if the mathematical assumption that a majority of cooperators is indeed gained less frequent in smaller groups than in larger groups, and thus cooperation is less likely to be achieved in smaller groups than in larger groups.

A second possible explanation for the difference in results between the study of Hauser et al. (2014a) and this study is the sample size. Hauser et al. (2014a) used a larger sample size (N = 96 and N = 74 respectively for the unregulated treatment and the median voting treatment) than what we used in this study (N = 28 per treatment). The larger sample size of Hauser et al. (2014a) resulted in smaller standard errors, and therefore gave opportunity to observe smaller effect sizes. In this study the sample size only allowed to observe large effect sizes (Cohen, 1992). The effect size found in this study was small (η_p^2 = .023) and therefore the significance might be unobserved. Hence, it is plausible that the difference in sample sizes caused the deviation in the observed statistical significances.

A third possible explanation for the difference in results is that Hauser et al. (2014a) addressed a participants pool with different attributes than the participants pool used for this study. Hauser et al. (2014a) used the Amazon's Mecanical Turk (AMT) participants pool, having a demographically diverse sample with an average age of 32.8 years (Burhmester, Kwang & Gosling, 2011). In this study the ORSEE participants pool was used, which largely consists of college students or ex-students from the Radboud University Nijmegen. As a consequence, the average age of the participants in this study was 21.8 years. It may be the case that the decisions of individuals of younger age are less influenced by institutions like voting mechanisms.

We would like to address three limitations and one strong part of this study. The first limitation of this study is that some of the collected data appeared to be non-normally distributed according to the Kolmogorov-Smirnov test. When the assumption of normality is violated, it has consequences for the significance tests and confidence intervals. For the F-test, violation of the assumption of normality means that the accuracy of the rejection probabilities decrease (Van den Bercken & Voeten, 2002). However, because the F-statistics can be quite robust to violation of normality when group sizes are equal (Field, 2013) and transformation of the data showed no substantial difference in normality, we still decided use the analysis of variance for repeated-measures in this study.

As previously mentioned, another limitation of this study is the use of a threshold. Thresholds and provision points in public good experiments tent to be focal points for coordinating contributions by the participants (Abele & Stasser, 2005). This was also observed in the data, which shows that in three of the four treatments, the value of the threshold is the most chosen extraction value by the individuals. Abele & Stasser (2005) state that these thresholds and provision points cause participants to take other factors less in consideration, which makes observing the effects of other factors more difficult. Although the threshold was necessary to give the experiment an intergenerational setting and to keep the passing on of resources easy to understand, it may be a cause for not finding proof for the stated hypotheses in this study.

The third limitation of this study is the sample size and sample characteristics. The sample size was selective and rather small. Smaller samples are less representative and are more sensitive for sampling errors (Field, 2013). This is also seen in the violation of the assumption of normality. Moreover, smaller samples are less likely to observe assumed effects, particularly when these effect are small (Cohen, 1992). Because the sample was not random but selective, it consisted for a large extent of students and ex-students of the Radboud University Nijmegen. This also had the consequence that differences were less observable, as there was not much variation between the characteristics of the participants. Furthermore, because the sample only consisted of people with a high educational degree, it is not a good representation of the total population. The implications of this study are therefore more difficult to generalize to the entire population. Hence, a reproduction of this study with a larger and more diverse sample is advised.

A strong part of this study is the use of a within-subject design. The within-subject design enabled us to enlarge the sample size with the same amount of resources, by subjecting the participants to multiple cases. Another advantage of this design is that it reduces the probability that the explained variance of the different conditions are caused by participant specific characteristics. As the participants were subject to both the homogeneous and heterogeneous cases, differences in the scores between homogeneous and heterogeneous cases could not be attributed to differences in the group characteristics of the treatments.

