Cooperation and Prosocial Behavior – Essays in Behavioral and Environmental Economics.

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Chapter 1

Introduction

Behavioral economics has become a cornerstone of contemporary economics, particularly in revealing the complexities of human decision-making. It reached its momentum as a recognized subfield in the late 20th Century through well-known scholars such as Nobel laureates Daniel Kahneman, Robert Shiller, George Akerlof, Herbert A. Simon, and Richard Thaler. Their work has become widely known for challenging the traditional economic assumption of human rationality by uncovering psychological factors that influence economic decision-making. Thereby, they laid the foundation for much of the subsequent research in a field that continues to gain prominence - also outside academia. For instance, Kahneman's and Tversky's seminal work "Prospect Theory: An Analysis of Decision under Risk" marked a significant milestone in the development of behavioral economics. By introducing the concept of cognitive biases, Kahneman and Tversky (1979) presented a new framework for understanding how people evaluate risks and make choices. Thaler's research also challenged traditional economic assumptions of perfect rationality. Focusing on how decision-making is influenced by factors such as bounded rationality, self-control problems, and social preferences, his work profoundly impacted both academia and public policy (Thaler and Johnson, 1990). Later, Elinor Ostrom won the Nobel Prize in Economics for her groundbreaking work on the governance of common resources (Ostrom, 1990). Her research demonstrated that communities can manage shared resources sustainably without relying on government regulation and thereby highlighted the importance of local institutions and collective action. These examples demonstrate the great diversity as well as importance of topics in the field of Behavioral Economics. Given their wide application to further disciplines, the field's prominence has spilled over to domains such as finance, public policy, marketing, etc.

Two central topics within Behavioral Economics that are of relevance for this dissertation are cooperation and prosocial behavior. Under which conditions individuals contribute to the common good or more generally act in ways that benefit others remains a key question to be answered in this literature. In this context, it has been widely recognized that people have certain social preferences which determine how they behave and take decisions (e.g. altruism, inequality aversion, risk aversion, etc.) which ultimately determine

e.g. whether or not one engages in cooperation (Fehr and Schmidt, 2006). Traditional economic theory assumes that individuals are primarily motivated by self-interest such as maximizing one's own monetary payoffs. Yet, insights from behavioral economics have shown that individuals are willing to sacrifice part of their own payoff to help others, even without any possibility of direct reciprocity (Bowles, 2006). Others, who have become known as "Conditional Cooperators" cooperate conditional on others also contributing. In such contexts, trust and reputation play a crucial role and have been thoroughly investigated to enrich our understanding of the drivers of cooperation in repeated settings (Wu et al., 2016). Further non-monetary motivations, such as moral considerations, intrinsic motivation and satisfaction have shown to enhance cooperation and prosocial behavior (Gintis et al., 2001). Even with low intrinsic motivation, experimental research has shown that high contribution levels can be sustained if individuals are observed and care sufficiently about social recognition (Seinen and Schram, 2006). In this context, observation has proven to be an extremely powerful tool for triggering reputational concerns which can serve as implicit (non-monetary) reward or punishment mechanism (Grimalda et al., 2016). Despite the wide recognition of such psychological motivators that influence a certain behavior (e.g. cooperation), these differ between cultures and social norms (Luttmer and Singhal, 2011). Social norms can be understood as shared expectations about appropriate behavior (in a group) and thereby provide unwritten behavioral guidelines (Bicchieri, 2005). Context-specific social norms continue to inspire behavioral scientists who investigate the phenomenon of cooperation. Another important component that has been shown to strongly influence cooperation and prosociality is inequality. Inequality between individuals can create a "normative conflict" and thereby make it more difficult for them to cooperate (Kingsley, 2016). Especially if fairness perceptions, and ideas of the deservingness of inequality differ - which they do significantly between cultures (Almås et al., 2020) - successful cooperation is difficult to sustain.

The challenge of achieving better environmental outcomes is often represented by collective action problems. Thoroughly investigated by the previously mentioned Elinor Ostrom, collective action problems arise when individuals, groups, or nations face a situation where the best group outcome is reached through cooperation while each individual has an incentive to free-ride. This is the case for many environmental challenges in which the actions of self-interested groups or nations affect others, while cooperation would be required to achieve the best environmental outcomes for everyone involved. For instance, reducing greenhouse gas emissions benefits all nations by mitigating the impacts of global warming. However, individual nations may be reluctant to take action if they fear others not to contribute in a similar manner. This could be due to a prioritization of short-term economic interests over long-term environmental benefits. Yet, this creates a context where nations act in their own self-interest which results in a sub-optimal outcome for the environment and consequently the global population. Similarly, topics such

as deforestation, over-fishing, pollution, etc. represent collective action problems in which individuals exploit natural resources or create negative externalities for their own benefit while creating negative consequences for the rest. Although it is widely acknowledged that without cooperation and coordination the dilemma cannot be effectively addressed, sufficient action to prevent environmental degradation is still lacking. Thus, reaching meaningful cooperation levels to slow down climate change remains a key challenge of our time.

A common way of measuring cooperation and prosocial behavior in Behavioral Economics is the use of economic experiments. Given the advantage of the controlled setting of economic experiments, they have been increasingly used to determine causal relationships (Podsakoff and Podsakoff, 2019). Common experimental games used to detect cooperation and prosocial behavior include games such as the Prisoner's Dilemma, Public Goods Game, Trust Game, Ultimatum Game, and Dictator Game. These games offer insights into how individuals take decisions regarding cooperation, trust, and fairness in social situations. In the case of public goods, they can be further differentiated between local and global public goods and field application examples range from local pollution to the mitigation of climate change. Analyzing the effectiveness of different institutions affecting the provision of public goods is extremely challenging, as it is not possible to observe the counterfactual. For example, in a world with the Paris Agreement, it is impossible to know how countries' effort in reducing emissions would have looked like without the Paris Agreement. Scientists can rely on theoretical models, yet if they wish to further take into account empirical data, they can make use of surveys or experiments. Experimental data from the laboratory is often criticized for its abstractness and experimental economists are cautious to draw direct conclusions from the lab to the field. Yet, alternative methods are rare or often hard to attain, as it is difficult to test the design and effectiveness of institutions in a completely context-neutral way in the field. Lab-in-the-field experiments have gained more prominence as they intend to bridge the gap between controlled environments of the laboratory and field conditions. Arguably, they include participant samples that are more naturally fitted for specific research questions (e.g. as they face a specific natural resource dilemma in their daily life). Though due to the results' lacking generalization to other contexts, external validity problems prevail also here. Yet, despite their flaws, the clear advantage of laboratory (field) experiments is that they are mostly context-neutral and allow for causal inference by tightly controlling decision environments. Given the internal validity of the results and the scarcity of readily accessible empirical alternatives, evidence from the laboratory can be highly useful to guide research in the field and point to potential drivers and barriers of cooperation.

In this dissertation, I use lab-in-the-field (Chapter 1) and laboratory experiments (in-person for Chapter 3, online for Chapter 2 and 4) to investigate research questions related

to cooperation and prosocial behavior. Thereby, the common thread of this dissertation are of methodological as well as topical nature. All four articles presented highlight the importance of behavioral, situational and institutional factors in social dilemmas. Precisely, Chapter 2 investigates the role of cooperation and social norms. Likewise, Chapters 3 and 4 study a cooperation dilemma, yet with a focus on the role of inequality. Lastly, Chapter 5 looks again at social norms in prosocial decision-making, yet in the domain of charitable giving. In the following, I will discuss the focus and contribution of each article in more detail.

In Chapter 2, titled "Expanding Community Climate Adaptation – Experimental Evidence from Papua New Guinea", I study contribution levels to climate adaptation measures in Bougainville, Papua New Guinea. Specifically, I investigate the willingness to contribute to inter-community funds devoted to climate adaptation measures, such as the conservation of local mangrove trees. In this culturally diverse, geographically secluded and hierarchical setting where people depend on their local neighborhood structures, community funds are common practice. At the same time, while experiencing extreme consequences of climate change through sea level rise and more frequent natural disasters such as tsunamis and subsequent coastal flooding, people deforest mangrove trees that would provide a natural protection mechanism. The individual incentive of selling the timber on local markets creates a cooperation dilemma that provides an interesting study setting for community cooperation. Specifically, I ask whether an in-group bias exists in such between-village adaptation projects and if so, whether observation by village authorities can increase cooperation and potentially counteract the out-group discrimination. The results are threefold: First, they indeed indicate that people are significantly more likely to contribute to a climate community fund if the other collaborators are from one's own village, i.e. confirming the in-group bias found previously in many different settings. Second, and similar to other studies on the effect of observation, I find that contribution levels increase significantly when being observed by a village authority. Third, and focusing on the novel contribution of this paper, I look at the interaction effect of the two treatments. I find that the effect of being observed by a village authority is so strong that it cancels out the out-group discrimination. This way, the study highlights the importance of observation by in-group authorities for increasing cooperation with the out-group, a necessity for expanding the scope of local climate adaptation.

Chapter 3, called "Making and Breaking Promises: On the voluntary provision of public goods under cost uncertainty" is co-authored with Andreas Lange (University of Hamburg). Inspired by the "pledge and review" mechanisms of the Paris Agreement, we investigate the role of cost uncertainty for both initial non-binding pledges and the subsequent voluntary contribution levels. We hypothesize that the commonly observed non-compliance in International Agreements might be a consequence of unknown costs of

compliance. As non-binding pledges are made for the far future and unforeseen crises and budget constraints might make complying much costlier than anticipated, non-compliance might be considered as justifiable excuse. We thus investigate the role of cost uncertainty for both initial non-binding pledges and contributions, and the effectiveness of reviews. Our results show that whenever pledges are made without any review process, cost uncertainty not only leads to rather conservative pledges, but can also affect the later contribution decisions. A review process increases pledges, but does not necessarily improve later compliance with pledges. Further, we observe that people reduce contribution levels more drastically when costs turn out to be higher than expected compared to their increase when learning that costs turn out to be lower. Finally, this study demonstrates the importance of (non-monetary) feedback mechanisms for achieving more ambitious goal setting, yet it does not guarantee compliance with non-binding pledges.

In Chapter 4, titled "A good neighbor – a found treasure: on the voluntary public good provision in overlapping neighborhoods", co-authored with Andreas Lange and Lorenzo Romero (both University of Hamburg), we investigate the importance of the spatial allocation in a circular-network public goods setting under inequality. When we think of public goods such as schools, security, clean air, or the provision of green spaces, we often observe an advantage for people living in richer neighborhoods without many spillovers to poorer neighborhoods. Inspired by ideas of policymakers advocating mixed neighborhoods, we investigate the role of varying spatial allocations of rich and poor for the voluntary provision of public goods. Precisely, we study whether people redistribute and contribute more when interacting in a smaller network and whether the spatial allocation of rich and poor matters. We thus look at two treatment dimensions: i) closed vs. overlapping neighbordhoods, and ii) clustered (i.e. rich, rich, rich, poor, poor, poor) vs. alternating (rich, poor, rich, poor, rich, poor) settings. We find that participants do invest in others' locations, yet mainly in a way in which they themselves benefit, i.e. in locations of their direct neighbors. In networks where rich and poor are clustered, we observe that it is the rich located at the border who trigger redistribution to the poor cluster. Finally, we observe participants to be motivated by reciprocity as they reduce (increase) investments and thereby punish (reward) neighbors who contributed less (more). This study highlights the importance of the spatial allocation between rich and poor in networks. It suggests that different spatial allocations between rich and poor can significantly impact redistribution and that making direct and indirect beneficiaries of public good provisions salient might be a way to decrease inequality.

In Chapter 5, titled 'Bluffing in Charitable Giving - An Experiment on Indirect Signaling', co-authored with Jonas Pilgaard Kaiser (Technical University of Berlin), we examine the use of indirect signals in the context of charitable giving. People often care about how they are perceived by others. Yet, while engaging in many different behaviours, not all

behaviours are observed. Thus, behaviours may influence people's image not only directly, but also indirectly by changing other people's beliefs about unobserved behaviours. Under different levels of observability, participants decide (i) how much to donate to charity, and (ii) what charities to donate to. We mimic charitable giving in the field by making it costly to spread donations among many charities. We find that donors respond to such costs by giving to fewer charities. Yet, when donors are observed and evaluated only regarding what charities they give to, they (correctly) anticipate that spectators infer larger donations from more charities. Some donors use this strategically by making numerous tiny donations, whereby they indirectly signal that they are altruistic. This wasteful "altruistic bluff" disappears once spectators also observe the amounts donated to each charity. Thus, our study shows that individuals use indirect signals to strategically influence their public image. This has implications for organisational design, as even seemingly unimportant behaviours may be influenced by reputational concerns if they correlate with important, unobserved behaviours.

Overall, the research presented in this thesis concentrates only on a small part of the drivers and barriers of collective action problems. Yet, I consider these studies to enhance our understanding of the magnitude of factors that have to be taken into account and demonstrate possible mechanisms that can improve cooperation and prosociality in particular settings.

Bibliography

Almås, I., Cappelen, A. W., and Tungodden, B. (2020). Cutthroat capitalism versus cuddly socialism: Are americans more meritocratic and efficiency-seeking than scandinavians? *Journal of Political Economy*, 128(5):1753–1788.

Bicchieri, C. (2005). *The Grammar of Society: The Nature and Dynamics of Social Norms*. Cambridge University Press.

Bowles, S. (2006). Group Competition, Reproductive Leveling, and the Evolution of Human Altruism. *Science*, 314(5805):1569–1572.

Fehr, E. and Schmidt, K. M. (2006). Chapter 8 The Economics of Fairness, Reciprocity and Altruism – Experimental Evidence and New Theories. In Kolm, S.-C. and Ythier, J. M., editors, *Handbook of the Economics of Giving, Altruism and Reciprocity*, volume 1 of *Foundations*, pages 615–691. Elsevier.

Gintis, HERBERT., Smith, E. A., and Bowles, SAMUEL. (2001). Costly Signaling and Cooperation. *Journal of Theoretical Biology*, 213(1):103–119.

Grimalda, G., Pondorfer, A., and Tracer, D. P. (2016). Social image concerns promote cooperation more than altruistic punishment. *Nature Communications*, 7(1):12288.

Kahneman, D. and Tversky, A. (1979). Prospect Theory: An Analysis of Decision under Risk. *Econometrica*, 47(2):263.

Kingsley, D. C. (2016). Endowment heterogeneity and peer punishment in a public good experiment: Cooperation and normative conflict. *Journal of Behavioral and Experimental Economics*, 60:49–61.

Luttmer, E. F. P. and Singhal, M. (2011). Culture, Context, and the Taste for Redistribution. *American Economic Journal: Economic Policy*, 3(1):157–179.

Ostrom, E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge university press.

Podsakoff, P. M. and Podsakoff, N. P. (2019). Experimental designs in management and leadership research: Strengths, limitations, and recommendations for improving publishability. *The Leadership Quarterly*, 30(1):11–33.

Seinen, I. and Schram, A. (2006). Social status and group norms: Indirect reciprocity in a repeated helping experiment. *European Economic Review*, 50(3):581–602.

Thaler, R. H. and Johnson, E. J. (1990). Gambling with the house money and trying to break even: The effects of prior outcomes on risky choice. *Management Science*, 36(6):643–660.

Wu, J., Balliet, D., and Van Lange, P. A. M. (2016). Reputation, Gossip, and Human Cooperation. *Social and Personality Psychology Compass*, 10(6):350–364.

Chapter 2

Expanding Community-based Adaptation – Experimental Evidence from Papua New Guinea.

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Abstract

This paper examines the willingness to engage in community protection against risky climate threats. In a framed field experiment in Bougainville, Papua New Guinea, I study whether individuals contribute to between-community climate funds to expand the scope of local climate adaptation. Specifically, I vary in a between-subjects design (i) whether one interacts with a member of one's own community or with someone from another community, and (ii) whether one is being observed by local authorities or not. I find that individuals are less likely to cooperate with members of another community, but being observed by one's own community leader increases contributions. Thus, this study shows that observation by in-group leaders reduces in-group bias, which is crucial for expanding the scope of local climate adaptation.

Keywords: Community-based Disaster Management, In-Group Bias, Observability, Climate Adaptation, Community Fund

JEL Classification: Q54, Q34, P32, C91

2.1 Introduction

Collective action problems pose a critical challenge to the conservation of natural resources. These problems arise when individuals act in accordance with their self-interest in situations where joint actions would be better for society (Ostrom, 2009). The result is often an over-use of natural resources and an inequitable distribution of wealth, where the people who free-ride end up benefiting the most. Collective action problems are exacerbated by limited institutional capacity and poverty, and they constitute an existential threat to resource-dependent regions (Badeeb et al., 2017). It is therefore crucial to study these problems in the areas of the Global South that are often characterized by abundant natural resources and economic and political challenges (Humphreys et al., 2007). In addition to the economic and ecological importance of natural resources, they also play an important role in the protection against climate disasters. This is particularly relevant for small island states, which are in a precarious position, as they are both vulnerable to natural hazards and often have limited economic diversification with a high dependence on natural resource exploitation (Nurse et al., 2014; Adger et al., 2009). In these island states, the social dilemma becomes apparent, as citizens choose whether to exploit natural resources in a trade-off between their own (economic) gains and the protection of the community from climate disasters.

To address the negative effects of climate change, comprehensive climate adaptation measures need to be initiated on a local, national, and international level (Forsyth, 2013). Yet, while the critical situation of small island states now appears on the international policy agenda (Intergovernmental Panel On Climate Change (Ipcc), 2023), the behavioral responses of local communities remain understudied. This could be detrimental, as increasing the efforts of climate adaptation on a local level is vital for a successful climate adaptation (Forsyth, 2013)[1]. With community-based adaptation, one seeks to enable vulnerable people to identify and implement appropriate responses to climate threats themselves, and this often leads to more contextually relevant and sustainable solutions compared to top-down political decisions (Kearney et al., 2007; Nelson and Agrawal, 2008). However, one major limitation of community-based adaptation is that most activities operate on a scale that is too small for the initiatives to comprise an adequate solution to the climate threat (Forsyth, 2013). This leads to the key question of how one can spur intercommunity-based adaptation.

The current study examines the support for community-based climate adaptation in the island of Bougainville, Papua New Guinea. Using a framed field experiment (Harrison

[1]While climate adaptation is often mirrored through the provision to a private/club good in experimental games (Barrett, 2008; Hasson et al., 2010), in the setting of this study it rather reflects the protection of common pool/open access resources as of ecosystem-based adaptation (Pérez et al., 2010; Chishakwe et al., 2012).

and List, 2004), it draws on social identity theory (Tajfel et al., 1971; Tajfel and Turner, 1979; Tajfel, 1986) to examine whether in-group bias may be a hindrance to scaling up community-based adaptation. It then examines whether observation by local authorities can mitigate the negative effects of in-group bias, motivated by research that shows how observability can lead to increases in contribution levels (Ambrus and Greiner, 2019; Nikiforakis and Normann, 2008; Savikhin Samek and Sheremeta, 2014). Importantly, when people are motivated by their public image, observation should induce them to change their behavior in the direction of what improves their reputation (Bénabou and Tirole, 2006; Andreoni and Bernheim, 2009). Whether observation works to reduce or exacerbate in-group bias is therefore likely dependent on whether social norms prescribe intergroup collaboration or parochialism.[2]

This paper uses an experimental approach to estimate causal impacts of in-group bias and observability on the support for a 'climate fund'. Importantly, such causal insights would not be obtainable by simply observing the cooperative behavior of villagers, as such behavior is likely to be endogenous due to selection into (i) within- or between-community collaboration, (ii) situations with more or less observability by the local authority, and (iii) villages with specific social norms.

The framed field experiment consists of an incentivized two-player Prisoner's Dilemma game that is modified to include risk. It uses the framing of 'preservation of natural resources', which serves to protect against a 'climate disaster' that occurs with a 50 percent probability.[3] In the experiment, villagers (henceforth 'subjects') face the binary choice of whether to contribute to a 'climate fund' that provides protection against the climate disaster. The payoffs are chosen such that a risk-neutral subject maximizes their expected earnings by not contributing, but the expected payoffs of the pair are greatest when both contribute. As I describe in Section 2.2, this framing is highly relevant to the coastal communities of Bougainville, Papua New Guinea, and I document in Section 2.5.4 that behavior in the experiment relates to relevant climate attitudes and behaviors outside the experiment.

In a 2×2 between-subjects design, I vary (i) whether subjects engage with a member of their own community or with someone from another community, and (ii) whether subjects are observed by their local authority or not. This design enables me to examine

[2]I follow Bicchieri et al. (2018) and define social norms as "the informal rules that govern behavior in groups and societies". As I explain below (Sections 2.2), the current setting is characterized by a hierarchical structure where the opinions of the local leaders carry extra weight when establishing social norms. In this context, the understanding of social norms is therefore closer to an injunctive norm (aligned with the views of the local authority) than a descriptive norm; that is, a norm of 'ought' rather than a norm of 'is' (Cialdini et al., 1990, 1991).

[3]The sample is not familiar with the abstract, context-neutral framings often applied in experiments that rely on game-theoretic settings. In contrast, community funds is a well-known concept and a common practice in all included villages. Thus, an additional advantage of using the framing of community funds is that it improves subjects' understanding of the current experiment despite its complexity.

how in-group bias influences the potential scope of climate adaptation as well as how observability influences the willingness to collaborate. Combined with survey questions about normative expectations, this study thus also sheds light on the social norms of collaboration and how this interacts with in-group bias.

As hypothesized, I find that when subjects act anonymously, they are 24 percentage points more likely to contribute to the 'climate fund' when they face a member of their own community compared to a member of another community. This suggests that in-group bias can be a critical hindrance to reaching the scope of climate adaptation that is required for such measures to be efficient. However, observation by local authorities increases cooperation both with members of one's own village (22 percentage points) and with members of other villages (55 percentage points). In this study, observability therefore proves to be effective at facilitating intercommunity climate adaptation. The result that observation by in-group leaders mitigates in-group bias suggests the presence of a social norm of intercommunity collaboration.

This paper makes two key contributions to the literature. First, this study adds to the literature on community-based adaptation (henceforth 'CBA'), as it is the first study to examine the importance of in-group bias in scaling up CBA. A growing body of literature emphasizes the benefits of CBA in ensuring sustainable responses to climate threats (Ayers and Huq, 2009; McNamara and Buggy, 2017; Spires et al., 2014), also with a specific focus on community-based natural resource management (Chishakwe et al., 2012; Medina Hidalgo et al., 2021). However, early evidence shows that collaborative efforts within communities depend on (i) trust, (ii) shared norms, and (iii) social networks that facilitate local cooperation (Ostrom, 1990; Pretty and Ward, 2001). Exactly these factors may be missing when one attempts to expand the CBA across different communities. Previous studies have looked at how financial and institutional support can facilitate the scaling of CBA approaches, often using case-study examples (Schipper et al., 2014; Mfitumukiza et al., 2020) (source Ratter et al, 2016). Instead, this study takes a behavioral approach to widen CBA efforts. In doing so, this study also relates to the literature on voluntary provision of multi-level public goods (with and without thresholds, Du and Tang, 2018; Lange et al., 2021; Catola et al., 2023). Most previous studies on multi-level public goods involve context-neutral lab experiments in WEIRD countries (Blackwell and McKee, 2003; Fellner and Lünser, 2014),[4] demonstrating that a preference for local goods exists. In contrast to this literature, the current study involves a framed field experiment in a non-WEIRD sample, and it applies a modified Prisoner's Dilemma game that in a simple way captures a situation with a potential climate disaster.[5]

[4]One exception is (Gallier et al., 2019), who conduct an artefactual field experiment with participants from two different German cities. They find evidence of parochialism, but this does not influence subjects' responsiveness to changes in relative productivities of the different public goods.

[5]An additional benefit of conducting this study in the traditional and hierarchical setting of Bougainville, Papua New Guinea, is that it provides the opportunity to study the importance of public

Second, this paper builds on the literature on in-group bias in social psychology and economics, as it is the first to study how observation by a prominent in-group person influences in-group bias. A common finding in the literature on group favoritism is that individuals tend to have a preference for treating members of their in-group more favorably than members of an out-group (Tajfel et al., 1971; Chen and Li, 2009; Currarini and Mengel, 2016). Previous studies have examined factors that can reduce in-group bias, including appealing to a common identity (Gaertner et al., 1989, 1993; Gaertner and Dovidio, 2000), using cross-cutting cleavages in society (Coser, 1956; Dahl, 1956; Lipset, 1959; Lipset and Rokkan, 1967), and the presence of external threats (Tajfel and Turner, 1979; Stephan and Stephan, 1996; Stephan et al., 2015). This study examines instead the role of observability. In doing so, the current paper is also related to the work by Charness et al. (2007) and Charness and Rustichini (2011), who study how students behave in a standard (non-framed) Prisoner's Dilemma game with observation. Here, the decision-makers are observed by a group of subjects who (in all but one treatment) have a vested interest in the outcome of the game. Importantly, these studies randomly allocate subjects to be a part of different groups, and they therefore find no in-group bias without observation.[6] In contrast, the current paper examines how observation by local authorities (i.e., the in-group leader) influences in-group bias among natural groups in the field, where in-group bias exists when people make their decisions in private. And rather than inducing payoff dependence within groups, the current study relates the effect of observation to the existing social norms in the groups.

This paper also has important policy implications for how to increase the scope of climate adaptation measures. It shows that when there is a social norm of intercommunity collaboration, observation by local authorities can help overcome in-group bias when members of different communities interact. This is essential for expanding community-based adaptation. Such insights may be particularly important in areas with weak governance, as these rely more on social hierarchies and social pressures than formal legislation, for which reason many standard policy tools may not be available.

The remainder of the paper is structured as follows: Section 2.2 describes the field setting. Section 4.2 details the experimental design, the pre-registered predictions, and the experimental procedure. The main results are presented in Section 4.3. Section 2.5 discusses further results, and Section 4.4 concludes.

image in a context that is more closely aligned with the majority of human societies throughout the evolutionary history (Grimalda et al., 2016; Bernhard et al., 2006).

[6]There are several other design differences between the current study and the studies by Charness et al. (2007) and Charness and Rustichini (2011). For example, the current paper uses a modified Prisoner's Dilemma game involving risk, there is no face-to-face interaction with the opposing player while subjects are being observed, there is no home/guest framing which could induce a sense of entitlement or focality in the game, and the private treatment is truly anonymous (compared to observability by the experimenter in the previous studies).

2.2 Field Setting

2.2.1 Bougainville, Papua New Guinea

The following section describes the field setting and elaborates on why in-group bias and observability are particularly relevant to study in this setting.