To conclude, the results of this study contribute to the existing literature in intergenerational dilemmas by generalizing the influences of factors from social dilemmas into intergenerational context. It gives insight in to what extent a heterogeneous wealth distribution and a median voting mechanism affect a group's willingness to cooperate on behalf of the future. The results do not support the expectations, as both a heterogeneous wealth distribution and a median voting mechanism had no statistically significant effect on the total group extractions made in an intergenerational common pool resource game. When addressing intergenerational sustainability issues, for instance by policy makers, it should be considered that a median voting institution can be effective, but not under all circumstances. Another implication is that economic inequality amongst the present decision makers does not need to be taken into account, as theories about inequality aversion, group cohesion and status differences seem to be inferior to the intergenerational dilemma. Future research could investigate the robustness of these findings by adjusting the circumstances of the experiment (e.g. group sizes, sample characteristics), while using the same independent variables. Also other conditions could be investigated to extent the framework of the Intergenerational Goods Game even further. Overlapping generations, sanctioning possibilities, communication and heterogeneity over different generations are interesting examples. Finally, in this study the group extractions per generation were observed, but as the group level outcomes are derivatives of the aggregate individual decisions, the scores on individual level are also important to be examined to gain a more accurate understanding of the fundamentals of intergenerational cooperation.

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Appendix A

Unregulated decision making treatment questionnaire

The questionnaire in all treatments consisted of a three parts. The first part gives an introduction about the experiment and explains what is asked from the participants (pages 1-3). The second part describes the two decision making situations, one about a pot of silver coins and one about a pot of golden coins. Each situation is closed with the question how many coins the participant wants to extract from the pot (pages 4-8). The third part consists of an additional questionnaire, asking about the participant's background characteristics (page 9).

The following texts are copies of the actual questionnaire in the unregulated decision making treatment, as these have been presented to the participants. Participants were shown one page at a time, and the pages were presented in the same sequence as below.

Page 1

Welkom bij dit experiment. In dit experiment krijg je twee situaties voorgelegd. In beide situaties moet je een keuze maken over een pot met waardevolle munten. Je kunt in dit experiment echt geld verdienen, maar dat hangt wel af van de keuzes die je maakt. **Tijdens het experiment is spreken verboden. Om het experiment niet te verstoren, vragen we je vriendelijk doch dringend om ook na het experiment niet met anderen hierover te spreken.** Het experiment zal ongeveer 20 minuten duren.

De opbouw van het experiment ziet er als volgt uit:
Er wordt gestart met een algemene uitleg over het experiment. Daarna volgen twee experimentele situaties. Steeds wordt de situatie eerst uitgelegd, waarna je een keuze moet maken. Bij de eerste situatie is een pagina toegevoegd met twee voorbeelden ter verduidelijking.

Je kunt verder naar de volgende pagina door op de rode knop rechts onderin het scherm te klikken. Mocht deze niet te zien zijn, scrol dan verder naar beneden. Je kunt binnen beide situaties terug naar de situatieomschrijving. Als je eenmaal een keuze hebt gemaakt in een situatie, kun je hier niet meer naar terug.

Als je dringende vragen hebt tijdens het experiment kun je je hand op steken. Wij komen dan naar je toe.

Page 2

Vul hieronder je groepsnummer en je lidnummer in die op het blaadje staat die je hebt gekregen.

Groepsnummer

Lidnummer

Page 3

Algemene uitleg experiment

Lees onderstaande informatie goed door. Zodra je doorgaat naar situatie 1, kun je niet meer terug naar deze pagina!

Samen met de 2 deelnemers waarmee je bent binnengekomen, vorm je één groep. Ieder lid van jouw groep heeft een lidnummer (lid 1, lid 2 en lid 3). Jouw lidnummer staat op het papier dat je hebt gekregen.

Jouw groep is onderdeel van een reeks van meerdere groepen die elkaar opvolgen. Vóór jouw groep is er dus een groep geweest, en na jouw groep komt een nieuwe groep.

Er zijn twee potten met munten die van groep op groep kunnen worden doorgegeven; er is een pot met gouden munten en een pot met zilveren munten. Zodra een groep over een pot met munten beschikt, kunnen de leden van die groep munten opnemen uit die pot. Als de groep in totaal (dus alle groepsleden gezamenlijk) de helft of minder van de munten uit de pot opneemt, wordt de pot weer bijgevuld en doorgegeven aan de volgende groep. Als de groep in totaal meer dan helft van de munten opneemt, dan wordt deze pot afgepakt en niet meer bijgevuld. De volgende groepen kunnen dan geen munten meer uit die pot opnemen. Dit geldt voor beide potten, zowel die met gouden munten als die met zilveren munten. Afhankelijk van de keuzes van de vorige groep, kan een groep beschikken over twee potten met munten (goud & zilver), één van beide potten met munten (goud óf zilver) of géén van beide potten.