Figure 2.1 Geographical Location of Bougainville, Papua New Guinea (Google Maps, 2023)

Papua New Guinea (henceforth 'PNG') is the world's third-largest island country located in the south-western Pacific Ocean whereas Bougainville, one of the country's autonomous island, forms the largest island of the Solomon Islands archipelago. The country is renowned for its cultural and ethnic diversity with over 800 distinct languages and a vast array of customs and traditions (Reilly, 2008). PNG and its islands are characterized by the traditional 'wantok' system which fosters strong rules of customs, norms, and kinship in some rural areas as a replacement to formal institutions (Nanau, 2011). According to World Bank indicators from 2022, 86% of the population lives in rural areas. Most of the country's rural area is organized in a traditional and hierarchical but independent community structure. In these rural areas, infrastructure between communities is lacking. Therefore, many villages are remote and need to maintain a self-sufficient lifestyle. The combination of diverse ethnolinguistic groups, cultural rituals, and the disconnection between villages makes group categorizations occur naturally and central to the everyday functioning of villages and this makes Bougainville an ideal setting for studying group identity and in-group bias.

Specific traditions are worth mentioning to understand the country's community hierarchies and gender norms. Whereas mainland PNG is mostly characterized by a patrilineal society, communities in Bougainville, with some exceptions in the Southern part of the island, practice matrilineal descent, i.e. inheritance follows the female line (Saovana-Spriggs et al., 2007; Rimoldi, 2011). Yet, community leaders are mostly men – so-called

Big Man – who take important decisions for the village. They possess informal authority and impose discipline to keep the traditional village life in order. They represent important nodes of a village's social network and are thereby important connectors, also when engaging with other villages. Other villagers often look up to the Big Man, and they are concerned about how the Big Man views them (Cochrane, 1970). More recently, villages have started to also encourage women to hold the equivalent position as a 'Big Woman'.

Despite the hierarchical community leader structure, there is a strong egalitarian sense of community in the villages, and many decisions and conflicts are resolved in regular community or mediation meetings (Boege, 2012). This way, problems are typically solved in a bottom-up communal way with the entire community serving as the primal actor (Adloff and Rehdanz, 2023). This combination of a highly respected village leadership and important social relations within the village make Bougainville an ideal and natural setting for studying how observation by local authorities influence behavior.

2.2.2 Climate, Natural Resources, and Community-Based Adaptation

Similar to other Pacific Island States, PNG is heavily affected by climate change and the resulting natural hazards (Lang et al., 2020; Vousdoukas et al., 2023). Extreme temperatures and frequent climate disasters such as cyclones, droughts, and flooding endanger vital harvests (Wadey et al., 2017; Bourke, 2018). Flooding is a particular problem for coastal villages, as the intrusion of saltwater destroys harvests, and houses are typically located close to the coastline. Recent calculations have shown that PNG has one of the highest 'Expected Annual Number of People Exposed' (EAPE) to coastal flooding (Vousdoukas et al., 2023). Sea level rise occurs twice as quickly in PNG compared to the global average with a pace of 7-10 mm/year (Adloff and Rehdanz, 2023). In Bougainville, the share of coastal communities is high, and climate change has made it common practice to relocate entire communities (Bronen, 2014; Luetz and Havea, 2018) although coastal villagers are reluctant to move (Davies, 2002). Towards the year 2090, the Pacific Climate Change Science Program (PCCSP) expects that the climate in PNG will be marked by (i) increasing temperatures, (ii) an increase in the incidence of very hot days, (iii) changing rainfall patterns, (iv) an increase in the incidence of extreme rainfall days, and (v) less frequent but more intense tropical cyclones (Power et al., 2011).

At the same time, PNG is richly endowed with natural resources and produces primary commodities such as crude oil, natural gas, timber, cocoa, coffee, palm oil, gold, copper, silver, nickel, and cobalt (Avalos et al., 2015). Among the natural resources, marine resources such as mangrove trees and coral reefs are among the most important for coastal

communities in that region (Warner, 2000). Conserving marine resources helps mitigate future climate changes, and the resources are key for providing protection against various natural hazards, as they reduce the impact of waves and storm surges (Wells and Ravilious, 2006). They further contribute to coastal resilience, as they generate soil accumulation and thus stabilizes against erosion (Alongi, 2002). Additionally, they are important providers of nursery and habitat for fisheries that are vital for the protein and income sources in coastal communities (Cinner, 2009).

Given the social structures described above, measures to protect coastal areas in PNG are typically implemented via a bottom-up process (Adloff and Rehdanz, 2023). The last decades have seen various initiatives, most often evolving around the protection of natural resources (Warner, 2000). Here, community-based adaptation approaches have been central for taking indigenous knowledge into account (Mercer et al., 2009; Lipset, 2013), but it remains a challenge to increase the scope of these initiatives beyond the local level (Forsyth, 2013).[7]

The fact that natural resources are important for both the economy and the climate adaptation in coastal villages introduces a natural social dilemma: On the one hand, exploiting natural resources is a major source of income, and it is therefore financially beneficial for the people who engage in this type of exploitation. On the other hand, preserving natural resources is key for protecting the community against the consequences of climate change. All six villages in this study share the same characteristic of being a coastal community with a history of an abundance of mangrove trees, and they all experience the consequences of the collective action problem: While experiencing a rise in sea-levels and more extreme natural hazards, the villages have seen mangrove deforestation and coral harvesting for many years despite knowing that this leaves them less resilient to the consequences of climate change.

2.3 Experimental Design

The experiment consists of five parts that subjects complete in one session. First, subjects play a modified Prisoner's Dilemma involving risk of a 'natural disaster' occurring. Second, subjects answer a battery of belief elicitation questions, including their beliefs about the actions of other players and of the Big Man. Third, the disaster outcome is determined by a random draw. Finally, subjects complete a survey to provide additional control variables for the analysis. Experimental instructions are included in Appendix

[7] These approaches typically involve capacity building for managing ecosystem services and biodiversity conservation, local-level discourse about the prospect of internal resettlement, or combining scientific climate projections with local risk perceptions (Lipset, 2013).

2.7.2.

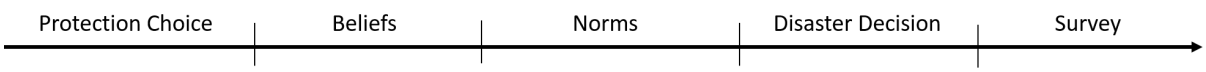

Figure 2.2 Timeline of the experiment

2.3.1 Modified Prisoner's Dilemma

For the first part of the experiment, subjects play a version of the Prisoner's Dilemma game that I modify to reflect the setting of climate adaptation. Specifically, subjects decide whether to contribute to the protection against a potential 'natural disaster', which may otherwise destroy the earnings of the subjects. Note that the game is incentivized, but the framing is hypothetical. That is, subjects decide on whether to contribute to a 'climate fund' with consequences that mirror how a climate fund functions in the field, but all interactions are limited to what happens between the players of the game. Below, I describe the setting of the game in detail before turning to the treatments.

Setting. In the modified Prisoner's Dilemma game, each subject is endowed with K15 (approximately EUR 3.8) and randomly matched with one other subject of whom they do not know the identity.

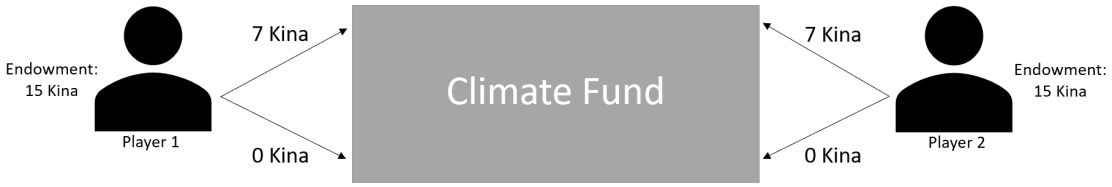

Figure 2.3 Game Setting

Subjects learn that there is a risk of a 'natural disaster' occurring with a probability of 50 percent. This means nature makes a random draw between two states: 'No Disaster' and 'Disaster'. If the disaster happens, both subjects can end up losing their entire endowment. Yet, before knowing the state of the world, subjects face the binary decision of whether to contribute K7 of their endowment to a climate fund or not (see Figure 2.3). In the case of a disaster occurring, contributions to the climate fund provide protection against the disaster for both players. Consequently, a subjects' payoff not only depends on their own choice but also on the choice of the other subject. Depending on the behavior of both players, there are three different levels of protection against the disaster: No protection, partial protection, and full protection (see Table 2.1). If the disaster occurs and none of the two players has contributed to the climate fund, both players lose their whole

endowment. When only one player contributes (partial protection), both participants lose K8. In this case, the player who contributed has zero earnings (K15-K7-K8; endowment minus contribution and partial destruction by the disaster), and the player who refrains from contributing earns K7. If both players contribute, they are fully protected by the disaster and both earn K8. If no disaster occurs, nothing is destroyed and participants earn what they did not contribute.

Table 2.1 Payoff Matrices

No Disaster		
	Contribution	No Contribution
Contribution	8;8	8;15
No Contribution	15;8	15;15
Disaster		
	Contribution	No Contribution
Contribution	8;8	0;7
No Contribution	7;0	0;0
Expected Payoffs		
	Contribution	No Contribution
Contribution	8;8	4;11
No Contribution	11;4	7.5;7.5

Notes: Known to the subjects, a disasters occurs with 50 percent probability. Note that it is only in the case of a disaster occurring that it is (weakly) optimal for a subject to contribute to the protection of natural resources. In terms of expected payoffs, No Contribution is the dominant strategy although it leaves both players worse off.

That is, although there was no disaster for the climate fund to protect against, the contributions are not returned to the subjects. This reflects investments in climate adaptation measures that deteriorate over time without having been used. Examples from the field include the building of unused or misplaced sea walls or other investments in disaster preparedness that incur irrecoverable costs when no disaster occurs during the expected time frame.

As evident from the payoff matrices in Table 2.1, 'No Contribution' is a dominant strategy in the 'No Disaster' state, and 'Contribution' is a weakly dominant strategy in the 'Disaster' state. Yet, the subjects do not know the state of the world before making their decision. In terms of expected payoffs, the optimal strategy for subjects is not to contribute to the climate fund. That is, 'No Contribution' is a dominant strategy for a risk-neutral individual. Yet, reflecting the support for climate adaptation in the field, the willingness to contribute to the climate fund depends on the individuals' risk preferences and beliefs about the behavior of the other subject.

At the end of the experimental instructions, subjects answer eight control questions that ensure that the subjects understand the setting of the game and the payoff structure.

Treatments. I apply a 2×2 between-subjects factorial design to obtain causal estimates of (i) how in-group bias influences support for the climate fund, (ii) how observation by local authorities influences the willingness to contribute to the fund, and (iii) whether observation by local authorities can mitigate any negative effects of in-group bias (see Table 4.1). In this first dimension, I vary the origin of the other player (see Figure 2.4).

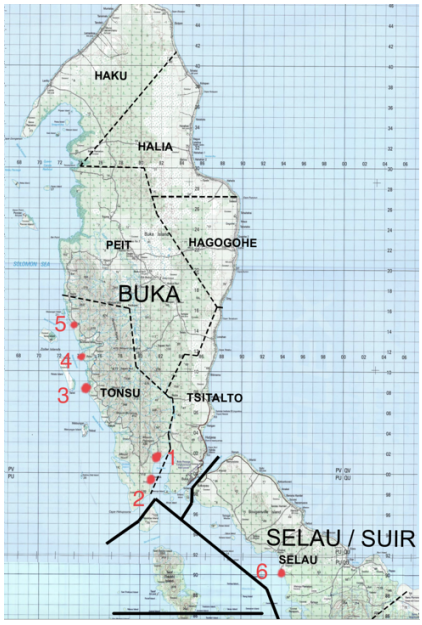

Figure 2.4 Research Locations in Bougainville, PNG (Google Maps, 2023)

Specifically, subjects are either matched with someone from their own village (in-group) or from another village (out-group). The out-group is chosen in such a way that all villages are located in the same district (north-western part of the island) but in different constituencies, where local dialects differ. That is, members of an in-group and an out-group belong to different ethnolinguistic communities. Comparing behavior in this first dimension thus sheds light on how the willingness to contribute to the fund depends on whether the fund is a collaboration between members of one's own village or with members of distinct villages. The second treatment dimension varies whether subjects are observed by their Big Man when deciding whether to contribute to the climate fund (see Figure 2.5).

The Big Man is physically present in the room while the subject makes their decision, thereby introducing pressure to act in accordance with what the subject believes that the Big Man wants. The Big Man does not make any active decision, and his earnings do not depend on the decisions made by the subjects. Comparing behavior between observed and private decisions sheds light on how observation by local authorities (i.e., an in-group leader) influences the willingness to cooperate with members of one's in-group and out-group.

Importantly, comparing behavior across the two treatment dimensions provides insights

Figure 2.5 Game Setting in the Field – Observation vs. Private

into how observability influences the scope of cooperation on climate funds. For example, if there is a strong norm of collaboration across villages, then observability may greatly reduce any in-group bias in collaboration. Opposingly, if there is a strong norm of limiting collaboration to members of one's own community, then observability may enhance any in-group bias in collaboration.

Table 2.2 Overview of Treatments

	No Observation	**Observation**
In-Group	T1-A: InPrivate	T1-B: InObserve
Out-Group	T2-A: OutPrivate	T2-B: OutObserve

2.3.2 Beliefs and Norms

After making their decision in the modified Prisoner's Dilemma game, subjects in all treatments are asked about a set of beliefs (unincentivized).[8] Subjects report their beliefs about the behavior of the opposing player, their Big Man, other players of their village, and other players of the other village. Subsequently, subjects are asked about what they think the opposing player expects them to do, what the Big Man wants them to do, and whether they believe that the Big Man would dislike any contribution behavior that deviates from his expectation.[9] The full list of questions with the exact wording can be

[8] I chose an unincentivized belief elicitation for two reasons: First, using unincentivized questions is easier to understand for the subjects, and it is therefore less likely to cause any confusion within this sample. Second, it reduces the time spent on the survey part, which is particularly important considering the number of belief elicitation questions included in this experiment.

[9] As explained in Section 2.3.5, the experiment was carried out in the local language Tok Pidgin. This language does not possess the same nuances as e.g. English for distinguishing between empirical and

found in Appendix 2.7.2.

2.3.3 Disaster Decision

After the belief elicitation, a random draw is made to determine whether the natural disaster occurs or not. Specifically, the state of the world is determined by drawing a card that indicates 'Disaster' on one side and 'No Disaster' on the other side. Subjects draw the card themselves to avoid any feelings of distrust towards the experimenter. This means that two cards are drawn for each pair of subjects, and each subject draws the card that is payoff-relevant for themselves. While explaining this procedure during the experimental game rules, the experimenters have subjects draw the card twice for practice, thereby internalizing the idea of a random draw.

2.3.4 Survey

After the disaster decision draw, subjects answer a set of survey questions on (i) demographics, (ii) social preferences, (iii) topics related to climate change. The demographic questions first ask about age, gender, education, type of work, and income. Importantly, I adapt questions related to income to the setting of villages in Bougainville: As the majority of people does not earn money but live in a self-sufficient manner, often using barter, questions about monetary income only provide insufficient information. To get a more complete picture of income, I therefore add further questions related to income, including money-recharging values on their cell phones.[10] Afterwards, subjects answer questions related to their origin, as this may predict group belongingness to the village. The questions include mother tongue (open-ended text allowing for multiple answers), whether the subject was born in their current village, and how many years they have lived their in case they moved between villages. The last questions related to demographics ask about community engagement. These questions referred to the type of engagement (time, money, or advice with multiple options possible) and the frequency of this engagement.[11]

The second section of the survey relates to (social) preferences, taken from the World Value Survey (WVS), the General Social Survey (GSS), or the German Socio-Economic

normative expectations (in the sense of Bicchieri, 2017). In addition, the social hierarchy is so ingrained in the culture that asking for what the Big Man 'wants' the subject to do is roughly equivalent to asking what the Big Man 'expects' that the subject will do.

[10]The weekly income questions was asked as an open question whereas the phone money recharge question is asked in way that indicates the Kina recharge of the last month in the following steps: 0Kina, 5Kina, 10Kina, 30Kina, 100Kina, more than 100Kina.

[11]The frequency was asked in the following steps: every day, several times a week, once a week, once a month, once every six months, and once a year.

Panel (SOEP), and reputational concerns. First, subjects answer three trust questions,[12] and questions related to their perception of others' altruism and fairness.[13] Afterwards, subjects answer a question about their risk preferences (10-point scale, Dohmen et al., 2011). Subjects then state whether they think their reputation would improve the most by contributing or not contributing to the climate fund.[14] Subjects also indicate what choice they think would benefit themselves, and they indicate what choice would benefit the community.

The last part of the survey asks a battery of questions related to climate change. First, subjects report what they think about, when they hear the word climate change (open-ended), and subjects indicate whether they believe in climate change (Yes/No). Second, subjects indicate whether they think a community climate fund would be beneficial for their village (Yes/No). Then, subjects are presented with eight different natural hazards/environmental changes, and they answer for each phenomenon (i) whether they have heard about it (binary), (ii) whether they have experienced it (binary), and how important they think the phenomenon is for ougainville (3-point Likert scale).[15] Finally, subjects answer three vignettes related to climate adaptation measures.

2.3.5 Village Selection and Experimental Procedure

The framed field experiment was conducted between April and May, 2023, in six small-scale coastal communities in northern Bougainville, Papua New Guinea. Data collection was completed in each village within two days to mitigate any discussion among villagers about the experiment (contagion effects). To further ensure comparability with respect to cultural variables, villages are drawn from the same geopolitical sub-region from different districts in the northwest of Bougainville (see Figure 2.4).

Prior to data collection, I arranged a pre-visit to each village to inform about and obtain consent for participation in the experiment. Due to the traditionally hierarchical structure in the villages, I most often approached the Big Man first, and he then asked the whole

[12]Specifically, subjects answer the following: 'Do you think most people can be trusted or that one needs to be very careful when dealing with people' (trust variable; binary answer, WVS and GSS question); 'How much do you trust people in general' (general trust variable; 4 points scale, SOEP question); 'How much do you trust people you just met' (trust in strangers variable; 4 points scale, SOEP question).

[13]These questions were as follows: 'Do you think people are mostly looking out for themselves as opposed to trying to help each other' (altruism variable; 10 points scale, WVS question); 'Do you think people would try to take advantage of them if they got a chance as opposed to trying to be fair' (fairness variable; 10 points scale, WVS question).

[14]Given the simplicity of the Tok Pisin language, these questions are formulated as follows to ensure that they are understandable: 'Which choice do you think would give you a better name?' (as used before in this country setting, e.g. Grimalda et al., 2016). Possible answers are 'Contributing', 'Not contributing', and 'None of both improves my reputation'.

[15]The phenomena were flooding/intense rainfall, tsunamis, earthquakes, sea level rise, intense drought, mountain erosion, change in weather patterns, and food scarcity/failed harvest.

community about whether they wished to take part in the research study. Once the participation was confirmed by the village representatives, the villagers were required to provide an up-to-date census to enable the conduction of a random draw of participants. To recruit participants, households were drawn at random from the village census in each village, and one villager was randomly selected from each household.[16] The resulting sample includes 60-70 adults from each of the six villages, yielding a total sample of 402 villagers. In this sample, 52 percent were female, the mean age was 36 years, the average subject had received 8 years of schooling, subjects on average earned a weekly income of K72 (approximately EUR 18.5), 79 percent reported to never use the Internet, and 77 percent reported to attend church once a week. The full set of sample characteristics is provided in Appendix 2.7.1.

At the start of each session, the local research assistants and I were presented to the villagers. Then, the consent form for participation was read out and signed by all participants. The research was conducted by local research assistants in a pen-and-paper format in Tok Pisin, which is the main language taught in schools. Prior to data collection in the field, the research assistants were extensively trained to ensure a professional conduct and homogeneity in elicitation styles. All research assistants were trained to be able to conduct all parts of the research.

The average duration of the experiment was about 50 minutes. Sessions took place in secluded spaces in community facilities of the village to ensure privacy during the decision process. On average, participants received a payout of K8.67, which was paid out in cash at the end of the data collection.[17] Additionally, all participants were paid K2 as a show-up payment at the start of the experiment.

2.3.6 Theory and Hypotheses

Social Identity Approach and In-Group Bias. One potential challenge for expanding the scope of climate adaptation is that it requires individuals to collaborate with people who are more distant – not only geographically, but also socially and culturally. People who are more distant often belong to other groups, and an extensive literature on the social identity approach documents that in-group bias may erode intergroup collaboration (Tajfel et al., 1971; Tajfel and Turner, 1979; Tajfel, 1986). Here, I follow Tajfel (1978, p. 63) and define social identity as "that part of an individual's self-concept which

[16] If the randomly selected households were not present in the village, or if the adults were unable to participate (e.g., due to illness), additional members of the other households were randomly selected to ensure a sufficient and comparable sample size across villages.

[17] Due to the design of the out-group, all were paid after finishing the conduction of all villages; this was communicated beforehand in the consent visits, and it did not cause any question or concern among the participants.

derives from his knowledge of his membership in a social group (or groups) together with the value or emotional significance attached to that membership". Central to the social identity approach is the insight that individuals tend to distinguish between people who belong to the same group as themselves (in-group) and people who do not (out-group, cf. self-categorization theory, Turner et al., 1987; Turner and Reynolds, 2012). By making categorizations into different groups, individuals are able to enhance their self-esteem and sense of meaning (Crocker and Luhtanen, 1990), obtain a feeling of distinctiveness compared to out-groups (Turner et al., 1987), and reduce uncertainty about the social world (Abrams and Hogg, 1988). Group identification leads to social comparisons and often makes individuals biased in favor of people from their own group (Turner, 1975; Weisel and Böhm, 2015). One behavioral consequence of such in-group bias is that individuals often side with members of their own group to show solidarity and a commitment to the group (Scheepers and Ellemers, 2019). In previous experiments, such behavior is e.g. seen with individuals being more inclined to collaborate and/or give money to members of their in-group compared to members of an out-group (Tajfel et al., 1971; Chen and Li, 2009; Chen and Chen, 2011).

In the present context, group association is determined by what village the subjects belong to. Affiliation to the different villages is 'essential', as the villages make up vital, tight-knit social groups, and it is therefore likely that in-group bias is particularly pronounced in the current context (Bernstein et al., 2010). If individuals favor people from their own village, they should be more likely to contribute to the climate fund when they interact with someone from their own village than with someone from another village. In the current experiment, I obtain a clean test for in-group favoritism by comparing subjects in InPrivate with subjects in OutPrivate: the only difference between the two treatments is the group affiliation of the other player, and there are no reputational concerns, as subjects make anonymous decisions. Based on the extensive literature documenting in-group favoritism, I obtain the following hypothesis:

When subjects decide in private, contribution levels are higher when subjects interact with a member of their in-group than with a member of their out-group.

The Effect of Observation. As social beings, humans are inherently motivated by how other people perceive them (Fiske, 2018). Consequently, when people are observed, they are often expected to change their behavior such that they send a favorable signal about themselves (Bénabou and Tirole, 2006; Andreoni and Bernheim, 2009).[18] Thus,

[18]The literature distinguishes two different effects of observability (Reinstein and Riener, 2012): first, the decision-maker may be concerned about their own reputation. Second, the decision-maker may believe that their own behavior influences the subsequent behavior of others and thus change their behavior to e.g. lead others to act more prosocially (see also Chiang and Wu, 2015). The current experimental design only allows for the first effect, and I will therefore disregard the second effect.

empirical research has shown that people tend to become more prosocial when they are observed. For example, observation can make people become more cooperative (Grimalda et al., 2016), lead people to increase volunteering (Linardi and McConnell, 2011), increase voter turnout (Gerber et al., 2008), and increase donations (Lacetera and Macis, 2010; Karlan and McConnell, 2014).

In the present context, one would expect that observability by the Big Man influences the behavior of the subjects in the direction of what would give the subjects the best reputation. The subjects are likely to be concerned about the opinions of the Big Man due to his central role in the village. The current experiment enables a clean test for the effect of observability on contribution levels by comparing subjects in InPrivate with subjects in InObserve: the only difference between the two treatments is that only people in InObserve are observed by the Big Man. When subjects interact with a member of their own village (in-group), the socially preferred option is likely the prosocial one: Contributing to the climate fund. I therefore reach the following hypothesis:

When subjects interact with a member of their own village, contribution levels are higher with observation than with no observation.

Interaction Between In-Group Bias and Observation. As explained for Hypothesis 2.3.6, one would expect observation to influence subjects in the direction of the action that yields the best reputation for them. In other words, if the decision-maker cares about how they are being valued by the spectator, they should be more likely to do what is appropriate as judged by the spectator. In the current context, however, it is not obvious what the local authority thinks is the preferred action when the subjects interact with a member of the out-group. On the one hand, the appropriate action may be to behave prosocially regardless of the identity of the other player. In this case, observation would reduce any existent in-group bias posited in Hypothesis 2.3.6. On the other hand, because the local authority is also the in-group leader, it could be the case that the spectator deems it more appropriate to favor the in-group and not undertake actions that will benefit the out-group. In this case, observation would *increase* the in-group bias posited in Hypothesis 2.3.6. Consequently, I expect ex ante that observation reduces (increases) in-group bias in contributions if subjects believe that the Big Man prefers (opposes) contributions when subjects interact with a member of another village. I sum up this hypothesis as follows, noting that H2.3.6a and H2.3.6b are mutually exclusive:

Depending on the subjects' beliefs about what action the Big Man prefers, either

a. Observation *increases* in-group bias in contribution levels.

b. Observation *decreases* in-group bias in contribution levels.

2.4 Results

In this section, I present the results on how in-group bias, observation, and the combination of the two influence contributions in the experiment. Throughout, I use logit regressions for the primary test, and I estimate such regressions with (i) no controls, (ii) demographic controls, and (iii) demographic and attitudinal controls. Note that some control variables were not answered by all participants, and this leads to a slightly lower number of observations in specifications (ii) and (iii). I use the nonparametric chi-squared and Fisher's exact tests for robustness when appropriate. Throughout, I report significance levels with two-sided tests. I discuss exploratory findings in Section 2.5.