Zojuist heeft de groep voorafgaand aan jouw groep hun keuzes gemaakt. Zij kozen uit beide potten niet meer dan de helft van de munten. Jouw groep beschikt daarom over twee bijgevulde potten met gouden en zilveren munten. Over beide potten maak je één keuze: in de éne situatie een keuze over de pot met gouden munten, en in de andere situatie een keuze over de pot met zilveren munten.

Je kunt geld verdienen in dit experiment. Je start met een basisuitkering voor de pot met gouden en voor de pot met zilveren munten. De basisuitkering staat vermeld op de uitlegpagina van beide situaties. De basisuitkering kan per groepslid verschillen. De hoeveelheid geld die je verdient, is je basisuitkering plus de gouden en zilveren munten die je extra hebt opgenomen. Welk van deze twee muntsoorten telt, wordt willekeurig geselecteerd (kop of munt). Zowel een gouden als een zilveren munt staat gelijk aan € 0,50.

Klik op 'volgende pagina' als je bovenstaande informatie nauwkeurig hebt doorgelezen, om door te gaan naar de eerste situatie.

Page 4

Situatie 1

De eerste situatie gaat over de zilveren munten.

Hieronder zie je de basisuitkering zilveren munten per lid:

Lid 1	4 munten
Lid 2	4 munten
Lid 3	4 munten

De pot in deze situatie bestaat uit 30 zilveren munten. Ieder groepslid heeft de keuze om 0 tot en met 10 munten uit de pot op te nemen. Hieronder staan voor ieder lid de verschillende opties:

0	1	2	3	4	5	6	7	8	9	10

Zoals je kunt zien heeft ieder lid binnen een groep dus de mogelijkheid om maximaal ⅓ van de totale pot op te nemen. De hoeveelheid munten die jouw groep in totaal pakt, beïnvloedt de keuzes die de groepen ná jullie kunnen maken:

1. Wanneer jouw groep **in totaal 15 munten of minder** opneemt, dan vullen wij de pot weer bij tot 30 gouden munten en wordt de pot doorgegeven aan de volgende groep. Zij kunnen dan ook weer munten opnemen.

2. Wanneer jouw groep **in totaal 16 munten of meer** opneemt, dan vullen wij de pot niet bij en pakken wij de pot af. Alle volgende groepen kunnen dan geen munten meer opnemen en hebben ook géén recht op de basisuitkering. De leden van de volgende groepen kunnen dan dus geen geld meer verdienen door deel te nemen aan het experiment.

Page 5

Voorbeeld

Ter illustratie volgen hier twee voorbeeldsituaties.

<u>Voorbeeld 1:</u>
De drie leden in groep 3 nemen de volgende zilveren munten op uit de pot:
- Lid 1: 1 munt
- Lid 2: 7 munten
- Lid 3: 4 munten

Samen nemen zij 1 + 7 + 4 = 12 zilveren munten op uit de pot. Dit betekent dat groep 3 in totaal **minder dan 15 munten** opneemt. Wij **vullen daarom de pot weer bij** tot 30 zilveren munten. Groep 4 krijgt deze bijgevulde pot van 30 munten ter beschikking en kunnen hier munten uit opnemen.

Voor elk lid geldt dat het aantal muntstukken dat hij heeft opgenomen, samen met zijn persoonlijke basisuitkering bepaalt hoeveel euro's hij verdient.

Lid 1 heeft een basisuitkering van 4 zilveren munten en nam 1 extra zilveren munt uit de pot. In totaal heeft lid 1 dus 5 zilveren munten van € 0,50. Lid 1 verdient daarom € 2,50.

Voorbeeld 2:
De drie leden in groep 4 nemen de volgende zilveren munten op uit de pot:
- Lid 1: 10 munten
- Lid 2: 5 munten
- Lid 3: 5 munten

Samen nemen zij 10 + 5 + 5 = 20 zilveren munten op uit de pot. Dit betekent dat groep 4 in totaal **meer dan 15 munten** opneemt. Wij **pakken de pot daarom permanent af**. Groep 5 (en alle daaropvolgende groepen) krijgen dan **geen** pot met munten, en die groepen kunnen dus geen munten opnemen uit de pot. Ook krijgen zij geen basisuitkering.

Voor elk lid geldt dat het aantal muntstukken dat hij heeft opgenomen, samen met zijn persoonlijke basisuitkering bepaalt hoeveel euro's hij verdient.

Lid 1 heeft een basisuitkering van 4 zilveren munten en nam 10 extra zilveren munten uit de pot. In totaal heeft lid 1 dus 14 zilveren munten van € 0,50. Lid 1 verdient daarom € 7,-.

Page 6

Beslissing situatie 1

Zojuist heeft de vorige groep hun keuze gemaakt. Zij hebben in totaal 15 of minder zilveren munten opgenomen uit de pot. De pot is daarom bijgevuld tot 30 zilveren munten en doorgegeven aan jouw groep.

Alle groepsleden ontvangen een basistuikering. Hieronder zie je nogmaals de basisuitkering zilveren munten per lid:

Lid 1	4 munten
Lid 2	4 munten
Lid 3	4 munten

Bovenop deze basisuitkering kunnen jij en de andere groepsleden nu extra munten uit de pot opnemen.

Selecteer hieronder je keuze hoeveel zilveren munten jij nu daadwerkelijk wilt opnemen:

0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Page 7

Situatie 2

De tweede situatie gaat over de gouden munten.

Hieronder zie je de basisuitkering gouden munten per lid:

Lid 1	1 munt
Lid 2	4 munten
Lid 3	7 munten

De pot bestaat uit 30 gouden munten. Ieder groepslid heeft de keuze om 0 tot en met 10 munten uit de pot op te nemen. Hieronder staan voor ieder lid de verschillende opties:

0	1	2	3	4	5	6	7	8	9	10

Zoals je kunt zien heeft ieder lid binnen een groep dus de mogelijkheid om maximaal ⅓ van de totale pot op te nemen. De hoeveelheid munten die jouw groep in totaal pakt, beïnvloedt de keuzes die de groepen ná jullie kunnen maken:

1. Wanneer jouw groep **in totaal 15 munten of minder** opneemt, dan vullen wij de pot weer bij tot 30 gouden munten en wordt de pot doorgegeven aan de volgende groep. Zij kunnen dan ook weer munten opnemen.

2. Wanneer jouw groep **in totaal 16 munten of meer** opneemt, dan vullen wij de pot niet bij en pakken wij de pot af. Alle volgende groepen kunnen dan geen munten meer opnemen en hebben ook géén recht op de basisuitkering. De leden van de volgende groepen kunnen dan dus geen geld meer verdienen door deel te nemen aan het experiment.

Page 8

Beslissing situatie 2

Zojuist heeft de vorige groep hun keuze gemaakt. Zij hebben in totaal 15 of minder gouden munten opgenomen uit de pot. De pot is bijgevuld tot 30 gouden munten en doorgegeven aan jouw groep.

Hieronder zie je nogmaals de basisuitkering gouden munten per lid

Lid 1	1 munt
Lid 2	4 munten
Lid 3	7 munten

Bovenop deze basisuitkering kunnen jij en de andere groepsleden nu extra munten uit de pot opnemen.

Selecteer hieronder je keuze hoeveel gouden munten jij nu daadwerkelijk wilt opnemen:

0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○

Page 9

Hieronder volgen een aantal vragen over jouw persoonlijke kenmerken

Wat is je geslacht?

○ Man

○ Vrouw

Wat is je geboortedatum?

[ ]

Wat is je hoogst voltooide opleiding?