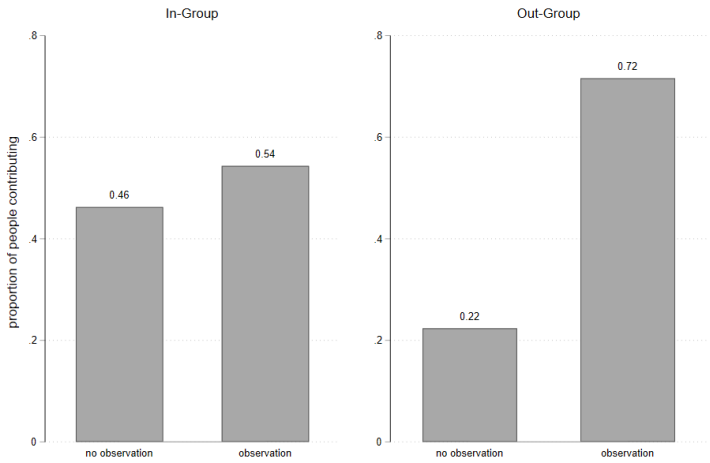

Figure 2.6 Contribution Behavior Across Treatments

2.4.1 Cooperation with In-Group

First, I report results related to Hypothesis 2.3.6, which states that subjects should be more inclined to contribute to the climate fund in InPrivate than in OutPrivate.

As illustrated in Figure 2.6, this is indeed the case with 46 percent of subjects contributing in InPrivate as opposed to only 17 percent in OutPrivate. In logit regressions, this effect is statistically significant for all levels of controls ($p < .001$, cf. Table 2.3), and the effect is robust (chi-squared: $p < .001$; Fisher's exact: $p < .001$). Accounting for all control variables (Column (3) in Table 2.3), subjects who decide in private on average become 24 percentage points less likely to contribute to the climate fund when interacting with a member of another village. In terms of practical significance, this effect is substantial. Supporting Hypothesis 2.3.6, I thus conclude the following:

Result 1 *When subjects decide in private, they are more likely to contribute to the climate fund when interacting with a person from their own village than from another village.*

Table 2.3 H1: In-Group Bias and Contribution Levels

	(1)	(2)	(3)
Out-group	-0.29***	-0.28***	-0.24***
	(0.06)	(0.06)	(0.06)
Demographic Controls	No	Yes	Yes
Attitudinal Controls	No	No	Yes
Observations	234	220	185

Notes: Logit regression with contribution (binary) as the dependent variable. The sample comprises only subjects who were not observed. The demographic controls are age, gender, years of schooling, weekly income, and volunteering. The attitudinal controls are perceptions of altruism, perceptions of fairness, trust, and risk preferences. Table with controls can be found in Appendix 5.8. Coefficients are average partial effects, robust standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

2.4.2 Cooperation under Observation

Second, I report results related to Hypothesis 2.3.6, which states that subjects should be more inclined to contribute to the climate fund in InObserve than in InPrivate. From Figure 2.6, this pattern seems to hold: 54 percent of subjects in InObserve contribute to the climate fund compared to 46 percent in InPrivate. In logit regressions, this effect is only marginally significant without controls ($p = .064$); however, it becomes significant when adding demographic controls ($p = .039$) and highly significant when also including attitudinal controls ($p = .006$), cf. Table 2.4.

Table 2.4 H2: Observation and Contribution Levels

	(1)	(2)	(3)
Observation	0.13*	0.15**	0.22***
	(0.07)	(0.07)	(0.08)
Demographic Controls	No	Yes	Yes
Attitudinal Controls	No	No	Yes
Observations	200	187	155

Notes: Logit regression with contribution (binary) as the dependent variable. The sample comprises only subjects who interacted with a member of their own village. The demographic controls are age, gender, years of schooling, weekly income, and volunteering. The attitudinal controls are perceptions of altruism, perceptions of fairness, trust, and risk preferences. Table with controls can be found in Appendix 5.9. Coefficients are average partial effects, robust standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

With nonparametric tests, the effect is also marginally significant (chi-squared: $p = .067$; Fisher's exact: $p = .079$), which is expected given the parametric results, as neither the chi-squared nor the Fisher's exact test accounts for control variables. In terms of practical significance, the effect of observation is substantial: when accounting for all control variables (Column (3) in Table 2.4), subjects interacting with a person from their own village are on average 22 percentage points more likely to contribute to the climate fund when

they are being observed compared to when they decide in private. Supporting Hypothesis 2.3.6, I sum up this result as follows:

Result 2 *When subjects interact with a member of their own village, they are much more likely to contribute to the climate fund when they are observed by the Big Man compared to when they decide in private.*

2.4.3 Cooperation with the Out-Group under Observation

Third, I report results related to Hypothesis 2.3.6, which examines whether observation by the Big Man influences the in-group bias demonstrated in Section 2.4.1. To form expectations about how observation influences collaboration with members of the out-group, I first examine the beliefs the subjects have about what the Big Man prefers that the subject does and then turn to the direct test of Hypothesis 2.3.6.

In all treatments, a majority of subjects believe that the Big Man wants them to contribute (68-79 percent, 73 percent for all treatments combined). Binomial tests reveal that the shares of subjects believing that the Big Man wants them to contribute is statistically significantly greater than 50 percent (all $p's < .001$). Furthermore, the share of subjects believing that the Big Man wants them to contribute is not influenced by what village the other player is a member of (all $p's > .209$) or whether the subject is being observed (all $p's > .316$), both for logit regressions (all levels of control), the chi-squared test, and the Fisher's exact test. The results are similar when instead examining beliefs about whether the Big Man would dislike if subjects deviated from his expectations: Answers are overwhelmingly 'Yes' (above 84 percent in all treatments), and they do not depend on group affiliation of the other player (all $p's > .487$) or observation (all $p's > .720$).[19]

In sum, the answers to the belief elicitation questions clearly indicate that subjects believe that the local authority prefers that they contribute to the climate fund, also when interacting with a member of the out-group. Based on this, one would expect that observation decreases the effect of in-group bias, cf. Section 2.3.6.

Accordingly, observation reduces in-group bias in contribution levels: The in-group bias without observation corresponds to a difference in support for contribution of 29 percentage points (InPrivate – OutPrivate). Opposingly, there is no in-group bias with observa-

[19]Beliefs about the attitudes of the Big Man is important for forming expectations about how observation by the Big Man influences behavior of the subjects. Yet, it does not speak to whether there is a shared social norm of in the village of contributing or not. This appears to be the case: In all treatments, a majority of subjects believe that their village wants them to contribute (between 64-78 percent, overall 70 percent). Binomial tests reveal that these second-order beliefs are closer to 'Contribution' than would be expected by chance (all $p's < .001$). This suggests that not only the Big Man, but also the village in general prefers contributions, thereby adding to the social pressure when people are observed.

tion; the sign actually reverses to -11 percentage points (InObserve – OutObserve), which is not statistically significant (all $p's > .148$, cf. Table 2.13).

As seen in Table 2.5, the reduction in in-group bias is highly statistically significant for all levels of controls (all $p's < .001$).

Table 2.5 H3: Interaction Effect of In-Group Bias and Observation on Contributions

	(1)	(2)	(3)
Out-group	-0.28***	-0.28***	-0.24***
	(0.05)	(0.05)	(0.06)
Observation	0.12*	0.14**	0.21***
	(0.07)	(0.07)	(0.08)
Observation × Outgroup	0.40***	0.38***	0.34***
	(0.07)	(0.08)	(0.10)
Demographic Controls	No	Yes	Yes
Attitudinal Controls	No	No	Yes
Observations	402	379	315

Notes: Logit regression with contribution (binary) as the dependent variable. The demographic controls are age, gender, years of schooling, weekly income, and volunteering. The attitudinal controls are perceptions of altruism, perceptions of fairness, trust, and risk preferences. Table with controls can be found in Appendix 2.12. Coefficients are average partial effects, robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

And with a decrease in the effect of out-group affiliation of 34 percentage points (Column (3) in Table 2.5) is the effect not only of statistical but also practical significance. In fact, the effect of observation makes the in-group bias statistically insignificant. Supporting Hypothesis 2.3.6b, I thus sum up this result as follows:

Result 3 *Observation by the local authority eliminates in-group bias in contribution rates.*

2.5 Discussion

The preceding analysis tested pre-registered hypotheses and revealed that (i) in-group bias influences contributions to a climate fund when individuals act anonymously, (ii) observation by local authorities increases contributions to a climate fund, and (iii) observation can mitigate in-group bias, at least in the current setting where individuals expect the in-group leaders to endorse collaboration with members of the out-group.

In what follows, I take an exploratory approach to the data. First, I demonstrate that treatment effects are likely to be driven by changes in preferences rather than beliefs about what the other player does. Second, I document gender differences in the effect of in-group bias.[20] Third, I show that the data indicate that there are different expectations

[20]In further exploratory analyses, I find no heterogeneity in any of the treatment effects across age, income, or years of schooling.

about the behavior of the local authorities compared to the villagers. Finally, I investigate how behavior in the framed lab-in-the-field experiment correlates with attitudes and self-reported behavior outside the experiment.

2.5.1 The Role of Beliefs and Preferences

A large literature documents that many people are conditional cooperators, deciding to collaborate with other people only if they believe that the others reciprocate the collaboration (Fischbacher et al., 2001, 2012). Thus, the treatment effects from Section 4.3 may arise from two different sources: First, individuals may have different preferences across the different treatments, e.g. due to in-group bias or a desire to obtain a good reputation. Second, individuals may expect that the behavior of the other player differs, thereby influencing subjects' behavior if they are conditional cooperators. As I document in this section, the second explanation is unlikely to be driving the results of this paper.

The current design provides no causal explanation for how expectations about the behavior of the other player influences the willingness to contribute to the climate fund. Yet, correlational evidence shows a positive association between contributing and believing that the other player will contribute. Across all treatments, subjects who answer that they think the other player contributes are 15 percentage points more likely to contribute themselves (logit, $p < .004$, cf. Table 2.14).[21]

To test for the effect of changing beliefs, I conduct analyses analogous to those in Section 4.3 with the expected behavior of the other player as dependent variable. Looking first at the influence of the group affiliation of the other player, I find that individuals become 10 percentage points less likely to expect that the other player contributes when the other player belongs to an out-group, but this effect is not statistically significant ($p = .184$, cf. Table 2.15). Similarly, I find no effect of observation on the subjects' expectations about what the other player does ($p = .229$, cf. Table 2.16). If anything, observability seems to reduce the probability that a subject expects the other player to contribute. Finally, I find in a joint logit regression for all treatments that neither the direct effects nor the interaction of treatments are statistically significant (cf. Table 2.17). These results suggest that the treatments have little to no effect on the expectations of subjects about what the other player does, suggesting that the treatments work through something else than expectations.

Another way to examine whether treatment effects go through expectations about the

[21] One would expect this correlation if there are conditional cooperators in the sample. Yet, it is also possible that the causality goes in the other direction, e.g. if a false-consensus effect makes subjects believe that the other player behaves similarly to themselves (Ross et al., 1977).

other player is to include beliefs about the actions of the other player as a control variable in the logit regressions conducted in Section 4.3. If beliefs were driving the results, one would expect that adding beliefs as a control variable would reduce the partial effects of the treatments. Yet, as shown in Tables 2.18-2.20, including beliefs in the treatments does not alter the treatment effects, neither in terms of their approximate size nor statistical significance.

In sum, the data provides no support for the treatment effects to run through average beliefs about what the other player does.[22] This suggests that treatment differences rather arise due to changes in preferences.

2.5.2 Gender Differences

Previous research has documented gender differences in in-group bias and strategic signaling behavior. For example, Fershtman and Gneezy (2001) show in a Jewish society that ethnic discrimination is strong among men but non-existent among women, and Vugt et al. (2007) find that men respond more strongly than women to intergroup competition. At the same time, men and women often respond differently to observation: To signal formidability and toughness, for instance, men are more likely to initiate negotiations (Kugler et al., 2018), use sabotage to improve performance (Dato and Nieken, 2014), or decrease cooperation when acting in front of their peers (Charness and Rustichini, 2011). Consequently, it is possible that men and women differ both in their degree of in-group bias and in their responsiveness to observation by the Big Man.

In this study, there is no overall significant difference between the general willingness to contribute for men and women (logit, $p = .640$). Yet, women are much less affected by the group affiliation of the other player: Whereas the contribution rate among men decreases by 35 percentage points (logit, $p < .001$), the decrease among women is a statistically insignificant 13 percentage points (logit, $p = .165$). Consequently, there is less scope for observation to have a bias-reducing effect for women. That is, while observation substantially reduces out-group bias among men (APE: 40 percent, logit: $p < .001$), the effect is somewhat less pronounced for women (APE: 28 percent, logit: $p = .021$).

[22]The current experiment only elicits binary beliefs about the actions of others (Contributing vs. Not contributing), and it therefore does not speak to uncertainty in beliefs about the response of the other player. Uncertainty could e.g. matter for subjects' decisions if they seek to lower the probability that they will be in a situation where they contribute and the other person does not contribute (cf. 'sucker aversion', Bougherara et al., 2009). For instance, if subjects who believe that the other player contributes become more uncertain about this when facing a member of another village, this could lead to lower contribution rates when facing an out-group member compared to an in-group member. This binary belief elicitation design was chosen for reasons of simplicity as percentage questions are often perceived as too complex.

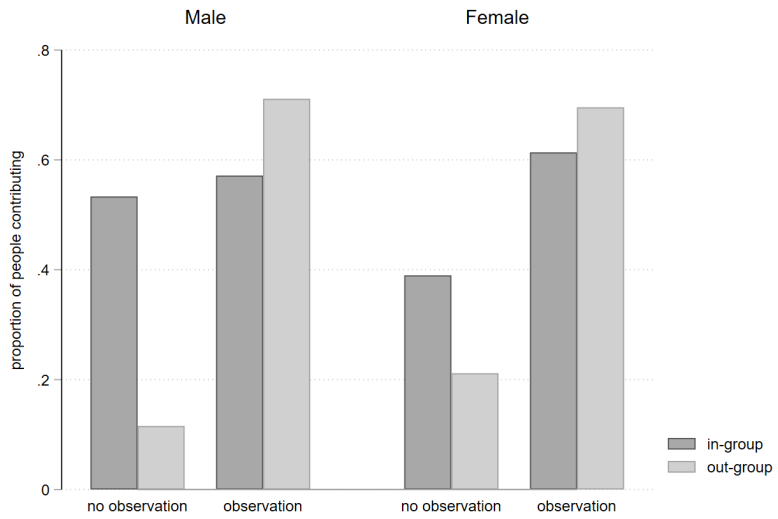

Figure 2.7 Contribution Behavior by Gender

One possible reason for the more pronounced in-group bias among men could be the gender differences in interactions with members of other villages in this field setting. Such interactions take place only rarely due to the seclusion of villages and lacking terrestrial infrastructure (see Section 2.2). Yet, when they meet, men typically interact with members of other villages in competitive settings. In most self-sufficient families, for example, men are responsible for going out fishing, and here they compete with fishers from other villages and have no close interactions. In contrast, women have closer contact in a more cooperative setting when meeting women from other villages. For instance, villages that are geographically closer share some facilities such as schools or medical facilities, and women are usually responsible for bringing and picking up school children. Contact with members of other villages may influence how people view their out-group (Allport, 1954; Paluck et al., 2019, cf. the contact hypothesis,). When the environment for such encounters is collaborative, contact may reduce in-group bias.[23] As the typical environment for contact with members of other villages is more collaborative for women, this could explain why women exhibit less in-group bias in the current study.

2.5.3 A Different Norm for Local Authorities

The analyses in Sections 2.4.2 and 2.4.3 documented that observation by in-group leaders induced more villagers to contribute to the climate fund. This is related to a belief in all treatments that the Big Man wants the subject to contribute, and that he would dislike if the subject deviates from this expectation. Yet, the beliefs of the subjects also

[23]Specifically, Allport (1954) describe that appropriate conditions for intergroup contact to reduce prejudice is when (i) the two groups have an equal status (as opposed to differences in prestige or rank), (ii) the groups work towards common goals, (iii) the groups collaborate rather than compete to reach their goals, and (iv) an authority, law, or custom encourages interaction between the groups.

reveal that the norm of intergroup collaboration may not hold for the local authorities themselves. Combining responses from all treatments, 70 percent believe that the Big Man would contribute to the climate fund when interacting with someone from their own village. Yet, only 21 percent believe that the Big Man would contribute if the other person is from another village. Both of these are statistically significantly different from 50 percent (binomial tests, $p's < .001$). This leads to a discrepancy in out-group interactions between what subjects believe that the Big Man wants them to do and what subjects believe the Big Man himself would do: In OutPrivate and OutObserve, subjects most often believe that the Big Man wants them to contribute while the Big Man would not himself contribute (OutPrivate: 59 percent, McNemar's test: $p < .001$; OutObserve: 60 percent, McNemar's test: $p < .001$). In contrast, beliefs about Big Man attitudes and behavior mostly coincide for InPrivate and InObserve (InPrivate: 66 percent, McNemar's test: $p = .108$; InObserve: 66 percent, McNemar's test: $p = .275$).

A similar discrepancy between the villagers and the expected behavior of the local authorities is seen by comparing beliefs about in-group bias among Big Men and Big Women. While male villagers exhibit in-group bias to a greater extent than female villagers (cf. Section 2.5.2), subjects do not believe that there will be a difference in the bias from their Big Man and Big Woman: Most subjects believe that their Big Man would act similarly to their Big Woman in both situations (in-group: 82 percent, McNemar's test: $p = .901$; out-group: 85 percent, McNemar's test: $p = .500$). Thus, subjects believe that both their Big Man and Big Woman would behave differently towards members of their in-group and out-group (McNemar's test: $p's < .001$), and the difference in expected in-group bias is not significant (sign test, $p = .586$).

This indicates that there may exist different norms for the behavior of the villagers and the behavior of the village authorities. Such a discrepancy is potentially problematic if increasing the scope of intercommunity collaboration requires agreements made between village authorities. I therefore view it as an interesting avenue for future research to examine how norms may differ across hierarchies in society, and a critical task for researchers is to find ways of changing also the existing norms for village authorities towards more intercommunity collaboration.

2.5.4 External Validity of the Framed Field Experiment

The current paper addresses the problem of expanding the scope of collective action beyond individuals' salient in-groups. In particular, it considers the case of climate adaptation that needs to be expanded to improve protection levels against the negative consequences of climate change. To do so, the experiment involves a modified Prisoner's Dilemma game and uses the frame of "contributions to a district climate fund" that will

"protect against a natural disaster". While this framing is not related to actual climate funds and disasters, previous studies have demonstrated that frames impact behavior in social dilemma games (Cartwright, 2016; Goerg et al., 2020; Mieth et al., 2021). To get an indication of whether the frame matters for subjects' behavior in the experiment, it is therefore interesting to correlate subjects' behavior with their responses to the survey questions that speak to climate attitudes and self-reported climate behaviors.

In the survey, subjects were asked to state on a 3-point scale how relevant they found eight different natural hazards and environmental changes, including change in weather patterns, rising sea levels, and flooding. All treatments combined, I find a positive association between average relevance ratings and the willingness to contribute to the climate fund in the experiment (logit, $p = .047$, cf. Table 2.21). To examine the magnitude of this association, I make a median split of the average relevance ratings. This reveals that the subjects who on average rate the natural hazards as more relevant are 13 percentage points more likely to contribute to the climate fund in the experiment (logit, $p = .010$, cf. Table 2.22). Analogously, subjects also answer whether they feel safe in their village with regard to the eight environmental hazards (binary Yes/No). Again combining all treatments, I find suggestive evidence that subjects who report feeling safe from environmental hazards are 12 percentage points less likely to contribute to the climate fund (logit, $p = .079$, cf. Table 2.23).

Responses to the survey also reveal an association between attitudes towards district climate funds and responsiveness to the treatments. Specifically, subjects are asked whether they think a district climate fund would be beneficial for their village (binary Yes/No).[24] For the subjects who respond to this question, 141 subjects (43 percent) say that a district climate fund would not be beneficial, and 187 (57 percent) respond that it would be beneficial. Examining how in-group bias influences contributions (H1: InPrivate vs. OutPrivate) reveals that subjects who think that a district climate fund would not be beneficial are much more influenced by the group affiliation of the person they interact with. Specifically, for the subjects who do not view a district climate fund as beneficial, the share of contributions decline by 57 percentage points when they interact with a person from another village (logit, $p < .001$, cf. Table 2.24). For the subjects who believe a district climate fund is beneficial, the decline is only 15 percentage points (logit, $p = .032$, cf. Table 2.24), and the difference between the two effects is statistically significant (Wald test, $p < .001$). Consequently, the bias-mitigating effect of observation (H3) is also less pronounced among the subjects with a favorable view towards district climate funds (logit, $p < .001$, 2.25).

[24]Subjects are also asked about whether they think a community climate fund would be beneficial for their village. Yet, with more than 90 percent of subjects agreeing to this statement, I have no statistical power for examining how these attitudes relate to behavior in the experiment.

While all these results are purely correlational, they indicate that the behavior in the framed field experiment taps into relevant climate attitudes and (self-reported) behaviors in the field.

2.6 Conclusion

This study sheds light on the behavioral foundations for expanding the scope of climate adaptation on a community level. A primary critique of community-based adaptation is that this approach often fails to reach the extent necessary for dealing with the negative consequences of climate change (Forsyth, 2013). In this study, I document using a framed field experiment in Bougainville, Papua New Guinea, that in-group bias is a hindrance to intercommunity collaboration: In a modified Prisoner's Dilemma game, villagers are much more likely to contribute to a 'climate fund' when they interact with a member of their own village compared to a member of another village. Yet, I also show that observation by local authorities (i.e., in-group leaders) increases the likelihood that villagers contribute to the climate fund. Importantly, observation has an even greater effect on contributions when villagers interact with members of another village, thereby mitigating the negative effects of in-group bias. This effect relates to an existing social norm of intercommunity collaboration across the villages.

These findings have key implications for policymakers who seek to preserve natural resources and/or expand community-based climate adaptation. Small island states are among the most vulnerable to climate change, and their unique situation of climate-sensitive economic systems, exposure to natural disasters, and weak formal governance poses a tremendous challenge for climate adaptation. This paper demonstrates that one can use the existing social structures to increase support for intercommunity collaborations. Specifically, when there is a social norm of cooperation with members of other villages, institutions that increase the observability of individuals' choices may mitigate the in-group bias that hinders joint action across communities.

However, this study also has certain limitations. First, this study does not explain *why* the existing social norms are in favor of intercommunity collaboration. It only examines the consequences of observation given that the social norm is prosocial, and it therefore does not explain what the consequences of observability would be if the social norm was different. Second, the study was conducted in a highly specific cultural and geographical context, and this limits the external validity of the findings. In terms of ecological validity, future studies should examine whether the results of this study generalize to other types of collective action problems, including aspects of climate adaptation that do not relate to natural resource protection. In terms of population validity, many researchers have

called for studies that examine non-WEIRD populations (Henrich et al., 2010), but it is important to also examine how well the current findings replicate in other populations.

Another interesting avenue for future research is to examine how in-group bias, social norms, and observability interact in collective decision-making. The current study focuses on the preferences of individuals in a community and therefore examines how people make decisions depending on the people they interact with and whether they are observed. This focus is warranted by the hierarchical structure of villages in Bougainville, which implies that the local authorities have power to make decisions on behalf of the village. Yet, in other contexts, it may be more relevant to examine how people act in group settings, for example if people vote (anonymously or publicly) on whether the entire community should establish a climate fund.

In sum, this study provides valuable insights into the complexities of intercommunity-based cooperation in climate adaptation. By understanding the factors that influence cooperation and the role of community leaders, policymakers and practitioners can better support community-based adaptation efforts in small island states and other vulnerable regions. As climate change continues to pose increasing threats, fostering cooperation and collaboration across communities becomes ever more critical for building resilience and addressing the challenges of a changing climate.

Bibliography

Abrams, D. and Hogg, M. A. (1988). Comments on the motivational status of self-esteem in social identity and intergroup discrimination. *European Journal of Social Psychology*, 18(4):317–334.

Adger, W. N., Lorenzoni, I., and O'Brien, K. L. (2009). *Adapting to Climate Change: Thresholds, Values, Governance*. Cambridge University Press.

Adloff, S. and Rehdanz, K. (2023). Wait and see? Public preferences for the temporal effectiveness of coastal protection. *Ecological Economics*, 204:107634.

Allport, G. W. (1954). *The Nature of Prejudice*. Cambridge, MA: Perseus Books.

Alongi, D. M. (2002). Present state and future of the world's mangrove forests. *Environmental conservation*, 29(3):331–349.

Ambrus, A. and Greiner, B. (2019). Individual, dictator, and democratic punishment in public good games with perfect and imperfect observability. *Journal of Public Economics*, 178:104053.

Andreoni, J. and Bernheim, B. D. (2009). Social image and the 50–50 norm: A theoretical and experimental analysis of audience effects. *Econometrica : journal of the Econometric Society*, 77(5):1607–1636.

Avalos, N., Gonzales Stuva, V., Heal, A., Lida, K., and Okazoe, N. (2015). Papua New Guinea and the Natural Resource Curse. *Comparative Economic Studies*, 57(2):345–360.

Ayers, J. and Huq, S. (2009). Community-based adaptation to climate change: An update.

Badeeb, R. A., Lean, H. H., and Clark, J. (2017). The evolution of the natural resource curse thesis: A critical literature survey. *Resources Policy*, 51:123–134.

Barrett, S. (2008). Climate treaties and the imperative of enforcement. *Oxford Review of Economic Policy*, 24(2):239–258.

Bénabou, R. and Tirole, J. (2006). Incentives and prosocial behavior. *American Economic Review*, 96(5):1652–1678.

Bernhard, H., Fischbacher, U., and Fehr, E. (2006). Parochial altruism in humans. *Nature*, 442(7105):912–915.

Bernstein, M. J., Sacco, D. F., Young, S. G., Hugenberg, K., and Cook, E. (2010). Being "in" with the in-Crowd: The effects of social exclusion and inclusion are enhanced by

the perceived essentialism of ingroups and outgroups. *Personality & Social Psychology Bulletin*, 36(8):999–1009.

Bicchieri, C. (2017). *Norms in the Wild*. New York, NY: Oxford University Press.

Bicchieri, C., Muldoon, R., and Sontuoso, A. (2018). Social Norms. In Zalta, E. N., editor, *The Stanford Encyclopedia of Philosophy*. Metaphysics Research Lab, Stanford University, winter 2018 edition.

Blackwell, C. and McKee, M. (2003). Only for my own neighborhood?: Preferences and voluntary provision of local and global public goods. *Journal of Economic Behavior & Organization*, 52(1):115–131.