● 1. Basisschool niet afgemaakt

○ 2.. Alleen basisschool afgemaakt

○ 3. LBO, VBO, LEAO, LTS ambachtsschool, huishoudschool, LHNO, VMBO (niveaus 1-3; basisberoepsgericht, kaderberoepsgericht, gemengd) afgemaakt

○ 4. MULO, ULO, MAVO, VMBO (niveau 4; theoretische leerweg); HAVO jaar 3-

○ 5. KMBO, leerlingwezen, MBO niveau 1, MEAO, MTS afgemaakt (duur 2 jaar)

○ 6. HAVO, MMS, MSVM afgemaakt

- 7. VWO, HBS, atheneum, gymnasium afgemaakt
- 8. MBO niveau 2 en 3 afgemaakt (duur 2-3 jaar)
- 9. MBO niveau 4 afgemaakt (duur 4 jaar)
- 10. MBO-plus voor havisten
- 11. propedeuse WO, OU-certificaat
- 12. korte HBO-opleiding einddiploma (2 of 3 jaar), kweekschool, conservatorium, MO-acten
- 13. Bachelor HBO afgemaakt
- 14. Bachelor universiteit afgemaakt
- 15. HBO: Masters degree, tweede fase opleidingen; Post HBO-opleidingen, pre-master onderwijs voor HBO
- 16. WO/universiteit: Masters degree, tweede fase opleidingen; ingenieur, meester, doctorandus
- 17. Doctoraat/gepromoveerd

Heeft u een partner, d.w.z. een man of vrouw met wie u getrouwd bent of samenwoont?

- Ja
- Nee

Wat is uw burgerlijke staat?

- 1. ongehuwd
- 2. gehuwd
- 3. partnerschap (geregistreerd)
- 4. gescheiden (na huwelijk)
- 5. gescheiden (na geregistreerd partnerschap)
- 6. verweduwd (na huwelijk)
- 7. verweduwd (na geregistreerd partnerschap)
- 8. anders, namelijk: [ ]

Wat is je woonsituatie?

- Bij ouders
- Zelfstandig
- Samenwonend

Uit hoeveel mensen, inclusief uzelf, bestaat het huishouden waar u deel van uitmaakt? (Dit kan ook een studentenhuis zijn)

[ ]

Vink hieronder aan welke familieleden je op dit moment hebt. Vul indien van toepassing ook het aantal in, in het vak achter de optie.

- [ ] Vader(s) [ ]

- Moeder(s)
- Opa(s) en of oma(s)
- Broers en of zussen
- Zonen en of dochters.
- Oom(s) of tante (s) van je moeders kant (niet aangetrouwd)
- Oom(s) of tante (s) van je vaders kant (niet aangetrouwd)
- Neven / nichten (Kinderen van ooms en tantes)
- Neefjes / nichtjes (Kinderen van broer of zus)

In hoeverre maak je in je leven plannen voor de toekomst?

- Zeer veel
- Behoorlijk
- Nauwelijks
- Niet

Maak je je zorgen over het veranderende wereldklimaat?

- Ja
- Nee

In hoeverre houd je rekening met het milieu?

- Zeer veel
- Behoorlijk veel
- Nauwelijks
- Niet

In hoeverre steun je goede doelen, d.w.z. geef je donaties of zet je je vrijwillig in voor non-profitorganisaties?

- Zeer veel
- Behoorlijk veel
- Nauwelijks
- Niet

Op 15 maart dit jaar heeft de Tweede Kamerverkiezing plaatsgevonden. Op welke politieke partij heb je toen gestemd?

- VVD
- PvdA
- PVV
- CDA
- D66
- SP

- GroenLinks
- ChristenUnie
- Partij voor de Dieren
- SGP
- overig
- Ik heb niet gestemd

Appendix B

Median voting treatment questionnaire

The median voting treatment uses an adjusted version of the questionnaire used in the unregulated decision making treatment. The introduction on pages 1-3 in the median voting treatment is the same as in the unregulated decision making treatment. Also the additional questionnaire about the background characteristics of the participants is similar. However, the explanation of the two decision making situations and the decision making sheets on pages 4-8 are adjusted.

The following texts are copies of the pages of the actual questionnaire in the median voting treatment. Only the pages that have a different content than the pages in the unregulated decision making treatment are shown.

Page 4

Situatie 1

De eerste situatie gaat over de zilveren munten.

Hieronder zie je de basisuitkering zilveren munten per lid:

Lid 1	4 munten
Lid 2	4 munten
Lid 3	4 munten

De pot bestaat uit 30 zilveren munten. Ieder groepslid neemt dezelfde hoeveelheid munten op uit de pot. Deze hoeveelheid is afhankelijk van een stemming. Ieder groepslid doet een voorstel over hoeveel munten eenieder uit de pot moet opnemen en heeft de keuze om 0 tot en met 10 munten voor te stellen. Hieronder staan voor ieder lid de verschillende opties:

0	1	2	3	4	5	6	7	8	9	10

De voorstellen van alle groepsleden worden dan geordend van klein naar groot. De **middelste waarde** bepaalt hoeveel ieder groepslid verplicht uit de pot neemt.

Zoals je kunt zien heeft ieder lid binnen een groep dus de mogelijkheid om voor te stellen dat ieder maximaal ⅓ van de totale pot op moet nemen. De hoeveelheid munten die jouw groep in totaal pakt, beïnvloedt de keuzes die de groepen ná jullie kunnen maken:

1. Wanneer jouw groep **in totaal 15 munten of minder** opneemt, dan vullen wij de pot weer bij tot 30 zilveren munten en wordt de pot doorgegeven aan de volgende groep. Zij kunnen dan ook weer munten opnemen.

2. Wanneer jouw groep **in totaal 16 munten of meer** opneemt, dan vullen wij de pot niet bij en pakken wij de pot af. Alle volgende groepen kunnen dan geen munten meer opnemen en hebben ook géén recht op de basisuitkering. De leden van de volgende groepen kunnen dan dus geen geld meer verdienen door deel te nemen aan het experiment.

Page 5

Voorbeeld

Ter illustratie volgen hier twee voorbeeldsituaties:

<u>Voorbeeld 1:</u>
De drie leden in groep 3 nemen de volgende zilveren munten op uit de pot:
- Lid 1: 1 munt
- Lid 2: 7 munten
- Lid 3: 3 munten

Deze voorstellen worden geordend van klein naar groot: (1 - 3 - 7) en de middelste waarde wordt geselecteerd: 3. Alle leden van groep 3 nemen verplicht 3 munten op uit de pot. Samen neemt groep 3 dan 3 * 3 = 9 munten uit de pot. Dit betekent dat groep 3 in totaal **minder dan 15 munten** opneemt. Wij **vullen daarom de pot weer bij** tot 30 zilveren munten. Groep 4 krijgt deze bijgevulde pot van 30 munten ter beschikking en kunnen hier munten uit opnemen.

Voor elk lid geldt dat het aantal muntstukken dat hij heeft opgenomen, samen met zijn persoonlijke basisuitkering bepaalt hoeveel euro's hij verdient.

Lid 1 heeft een basisuitkering van 4 zilveren munten en was verplicht om 3 extra zilveren munt uit de pot te nemen. In totaal heeft lid 1 dus 7 zilveren munten van € 0,50. Lid 1 verdient dus € 3,50.

<u>Voorbeeld 2:</u>
De drie leden in groep 4 nemen de volgende zilveren munten op uit de pot:
- Lid 1: 10 munten
- Lid 2: 5 munten
- Lid 3: 6 munten

Deze voorstellen worden geordend van klein naar groot: (5 - 6 - 10) en de middelste waarde wordt geselecteerd: 6. Alle leden van groep 4 nemen verplicht 6 munten op uit de pot. Samen neemt groep 4 dan 3 * 6 = 18 munten uit de pot. Dit betekent dat groep 4 in totaal **meer dan 15 munten** opneemt. Wij **pakken de pot daarom permanent af**. Groep 5 (en alle daaropvolgende groepen) krijgen dan **geen** pot met munten, en die groepen kunnen dus geen munten opnemen uit de pot. Ook krijgen zij geen basisuitkering.