Boege, V. (2012). Hybrid forms of peace and order on a south sea island: Experiences from Bougainville (Papua New Guinea). In *Hybrid Forms of Peace: From Everyday Agency to Post-Liberalism*, pages 88–106. Springer.

Bougherara, D., Costa, S., Grolleau, G., and Ibanez, L. (2009). Dealing with aversion to the sucker's payoff in public goods games. *Economics Bulletin*, 29(4):3194–3202.

Bourke, R. M. (2018). Impact of climate change on agriculture in Papua New Guinea. *Climate Change: Our Environment, Livelihoods, and Sustainabilit*, pages 35–50.

Bronen, R. (2014). Community relocations: The arctic and south pacific. In *Humanitarian Crises and Migration*, pages 221–242. Routledge.

Cartwright, E. (2016). A comment on framing effects in linear public good games. *Journal of the Economic Science Association*, 2(1):73–84.

Catola, M., D'Alessandro, S., Guarnieri, P., and Pizziol, V. (2023). Multilevel public goods game: Levelling up, substitution and crowding-in effects. *Journal of Economic Psychology*, 97:102626.

Charness, G., Rigotti, L., and Rustichini, A. (2007). Individual Behavior and Group Membership. *American Economic Review*, 97(4):1340–1352.

Charness, G. and Rustichini, A. (2011). Gender differences in cooperation with group membership. *Games and Economic Behavior*, 72(1):77–85.

Chen, R. and Chen, Y. (2011). The potential of social identity for equilibrium selection. *American Economic Review*, 101(6):2562–89.

Chen, Y. and Li, S. X. (2009). Group Identity and Social Preferences. *American Economic Review*, 99(1):431–457.

Chiang, Y.-S. and Wu, C.-I. (2015). Social influence and the adaptation of parochial altruism: A dictator-game experiment on children and adolescents under peer influence. *Evolution and Human Behavior*, 36(6):430–437.

Chishakwe, N., Murray, L., and Chambwera, M. (2012). Building climate change adaptation on community experiences: Lessons from community-based natural resource management in southern Africa.

Cialdini, R. B., Kallgren, C. A., and Reno, R. R. (1991). A Focus Theory of Normative Conduct: A Theoretical Refinement and Reevaluation of the Role of Norms in Human Behavior. In Zanna, M. P., editor, *Advances in Experimental Social Psychology*, volume 24, pages 201–234. Academic Press.

Cialdini, R. B., Reno, R. R., and Kallgren, C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology*, 58(6):1015–1026.

Cinner, J. E. (2009). Migration and coastal resource use in Papua New Guinea. *Ocean & Coastal Management*, 52(8):411–416.

Cochrane, G. (1970). Big men and cargo cults. (Oxford, U.K.: Clarendon Press).

Coser, L. A. (1956). *The Functions of Social Conflict*. Clencoe, IL: The Free Press.

Crocker, J. and Luhtanen, R. (1990). Collective self-esteem and ingroup bias. *Journal of Personality and Social Psychology*, 58(1):60–67.

Currarini, S. and Mengel, F. (2016). Identity, homophily and in-Group bias. *European Economic Review*, 90:40–55.

Dahl, R. A. (1956). *A Preface to Democratic Theory*. Chicago: The University of Chicago Press.

Dato, S. and Nieken, P. (2014). Gender differences in competition and sabotage. *Journal of Economic Behavior & Organization*, 100:64–80.

Davies, H. (2002). Tsunamis and the coastal communities of Papua New Guinea. In *Natural Disasters and Cultural Change*. Routledge.

Dohmen, T., Falk, A., Huffman, D., Sunde, U., Schupp, J., and Wagner, G. G. (2011). Individual risk attitudes: Measurement, determinants, and behavioral consequences. *Journal of the European Economic Association*, 9(3):522–550.

Du, J. and Tang, L. (2018). Evolution of global contribution in multi-level threshold public goods games with insurance compensation. *Journal of Statistical Mechanics: Theory and Experiment*, 2018(1):013403.

Fellner, G. and Lünser, G. K. (2014). Cooperation in local and global groups. *Journal of Economic Behavior & Organization*, 108:364–373.

Fershtman, C. and Gneezy, U. (2001). Discrimination in a Segmented Society: An Experimental Approach*. *The Quarterly Journal of Economics*, 116(1):351–377.

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

Fischbacher, U., Gächter, S., and Quercia, S. (2012). The behavioral validity of the strategy method in public good experiments. *Journal of Economic Psychology*, 33(4):897–913.

Fiske, S. T. (2018). *Social Beings: A Core Motives Approach to Social Psychology*. Hoboken, NJ: John Wiley & Sons, Inc.

Forsyth, T. (2013). Community-based adaptation: A review of past and future challenges. *WIREs Climate Change*, 4(5):439–446.

Gaertner, S. and Dovidio, J. (2000). *Reducing Intergroup Bias: The Common Ingroup Identity Model*. Philadelphia: Psychology Press.

Gaertner, S. L., Dovidio, J. F., Anastasio, P. A., Bachman, B. A., and Rust, M. C. (1993). The Common Ingroup Identity Model: Recategorization and the Reduction of Intergroup Bias. *European Review of Social Psychology*, 4(1):1–26.

Gaertner, S. L., Mann, J., Murrell, A., and Dovidio, J. F. (1989). Reducing intergroup bias: The benefits of recategorization. *Journal of Personality and Social Psychology*, 57(2):239–249.

Gallier, C., Goeschl, T., Kesternich, M., Lohse, J., Reif, C., and Römer, D. (2019). Leveling up? An inter-neighborhood experiment on parochialism and the efficiency of multi-level public goods provision. *Journal of Economic Behavior & Organization*, 164:500–517.

Gerber, A. S., Green, D. P., and Larimer, C. W. (2008). Social Pressure and Voter Turnout: Evidence from a Large-Scale Field Experiment. *The American Political Science Review*, 102(1):33–48.

Goerg, S. J., Rand, D., and Walkowitz, G. (2020). Framing effects in the prisoner's dilemma but not in the dictator game. *Journal of the Economic Science Association*, 6(1):1–12.

Grimalda, G., Pondorfer, A., and Tracer, D. P. (2016). Social image concerns promote cooperation more than altruistic punishment. *Nature Communications*, 7(1):12288.

Harrison, G. W. and List, J. A. (2004). Field experiments. *Journal of Economic Literature*, 42(4):1009–1055.

Hasson, R., Löfgren, Å., and Visser, M. (2010). Climate change in a public goods game: Investment decision in mitigation versus adaptation. *Ecological Economics*, 70(2):331–338.

Henrich, J., Heine, S. J., and Norenzayan, A. (2010). Most people are not WEIRD. *Nature*, 466(7302):29–29.

Humphreys, M., Sachs, J., and Stiglitz, J. E. (2007). *Escaping the Resource Curse*. Columbia University Press.

Intergovernmental Panel On Climate Change (Ipcc) (2023). *Climate Change 2022 – Impacts, Adaptation and Vulnerability: Working Group II Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, 1 edition.

Karlan, D. and McConnell, M. A. (2014). Hey look at me: The effect of giving circles on giving. *Journal of Economic Behavior & Organization*, 106:402–412.

Kearney, J., Berkes, F., Charles, A., Pinkerton, E., and Wiber, M. (2007). The role of participatory governance and community-based management in integrated coastal and ocean management in Canada. *Coastal Management*.

Kugler, K. G., Reif, J. A. M., Kaschner, T., and Brodbeck, F. C. (2018). Gender differences in the initiation of negotiations: A meta-analysis. *Psychological Bulletin*, 144(2):198–222.

Lacetera, N. and Macis, M. (2010). Social image concerns and prosocial behavior: Field evidence from a nonlinear incentive scheme. *Journal of Economic Behavior & Organization*, 76(2):225–237.

Lang, A. L., Omena, M., Abdad, M. Y., and Ford, R. L. (2020). Climate change in Papua New Guinea: Impact on disease dynamics. *Papua New Guinea Medical Journal*, 58(1/4):1–10.

Lange, A., Schmitz, J., and Schwirplies, C. (2021). Inequality, role reversal and cooperation in multiple group membership settings. *Experimental Economics*, 25(1):68–110.

Linardi, S. and McConnell, M. A. (2011). No excuses for good behavior: Volunteering and the social environment. *Journal of Public Economics*, 95(5):445–454.

Lipset, D. (2013). The New State of Nature Rising Sea-levels, Climate Justice, and Community-based Adaptation in Papua New Guinea (2003–2011) on JSTOR.

Lipset, S. M. (1959). *Political Man: The Social Bases of Politics*. Garden City, NJ: Doubleday.

Lipset, S. M. and Rokkan, S. (1967). Cleavage Structures, Party Systems, and Voter Alignments. In *Party Systems and Voter Alignments: Cross-National Perspectives*, pages 1–64. New York: The Free Press.

Luetz, J. and Havea, P. H. (2018). "We're not refugees, we'll stay here until we Die!"—Climate change adaptation and migration experiences gathered from the Tulun and Nissan Atolls of Bougainville, Papua New Guinea. *Climate change impacts and adaptation strategies for coastal communities*, pages 3–29.

McNamara, K. E. and Buggy, L. (2017). Community-based climate change adaptation: A review of academic literature. *Local Environment*, 22(4):443–460.

Medina Hidalgo, D., Nunn, P. D., Beazley, H., Sovinasalevu, J. S., and Veitayaki, J. (2021). Climate change adaptation planning in remote contexts: Insights from community-based natural resource management and rural development initiatives in the Pacific Islands. *Climate and Development*, 13(10):909–921.

Mercer, J., Kelman, I., Suchet-pearson, S., and Lloyd, K. (2009). Integrating indigenous and scientific knowledge bases for disaster risk reduction in papua new guinea. *Geografiska Annaler: Series B, Human Geography*, 91(2):157–183.

Mfitumukiza, D., Roy, A. S., Simane, B., Hammill, A., Rahman, M. F., and Huq, S. (2020). Scaling local and community-based adaptation. *Global Commission on Adaptation Background Paper*.

Mieth, L., Buchner, A., and Bell, R. (2021). Moral labels increase cooperation and costly punishment in a Prisoner's Dilemma game with punishment option. *Scientific Reports*, 11(1):10221.

Nanau, G. (2011). The wantok system as a socio-economic and political network in Melanesia. *OMNES: The Journal of Multicultural Society*, 2(1):31–55.

Nelson, F. and Agrawal, A. (2008). Patronage or participation? Community-based natural resource management reform in sub-Saharan Africa. *Development and change*, 39(4):557–585.

Nikiforakis, N. and Normann, H.-T. (2008). A comparative statics analysis of punishment in public-good experiments. *Experimental Economics*, 11:358–369.

Nurse, L. A., McLean, R. F., Agard, J., Briguglio, L. P., Duvat-Magnan, V., Pelesikoti, N., Tompkins, E., and Webb, A. (2014). Small Islands. In *Climate Change 2014: Impacts, Adaptation, and Vulnerability: Part B: Regional Aspects: Working Group II*

Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Ed., pages 1613–54. Cambridge University Press.

Ostrom, E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge university press.

Ostrom, E. (2009). A General Framework for Analyzing Sustainability of Social-Ecological Systems. *Science (New York, N.Y.)*, 325(5939):419–422.

Paluck, E. L., Green, S. A., and Green, D. P. (2019). The contact hypothesis re-evaluated. *Behavioural Public Policy*, 3(2):129–158.

Pérez, A. A., Fernández, B. H., and Gatti, R. C. (2010). *Building Resilience to Climate Change: Ecosystem-based Adaptation and Lessons from the Field*. IUCN.

Power, S., Schiller, A., Cambers, G., Jones, D., and Hennessy, K. (2011). The Pacific Climate Change Science Program. *Bulletin of the American Meteorological Society*, 92:1409–1411.

Pretty, J. and Ward, H. (2001). Social capital and the environment. *World development*, 29(2):209–227.

Reilly, B. (2008). Ethnic conflict in Papua New guinea. *Asia Pacific Viewpoint*, 49(1):12–22.

Reinstein, D. and Riener, G. (2012). Reputation and influence in charitable giving: An experiment. *Theory and Decision. An International Journal for Multidisciplinary Advances in Decision Science*, 72(2):221–243.

Rimoldi, E. (2011). Force of circumstance: Feminist discourse in a matrilineal society. *The Asia Pacific Journal of Anthropology*, 12(2):180–194.

Ross, L., Greene, D., and House, P. (1977). The "False consensus effect": An egocentric bias in social perception and attribution processes. *Journal of Experimental Social Psychology*, 13(3):279–301.

Saovana-Spriggs, R. V. et al. (2007). Gender and peace: Bougainvillean women, matriliny, and the peace process. *PhD thesis, Australian National University.*

Savikhin Samek, A. and Sheremeta, R. M. (2014). Recognizing contributors: An experiment on public goods. *Experimental Economics*, 17:673–690.

Scheepers, D. and Ellemers, N. (2019). Social Identity Theory. In Sassenberg, K. and Vliek, M. L., editors, *Social Psychology in Action*, pages 129–143. Springer International Publishing, Cham.

Schipper, E. L., Ayers, J., Reid, H., Huq, S., and Rahman, A. (2014). *Community-Based Adaptation to Climate Change: Scaling It Up*. Routledge.

Spires, M., Shackleton, S., and Cundill, G. (2014). Barriers to implementing planned community-based adaptation in developing countries: A systematic literature review. *Climate and Development*, 6(3):277–287.

Stephan, W. G. and Stephan, C. W. (1996). Predicting prejudice. *International Journal of Intercultural Relations*, 20(3):409–426.

Stephan, W. G., Ybarra, O., and Rios, K. (2015). Intergroup threat theory. In *Handbook of Prejudice, Stereotyping, and Discrimination*. Mahwah, NJ: Lawrence Erlbaum Associates.

Tajfel, H. (1978). Social categorization, social identity and social comparisons. In *Differentiation between Social Groups*, pages 61–76. London, UK: Academic Press.

Tajfel, H. (1986). An integrative theory of intergroup conflict. In *The Social Psychology of Intergroup Relations*, pages 33–37. Monterey, CA, USA: Brooks/Cole.

Tajfel, H., Billig, M. G., Bundy, R. P., and Flament, C. (1971). Social categorization and intergroup behaviour. *European Journal of Social Psychology*, 1(2):149–178.

Tajfel, H. and Turner, J. C. (1979). An integrative theory of intergroup conflict. In *The Social Psychology of Intergropu Relations*. Monterey, CA: Brooks/Cole.

Turner, J. C. (1975). Social comparison and social identity: Some prospects for intergroup behaviour. *European Journal of Social Psychology*, 5(1):1–34.

Turner, J. C., Hogg, M. A., Oakes, P. J., Reicher, S. D., and Wetherell, M. S. (1987). *Rediscovering the Social Group: A Self-Categorization Theory*. Rediscovering the Social Group: A Self-Categorization Theory. Basil Blackwell, Cambridge, MA, US.

Turner, J. C. and Reynolds, K. J. (2012). Self-categorization theory. In *Handbook of Theories of Social Psychology, Vol. 2*, pages 399–417. Sage Publications Ltd, Thousand Oaks, CA.

Vousdoukas, M. I., Athanasiou, P., Giardino, A., Mentaschi, L., Stocchino, A., Kopp, R. E., Menéndez, P., Beck, M. W., Ranasinghe, R., and Feyen, L. (2023). Small Island Developing States under threat by rising seas even in a 1.5 °C warming world. *Nature Sustainability*, pages 1–13.

Vugt, M. V., Cremer, D. D., and Janssen, D. P. (2007). Gender Differences in Cooperation and Competition: The Male-Warrior Hypothesis. *Psychological Science*, 18(1):19–23.

Wadey, M., Brown, S., Nicholls, R. J., and Haigh, I. (2017). Coastal flooding in the Maldives: An assessment of historic events and their implications. *Natural Hazards*, 89:131–159.

Warner, M. (2000). Conflict Management in Community-Based Natural Resource Projects: Experiences from Fiji and Papua New Guinea. *Overseas Development Institute*.

Weisel, O. and Böhm, R. (2015). "Ingroup Love" and "Outgroup hate" in intergroup conflict between natural groups. *Journal of Experimental Social Psychology*, 60:110–120.

Wells, S. and Ravilious, C. (2006). *In the Front Line: Shoreline Protection and Other Ecosystem Services from Mangroves and Coral Reefs*. Number 24. UNEP/Earthprint.

2.7 Appendix

2.7.1 Tables and Figures

Table 2.6 Sample Characteristics by Treatment

	InPrivate	OutPrivate	InObserve	OutObserve	Total
Gender					
Male	50%	50%	39%	49%	48%
Female	50%	50%	61%	51%	52%
Frequency of Internet Usage					
Never	75%	77%	86%	80%	79%
Once a Month	2%	1%	1%	0%	1%
Once a Week	14%	16%	10%	13%	14%
Several Times a Week	4%	4%	1%	3%	3%
Every day	4%	2%	1%	3%	3%
Money on Phone					
0	45%	50%	58%	49%	50%
K5	7%	3%	4%	14%	7%
K10	6%	11%	6%	7%	7%
K30	13%	17%	8%	11%	13%
K100	8%	6%	4%	5%	6%
+K100	21%	13%	19%	13%	17%
Frequency of Church Attendance					
Never	2%	3%	0%	1%	2%
Once a Year	2%	0%	0%	1%	1%
Once a Month	0%	2%	0%	1%	1%
Once a Week	76%	75%	80%	78%	77%
Several Times a Week	15%	9%	7%	8%	10%
Every day	6%	12%	13%	11%	10%
Community Engagement					
No	8%	13%	8%	14%	11%
Yes	92%	87%	92%	86%	89%
Born in Village					
No	28%	32%	32%	20%	28%
Yes	72%	68%	68%	80%	72%

Table 2.7 Demographics by Treatment

	InPrivate	OutPrivate	InObserve	OutObserve	Total
Age	34.82	37.63	38.71	34.57	36.24
	(13.79)	(14.76)	(13.28)	(13.02)	(13.84)
Years of Schooling	8.08	7.90	8.03	8.20	8.05
	(2.21)	(2.73)	(2.17)	(2.27)	(2.36)
Weekly Income	77.10	56.18	79.11	77.80	71.99
	(135.51)	(80.29)	(143.89)	(219.17)	(149.99)

Notes: The table shows mean values for each treatment and in the total sample, and it reports standard errors in parentheses. Weekly Income is measured in local currency Kina (EUR 1 = Kina 3.9).

Table 2.8 Responses to Climate Questions by Treatment

	InPrivate	OutPrivate	InObserve	OutObserve	Total
Believe in Climate Change	0.97	0.98	0.94	0.97	0.97
Engaged in Climate Adaptation	0.70	0.75	0.75	0.69	0.72
Perceived Safety from Disasters	0.85	0.79	0.79	0.71	0.79
Fear for Food Security	0.64	0.78	0.81	0.79	0.74
Climate Knowledge	0.83	0.83	0.86	0.86	0.84
Climate Attitudes	0.37	0.39	0.38	0.42	0.39
Climate Experience	0.38	0.37	0.40	0.39	0.39

Notes: Believe in Climate Change, Engagement in Climate Adaptation, Perceived Safety from Disasters, and Fear for Food Security are all binary questions. Climate Knowledge is the share of natural hazards that the subject reported to have heard about. Climate Attitudes is the average relevance score given by the subject to each of the natural hazards (standardized between 0 and 1). Climate Experience is the share of the natural hazards that the subject has experienced.

Table 2.9 Attitudes by Treatment

	InPrivate	OutPrivate	InObserve	OutObserve	Total
Risk Aversion	7.94	7.81	7.69	7.49	7.75
	(2.03)	(2.18)	(2.39)	(2.29)	(2.20)
General Trust	2.50	2.40	2.62	2.59	2.52
	(0.54)	(0.60)	(0.58)	(0.59)	(0.58)
Perceived Altruism	7.17	7.20	6.82	7.14	7.11
	(2.47)	(2.36)	(2.42)	(2.33)	(2.39)
Perceived Fairness	6.66	6.22	6.79	6.18	6.45
	(2.41)	(2.58)	(2.34)	(2.66)	(2.51)

Notes: The table shows mean values for each treatment and in the total sample, and it reports standard errors in parentheses. Risk Aversion, Perceived Altruism, and Perceived Fairness are all measured on scales from 1-10, General Trust is measured on a scale from 1-4.

Table 2.10 H1: In-Group Bias and Contributions

	(1)	(2)	(3)
Out-group	-0.29***	-0.28***	-0.24***
	(0.06)	(0.06)	(0.06)
Age		0.00	0.00
		(0.00)	(0.00)
Female		-0.03	-0.03
		(0.06)	(0.06)
Years of Schooling		0.04***	0.03**
		(0.01)	(0.01)
Weekly Income		0.00	0.00
		(0.00)	(0.00)
Volunteering		-0.13	-0.14
		(0.10)	(0.10)
Altruism Perception			0.00
			(0.01)
Fairness Perception			-0.01
			(0.01)
Trust, General			-0.04
			(0.05)
Risk Aversion			-0.03**
			(0.01)
Observations	234	220	185

Notes: Logit regression with contribution (binary) as the dependent variable. The sample comprises only subjects who were not observed. Coefficients are average partial effects, robust standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.11 H2: Observation and Contribution Levels

	(1)	(2)	(3)
Observation	0.13*	0.15**	0.22***
	(0.07)	(0.07)	(0.08)
Age		0.01**	0.01*
		(0.00)	(0.00)
Female		-0.10	-0.13
		(0.07)	(0.08)
Years of Schooling		0.04***	0.05***
		(0.02)	(0.02)
Weekly Income		-0.00	-0.00**
		(0.00)	(0.00)
Volunteering		-0.11	-0.13
		(0.12)	(0.12)
Altruism Perception			-0.00
			(0.01)
Fairness Perception			-0.02
			(0.02)
Trust, General			0.03
			(0.07)
Risk Aversion			-0.04**
			(0.02)
Observations	200	187	155

Notes: Logit regression with contribution (binary) as the dependent variable. The sample comprises only subjects who interacted with a member of their own village. Coefficients are average partial effects, robust standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.12 H3: Interaction Effect of In-Group Bias and Observation on Contributions

	(1)	(2)	(3)
Out-group	-0.28***	-0.28***	-0.24***
	(0.05)	(0.05)	(0.06)
Observation	0.12*	0.14**	0.21***
	(0.07)	(0.07)	(0.08)
Observation × Outgroup	0.40***	0.38***	0.34***
	(0.07)	(0.08)	(0.10)
Age		0.00	0.00
		(0.00)	(0.00)
Female		-0.02	-0.02
		(0.05)	(0.05)
Years of Schooling		0.03***	0.03**
		(0.01)	(0.01)
Weekly Income		-0.00	-0.00
		(0.00)	(0.00)
Volunteering		-0.07	-0.07
		(0.08)	(0.08)
Altruism Perception			0.00
			(0.01)
Fairness Perception			-0.00
			(0.01)
Trust, General			-0.03
			(0.04)
Risk Aversion			-0.02
			(0.01)
Observations	402	379	315

Notes: Logit regression with contribution (binary) as the dependent variable. Coefficients are average partial effects, robust standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.13 Contributions and In-Group Bias, Observation

	(1)	(2)	(3)
Out-group	0.11	0.09	0.10
	(0.07)	(0.08)	(0.08)
Age		0.00	0.00
		(0.00)	(0.00)
Female		-0.01	-0.01
		(0.08)	(0.09)
Years of Schooling		0.02	0.03
		(0.02)	(0.02)
Weekly Income		-0.00	-0.00
		(0.00)	(0.00)
Community Engagement		-0.04	-0.01
		(0.13)	(0.13)
Altruism Perception			-0.01
			(0.02)
Fairness Perception			0.01
			(0.02)
Trust, General			0.02
			(0.07)
Risk Aversion			0.00
			(0.02)
Observations	168	159	130

Notes: Logit regression with contribution (binary) as the dependent variable. The sample comprises only subjects who were observed. Coefficients are average partial effects, robust standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.14 Contributions and Beliefs About Other Player's Behavior

	(1)	(2)	(3)
Expected Contribution	0.16***	0.15***	0.15***
	(0.05)	(0.05)	(0.05)
OutPrivate	-0.29***	-0.28***	-0.23***
	(0.06)	(0.06)	(0.06)
InObserve	0.13*	0.15**	0.22***
	(0.07)	(0.07)	(0.08)
OutObserve	0.26***	0.26***	0.32***
	(0.06)	(0.07)	(0.07)
Age		0.00	0.00
		(0.00)	(0.00)
Female		-0.02	-0.02
		(0.05)	(0.05)
Years of Schooling		0.02**	0.03**
		(0.01)	(0.01)
Weekly Income		-0.00	-0.00
		(0.00)	(0.00)
Community Engagement		-0.08	-0.07
		(0.08)	(0.09)
Altruism Perception			0.00
			(0.01)
Fairness Perception			-0.00
			(0.01)
Trust, General			-0.04
			(0.04)
Risk Aversion			-0.02
			(0.01)
Observations	380	373	309

Notes: Logit regression with contribution (binary) as the dependent variable. Coefficients are average partial effects, robust standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.15 Expected Contributions and In-Group Bias, No Observation

	(1)	(2)	(3)
Out-group	-0.13*	-0.12*	-0.10
	(0.07)	(0.07)	(0.07)
Age		0.00	-0.00
		(0.00)	(0.00)
Female		-0.03	-0.04
		(0.07)	(0.07)
Years of Schooling		0.01	0.02
		(0.01)	(0.02)
Weekly Income		-0.00	-0.00
		(0.00)	(0.00)
Community Engagement		0.19*	0.24**
		(0.11)	(0.10)
Altruism Perception			-0.01
			(0.01)
Fairness Perception			-0.00
			(0.02)
Trust, General			0.02
			(0.06)
Risk Aversion			0.01
			(0.02)
Observations	219	216	181

Notes: Logit regression with expected contribution of the other player (binary) as the dependent variable. The sample comprises only subjects who were not observed. Coefficients are average partial effects, robust standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.16 Expected Contributions and Observation

	(1)	(2)	(3)
Observation	-0.09	-0.07	-0.10
	(0.08)	(0.08)	(0.08)
Age		0.00	0.00
		(0.00)	(0.00)
Female		-0.06	-0.08
		(0.07)	(0.08)
Years of Schooling		0.04**	0.05***
		(0.02)	(0.02)
Weekly Income		0.00	0.00
		(0.00)	(0.00)
Community Engagement		0.00	-0.00
		(0.14)	(0.14)
Altruism Perception			-0.01
			(0.02)
Fairness Perception			-0.01
			(0.02)
Trust, General			0.13*
			(0.07)
Risk Aversion			-0.01
			(0.02)
Observations	186	182	150

Notes: Logit regression with expected contribution of the other player (binary) as the dependent variable. The sample comprises only subjects who interacted with a member of their own village. Coefficients are average partial effects, robust standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.17 Expected Contributions and Observation/Group Bias

	(1)	(2)	(3)
Out-group	-0.12*	-0.12*	-0.11
	(0.07)	(0.07)	(0.07)
Observation	-0.09	-0.08	-0.09
	(0.07)	(0.07)	(0.08)
Observation × Outgroup	0.02	-0.00	-0.01
	(0.10)	(0.10)	(0.11)
Age		0.00	-0.00
		(0.00)	(0.00)
Female		-0.02	0.00
		(0.05)	(0.06)
Years of Schooling		0.02	0.02
		(0.01)	(0.01)
Weekly Income		-0.00	-0.00
		(0.00)	(0.00)
Community Engagement		0.05	0.06
		(0.08)	(0.09)
Altruism Perception			-0.01
			(0.01)
Fairness Perception			-0.01
			(0.01)
Trust, General			0.06
			(0.05)
Risk Aversion			0.00
			(0.01)
Observations	380	373	309

Notes: Logit regression with expected contribution of the other player (binary) as the dependent variable. Coefficients are average partial effects, robust standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.18 Contributions and In-Group Bias, No Observation, Including Beliefs

	(1)	(2)	(3)
Out-group	-0.30***	-0.28***	-0.24***
	(0.06)	(0.06)	(0.06)
Belief, Other Player Contributes	0.09	0.08	0.08
	(0.06)	(0.06)	(0.06)
Age		0.00	0.00
		(0.00)	(0.00)
Female		-0.02	-0.03
		(0.06)	(0.06)
Years of Schooling		0.03***	0.03**
		(0.01)	(0.01)
Weekly Income		0.00	0.00
		(0.00)	(0.00)
Community Engagement		-0.14	-0.16
		(0.10)	(0.10)
Altruism Perception			0.00
			(0.01)
Fairness Perception			-0.01
			(0.01)
Trust, General			-0.04
			(0.06)
Risk Aversion			-0.03**
			(0.01)
Observations	219	216	181

Notes: Logit regression with contribution (binary) as the dependent variable. The sample comprises only subjects who were not observed. Coefficients are average partial effects, robust standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.19 Observation and Contribution Levels, In-Group, Including Beliefs

	(1)	(2)	(3)
Observation	0.13*	0.15**	0.22***
	(0.07)	(0.07)	(0.08)
Belief, Other Player Contributes	0.20***	0.17**	0.15**
	(0.07)	(0.07)	(0.07)
Age		0.01*	0.00
		(0.00)	(0.00)
Female		-0.09	-0.12
		(0.07)	(0.08)
Years of Schooling		0.04**	0.04**
		(0.02)	(0.02)
Weekly Income		-0.00	-0.00**
		(0.00)	(0.00)
Community Engagement		-0.10	-0.12
		(0.12)	(0.12)
Altruism Perception			0.00
			(0.01)
Fairness Perception			-0.01
			(0.01)
Trust, General			0.00
			(0.07)
Risk Aversion			-0.04**
			(0.02)
Observations	186	182	150

Notes: Logit regression with contribution (binary) as the dependent variable. The sample comprises only subjects who interacted with a member of their own village. Coefficients are average partial effects, robust standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.20 Contributions and Observation/Group Bias, Including Beliefs

	(1)	(2)	(3)
Out-group	-0.28***	-0.27***	-0.23***
	(0.05)	(0.05)	(0.06)
Observation	0.12*	0.14*	0.20***
	(0.07)	(0.07)	(0.08)
Observation × Outgroup	0.41***	0.38***	0.35***
	(0.07)	(0.08)	(0.10)
Belief, Other Player Contributes	0.16***	0.14***	0.14***
	(0.04)	(0.04)	(0.05)
Age		0.00	0.00
		(0.00)	(0.00)
Female		-0.02	-0.02
		(0.05)	(0.05)
Years of Schooling		0.02**	0.03**
		(0.01)	(0.01)
Weekly Income		-0.00	-0.00
		(0.00)	(0.00)
Community Engagement		-0.08	-0.07
		(0.08)	(0.09)
Altruism Perception			0.00
			(0.01)
Fairness Perception			-0.00
			(0.01)
Trust, General			-0.04
			(0.04)
Risk Aversion			-0.02
			(0.01)
Observations	380	373	309

Notes: Logit regression with contribution (binary) as the dependent variable. Coefficients are average partial effects, robust standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.21 Contributions and Climate Attitudes

	(1)	(2)	(3)
Climate Attitudes	0.19*	0.18*	0.23**
	(0.10)	(0.10)	(0.12)
OutPrivate	-0.30***	-0.29***	-0.24***
	(0.06)	(0.06)	(0.06)
InObserve	0.13*	0.16**	0.23***
	(0.07)	(0.07)	(0.08)
OutObserve	0.23***	0.23***	0.28***
	(0.07)	(0.07)	(0.08)
Age		0.00	0.00
		(0.00)	(0.00)
Female		-0.02	-0.03
		(0.05)	(0.05)
Years of Schooling		0.03**	0.03**
		(0.01)	(0.01)
Weekly Income		-0.00	-0.00
		(0.00)	(0.00)
Community Engagement		-0.06	-0.06
		(0.08)	(0.08)
Altruism Perception			0.00
			(0.01)
Fairness Perception			0.00
			(0.01)
Trust, General			-0.04
			(0.04)
Risk Aversion			-0.02
			(0.01)
Observations	385	378	315

Notes: Logit regression with contribution (binary) as the dependent variable. Climate Attitudes is the average relevance score given by the subject to each of eight different natural hazards (standardized between 0 and 1). Coefficients are average partial effects, robust standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.22 Contributions and Binary Climate Attitudes

	(1)	(2)	(3)
High Climate Attitudes	0.11**	0.11**	0.13***
	(0.05)	(0.05)	(0.05)
OutPrivate	-0.30***		-0.24***
	(0.06)		(0.06)
InObserve	0.14*		0.23***
	(0.07)		(0.08)
OutObserve	0.24***		0.30***
	(0.07)		(0.07)
Age		0.00	0.00
		(0.00)	(0.00)
Female		0.00	-0.03
		(0.05)	(0.05)
Years of Schooling		0.03***	0.03**
		(0.01)	(0.01)
Weekly Income		0.00	-0.00
		(0.00)	(0.00)
Community Engagement		-0.04	-0.05
		(0.08)	(0.08)
Altruism Perception			0.00
			(0.01)
Fairness Perception			0.00
			(0.01)
Trust, General			-0.04
			(0.04)
Risk Aversion			-0.01
			(0.01)
Observations	385	378	315

Notes: Logit regression with contribution (binary) as the dependent variable. Whereas Climate Attitudes is the average relevance score given by the subject to each of eight different natural hazards (standardized between 0 and 1), High Climate Attitudes is a binary variable that takes on a value of 1 if the subject belongs to the 50 percent with the greatest average relevance score. Coefficients are average partial effects, robust standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.23 Contributions and Perceived Safety

	(1)	(2)	(3)
Perceived Safety	-0.06	-0.05	-0.12*
	(0.06)	(0.06)	(0.07)
OutPrivate	-0.30***	-0.30***	-0.25***
	(0.06)	(0.06)	(0.06)
InObserve	0.13*	0.14*	0.21***
	(0.07)	(0.07)	(0.08)
OutObserve	0.22***	0.22***	0.27***
	(0.07)	(0.07)	(0.08)
Age		0.00	0.00
		(0.00)	(0.00)
Female		-0.01	-0.01
		(0.05)	(0.05)
Years of Schooling		0.03**	0.03**
		(0.01)	(0.01)
Weekly Income		-0.00	-0.00
		(0.00)	(0.00)
Community Engagement		-0.07	-0.06
		(0.08)	(0.08)
Altruism Perception			0.00
			(0.01)
Fairness Perception			-0.01
			(0.01)
Trust, General			-0.03
			(0.04)
Risk Aversion			-0.02
			(0.01)
Observations	382	375	313

Notes: Logit regression with contribution (binary) as the dependent variable. Coefficients are average partial effects, robust standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.24 Contributions and Preferences for District Fund/Treatment Interactions

	(1)	(2)	(3)
Out-group	-0.60***	-0.59***	-0.57***
	(0.03)	(0.03)	(0.04)
Support for District Fund	0.14	0.08	0.05
	(0.13)	(0.14)	(0.16)
Support × Out-group	0.38***	0.39***	0.42***
	(0.03)	(0.03)	(0.04)
Age		0.00	0.00
		(0.00)	(0.00)
Female		-0.04	-0.04
		(0.07)	(0.07)
Years of Schooling		0.04**	0.03**
		(0.01)	(0.01)
Weekly Income		0.00	0.00
		(0.00)	(0.00)
Community Engagement		-0.14	-0.16
		(0.11)	(0.11)
Altruism Perception			-0.00
			(0.01)
Fairness Perception			-0.01
			(0.01)
Trust, General			-0.02
			(0.06)
Risk Aversion			-0.03*
			(0.01)
Observations	190	188	158

Notes: Logit regression with contribution (binary) as the dependent variable. Support for District Fund is a binary variable equal to 1 if the subject believes that a district climate fund would be beneficial for their village. Support × Out-group is a interaction between Support for District Fund and the Out-group condition. Coefficients are average partial effects, robust standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.25 Contributions and Observation/Group Bias/District Fund Interactions

	(1)	(2)	(3)
Out-group	-0.52***	-0.52***	-0.51***
	(0.03)	(0.03)	(0.03)
Observation	0.09	0.10	0.13
	(0.24)	(0.25)	(0.27)
Support for District Fund	0.15	0.12	0.09
	(0.15)	(0.15)	(0.18)
Observation × Outgroup	0.60***	0.60***	0.63***
	(0.03)	(0.03)	(0.03)
Support × Out-group	0.47***	0.46***	0.48***
	(0.03)	(0.03)	(0.03)
Support × Observation	-0.04	-0.02	0.03
	(0.23)	(0.24)	(0.27)
Support × Out-group × Observation	-0.39***	-0.39***	-0.36***
	(0.03)	(0.03)	(0.03)
Age		0.00	0.00
		(0.00)	(0.00)
Female		-0.01	-0.01
		(0.05)	(0.06)
Years of Schooling		0.02*	0.03**
		(0.01)	(0.01)
Weekly Income		-0.00	-0.00
		(0.00)	(0.00)
Community Engagement		-0.08	-0.09
		(0.09)	(0.09)
Altruism Perception			-0.00
			(0.01)
Fairness Perception			-0.00
			(0.01)
Trust, General			-0.02
			(0.05)
Risk Aversion			-0.02*
			(0.01)
Observations	326	320	264

Notes: Logit regression with contribution (binary) as the dependent variable. Support for District Fund is a binary variable equal to 1 if the subject believes that a district climate fund would be beneficial for their village. Support × Out-group is an interaction between Support for District Fund and the Out-group condition, and Support × Out-group × Observation is an interaction between Support for District Fund, the Out-group condition, and the Observation condition. Coefficients are average partial effects, robust standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

2.7.2 Experimental Instructions

1. Introduction

Welcome. My name is ____. This game consists of **a problem-solving game** played in groups of two, in which you and the other player can earn additional money. At the start of the game, you will be given **15 Kina** with which you will play the game. There is a possibility that you will lose this money during the game, but we will explain how you can prevent this from happening.

2. Situation

For this game, we kindly ask you to imagine the following situation: You live on an island that is heavily affected by climate change and that is harmed more and more often by extreme weather events. For example, think back at the Cyclone Ita (in April 2014) which was a storm that caused widespread damage in Bougainville. The storm brought heavy rain, coastal flooding, and strong winds that caused significant damage to infrastructure, homes, and crops. Or think about the sea level that continues steadily and that already forced some entire villages to relocate to further inland. Lastly, think about the flooding (in December 2018) in many parts of Bougainville, damaging homes, infrastructure, and crops. The flooding also disrupted transportation and caused landslides, which further compounded the damage.

It is known and has been widely shown that because of climate change, these extreme weather events happen more frequently and more severely. In order to adapt to these threats that become stronger but also more unpredictable over the years, communities can take action. You can coordinate in order to protect yourself better for those situations in the future. This way you can decrease the caused harm as much as possible. Precisely, by coordination, we mean village members can engage in community funds that manage reserve or prevention mechanisms for the sake of upcoming disasters. On a bigger scale, district climate funds could engage in preservation and re-forestation of mangroves in the North-West of Bougainville that would benefit the whole region. Mangroves not only capture carbon emissions and thereby contributing to the slowing down of sea level rise, they also provide a strong under water root system that detains water flooding into the land in times of coastal flooding and tsunamis.

The fund could also be used for sea wall building in those locations where the sea level rise is affecting villages most. Similarly, as for other district or community fund situations that you and others normally engage in, the success of this depends on the cooperation of all. If all engage in the district climate fund, the benefit is bigger and you all benefit from this in the moment this is needed. However, if only some engage in it, the benefit becomes smaller for all whereas the costs are only born by the few people engaging in it.

3. Explanation of the Game

For the game that you are about to play you have now been randomly assigned to a group of 2 players (you and someone else). You don’t know who the other person is, only that it is a person from the same village as you/from a village in the North-West of Bougainville.

We give you a starting money of 15Kina with which you play the game. With this money, you can protect yourself and further people in your village and Bougainville in general against the threat of a natural disaster.

Please note: This is only an example! The protection holds for the disaster of the game where we hypothetically induce a disaster for which you can protect. This is not an insurance for the real case when a disaster comes in the future.

In the game, you and your respective game partner have two options:

1) *Investing in a district climate fund for protection reasons in case of a disaster happening – Cost: 7Kina,* or
2) *Not investing in a district climate fund. So, there is no protection in case of a disaster happening – No costs*

The card draw decides whether the natural disaster happens and reduces your money or not. So, there is a 50% probability that the disaster occurs and a 50% probability that is does not occur.

If the natural disaster does occur, you lose money. How much you lose depends on the decision taken by you and the other player regarding the climate protection investment. You can be:

- Fully covered: If you have both invested in the district climate fund
- Partially covered: If only one of you has invested in the district climate fund
- Not covered: If none of you has invested in the district climate fund

If the natural disaster does not occur, you do not lose anything. If you have invested into the district climate fund, you will lose this investment.

When you take your decision, you cannot communicate with the other player. You will therefore not know what your game partner decides at the moment when you have to take a decision.

4. Examples

For example, if the disaster does not happen, there are two possible outcomes for you:

(1) You have not invested into the district climate fund. You keep all your ***15Kina***
(2) You have invested into the district climate fund which has a cost of 7 Kina. So, you keep ***8 Kina***

However, if the disaster does happen, there are different potential outcomes for you depending on what you and the other player did:

(1) **Fully protected:** You have both invested into the district climate fund. You have invested 7 Kina for the district climate fund but the rest of your money is protected, so you keep ***8 Kina***
(2) **Partially protected through you:** Only you have invested into the district climate fund but your group member did not. You have invested 7 Kina for the district climate fund and you are both partially protected, meaning the disaster destroys 8 Kina of your money. So, you lose all your money: ***15-7-8=0 Kina***
(3) **Partially protected through game partner:** Only your group member has invested into the district climate fund but you did not. You are both partially protected, meaning the disaster destroys 10 Kina of your money. So, you keep ***15-8=7 Kina***
(4) **Not protected:** You have both not invested into the district climate fund. You are not protected at all and lose 15 Kina, so you keep ***15-15=0 Kina***

5. Situation and Decision

Imagine that the forecasts predict that there is a 50% chance that a natural disaster will occur on the island. If the tsunami occurs, coastal flooding will enter your and other coastal villages. You know that mangrove trees at the coast lines reduce the wave energies of tsunamis and coastal flooding which can save the crops.

You in your community and the other communities of the island can take action by engaging in some kind of protection. You now have to decide whether or not you want to invest into the district climate fund devoted to this activity. For this activity, you get two envelops: One is for the money that you keep for yourself and one is for the district climate fund in case you decide to pay for it.

If you want to invest into the district climate fund, you put 7Kina into the 'district climate fund' envelop and the rest (8Kina) into the envelop for the money that belongs to you. If you don't want to invest into the district climate fund, you put nothing into the 'district climate fund' envelop and all 15Kina into the envelop for the money that belongs to you.

Remember that if you don't invest into the district climate fund and your game partner also doesn't invest into the district climate fund, you both have no protection at all. That means if the disaster comes next year, the money of you and your game partner will be destroyed, so you are left with 0Kina. If the disaster does not occur, you can both keep all the money, so 15Kina.

Remember that if only one of you two invests into the district climate fund, you or your game partner, you only have partial protection against the disaster. That means if the disaster occurs, the money of you and your game partner will be reduced by 10Kina. So, it will be 5Kina for the person who has not invested into the district climate fund and 0Kina for the person who has invested.

If the disaster does not occur, no money will be lost. The person who has not invested into the district climate fund keeps all the money, so 15Kina, and the person who has invested into the district climate fund with 5Kina keeps 10Kina.

Remember that if both of you invest into the district climate fund, you and your game partner, you have full protection against the disaster. That means no matter if the disaster comes or not next year, the money of you and your game partner will be saved and you keep all the money, so 15Kina minus the payment of the investment (5Kina), so 10Kina.

I would now like to ask you some questions to check whether you have understood the rules of the game. Then, I ask you some final questions, next you take your decision while I leave the room before we will finally draw the card that determines whether the disaster will occur or not. Your game partner from your village/a village from another constituency in the North-West of Bougainville has to make the same decision as you. You do not know who this is and you do not know what he/she decides.

6. Control Questions

1) How many people are you playing the game with? *(Correct answer: 1)*
O 1 other person from my village/from a village in the North-West of Bougainville.
O Alone
O 2 other people from my village/ from a village in the North-West of Bougainville.
O 3 other people from my village/ from a village in the North-West of Bougainville.

2) How much money do you have at the beginning of the game? *(Correct answer: 15)*
O 10 Kina O 5 Kina O 15 Kina O 20 Kina

3) How much money does it cost you to invest into the district climate fund? *(Correct answer: 7)*
O 10 Kina O 7 Kina O 15 Kina O 20 Kina

4) What is the likelihood of the disaster happening? *(Correct answer: Half of the times)*
O Never O Very few times O Half of the times O Always

5) How much money do you have if you have invested into the district climate fund and the disaster did not occur? *(Correct answer: 8)*
O 8 Kina O 5 Kina O 15 Kina O 20 Kina

6) How much money do you have if you have not invested into the district climate fund and the disaster did not occur? *(Correct answer: 15)*
O 10 Kina O 5 Kina O 15 Kina O 20 Kina

7) How much money do you have if you and your group member have not invested into the district climate fund and the disaster did occur? *(Correct answer: 0)*
O 10 Kina O 5 Kina O 15 Kina O 0 Kina

8) How much money do you have if you have not invested into the district climate fund but your group member did and the disaster did occur? *(Correct answer: 7)*
O 10 Kina O 7 Kina O 15 Kina O 2 Kina

9) Decision

I everything alright? Do you have any further questions?

If not, I will leave the table while you take your decision. Afterwards I will come back and I will draw a card that determines whether or not the climate disaster will come next year.

Are you done? If yes, I will now return into the room.

10) Belief elicitation

I would now like to ask you some questions before conducting the disaster card draw.

1. Do you think the card will draw that the disaster occurs?
   O Yes O No

2. Think about the game that you played with someone else. Do you think she/he has contributed to the district climate fund?
   O Yes O No

3. Do you think the other person expects you to contribute?
   O Yes O No

4. Suppose the big man was playing this game with someone from his village. Do you think he would contribute to the district climate fund?
   O Yes O No

5. Suppose the big man was playing this game with someone from a village from another constituency. Do you think he would contribute to the district climate fund?
   O Yes O No

6. Suppose the big woman was playing this game with someone from her village. Do you think she would contribute to the district climate fund?
   O Yes O No

7. Suppose the big woman was playing this game with someone from a village from another constituency. Do you think she would contribute to the district climate fund?
   O Yes O No

8. Suppose this envelop is from another man in your village who plays the game with you. Do you think he contributes to the district climate fund?
   O Yes O No

9. Suppose this envelop is from another man from a village of another constituency who plays the game with you. Do you think he contributes to the district climate fund?
   O Yes O No

10. Suppose this envelop is from another woman in your village who plays the game with you. Do you think he contributes to the district climate fund?
    O Yes O No

11. Suppose this envelop is from another woman from a village of another constituency who plays the game with you. Do you think she contributes to the district climate fund?
    O Yes O No

12. Suppose this envelop is from another man from a village of another constituency who plays the game with someone from his village. Do you think he contributes to the district climate fund?
    O Yes O No

13. Suppose this envelop is from another man from a village of another constituency who plays the game with someone from your village. Do you think he contributes to the district climate fund?
    O Yes O No

14. Suppose this envelop is from another woman from a village of another constituency who plays the game with someone from her village. Do you think she contributes to the district climate fund?
    O Yes O No

15. Suppose this envelop is from another woman from a village of another constituency who plays the game with someone from your village. Do you think she contributes to the district climate fund?
    O Yes O No

16. What do you think most of the people in your village do?
    O Contribute to the district climate fund
    O Don't contribute to the district climate fund

17. What do you think most of the people from villages in other constituencies do?
    O Contribute to the district climate fund
    O Don't contribute to the district climate fund

18. What do you think does the other player in your game?
    O Contribute to the district climate fund
    O Don't contribute to the district climate fund

19. What do you think your village wants you to do?
    O Contribute to the district climate fund
    O Don't contribute to the district climate fund

20. What do you think the big man/big woman wants you to do?
    O Contribute to the district climate fund
    O Don't contribute to the district climate fund

21. Are you afraid of doing something against the will of the big man/big woman?
    O Yes
    O No

22. Do you believe a district climate fund would be beneficial for your village?
    O Yes
    O No

23. Do you believe a community climate fund would be beneficial for your village?
    O Yes
    O No

11) Disaster Decision Outcome and End of the Experimental Session

Thank you for your answers. You can now draw a card that determines whether the disaster will come or not.

Card draw that determines the disaster happening or not.

The card draw has decided that the climate disaster will (not) occur. Your final payout also depends on the decision of the other player. So, you will receive your money at the end of the whole experiment, so once all players in all villages have taken their decision. So, today you take your participation fix fee of 2Kina once you have finished the questionnaire and in two weeks we will make the final payout of the game.

You can now leave this first part of the game and go to the final questionnaire.

Questionnaire

1. Demographic Questions

1. Please indicate you participant ID: _____

2. Please confirm your gender?
   O Man O Female

3. How old are you?: _____ *years*

4. How many completed years of education do you have?: _____ years

5. Normally how much money do you earn within each week?: _____ kina

6. How often do you go to church?
   O Every day O Several times a week O Once a week O Once a month
   O Once a year O Never

7. What is your main activity in terms of work?
   O Self-sustained O Own plantation O Selling food on the market O Employed
   O Student O Teacher O Other: _____

8. Do you live here since you were born or after that?
   O Yes, I have lived here since I was born O No, I came here after I was born.

   8b. If no, for how many years have you been living here?: _____ years

9. How much money have you spent to recharge your phone credit over the last month?
   O K0 O K5 O K10 O K30 O K100 O More than K100

10. How often have you accessed the internet, Facebook, whatsapp, over the last month?
    O Every day O Several times a week O Once a week O Once a month O Never

11. What is your mother tongue?
    O Location language O Tok Pidgin O Other: ____

12. What language group are you in?: (Halia, Saposa, Selau): _____

13. Do you engage (with money, time or advice) in community activities/ community funds?
    O Yes O No

    13c. If yes, how often?
    O Every day O Several times a week O Once a week O Once a month
    O Once every six months O Once a year

2. Social preference questions and reputational concerns

1. Do you think people are mostly looking out for themselves as opposed to trying to help each other?

People mostly looking out for themselves

People trying to help each other

1 2 3 4 5 6 7 8 9 10

2. Do you think people would try to take advantage of them if they got a chance as opposed to trying to be fair?

People take advantage of other people

People Try to be fair

1 2 3 4 5 6 7 8 9 10

3. Do you think most people can be trusted or that one needs to be very careful when dealing with people?

O Yes
O No

4. How much do you trust people in general?

O I trust fully
O I rather trust
O I rather distrust
O I don't trust at all

5. How much do you trust people you just met?

O I trust fully
O I rather trust
O I rather distrust
O I don't trust at all

6. Do you generally see yourself as fully prepared to take risks as opposed to generally trying to avoid taking risks?

I am fully prepared to take risks

I rather try to avoid taking risks

1 2 3 4 5 6 7 8 9 10

7. Please think of the game you just took part in. Suppose a person like the Big Man was observing you while you were making your decision. How do you think you would get a better name for yourself?
O Not contributing to the district climate fund gives me a good name
O Contributing to the district climate fund gives me a good name
O My decision will never change my name.

8.Which action would be better for you?
O I contribute to the district climate fund.
O I keep all the money.

9. Which action would be better for the community?
O I contribute to the district climate fund.
O I keep all the money.

3. Climate Change Questions

1. Many people nowadays talk about climate change. When you hear the word climate change, what do you think of? _____

2. Do you believe in climate change? For example, do you believe in that the temperatures are rising, that more severe natural disasters happen with more frequency?
   O Yes
   O No

3. Do you think there should be climate change community funds that protect the whole village when climate disasters appear?
   O Yes
   O No

4. Have you ever heard of any of the following natural hazards or environmental changes?
   1. Flooding/Intense rainfall:
      O Yes
      O No
   2. Tsunamis:
      O Yes
      O No
   3. Earthquakes:
      O Yes
      O No
   4. Sea level rise:
      O Yes
      O No
   5. Intense drought:
      O Yes
      O No

6. Mountain erosion (unrelated to heavy rainfall):
   O Yes
   O No
7. Change in weather patterns:
   O Yes
   O No
8. Food scarcity/Failed harvest (due to flood, drought, etc.):
   O Yes
   O No
9. Other: _____

5. How important are the following issues for Bougainville, in your opinion? (*Please indicate one of the options for each: Important, Somewhat important, Unimportant, I Don't know)*
   1. Flooding/Intense Rainfall: _____
   2. Tsunamis: _____
   3. Earthquakes: _____
   4. Sea level rise: _____
   5. Intense drought: _____
   6. Mountain erosion (unrelated to heavy rainfall) : _____
   7. Change in weather patterns: _____
   8. Food scarcity/Failed harvest (due to flood, drought, etc.): _____
   9. Other: _____

6. Has any of the following natural hazards or environmental changes ever harmed you or your family?
   1. Flooding/Intense rainfall:
      O Yes
      O No
   2. Tsunamis:
      O Yes
      O No
   3. Earthquakes:
      O Yes
      O No
   4. Sea level rise:
      O Yes
      O No
   5. Intense drought:
      O Yes
      O No
   6. Mountain erosion (unrelated to heavy rainfall):
      O Yes
      O No
   7. Food scarcity/Failed harvest (due to flood, drought, etc.):
      O Yes
      O No
   8. Other: _____

7. Which of the natural hazards is the most dangerous for your village? (*Please name one only)*
   - O Tsunami
   - O Earthquakes
   - O Intense drought
   - O Intense rainfall
   - O Mountain erosion (unrelated to heavy rainfall)
   - O Change in weather patterns
   - O Food scarcity/Failed harvest (due to flood, drought, etc.)