Voor elk lid geldt dat het aantal muntstukken dat hij heeft opgenomen, samen met zijn persoonlijke basisuitkering bepaalt hoeveel euro's hij verdient.

Lid 1 heeft een basisuitkering van 4 zilveren munten en was verplicht om 6 extra zilveren munten uit de pot te nemen. In totaal heeft lid 1 dus 10 zilveren munten van € 0,50. Lid 1 verdient dus € 5,-.

Page 6

Beslissing situatie 1

Zojuist heeft de vorige groep hun keuze gemaakt. Zij hebben in totaal 15 of minder zilveren munten opgenomen uit de pot. De pot is bijgevuld tot 30 zilveren munten en doorgegeven aan jouw groep.

Hieronder zie je de basisuitkering zilveren munten per lid nogmaals:

Lid 1	4 munten
Lid 2	4 munten
Lid 3	4 munten

Bovenop deze basisuitkering kunnen jij en de andere groepsleden nu extra munten uit de pot opnemen.

Jij en de andere twee leden van je groep mogen nu ieder individueel een voorstel doen hoeveel munten jullie op willen nemen uit de pot. Het voorstel met de middelste waarde zal de bindende keus zijn voor alle groepsleden.

Selecteer hieronder je keuze hoeveel zilveren munten jij voorstelt om op te nemen uit de pot:

0	1	2	3	4	5	6	7	8	9	10
◉	○	○	○	○	○	○	○	○	○	○

Page 7

Situatie 2

De tweede situatie gaat over de gouden munten.

Hieronder zie je de basisuitkering gouden munten per lid:

Lid 1	1 munt
Lid 2	4 munten
Lid 3	7 munten

De pot bestaat uit 30 gouden munten. Ieder groepslid neemt dezelfde hoeveelheid munten op uit de pot. Deze hoeveelheid is afhankelijk van een stemming. Ieder groepslid doet een voorstel over hoeveel munten eenieder uit de pot moet opnemen en heeft de keuze om 0 tot en met 10 munten voor te stellen. Hieronder staan voor ieder lid de verschillende opties:

0	1	2	3	4	5	6	7	8	9	10

De voorstellen van alle groepsleden worden dan geordend van klein naar groot. De **middelste waarde** bepaalt hoeveel ieder groepslid verplicht uit de pot neemt.

Zoals je kunt zien heeft ieder lid binnen een groep dus de mogelijkheid om voor te stellen dat ieder maximaal ⅓ van de totale pot op moet nemen. De hoeveelheid munten die jouw groep in totaal pakt, beïnvloedt de keuzes die de groepen ná jullie kunnen maken:

1. Wanneer jouw groep **in totaal 15 munten of minder** opneemt, dan vullen wij de pot weer bij tot 30 gouden munten en wordt de pot doorgegeven aan de volgende groep. Zij kunnen dan ook weer munten opnemen.

2. Wanneer jouw groep **in totaal 16 munten of meer** opneemt, dan vullen wij de pot niet bij en pakken wij de pot af. Alle volgende groepen kunnen dan geen munten meer opnemen en hebben ook géén recht op de basisuitkering. De leden van de volgende groepen kunnen dan dus geen geld meer verdienen door deel te nemen aan het experiment.

Page 8

Beslissing situatie 2

Zojuist heeft de vorige groep hun keuze gemaakt. Zij hebben in totaal 15 of minder gouden munten opgenomen uit de pot. De pot is bijgevuld tot 30 gouden munten en doorgegeven aan jouw groep.

Hieronder zie je de basisuitkering gouden munten per lid nogmaals:

Lid 1	1 munt
Lid 2	4 munten
Lid 3	7 munten

Bovenop deze basisuitkering kunnen jij en de andere groepsleden nu extra munten uit de pot opnemen.

Jij en de andere twee leden van je groep mogen nu ieder individueel een voorstel doen hoeveel munten jullie op willen nemen uit de pot. Het voorstel met de middelste waarde zal de bindende keus zijn voor alle groepsleden.

Selecteer hieronder je keuze hoeveel gouden munten jij voorstelt om op te nemen uit de pot:

0	1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○	○