8. Which of the natural hazards is the second most dangerous for your village? (*Please name one only)*
   - O Tsunami
   - O Earthquakes
   - O Intense drought
   - O Intense rainfall
   - O Mountain erosion (unrelated to heavy rainfall)
   - O Change in weather patterns
   - O Food scarcity/Failed harvest (due to flood, drought, etc.)

9. Do you feel safe to live in your village with regard to environmental hazards, named above?
   - O Yes
   - O No

   9b. If no, why? _____

10. Do you act in any way to protect yourself or your belongings from any of the environmental hazards named above?
    - O Yes
    - O No

    10b. If yes, how? Through:
    - O Flood prevention measures (individual level)
    - O Flood prevention measures (individual level)
    - O Drought prevention measures (individual level)
    - O Drought prevention measures (community level)
    - O Earthquake/Tsunami detection/ prevention measures (community level)
    - O Preserving the environment
    - O Engaging in local politics matters
    - O Other _____

    10c. If no, why not?
    - O No time
    - O No money
    - O No interest
    - O Not important enough
    - O Other:_____

11. Have you ever feared any natural hazards or environmental changes for food security reasons? *(E.g. droughts or floods)*
    O Yes
    O No

    11b. If yes, which natural hazard causing what?: _____
_____

12. Suppose the government could invest a fixed amount of money in one of the following areas, in order to improve the danger of the natural hazards. Which one would you choose for your community? (*Please indicate only one option)*
    1. Re-forestation to attenuate the floods
    2. Water tanks for reservation for drought periods
    3. Walls for times of beach flooding and generally sea level rise
    4. Other: _____

13. Do you trust the following politicians to implement the correct measures to develop the island and/ or community? (*Please rate each by: Mostly yes, Mostly no, Don't know)*
    1. National Politicians: _____
    2. Regional Politicians (ABG Goverment/ HOR): _____
    3. COC/ COE/ Ward Members: _____
    4. Local Politicians (Big Men/ Big Women): _____
       _____

4. Vignettes

1. Story: Fred plants trees

In a distant community that is very much like this community, Mr Fred receives money from a non-governmental organization to plant 20 trees. The trees that are planted in the mountains close to the village help to protect villages against flooding.

Mr Fred has four options:

A) Plant all 20 trees in his own village
B) Plant 10 trees in his own village and leave the other 10 for the two closest villages
C) Plant 4 trees in his own village and leave the other 16 for other villages in the northern area of Bougainville.
D) Plant 1 trees in his own village and leave the other 19 for other villages over the whole of Bougainville.

All other places would also need trees against climate change.

What do you think Mr Fred should do?: A, B, C, D?

2. Story: Thelma and Iris

In a distant community that is very much like this community, there are two women, Thelma and Iris. Thelma and Iris start working on two gardens of the same size and they work about the same time and put in the same effort. After a month of work, a big storm comes and destroys nearly all the harvest of Iris. Thelma's harvest survives entirely and she sells it on the market and she earns a lot of money. Iris has very little to sell.

A) Do you think it is right that Thelma earns much more money than Iris at the end of the month?
O Very fair
O Rather fair
O Rather not fair
O Not fair at all

B) Thelma decides not to share any harvest or money with Iris. Another person, Richard, gossips about what Iris did. Do you think that Richard will get a good name, a bad name, or nothing at all?
O good reputation
O bad reputation
O no reputation change

C) Another person, Adrian punishes Iris. Do you think that Adrian will get a good name, a bad name, or nothing at all?
O good reputation
O bad reputation
O no reputation change

3. Story: Steven and Peter

In a distant community that is very much like this community that has introduced a climate community fund, there are two men, Steven and Peter. Steve has contributed with time and money into the community fund, Peter has not contributed anything. A natural disaster happens and thanks to the climate community fund the harvests of both, Steven and Peter, are saved.

A) Do you think it is right that Peter has not contributed to the climate community fund?
O Very fair
O Rather fair
O Rather not fair
O Not fair at all

B) The community thinks about excluding Peter from the benefits of the climate change community fund if Peter continues to deny a contribution. Do you think it is right of the community to exclude Peter from the benefits in case a natural disaster happens?
O Very fair
O Rather fair
O Rather not fair
O Not fair at all

Chapter 3

Making and breaking promises: on the voluntary provision of public goods under cost uncertainty.

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Abstract

Breaking promises might be easier if one faces unexpectedly high costs for keeping them. Inspired by the pledge and review mechanisms of the Paris Agreement, we investigate the role of cost uncertainty for both initial non-binding pledges and the subsequent voluntary provision of public goods. Without a pledge review process, we find that cost uncertainty not only leads to rather conservative pledges, but can also affect the later contribution decisions. A review process increases pledges, but does not necessarily improve later cooperation levels. When costs are initially uncertain, benefits only accrue in homogeneous groups, but not when high and low cost players interact.

Keywords: Pledge and Review, Voluntary Public Good Provision, (Non-)Compliance, Cost Uncertainty, Heterogeneity

JEL Classification: C91, H41, Q54

3.1 Introduction

"We must not promise what we ought not,
lest we be called on to perform what we cannot."
Abraham Lincoln

Making promises is risky when the costs of keeping them are uncertain. In times where viruses, natural disaster or other unforeseen events turn budget plans upside down, it seems inevitable to push long-term promises aside and devote all resources to ongoing emergencies. Especially when contributions are voluntary and punishment mechanisms are lacking, non-compliance may rather be the norm than the exception.

International environmental agreements are examples where compliance issues arise. While the nature of environmental agreements has become more legally binding over the years, with the Paris Agreement being subject to the definition of the Vienna Convention on the Law of Treaties, not every provision of the agreement creates a legal obligation (Bodansky, 2016). The Paris Agreement introduced a 'Pledge and Review' mechanism where participating countries indicate their Intended Nationally Determined Contributions (INDCs). These pledges and the later contributions are regularly reviewed to track a country's development in achieving its own INDCs. It is to be hoped to benefit compliance even though not being a "formal peer review mechanism" (Aldy, 2014, p. 283).

In this paper, we investigate the role of review mechanisms for voluntary contributions to a public good when the costs of compliance are uncertain at the time pledges are made. We report findings from a laboratory experiment. Given the extensive literature on voluntary public good provision, there is surprisingly little evidence on the role of varying cost of contributions. Importantly, we find that the reviewing process for pledges and contributions is crucial for sustaining larger contribution levels. Uncertainty affects initial pledge making and might lend excuses for breaking promises.

Our paper is related to several strands of the literature which we review in detail in section 3.2. First, it directly adds to the understanding of the pledge and review (P&R) mechanisms (e.g., Barrett and Dannenberg, 2016).[1] Second, we relate to the (experimental) literature on the voluntary provision of public goods in presence of heterogeneous players. This literature mostly focuses on heterogeneity regarding endowment levels or individual benefits from public goods, yet less direct evidence exists on the effects of heterogeneous costs. Third, we add to the understanding of the impact of uncertainty for the voluntary provision of public goods.

[1] More generally, our findings on the facilitating role of reviews for providing public goods are consistent with more general observations that social feedback can impact behavior (e.g., Masclet et al., 2003; López-Pérez and Vorsatz, 2010).

By combining these elements, our experiment allows to distinguish the role of (anticipated) feedback on pledge levels and the later compliance with these pledges. Importantly, we investigate if individuals shy away from making promises whose costs they do not know or if they take high costs as an excuse to break the initial promise. We complement treatments where pledges are made in terms of the *quantity* of contributions with a treatment where pledges are made in terms of *costs*. Here, cost uncertainty allows to condition the quantity contribution on the actual cost realization while adhering to the cost pledge.

In fact, both, quantity and cost pledges, can be found in international agreements. In the Paris Agreement, pledges specify emission cuts relative to nationally chosen baselines.[2] Yet, several developing countries state pledges in terms of emission per GDP, thereby linking emission reductions to the actual economic situation. Another example for such links is given in the North Atlantic Treaty Organization (NATO) that specifies contribution targets as percentage shares of GDP.

Our experiment shows that cost uncertainty mainly affects the pledge levels, but not necessarily the actual contribution decisions following the actual costs realization. Without review process, pledges are made conservatively, i.e. are more in line with those made by high cost types under cost certainty. This changes when a review mechanism is introduced: here, pledges tend to be larger and do not differ significantly from those of low cost types under cost certainty. Yet, such increased pledges do not necessarily translate into larger contribution levels: the pledge and contribution review mechanism only increases contributions when all players face the same cost realization. Under cost heterogeneity, the contributions of low cost players only increase marginally. Additionally, we find that contribution decisions are not affected whether initial pledges are made in terms of quantity or costs of contributions.

The remainder of the paper is structured as follows: section 3.2 reviews the related literature, section 4.2 discusses the experimental design and predictions, section 4.3 reports the experimental results, before we provide some concluding discussion.

3.2 Related Literature

We review the related strands of the literature on (i) the role of pledge and review (P&R) mechanisms, (ii) on the voluntary provision of public goods under heterogeneity, and (iii) on the impact of uncertainty contributions to public goods.

Pledge and review mechanism. Experimentally, Barrett and Dannenberg (2016) were

[2] Article 4.4 of the Paris Agreement invites to indicate "economy-wide absolute emission reduction targets".

one of the first to mirror the pledge and review mechanism of the 2015 Paris Agreement in a Public Goods Game (PGG). They find that the reviewing process leads participants to increase their group targets to avoid an uncertain adverse event. Given the ambitious collective goal, high individual pledges followed but did not translate into higher contribution levels. Theoretically, Harstad (2023, 2022) shows the benefits from voluntary and less ambitious pledges within a coalition formation framework as those can incentivize more countries to participate (cf., Finus and Maus, 2008). Based on a simplified version of Harstad (2022)'s model, Lippert and Tremewan (2021) report experimental findings where pledge and review bargaining can increase contributions in settings with and without uncertainty over the value of possible future payoffs, which contrasts the findings of Barrett and Dannenberg (2016). Besancenot and Vranceanu (2021) use a two-person 'pledge and give' game to show the impact of high pledges on the generosity of the partner, but also identify substantial non-compliance as mean contributions fall behind mean pledges. The sole effects of pledges, promises or oaths (without reviews) have been studied extensively and generally indicate an increase in contributions but not necessarily compliance (e.g., Charness and Dufwenberg, 2006; Koessler et al., 2021; Carlsson et al., 2021).

Heterogeneity. Beyond a vast literature on public goods games under homogeneous settings, different types of heterogeneities have been studied experimentally: For instance heterogeneity w.r.t. endowments (e.g., Cherry et al., 2005; Heap et al., 2016; Zelmer, 2003) or marginal per capita returns (MPCR) (e.g., Fischbacher et al., 2014; Gangadharan et al., 2017; Kolstad, 2010; Hauser et al., 2019). Overall, this literature suggests that heterogeneity decreases average contribution and cooperation levels. Typically larger relative contribution shares are reported for low endowment players.

Less evidence is given on heterogeneity of contribution costs that we focus on in this paper. Under certainty, a higher cost of contributing to the public good is equivalent to being able to generate less of a public good with the same amount of money. The impact of heterogeneity regarding productivity has been investigated by Tan (2008), Kölle (2015) and Hauser et al. (2019). Tan (2008) finds that such heterogeneity reduces average contributions due to freeriding by low-productivity agents. When introducing sanctions, the cooperation levels pick up significantly. In contrast, Kölle (2015) finds that cooperation increases when players have different capabilities. Hauser et al. (2019) find within the setting of a two-player PGG that cooperation under productivity inequality depends on likewise existing endowment differences. Cooperation prevails when the productive player also has a higher endowment, but can quickly break down when productivity and endowments are misaligned.

When agents are certain about their cost (or productivity) for contributing to the public good, they can equivalently state their initial pledges and make their contributions as a monetary (cost) or a quantity commitment. This is different when the costs (or pro-

ductivity) is uncertain. If pledges are indicated in costs, a player's commitment leads to a larger quantity contribution if she finally turns out to have low costs, but contributes less when confronted with high costs. In contrast, quantity contribution pledges generate uncertainty regarding the final costs a player faces.

To our knowledge, cost or productivity differences under uncertainty have not been thoroughly investigated in the literature. Motivated by the Paris Agreement, we investigate the role of uncertainty at the time of pledge-making, while we assume uncertainty to be resolved once contribution decisions are to be made. We largely focus on quantity pledges, but additionally compare their performance to cost pledges in one exploratorive treatment under cost heterogeneity.

Uncertainty. The role of risks in the public good settings has been investigated w.r.t. the benefit of a public good (e.g., Levati et al., 2009; Levati and Morone, 2013; Stoddard et al., 2015; Stoddard, 2017; Banerjee and Gravel, 2020; Aksoy and Krasteva, 2020), regarding threshold (e.g., McBride, 2006; Gronberg and Peng, 2014), and regarding group constellation, such as group size (e.g., Mill and Theelen, 2019) and group composition (e.g., De Oliveira et al., 2015). If subjects do not know the exact benefits from contributing to the public good, contributions typically decline (e.g., Dickinson, 1998; Levati et al., 2009). Yet, Levati and Morone (2013) conclude that lower contributions mostly result if the worst possible outcome from contributing, i.e. the lowest benefits, can leave subjects worse-off than in a free-riding equilibrium. Within this literature, the initially uncertain returns from the public good typically accrue to all players, i.e. no heterogeneities result. In contrast, Théroude and Zylbersztejn (2020) allow for individual draws for the returns from the public good which is more in line with individually differing costs of contributions that we consider. Gangadharan and Nemes (2009) study situations in which the return from the public account or the return from the subject's private account is risky. Freundt and Lange (2017) introduce risks in the internal and external components of the *return* from investment. Relatedly, Banerjee and Gravel (2020) test if within-group heterogeneity in returns of the public good affects contributions, both under certainty and uncertainty. Interestingly, the results indicate that heterogeneity seems to matter less when benefits are uncertain as contribution levels drop more strongly under certainty.

3.3 Experimental Design and Predictions

Our experimental treatments vary (i) the cost heterogeneity within the group of four players, (ii) the cost uncertainty at the time when pledges are made, and (iii) the possibility to review others' pledges and contributions. In all treatments, subjects initially make a pledge on their contribution, before playing five rounds of a linear public goods game.

3.3.1 Experimental Treatments and Procedure

Subjects are randomly assigned to groups of four players who interact in a five-round public goods game. The groups are kept constant throughout the game which is communicated to the subjects.

For each round, players receive an endowment e of 36 Laboratory Points (LP). With this endowment, they can contribute up to $q_{max} = 20$ units to the public good. The costs c_i per unit of contributing are either 0.6LP or 1.8LP[3]. Every unit contributed to the public good generates an individual payoff of $h = 0.5$. With this, the payoff within a round is given by

$$\pi_i = e - c_i q_i + h \sum_j q_j \qquad \text{with} \qquad q_i \leq q_{max}.$$

A one-time pledge process (as in Barrett and Dannenberg, 2016)[4] precedes the five contribution rounds: subjects are required to make a one-time pledge p_i which is non-binding yet that states their intended contributions per round. The experiment is implemented in a 2x4 (+1) between-subject design.

The first treatment dimension distinguishes cost homogeneity where all players have identical costs $c_i = c_j \in \{0.6, 1.8\}$) and cost heterogeneity where two players within the group have high ($c_i = 1.8$) and two players have low costs ($c_i = 0.6$)

The second treatment dimensions addresses the information regarding the costs of contributions: under cost certainty, the information about the actual cost realization is given *before* the pledge process. In the cost uncertainty treatments, the actual costs are realized *after* the pledges are given, but before the contribution decisions are made.

The third treatment dimension investigates the role of a review process for pledges and contributions: the review process is implemented following every stage, i.e. the unique pledge stage and the five subsequent contributions rounds. Subjects evaluate their own and their group members' decisions. For the reviewing process we follow Barrett and Dannenberg (2016): every subject reviews all group members and likewise is reviewed by the others in form of a school grade 1-6 (1: very good, 2: good, 3: satisfactory, 4: sufficient, 5: poor, 6: deficient) which corresponds to the German school system. Each subject receives feedback on her own average grade as well as the average grade of all other group members. Here, the average grade of a subject is calculated as the mean of

[3]The pledge and contribution limit $q_i, p_i \leq 20$ guarantees that all subjects, independently of their cost types, can always comply with their pledge. That is, even fulfilling the maximal pledge of 20 is feasible as $c_i p_i \leq 1.8 p_i \leq 36$.

[4]Yet the difference to the design of the pledge mechanism of Barrett and Dannenberg (2016) is that in our setting, there is no group pledge that is being determined jointly before subjects submit individual pledges.

the evaluation by the three other group members, i.e. excluding her own evaluation.

Table 3.1 summarizes our labeling of the respective treatments. In T1A 'Cost Homogeneity & Cost Certainty', all subjects have identical and known costs, while T2A refers to 'Cost Heterogeneity & Cost Certainty'. Treatments T3A ('Cost Homogeneity & Cost Uncertainty') and T4A ('Cost Heterogeneity & Cost Uncertainty') introduce cost uncertainty. The labels T1B, T2B, T3B, T4B refer to the corresponding treatments in presence of the review process. A last treatment, T4C, is analogous to treatment T4B, 'Cost-heterogeneity & Cost-uncertainty' but differs in the dimension of pledge and contribution decisions: subjects report their pledges and contributions in terms of their contribution costs instead of their contribution quantities.

Figure 3.1 illustrates the temporal stages of the respective treatments.

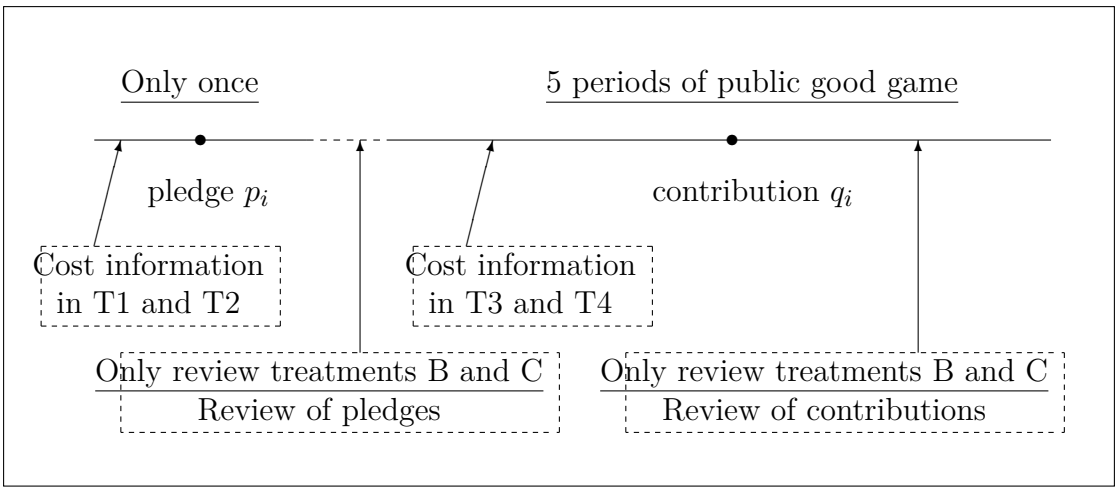


Figure 3.1 Stages of decision-making in the respective treatments.

After concluding the public goods game, subjects completed a short questionnaire to collect data on demographic variables (age, gender, education) and social preference questions (risk aversion, importance of promise keeping of own and others).

	No review	Pledge & contribution review	Pledge & cost review
Cost Homogeneity & Cost Certainty	T1A	T1B	
Cost Heterogeneity & Cost Certainty	T2A	T2B	
Cost Homogeneity & Cost Uncertainty	T3A	T3B	
Cost Heterogeneity & Cost Uncertainty	T4A	T4B	T4C

Table 3.1 Labeling of experimental treatments

3.3.2 Experimental Procedures

The experiment was conducted as an online lab experiment at the WiSo Forschungslabor at University of Hamburg from February to March 2022.[5] Participants were invited via hroot (Bock et al., 2014) and the experimental software used was oTree (Chen et al., 2016). In total, 780 students from all departments of the University of Hamburg participated in one of the 9 sessions and were randomly assigned to groups of four players. To avoid a possible selection bias in terms of time and day preferences among the participants, sessions were conducted on different days and times and all treatments were played in each session. Laboratory Points (LP) are converted into Euro at an exchange rate of 1LP=0.20. One round was randomly chosen for payment and on average students received a payoff of 9.37. The experimental sessions lasted on average 25 minutes. The experiment was originally conducted in German. An English translation of the instructions can be found in Appendix 5.7.5. The instructions include several payout examples as well as control questions to ensure the understanding of the game and the different possible strategies.

3.3.3 Predictions

A large amount of literature suggests that people do not behave fully rational and do contribute in public good scenarios (e.g., Zelmer, 2003). Evidence shows that people do give positive amounts which can be a consequence of different behavioral motivations, such as reputational concerns (e.g., Masclet et al., 2003), altruism (e.g., Rabin, 1993) or the aim for conditional cooperation (e.g., Chaudhuri, 2011).

Following the literature, we expect that cost heterogeneity (similar as benefit heterogeneity) may hamper contribution levels. High-cost players are expected to contribute less than low-cost players. We expect that this is already reflected in the pledge levels under cost-certainty, i.e. when players know their exact costs from the very beginning.

Hypothesis 1: Cost-heterogeneity induces lower contribution levels and pledge levels.

Cost uncertainty is only present at the time of pledge-making. That is, at the time of contribution decisions, subjects know their costs such that differences between certainty and uncertainty treatments no longer exist (T1 vs. T3, T2 vs. T4). As such, any differences in contribution decisions between certainty and uncertainty treatments necessarily relate to the initial pledge-making stage and are evidence of pledges not only being cheap talk.

[5]The experiment was preregistered on 5th of November 2021 at the AEA RCT Registry with the unique identifying number AEARCTR-0008481; Koch, Juliane and Andreas Lange. 2022. "Non-compliance and the voluntary provision of public goods: the role of cost uncertainty and heterogeneity." (AEA RCT Registry); `https://doi.org/10.1257/rct.8481` and got the ethical approval of the Faculty of Business, Economics and Social Sciences of the University of Hamburg on 12th of November 2021.

Under uncertainty, all subjects are confronted with the possibility of turning out as a high-cost type. We thus expect to find overall lower pledge levels compared to the control treatment where costs are certain. If they care about compliance, the pledges under uncertainty can be expected to be closer to the pledges of high cost types under certainty. However, when entering the contribution phase no more cost uncertainty prevails, i.e. all groups learned their homogeneous cost types. We test if the hypothesized lower pledge level also translate into lower contribution levels for players who turn out as high-cost types.

Hypothesis 2: Cost-uncertainty reduces pledge levels and can lead to lower contribution levels of high-cost types.

The review mechanism can be understood as a form of social sanction. If players care about their reputation (as reflected in the grades assigned by their fellow group members), the pledge review mechanism might lead to more ambitious pledges and contribution levels. Yet, this might be countered if subjects fear that their contribution levels are assessed against their initial pledges, i.e. that grading partly is based on compliance levels. This latter effect can particularly expected under cost certainty, i.e. when players know their costs already at the time of pledge making. Under cost uncertainty, lacking compliance for high cost players may be less problematic as they have an "excuse" for not fulfilling their pledge. We thus expect the pledges under cost uncertainty and pledge and contribution review (T3B, T4B) to be larger than under cost certainty (T1B, T2B) and without the review mechanism (T3A, T4A). Again, it is an open question to what extent potential changes to pledge levels lead to different contribution decisions.

Hypothesis 3: A review process incentivizes larger pledges, particularly under cost uncertainty, and can also lead to larger overall contribution levels.

The logic of high cost draws allowing an "excuse" to not comply are not present when the pledges are made in terms of cost contributions (T4C) instead of quantity contributions (T4B). With the exploratory cost pledge treatment, we thus expect cost pledges to lead to larger compliance levels and possibly larger contributions levels.

Hypothesis 4: In comparison to a contribution pledge, cost pledges lead to larger compliance levels under costs uncertainty and heterogeneity.

3.4 Results

We report the results by first discussing the treatments under certainty, before turning to the effects of uncertainty on pledges and contributions. Finally, the role of the review

mechanism is explored. A summary statistics for pledges, contributions across all five periods, and payoffs across all treatments is given in Table 3.2. Table 3.3 reports the frequency of pledges and contributions in period 1 being at the minimal (at 0) or the maximal level (at 20).

Effects of cost levels. For both the homogeneous (T1A) and heterogeneous treatments (T2A), we observe that low cost types pledge significantly more than high cost types (14.66 vs. 10.88 in T1A, p=0.002 MWU; 15.07 vs. 11.67 in T2A, p=0.0274 MWU). This difference is also reflected in the contribution levels. Averaged across all five periods, low cost types in T1A (T2A) contribute 14.43 (12.26), while high cost types contribute 8.44 (5.76). With this, the low cost types contribute significantly more than the high cost types (p=0.002 in T1A, p=0.001 in T2A).

This also is reflected in significantly different compliance levels: in the homogeneous cost treatments, low cost types largely comply with their pledges, while the compliance of high cost types is significantly lower (p=0.086). Under cost heterogeneity, non-compliance is again larger for high-cost types (p=0.057).

Despite the lower contributions, the implicit costs born by high cost types are significantly larger than the costs for low cost types. In the heterogeneous treatment, this directly leads to different payoffs between high-cost and low-cost types, that is inequality within groups (43.65 vs. 46.66, p=0.057).

While we observe differences between high and low cost types, pledges and contribution levels for both respective types do not significantly differ between treatments, i.e. the effect of heterogeneity under cost certainty appears to be limited.

Effect of cost uncertainty. These highly significant differences between low and high cost types are taken as a prerequisite for our investigations into the role of uncertainty. When costs are uncertain at the time of pledge making, the pledges (12.42 in T3A, 11.20 in T4A) do not significantly differ from those made by high cost types make under cost certainty. They are significantly smaller than the pledges by low-cost types under cost certainty (p=0.017 T3A vs. T1A; p=0.020 for T4A vs. T2A). That is, pledges under cost uncertainty are rather conservative as players may anticipate that they will not contribute according to the pledged amounts in case their costs turn out to be high.

Turning to the contribution decisions, we observe that the contributions under cost homogeneity in T3A are not significantly different and only slightly smaller than those under cost certainty in T1A. If low costs materialize, subjects largely comply with their pledges (contributions vs. pledges, p=0.52, Wilcoxon signed-rank test) , while high cost draws again lead to significantly smaller contributions than promised (p=0.0005).

Under cost heterogeneity in T4A, high cost types contribute significantly more than the high cost types in T2A (p=0.024), even though their pledged amounts are very similar. In fact, contributions levels in T4A do not differ between high and low cost types and are only insignificantly smaller than the initially pledged levels. The payoff differences between cost types are correspondingly further strengthened with low cost types earning more in T4A than in T2A (50.17 vs. 46.66, not significant, though) and high cost types earning less (40.21 vs. 43.65, p=0.061).

Summarizing these effects, cost uncertainty not only affects pledges, but can also lead to changing contributions. Yet, after the resolution of uncertainty no difference exists between certainty and uncertainty treatments at the contribution stage. That is, cost certainty allows for significantly different pledges and contributions between cost types, while the initial costs uncertainty at the pledge making stages induces not only pledges, but also contribution levels to not differ between cost types.

Result 1 *Pledges under cost uncertainty are similar to those made by high cost types under cost certainty. The initial cost uncertainty can lead to different contribution decisions even after the resolution of cost uncertainty.*

Result 1 indicates that subjects may indeed take pledges into account at the time their contribution decisions are made. If otherwise, we would not expect any differences in contribution decisions *after* resolution of uncertainty. Yet, the disutility that agents may receive interacts with strategic uncertainty regarding others' contributions and may be less prominent, e.g. if other players also non-comply (as in T3A after receiving a high cost draw).

Effect of pledge and contribution review. We now turn to discussing the role of pledge and contribution reviews. For this, we compare the respective B treatments with the corresponding A treatments. For treatments under cost certainty, we do not observe significant changes to pledge making for the respective cost types. Under cost uncertainty, pledges tend to increase, but the effect is only significant under cost homogeneity (14.25 in T3B vs. 12.42 in T3A, p=0.018). As a consequence, pledges under uncertainty move closer to (and are no longer significantly different from) the pledges made by low cost types under certainty than without the pledge review. In fact, they are significantly different in T3B from the pledges by high cost types in T1B (14.25 vs. 12.32, p=0.081). The pledge review thus appears to motivate subjects to submit larger pledges, likely to obtain good grades.

Regarding the contributions, the pledge and contribution review does not change contributions in T1, i.e. under cost certainty and homogeneity. Under cost heterogeneity, high types contribute more in T2B than in T2A (p=0.002), leading to gains in average group contributions (T21B vs. T2A, p=0.026), and increased inequality as the payoffs of low

cost types increase (51.76 T21B vs. 46.66 T2A, p=0.006), while the payoff of high cost types insignificantly declines (40.80 vs. 43.65, p=0.229).

Under cost homogeneity and uncertainty, the pledge and contribution review increases contributions under both cost realizations (T3B vs. T3A: p=0.006 for low cost types, p=0.011 for high cost types). Consequently, the review mechanisms leads to payoff gains (p=0.056 under both cost realizations).

Under cost heterogeneity and initial cost uncertainty, the review mechanisms does not lead to significant changes in contributions or payoffs.

Overall we thus obtain a mixed picture: the review mechanism is only partly effective in increasing contributions. Benefits particularly materialize under cost uncertainty when subjects know that they all face identical costs. Yet, when costs are heterogeneous and initially uncertain, no significant changes to pledges, contributions or payoffs accrue.

Result 2 *Pledge and contribution review mechanisms do not necessarily increase pledges and contributions. Benefits arise particularly under cost uncertainty and homogeneity where both pledges and final contributions under both cost realizations are increased.*

Effect of the pledge dimension. For the potentially most realistic scenario where costs are uncertain and may differ between players, the pledge and contribution review mechanism does not change decisions. Here, low cost types on average contribute more than pledged, i.e. comply with their pledges, while high cost types contribute less and thus fail to comply. That is, they realize that contributing at a level of the initial pledge is too costly and they thus reduce their contributions. We initially had hypothesized that anticipating this behavior may lower the initial pledges. If this is the case, we would assume that changing the dimension of the pledge from a quantity to a cost pledge may be beneficial. We thus finally compare decisions in treatment T4B and T4C. We observe no difference in the contribution decisions (11.87 vs. 12.62, p=0.624, across all types; 14.05 vs. 15.31, p=0.458 for low cost types; 9.70 vs. 9.93, p=0.902 for high cost types). Thus, the initially different pledge dimension does not improve cooperation decisions.

Result 3 *Contribution and payoff levels following initial cost uncertainty are not affected by the dimension in which the initial pledge is made, i.e. if in terms of contribution quantity or contribution costs.*

3.4.1 Determinants of Grades

The functionality of the pledge and review mechanism depends on subjects potentially caring about the grades that are assigned to their decisions. We now consider the grade

reviews given to the individual pledge and contribution decisions.

Table 3.5 reports the results of linear regressions of the average grade given to a subject based on the pledge she made. As expected, a larger pledge leads to a better grade, i.e. a lower assigned number. This effect is present in all treatments. In treatments T1A and T2A, no significant difference is made between assigning grades to low or high cost types after conditioning on the pledge level.

Turning to the grades assigned on contributions, Table 3.6 provides the results of individual random effects models for the grade given to the contribution decisions (as measured in quantities). The corresponding regression controlling for the implicit contribution costs rather than the quantity is reported in Table 3.7. Figure 3.2 additionally illustrates the average grades given to the high and low cost types in the respective treatments T1B-T4B.

We observe that higher contribution levels generate better grades. Under homogeneity (T1B, T3B), grades given under high cost are better than under low cost realizations when controlling for the contribution level. Importantly, and perhaps surprisingly, this effect does not carry over to the heterogeneous cost treatments. In both T2B and T4B, high cost types do not receive better grades than low cost types when conditioning on their contribution decision. That is, players do not appear to condition their grading on the implicit cost commitment by the players, but rather only focus on the quantity. This is different in T4C where pledges and contribution decisions are made in terms of costs such that the costs are much more salient.

When translated into quantity equivalents as in Table 3.6, high cost players now receive significantly better grades than low cost players who contribute the same quantity. Focusing on pledges and contribution decisions in terms of costs in T4C thus gives high cost types better grades even if it did not affect their contribution decisions (see Result 3).

Yet, Table 3.7 reveals that despite the salience of the cost of contributing in T4C, high cost types receive worse grades than low cost players with similar contribution costs. This effect is also present in all other treatments. This suggests that grading does not appreciate the costs of contributing, but might be more focused on comparing the quantity contribution, i.e. reflects the benefits that the evaluator receives through the contribution decision.

Table 3.6 also reveals another interesting determinant of the grades in the homogeneous treatments T1B and T3B as well as in T2B where subjects know about their (heterogeneous) costs at the time they make the pledge: the grade a player is given is negatively affected by the pledge level, that is – when controlling for the contribution level – a player pledged more and thus is less in compliance with the initial pledge receives a worse grade. We formulate the following result:

Result 4 *Larger contribution levels improve the grade received in the review process. Under cost heterogeneity, no difference is made between high and low cost types when assigning grades on contribution quantities. Larger pledge levels improve the grades received on pledges but may backfire in the contribution review process as larger pledges at the same contribution level imply less compliance.*

Thus, the results suggest that when costs are heterogeneous but certain, it is rather the high-cost players who are incentivized by the review mechanism to increase contribution levels if they care about the received grades. While contributions are relatively costly for them, high-cost types increase their contribution levels significantly relative to the treatment without the review process, perhaps in order to avoid even worse grades.

When costs are uncertain at the pledge-making stage, players cannot condition their pledge on the costs. Turning out as high-cost type, may thus serve as a credible excuse for non-compliance. In contrast, those who turn out to have low costs have no such excuse. Yet, the grading process does not appear to reflect on the different cost structure of subjects and only focuses on the quantity contribution level. Still, players may retain their self-image for being in non-compliance such that adding the review process does not increase contributions relative to the corresponding treatments without review.

3.5 Conclusions

This paper provides experimental evidence on the role of cost uncertainty for the voluntary provision of public goods. Motivated by the pledge and review mechanisms of the Paris Agreement, we explored the impact of reviewing mechanisms for both pledges and contribution decisions.

Even without a review process, we find that initial cost uncertainty does not only affect the pledges, but can also spill over to different contribution decisions *after* the uncertainty is resolved. The conditions under which pledges are thus important for later decisions as they affect compliance levels.

Reviewing mechanisms are widely thought to enhance cooperation levels. We are first to consider the role of reviews after initial cost uncertainty. While conservative pledges are chosen when subjects do not know the costs of contribution without being exposed to a review, the introduction of a review mechanism significantly lifts the ambitiousness of pledges, even under cost uncertainty. Yet, complying with the initial pledge is relatively costly after eventually facing high contribution costs, such that one can expect that the contribution review might be important to generate compliance. Yet, we find that the

review process improves cooperation levels following initial cost uncertainty only if agents face homogeneous costs, but not when both high and low cost types interact. Here, high cost types are only "punished" through bad reviews that are primarily based on their (lower) contribution levels and do not take into account that they face significantly larger costs for their contributions. Making these costs more salient by basing the reviews on the pledges and contributions in the cost rather than the quantity dimension, does not change contribution decisions but affects the way grades are assigned to high and low cost types: high costs types receive better grades when controlling for their quantity contribution as grading focuses more on the (high) costs of contributing.

We can thus expect that contribution decisions might be more impacted if non-compliance triggers more severe consequences (than merely worse grades). We leave these explorations of interaction between pledges under cost uncertainty and subsequent contribution decisions to further research.

Bibliography

Aksoy, B. and Krasteva, S. (2020). When does less information translate into more giving to public goods? *Experimental Economics*, 23:1–30.

Aldy, J. E. (2014). The crucial role of policy surveillance in international climate policy. *Climatic Change*, 126(3):279–292.

Banerjee, A. and Gravel, N. (2020). Contribution to a public good under subjective uncertainty. *Journal of Public Economic Theory*, 22(3):473–500.

Barrett, S. and Dannenberg, A. (2016). An experimental investigation into 'Pledge and review' in climate negotiations. *Climatic Change*, 138(1):339–351.

Besancenot, D. and Vranceanu, R. (2021). The generosity spillover effect of pledges in a two-person giving game. *Journal of Behavioral and Experimental Economics*, 90:101630.

Bock, O., Baetge, I., and Nicklisch, A. (2014). Hroot: Hamburg registration and organization online tool. *European Economic Review*, 71:117–120.

Bodansky, D. (2016). The legal character of the Paris Agreement. *Review of European, Comparative & International Environmental Law*, 25(2):142–150.

Carlsson, F., Ek, C., and Lange, A. (2021). All it takes is one: The effect of weakest-link and summation aggregation on public good provision under threshold uncertainty.

Charness, G. and Dufwenberg, M. (2006). Promises and partnership. *Econometrica : journal of the Econometric Society*, 74(6):1579–1601.

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

Chen, D. L., Schonger, M., and Wickens, C. (2016). oTree - An open-source platform for laboratory, online, and field experiments. *Journal of Behavioral and Experimental Finance*, 9:88–97.

Cherry, T. L., Kroll, S., and Shogren, J. F. (2005). The impact of endowment heterogeneity and origin on public good contributions: Evidence from the lab. *Journal of Economic Behavior & Organization*, 57(3):357–365.

De Oliveira, A. C., Croson, R. T., and Eckel, C. (2015). One bad apple? Heterogeneity and information in public good provision. *Experimental Economics*, 18(1):116–135.

Dickinson, D. (1998). The voluntary contributions mechanism with uncertain group payoffs. *Journal of Economic Behavior & Organization*, 35:517–533.

Finus, M. and Maus, S. (2008). Modesty may pay! *Journal of Public Economic Theory*, 10(5):801–826.

Fischbacher, U., Schudy, S., and Teyssier, S. (2014). Heterogeneous reactions to heterogeneity in returns from public goods. *Social Choice and Welfare*, 43(1):195–217.

Freundt, J. and Lange, A. (2017). On the determinants of giving under risk. *Journal of Economic Behavior & Organization*, 142:24–31.

Gangadharan, L. and Nemes, V. (2009). Experimental analysis of risk and uncertainty in provisioning private and public goods. *Economic Inquiry*, 47(1):146–164.

Gangadharan, L., Nikiforakis, N., and Villeval, M. C. (2017). Normative conflict and the limits of self-governance in heterogeneous populations. *European Economic Review*, 100:143–156.

Gronberg, T. J. and Peng, H.-C. (2014). Changes in the threshold uncertainty in a simultaneous subscription game. *Theoretical Economics Letters*, 2014.

Harstad, B. (2022). A theory of pledge-and-review bargaining. *Journal of Economic Theory*, page 105574.

Harstad, B. (2023). Pledge-and-review bargaining: From kyoto to paris. *The Economic Journal*, 133(651):1181–1216.

Hauser, O. P., Hilbe, C., Chatterjee, K., and Nowak, M. A. (2019). Social dilemmas among unequals. *Nature*, 572(7770):524–527.

Heap, S. P. H., Ramalingam, A., and Stoddard, B. V. (2016). Endowment inequality in public goods games: A re-examination. *Economics Letters*, 146:4–7.

Koessler, A.-K., Page, L., and Dulleck, U. (2021). Public cooperation statements. *Journal of Economic Interaction and Coordination*, 16:747–767.

Kölle, F. (2015). Heterogeneity and cooperation: The role of capability and valuation on public goods provision. *Journal of Economic Behavior & Organization*, 109:120–134.

Kolstad, C. D. (2010). Equity, heterogeneity and international environmental agreements. *The BE Journal of Economic Analysis & Policy*, 10(2).

Levati, M. V. and Morone, A. (2013). Voluntary contributions with risky and uncertain marginal returns: The importance of the parameter values. *Journal of Public Economic Theory*, 15(5):736–744.

Levati, M. V., Morone, A., and Fiore, A. (2009). Voluntary contributions with imperfect information: An experimental study. *Public Choice*, 138(1-2):199–216.

Lippert, S. and Tremewan, J. (2021). Pledge-and-review in the laboratory. *Games and Economic Behavior*, 130:179–195.

López-Pérez, R. and Vorsatz, M. (2010). On approval and disapproval: Theory and experiments. *Journal of Economic Psychology*, 31(4):527–541.

Masclet, D., Noussair, C., Tucker, S., and Villeval, M.-C. (2003). Monetary and non-monetary punishment in the voluntary contributions mechanism. *American Economic Review*, 93(1):366–380.

McBride, M. (2006). Discrete public goods under threshold uncertainty. *Journal of Public Economics*, 90(6-7):1181–1199.

Mill, W. and Theelen, M. M. (2019). Social value orientation and group size uncertainty in public good dilemmas. *Journal of Behavioral and Experimental Economics*, 81:19–38.

Rabin, M. (1993). Incorporating fairness into game theory and economics. *The American Economic Review*, pages 1281–1302.

Stoddard, B. (2017). Risk in payoff-equivalent appropriation and provision games. *Journal of Behavioral and Experimental Economics*, 69:78–82.

Stoddard, B. V. et al. (2015). Probabilistic production of a public good. *Economics Bulletin*, 35(1):37–52.

Tan, F. (2008). Punishment in a linear public good game with productivity heterogeneity. *De Economist*, 156(3):269–293.

Théroude, V. and Zylbersztejn, A. (2020). Cooperation in a risky world. *Journal of Public Economic Theory*, 22(2):388–407.

Zelmer, J. (2003). Linear public goods experiments: A meta-analysis. *Experimental Economics*, 6(3):299–310.

3.6 Appendix

3.6.1 Tables and Figures

	Pledge	Contribution	Payoff	n (N)*
A Groups				
Cost Homogeneity & Cost Certainty (T1A)				
All	12.89 (6.55)	11.64 (5.41)	47.57 (10.42)	120 (30)
Low cost	14.66 (6.00)	14.43 (4.42)	56.21 (6.19)	64 (16)
High cost	10.88 (6.65)	8.44 (4.69)	37.69 (0.94)	56 (14)
Cost Heterogeneity & Cost Certainty (T2A)				
All	13.37 (6.25)	9.01 (3.63)	45.16 (3.84)	60 (15)
Low cost	15.07 (6.24)	12.26 (5.22)	46.66 (4.31)	30 (15)
High cost	11.67 (5.89)	5.76 (2.59)	43.65 (4.07)	30 (15)
Cost Homogeneity &Cost Uncertainty (T3A)				
All	12.42 (5.84)	10.28 (5.30)	46.26 (9.45)	120 (30)
Low cost	12.95 (5.59)	12.82 (4.32)	53.95 (6.04)	64 (16)
High cost	11.80 (6.04)	7.38 (4.91)	37.48 (0.98)	56 (14)
Cost Heterogeneity & Cost Uncertainty (T4A)				
All	12.15 (5.85)	10.62 (4.65)	45.19 (4.13)	60 (15)
Low cost	13.1 (5.41)	11.78 (5.45)	50.17 (6.48)	30 (15)
High cost	11.2 (6.05)	9.46 (4.90)	40.21 (4.33)	30 (15)
B Groups				
Cost Homogeneity & Cost Certainty (T1B)				
All	13.59 (6.19)	12.83 (4.54)	47.77 (10.04)	120 (30)
Low cost	14.70 (5.62)	14.38 (4.19)	56.13 (5.81)	64 (16)
High cost	12.32 (6.60)	11.06 (4.41)	38.21 (0.88)	56 (14)
Cost Heterogeneity & Cost Certainty (T2B)				
All	12.88 (6.49)	11.84 (2.81)	46.28 (3.29)	60 (15)
Low cost	14.67 (6.39)	13.19 (4.83)	51.76 (4.29)	30 (15)
High cost	11.1 (6.19)	10.49 (4.36)	40.80 (6.64)	30 (15)
Cost Homogeneity & Cost Uncertainty (T3B)				
All	14.25 (5.00)	13.66 (5.01)	48.97 (11.04)	120 (30)
Low cost	13.61 (5.12)	16.00 (4.02)	58.40 (5.62)	64 (16)
High cost	14.98 (4.72)	10.98 (4.79)	38.20 (0.96)	56 (14)
Cost Heterogeneity & Cost Uncertainty (T4B)				
All	13.1 (5.24)	11.87 (3.19)	46.80 (2.77)	60 (15)
Low cost	12.63 (4.84)	14.05 (3.37)	51.32 (4.53)	30 (15)
High cost	13.57 (5.52)	9.70 (3.53)	42.29 (3.04)	30 (15)
*C Groups***				
Cost Heterogeneity & Cost Uncertainty (T4C)				
All	14.33 (5.89)	12.62 (4.84)	47.71 (4.29)	60 (15)
Low cost	12.79 (6.75)	15.31 (5.74)	52.05 (7.04)	30 (15)
High cost	15.88 (4.29)	9.93 (5.78)	43.37 (5.71)	30 (15)

* First number gives the number of subjects n in the respective treatments, the number in brackets gives the number of independent (group level) observations N which are used to calculate the standard deviations for contributions and payoffs reported in the table. Pledges are independent across subjects such that std is reported based on n

** Pledges and Mean Contributions are recalculated into quantity units to make them comparable.

Table 3.2 Summary statistics on pledges, contributions, and payoff ($N = 780$)

	Pledge		**Contribution in period 1**		
	Pledge=0	Pledge=20	Average	Contr=0	Contr=20
A Groups					
Cost Homogeneity & Cost Certainty (T1A)					
All	0.05 (0.22)	0.37 (0.48)	12.03 (6.87)	0.11 (0.31)	0.32 (0.47)
Low cost	0.02 (0.13)	0.48 (0.50)	14.00 (6.60)	0.08 (0.27)	0.44 (0.50)
High cost	0.09 (0.29)	0.23 (0.43)	9.79 (6.51)	0.14 (0.35)	0.18 (0.39)
Cost Heterogeneity & Cost Certainty (T2A)					
All	0.05 (0.22)	0.37 (0.49)	10.78 (6.77)	0.13 (0.34)	0.22 (0.42)
Low cost	0.07 (0.25)	0.47 (0.51)	14.93 (5.34)	0.03 (0.18)	0.40 (0.50)
High cost	0.03 (0.18)	0.27 (0.45)	6.63 (5.39)	0.23 (0.43)	0.03 (0.18)
Cost Homogeneity &Cost Uncertainty (T3A)					
All	0.03 (0.18)	0.26 (0.44)	10.39 (6.33)	0.10 (0.30)	0.17 (0.38)
Low cost	0.02 (0.13)	0.28 (0.45)	12.44 (6.06)	0.05 (0.21)	0.25 (0.44)
High cost	0.05 (0.23)	0.23 (0.43)	8.05 (5.84)	0.16 (0.37)	0.09 (0.29)
Cost Heterogeneity & Cost Uncertainty (T4A)					
All	0.02 (0.13)	0.23 (0.43)	10.63 (5.85)	0.07 (0.25)	0.12 (0.32)
Low cost	0 (0.00)	0.30 (0.47)	12.57 (5.46)	0 (0.00)	0.23 (0.43)
High cost	0.03 (0.18)	0.17 (0.38)	8.70 (5.66)	0.13 (0.35)	0 (0.00)
B Groups					
Cost Homogeneity & Cost Certainty (T1B)					
All	0.03 (0.18)	0.38 (0.49)	13.01 (6.31)	0.06 (0.24)	0.30 (0.46)
Low cost	0.02 (0.13)	0.44 (0.50)	14.77 (5.81)	0.03 (0.18)	0.41 (0.50)
High cost	0.05 (0.23)	0.30 (0.46)	11.00 (6.32)	0.09 (0.29)	0.18 (0.39)
Cost Heterogeneity & Cost Certainty (T2B)					
All	0.05 (0.22)	0.30 (0.46)	12.65 (6.60)	0.07(0.25)	0.28 (0.45)
Low cost	0.07 (0.25)	0.40 (0.50)	14.90 (6.40)	0.07 (0.25)	0.43 (0.50)
High cost	0.03 (0.18)	0.20 (0.41)	10.40 (6.09)	0.07 (0.25)	0.13 (0.35)
Cost Homogeneity & Cost Uncertainty (T3B)					
All	0 (0.00)	0.33 (0.47)	13.88 (6.12)	0.07 (0.25)	0.35 (0.48)
Low cost	0 (0.00)	0.28 (0.45)	15.30 (5.14)	0.02 (0.13)	0.41 (0.50)
High cost	0 (0.00)	0.39 (0.49)	12.27 (6.76)	0.13 (0.33)	0.29 (0.46)
Cost Heterogeneity & Cost Uncertainty (T4B)					
All	0 (0.00)	0.22 (0.42)	12.52 (6.17)	0.05 (0.22)	0.27 (0.45)
Low cost	0 (0.00)	0.17 (0.38)	14.70 (5.12)	0 (0.00)	0.33 (0.48)
High cost	0 (0.00)	0.27 (0.45)	10.33 (6.42)	0.10 (0.31)	0.20 (0.41)
*C Groups***					
Cost Heterogeneity & Cost Uncertainty (T4C)					
All	0.05 (0.22)	0.30 (0.46)	13.72 (7.50)	0.13 (0.34)	0.48 (0.50)
Low cost	0.07 (0.25)	0.27 (0.45)	16.67 (6.55)	0.10 (0.31)	0.73 (0.45)
High cost	0.03 (0.18)	0.33 (0.48)	10.78 (7.33)	0.17 (0.38)	0.23 (0.43)

** Pledges and Mean Contributions are recalculated into quantity units to make them comparable.

Table 3.3 Summary statistics on pledges (percentage pledging at level 0 or 20) and contributions (average and percentage contributing 0 or 20) in period 1.

	Pledge	**Contribution** (q_i)	**Costs** ($c_i q_i$)	**Payoff** (π_i)
High cost type	-3.78***	-6.00***	6.52***	-18.52***
	(1.14)	(1.63)	(2.30)	(1.54)
T2A	0.41	-2.17	-1.30	-9.54***
	(1.38)	(1.71)	(1.02)	(1.87)
High cost type # T2A	0.38	-0.50	-3.51	15.51***
	(1.97)	(1.91)	(2.45)	(1.76)
Constant	14.66***	14.43***	8.66***	56.21***
	(0.78)	(1.08)	(0.65)	(1.52)
Observations	180	900	900	900
Number of id_unique		180	180	180

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.4 Certainty treatments without review (T1A, T2A). Linear regression on pledge level, regression with individual random effects (5 periods) on contributions, costs, and payoff (clustered standard errors at group level).

	T1B grade of pledge	T2B grade of pledge	T3B grade of pledge	T4B grade of pledge	T4C grade of pledge
pledge (quantity)	-0.18***	-0.17***	-0.19***	-0.16***	-0.19***
	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)
High cost type	-0.21	-0.26			
	(0.23)	(0.26)			
Constant	4.95***	5.08***	5.10***	4.51***	5.42***
	(0.33)	(0.35)	(0.25)	(0.52)	(0.33)
Observations	120	60	120	60	60
R-squared	0.61	0.60	0.68	0.54	0.65

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.5 Grading of (quantity) pledges in treatments T1B, T2B, T3B, T4B, T4C. Linear regressions (OLS) with (clustered standard errors at group level).

	T1B grade	T2B grade	T3B grade	T4B grade	T4C grade
pledge (quantity)	0.03**	0.03**	0.05***	0.02	0.00
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
contribution (quantity)	-0.21***	-0.22***	-0.22***	-0.19***	-0.21***
	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)
High cost type	-0.31*	-0.08	-0.40**	0.02	-0.74***
	(0.18)	(0.29)	(0.20)	(0.16)	(0.25)
Constant	4.92***	5.14***	4.90***	4.72***	5.67***
	(0.27)	(0.37)	(0.25)	(0.46)	(0.52)
Observations	600	300	600	300	300
Number of id_unique	120	60	120	60	60

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

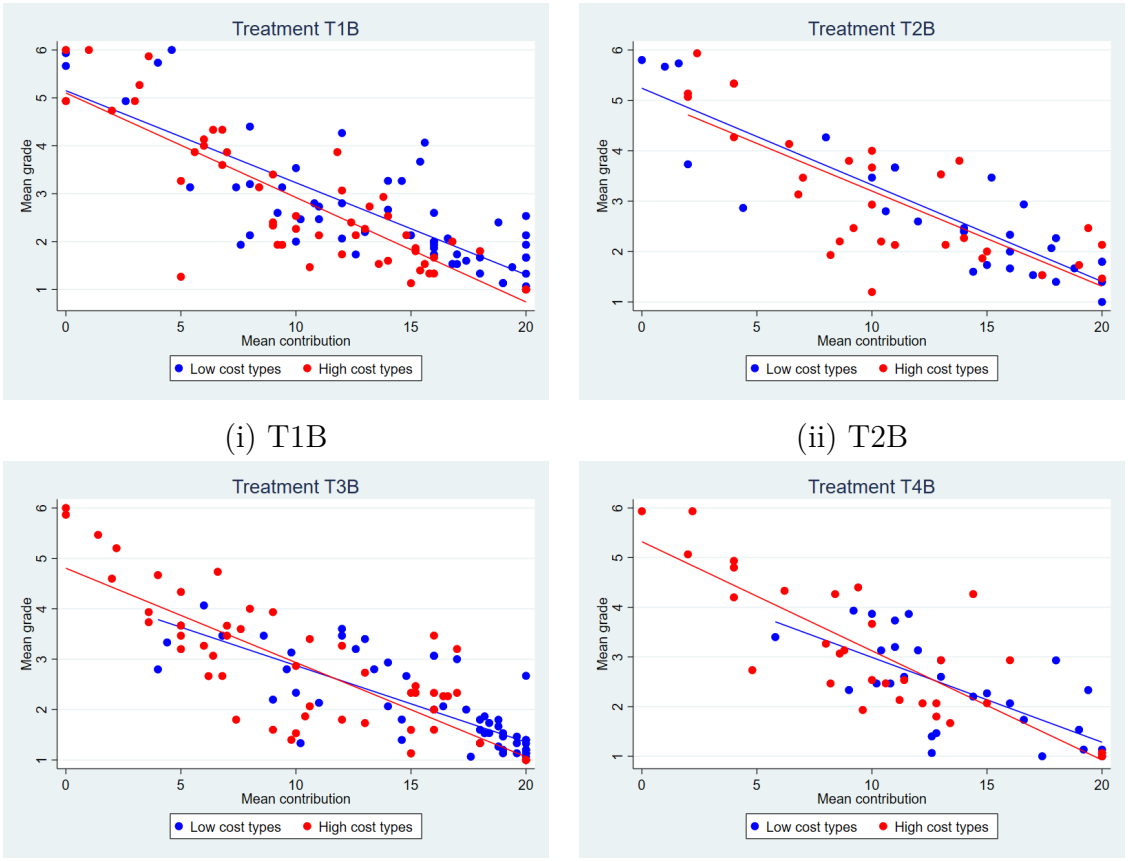
Table 3.6 Grading of quantity contributions in treatments T1B, T2B, T3B, T4B, T4C. Regressions with individual random effects (5 periods) (clustered standard errors at group level).

VARIABLES	T1B grade	T2B grade	T3B grade	T4B grade	T4C grade
pledge (quantity)	0.02	0.01	0.02	0.00	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)
contribution (cost)	-0.15***	-0.16***	-0.14***	-0.12***	-0.14***
	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)
High cost type	2.00***	2.13***	2.20***	2.00***	1.65***
	(0.24)	(0.28)	(0.26)	(0.28)	(0.41)
Constant	3.38***	3.83***	3.04***	3.31***	3.98***
	(0.28)	(0.42)	(0.25)	(0.35)	(0.45)
Observations	600	300	600	300	300
Number of id_unique	120	60	120	60	60

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.7 Grading of cost contributions in treatments T1B, T2B, T3B, T4B, T4C. Regressions with individual random effects (5 periods) (clustered standard errors at group level).



(i) T1B (ii) T2B

(iii) T3B (iv) T4B

Figure 3.2 Mean grades given to players as a function of mean contributions across all five periods, treatments T1B-T4B

3.6.2 Experimental Instructions

On the next pages, we include the instructions for a subject who is randomly assigned to the *4B* treatment. As this study features different treatment dimensions, firstly, whether or not players are evaluated (A vs. B) and secondly, whether costs are heterogeneous and at which time of the experiment they get to be known - after showing the instructions of treatment 4B - we will display the timeline for all treatments for a better understanding in the following order: T1A, T1B, T2A, T2B, T3A, T3B, T4A, T4B, T4C. Note that the survey is identical for all treatments.

Importantly, one interactive design feature requires further explanation: on the 'Promise' and 'Contribution' pages, participants can enter a value for which in the box on the lower right hand side of the screens, it is automatically calculated what a certain contribution would mean for the group contribution and thus to each player of the group and which costs such contribution would imply for the participant. This interactive feedback before submitting the final pledge and contribution decision intends to facilitate the understanding of the calculation of a certain contribution for the overall public good outcome as well as for costs.

Welcome to the WiSo experimental laboratory of the University of Hamburg!

Please read the instructions carefully and call the research laboratory on +49 XXX

Instructions

Dear participant,
In this laboratory experiment, you can earn money depending on your decisions and the decisions of your fellow players. Your payout from the experiment is calculated in laboratory points (LP). The conversion rate between LP and € is **5:1**, i.e. 1 LP equals €0.20.
You make your decision in the experiment anonymously. The researchers only see the decisions but cannot link it to your identity.
At the end, you will be asked a few survey questions and then the experiment will end. In total, the experiment will take about **30 minutes.** Payments will only be made to those who participate in the full study. Your answers will be treated confidentially and anonymously. You can withdraw from the experiment at any time, but without payment.

Rules of the game

The rules and procedure of the game in which you are now participating are explained below:

- You take part in the game **in a group with 3 other players**. The game consists of **5 separate rounds** in which you always play the same game. **In each round**, all players receive an **endowment of 36 LP**, which they can use to pay for contribution units to a joint project.
- Your task (as well as the task of the other players in your group) is to decide in each round how many contribution units you want to contribute to a **joint project**. This contribution can be between 0 and 20 contribution units (integers only) and can vary from round to round.
- The sum of all contributions to the joint project is **doubled** and then divided equally among the players in the group.
- Before the 5 rounds start, all players first enter the amount they plan to contribute **per round**. Your pledge and that of your fellow players will then be displayed to all players in the group. This pledge is **non-binding**, i.e. you are not obliged to subsequently make the contribution stated in the pledge.
- At the beginning, a lot is drawn to determine which two players have **high costs** and which two players have **low costs** per contribution unit. However, all players will only be told who has high and who has low costs **after the pledge, but before the 5 contribution rounds**.

- The three players you interact with are the same in each round. In each round, you will be informed about the contributions and draws of all players in your group as well as the average scores (D).
- You will also be asked to give a **rating** for the initial promise of all players, as well as for the actual contributions after each round. The German school grades (1: very good, 2: good, 3: satisfactory, 4: sufficient, 5: poor, 6: unsatisfactory) are used for this. Please note that you will also be rated by your fellow players for your decisions and the grades will be visible to all players on the screens. The overall scores are the average of the three scores given by the other players.
- At the end of the experiment, you will receive the **payout from one of the five rounds** in €. The round that is paid out is determined at **random**. You should therefore behave in each round as if it was relevant for payment

Sequence of the game in steps

Only once in the beginning:

1) Everyone makes a pledge for the group contribution
2) Promises are made public
3) All promises are evaluated
4) Evaluations are made public
5) All players are informed of their individual costs per contribution unit

In each of Round 1 – Round 5

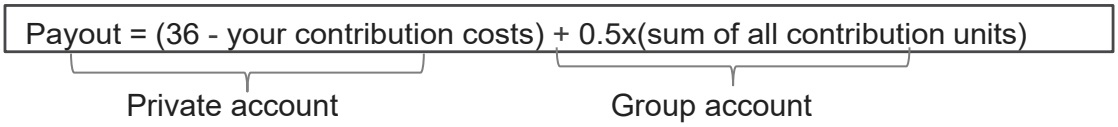
1) Everyone makes their group contribution
2) Group contributions are made public
3) Contributions are evaluated
4) Evaluations are made public

Payout

Your payout **converted from laboratory points** is made up of two parts:

Private Account	Group Account
(1) The sum of the lab points you are initially endowed with, minus the cost of your contribution to the group account, determines your payout from the private account. (This means that the less you contribute individually to the group account, the higher the return on the private account).	(2) The sum of all players' contributions to the group account determines your payout from the group account. Each contribution unit contributed to the group account project is first doubled and then divided equally among all players. (This means that the more all players contribute to the group account, the higher the return on the group account).

The individual **payout** (in LP) for each player is calculated as follows:



Further explanation:

36 = Your initial equipment per round
0.5 = multiplication factor of the joint project (all contribution units that flow into the group account are doubled and then divided among the four players, i.e. first x2, then :4 = x 0.5)
Sum of all contribution units = your contribution units + contribution units of the other players

Cost of contribution

Two players have a **low cost of 0.6 LP per contribution unit** and two players have a **high cost of 1.8 LP per contribution unit**. Whether you have high or low costs will be drawn by lot and you will be informed on the screen **after your promise** but **before the contribution rounds**.

The contribution costs are therefore determined as a player with high costs:

Your individual contribution costs = your contribution units x **1.8**

Or as a player with low costs:

Your individual contribution costs = your contribution units x **0.6**

Payout - Examples

Assume that you and your fellow players have **low costs**: Your payout (in LP) is then as follows:

Payout = (36 - your contribution units x **0.6**) + 0.5 x (sum of all contribution units)

Private account | Group account

This means, for example, that if all other players have a total of 60 contribution units and you have contributed 20 contribution units to the project, then you receive the following payout:

Payout = (36 – 20 x 0,6) + 0.5 x (60 + 20) = 64

Private account | Group account

However, if all other players contribute a total of 60 contribution units and you nothing, then you receive the following payout:

Payout = (36 – 0) + 0.5 x (60 + 0) = 66

Private account | Group account

Payout - Examples

However, if you and your fellow players have **high costs**, your payout (in LP) is:

Payout = (36 - your contribution units x **1.8**) + 0.5 x (sum of all contribution units)

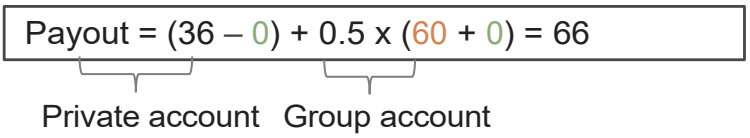
Private account | Group account

This means, for example, that if all other players contribute a total of 60 contribution units and you contribute 20 contribution units to the project, then you receive the following payout:

Payout = (36 – 20 x 1.8) + 0.5 x (60 + 20) = 40

Private account | Group account

However, if all other players contribute a total of 60 contribution units and nothing, then you receive the following payout:



Control Questions

If you have read through the instructions and have no questions, please answer the following control questions:

1. Assuming that each of the other three players has contributed 20 contribution units to the project, which of the following contributions will generate the highest return for your private account?

   O 0 points O 5 points O 10 points O 20 points

2. Assuming that each of the other three players has contributed 20 contribution units to the project, which of the following contributions will generate the highest return for the group account?

   O 0 points O 5 points O 10 points O 20 points

3. For players with low costs per contribution unit, the cost of the same group contribution is:

   O lower O the same O higher

   than for players with high costs per contribution unit.

As soon as you have answered all the questions, they will be checked for correctness. The game begins when all participants have successfully completed the test.

Good luck with the experiment!

Promise

You and the other 3 players of your group are now asked to make a pledge about the contribution you plan to make to a joint project each round.

You and the other players of your group all have an **initial endowment of 36 LP** each round, from which you can contribute 0 to 20 contribution units [integers only]. **Each contribution unit costs you either 0.6 LP or 1.8 LP**, which is deducted from your initial endowment. You will be informed about the exact cost after having made your pledge.

The game consists of 5 separate rounds and your contribution may vary from round to round.

The pledge that you now make once is non-binding, i.e. you are not obliged to make the contribution specified in the pledge afterwards. However, it will be displayed to all players in your group and you will also see the pledges of your fellow players below.

Your promised contribution units for the joint account per round: [ ]

If you keep your promise, your contribution means:

Your contribution of _____ units for the group project generates _____ units for the group, so _____ units per player.

Your contribution incurs costs of _____ LP if the costs per contribution unit are high, or costs of _____ LP if the costs per contribution unit are low. After deducting these costs, you will be left with _____ LP or _____ LP respectively in your private account.

Promise

You and your 3 group members have made your promises for the group account.
Below you can see the promises of all players, as well as the resulting average (A):

	Contribution pledge per round	A
Player 1 (You):	15	12.5
Player 2:	5	
Player 3:	20	
Player 4:	10	

Evaluation of the Promise

You and your 3 group members are now asked to rate the contribution pledge of all players. Please use the German school grades (1: very good, 2: good, 3: satisfactory, 4: sufficient, 5: poor, 6: unsatisfactory).

The evaluation you give for your own contribution is not included in your grade.

	Contribution pledge per round	A	
Player 1 (You):	15	12.5	_____ Your evaluation for your own pledge.
Player 2:	5		_____ Your evaluation for the pledge of player 2.
Player 3:	20		_____ Your evaluation for the pledge of player 3.
Player 4:	10		_____ Your evaluation for the pledge of player 4.

Evaluation of the Promise

You and your 3 group members have evaluated the pledges for the contribution to the group account.
Below you can see the average evaluation of the pledges of all players:

	Contribution pledge per round	A	Evaluation Pledge
Player 1 (You):	15	12.5	3
Player 2:	5		4.33
Player 3:	20		2
Player 4:	10		3.33

Cost Information

Below you can see the individual costs (C) of all players per contribution unit for the group account:

	Contribution pledge per round	A	Evaluation Pledge	C
Player 1 (You):	15	12.5	3	0.6
Player 2:	5		4.33	1.8
Player 3:	20		2	1.8
Player 4:	10		3.33	0.6

Contribution Round 1

Below you can see the individual costs (C) of all players per contribution unit for the group account:

	Contribution pledge per round	A	Evaluation Pledge	C
Player 1 (You):	15	12.5	3	0.6
Player 2:	5		4.33	1.8
Player 3:	20		2	1.8
Player 4:	10		3.33	0.6

You and your 3 group members are now asked to make your contribution to the joint project for round 1.

You and your group members have an **initial endowment of 36 LP** each round, from which you can contribute 0 to 20 contribution units (integers only). **Each contribution unit costs you 0.6 LP**, which is deducted from your initial endowment.

The game consists of **5 separate rounds** and your contribution may vary from round to round.

The pledge you have made is **non-binding**, i.e. you are not obliged to subsequently make the contribution stated in the pledge.

Your contribution units for the joint account for round 1: [ ]

Your contribution in round 1 means:

Your contribution of ____ LP for the group account generates ____ LP for the group, so ____ LP per player.

Your contribution will result in costs of ____ LP. After deduction of these costs, ____ LP will remain in your private account.

Contribution Results Round 1

You and your 3 group members have now submitted your contributions to the joint project for Round 1.

Below you can see the individual costs (C) per contribution unit, as well as the contributions of all players in round 1 and the resulting averages (A):

	Contribution pledge per round	A	Evaluation Pledge	C	Contribution Round 1	A
Player 1 (You):	15	12.5	3	0.6	12	9.25
Player 2:	5		4.33	1.8	5	
Player 3:	20		2	1.8	0	
Player 4:	10		3.33	0.6	20	

If this round is selected for your payout, you will receive a payout of 47.3 LP based on your decision and that of your group members.

Contribution Results Round 1

You and your 3 group members are now asked to evaluate the contributions of all players for round 1. Please use the German school grades (1: very good, 2: good, 3: satisfactory, 4: sufficient, 5: poor, 6: unsatisfactory).

The evaluation you give for your own contribution is not included in your grade.

	Contribution pledge per round	A	Evaluation Pledge	C	Contribution Round 1	A	
Player 1 (You):	15	12.5	3	0.6	12	9.25	____ Your evaluation for your own contribution.
Player 2:	5		4.33	1.8	5		____ Your evaluation for the contribution of player 2.
Player 3:	20		2	1.8	0		____ Your evaluation for the contribution of player 3.
Player 4:	10		3.33	0.6	20		____ Your evaluation for the contribution of player 4.

Evaluation Results Round 1

You and your 3 group members have now submitted your evaluations for all contributions in round 1 for the group account.

Below you can see the average evaluations of the contributions of all players:

	Contribution pledge per round	A	Evaluation Pledge	C	Contribution Round 1	A	Evaluation Contribution Round 1
Player 1 (You):	15	12.5	3	0.6	12	9.25	1.67
Player 2:	5		4.33	1.8	5		2.67
Player 3:	20		2	1.8	0		3.67
Player 4:	10		3.33	0.6	20		1.33

Continued for rounds 2 to 5.

Final survey

Finally, please answer a few questions about yourself and your personal preferences.

1. Please enter your age: _____

2. Please state your biological sex at birth:

O female

O male

O diverse

3. Which faculty are you studying at? (*Dropdown menu)*

4. Please enter your study program and your current desired degree (e.g. Business Administration, Bachelor):

_____

Please use the scale from 0 to 10, where 0 means: "not at all willing to take risks/not at all important" and 10 "very willing to take risks/very important". You can use the values between 0 and 10 to classify your assessment more precisely.

5. Are you generally a risk-taking person, or do you try to avoid risks?

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

Not at all willing to take risks Very willing to take risks

6. How important is it to you in real life that you keep your promises?

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

Not at all important Very important

7. How important is it to you in real life that others keep their promises?

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

Not at all important Very important

Chapter 4

A good neighbor – a found treasure: on the voluntary public good provision in overlapping neighborhoods.

Author: Juliane Koch, Andreas Lange Lorenzo Romero

Abstract

Providing for a public good that benefits the poor might be more lucrative for the rich if they benefit likewise. Inspired by ideas of policymakers advocating mixed neighborhoods and the general problem of public goods benefiting some groups relatively more than others, we investigate the role of varying spatial allocations of rich and poor for the voluntary provision of public goods. We find that participants do invest in others' locations, yet mainly in a way in which they themselves benefit, i.e. in locations of their direct neighbors. In networks where rich and poor are clustered, we observe that it is the rich located at the border who drive the redistribution to the poor cluster. Apart from equity concerns, we observe participants to be motivated by reciprocity as they reduce (increase) investments and thereby punish (reward) neighbors who contributed less (more). This study highlights the importance of the spatial allocation between rich and poor in networks and suggests that making direct and indirect beneficiaries of public good provisions salient can be a way to decrease inequality.

Keywords: Public Goods, Summation Technology, Overlapping Neighborhoods, In-Kind Transfer, Heterogeneity.

JEL Classification: C91, H41, Q50

4.1 Introduction

"It is discouraging to try to be a good neighbor in a bad neighborhood."
(William Castle)

Many public goods rely on voluntary contributions by members of communities. The benefits of most public goods thereby depend on the location of their provision relative the the location of potential beneficiaries. Examples range from local air quality or the access to public parks, over the quality of local schools or public infrastructure to public security. Reflecting the spatial structure of benefits, distributional concerns have received increased attention in both public debate and academic literature as the quality of local public goods may also correlate with socio-economic status, e.g. for school quality (Avery and Pathak, 2021; Epple and Romano, 1998) or for environmental justice (Banzhaf et al., 2019).

Motivated by these examples, we introduce and investigate spatial patterns in an experiment on voluntary public good provision. We study a spatial public goods game with overlapping neighborhoods. Within this setting which corresponds to a circular network, we investigate the role of endowment heterogeneity. Inspired by public discourse on mixed vs. segregated (income) neighborhoods (e.g., Thurber et al., 2018), we compare a mixed neighborhoods setting where rich and poor alternate in space with a clustered neighborhood settings where rich and poor are spatially segregated and directly interact only at the boundaries of their respective neighborhoods. Such mixed-neighborhoods are often advocated by policymakers and scholars to address problems of social exclusion.

We consider this experimental setting as novel and empirically relevant. It further allows to provide new insights into behavioral motivations for voluntary public good provision. Differently from the often studied experimental public good paradigm, the spatial structure allows players to not only choose the level of their contributions, but – through the location of their investments – also to decide on who benefits. We thus can differentiate general prosocial from distributional concerns and also provide new evidence on the nature of reciprocal preferences (e.g, Rabin, 1993; Dufwenberg and Kirchsteiger, 2004).

Our experimental design is most closely related to recent studies on voluntary public good provision in networks (e.g., Cassar, 2007; Kirchkamp and Nagel, 2007; Rosenkranz and Weitzel, 2012; Angelovski et al., 2018a,b). These studies investigate how the network structure affects cooperation but concentrate on homogeneous agents. Angelovski et al. (2018a,b) use a circular network similar to ours with overlapping neighborhoods, where each person can contribute to and benefit from two separate public goods, one with the right and another with the left neighbor. Yet, none of these studies has explored the role

of endowment heterogeneity nor considered the option of investing not only in one's own location, but also of providing in-kind transfers to others.[1]

The impact of endowment heterogeneity has received substantial attention in typical public good experiments (e.g., Zelmer, 2003; Cherry et al., 2005; Heap et al., 2016).[2] Apart from few results in which inequality can trigger cooperation (e.g Barrett, 2001; Waichman et al., 2021) or has no effect (Hofmeyr et al., 2007), most results suggest that heterogeneity leads to lower contribution and cooperation levels.[3] This also applies in settings where players can simultaneously contribute to different, e.g. global and local public goods (e.g., Falk et al., 2013; Fellner and Lünser, 2014; Lange et al., 2022). Under heterogeneity, decreases in contribution levels can result from a "normative conflict" as different individuals may favor different distributional norms (e.g., Nikiforakis et al., 2012; Lippert and Tremewan, 2021; Kesternich et al., 2014). That is, normative rules such as equal income or wealth do no longer correspond to equal absolute or relative contribution levels.

Theoretically, voluntary contributions in networks have been analyzed in recent literature (e.g., Bramoullé and Kranton, 2007; Bramoullé et al., 2014; Allouch, 2015). This literature demonstrates that the network structure itself affects the patterns of public good provision and that networks can lead to specialization in public good provision, where only some agents contribute, depending on their links with other agents. Our circular network structure is inherently symmetric with each player interacting with two direct neighbors, yet asymmetries are achieved through implementing different endowment patterns. While the theoretical literature largely focuses on standard preferences for private and public good consumption, our experiment relies on a linear public good setting such that any (positive) contributions to public accounts rely on behavioral motivations.

Our results show that participants focus their investments on locations in their own neighborhood, i.e. those which generate benefits to themselves. Their investments in l(direct) neighbors' locations are found to reflect both concerns for inequality as well as reciprocity. Neither the introduction of the spatial structure of overlapping neighborhoods nor endowment heterogeneity per se affect the *average* payoff levels. Yet, the spatial distribution of endowments matters for the payoff distribution within the group. In both, the alternating and the clustered endowment settings, the investments trigger distributions from

[1] Lange and Romero-Fernández (2022) also consider a circular network structure with heterogeneous agents, but investigate a different aggregation technology, namely a weakest link.

[2] Heterogeneities have been investigated along different dimensions, e.g. w.r.t. endowments (e.g Zelmer, 2003; Cherry et al., 2005; Heap et al., 2016), marginal per capita returns on contributions (e.g. Kolstad, 2010; Fischbacher et al., 2014; Nosenzo et al., 2015; Gangadharan et al., 2017), productivity (Hauser et al., 2019), benefits from the public good (Kölle, 2015), or a symmetric or asymmetric inequality combination between income and productivity (Hauser et al., 2019).

[3] The extent to which groups suffer from this coordination failure depends on factors such as the information setting (Fellner-Röhling et al., 2020), the institutions (Kingsley, 2016), group size (Nosenzo et al., 2015) or the production function (Chan et al., 1996, 1999).

the rich to the poor and, thus, reductions of inequality. When rich and poor players are clustered, this redistribution is primarily driven by the rich players located at the border to the poor who channel most of their investments to benefit the poor and not the rich neighbor. Still, the rich player in the center is better off in terms of higher final payoffs in the clustered setting. The dynamic adjustments of contributions show reciprocal preferences: the level and the locational patterns of their investments respond to investment behavior of their direct neighbors. Our insights demonstrate that enriching the strategy space beyond the canonical public good experimental paradigm is beneficial in identifying behavioral motives.

The remainder of the paper is structured as follows: section 4.2 discusses the experimental design and provides a theoretical guidance and predictions, section 4.3 reports the experimental results, before we conclude in section 4.4.

4.2 Experimental design and predictions

4.2.1 Experimental Setting and Treatments

We propose an experimental design that extends the classical public goods game by adding a spatial element, where the location of a player has an effect on her provision of the public good. Each of six participants of a group is identified with her respective location $i \in \{A, B, C, D, E, F\}$. For each player, we define a neighborhood N_i that comprises $k = 3$ participants. The public good provided to player i is calculated by the sum of all the investments made in her neighborhood, i.e. the sum of the investment in her location, plus the investments at her left- and right-hand neighbors' location.

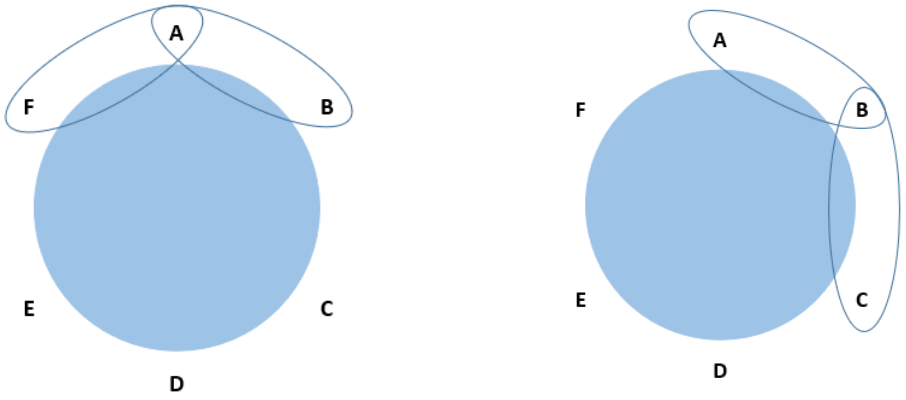
Participants have an endowment of w_i tokens which they can invest in any of the locations. We denote g_{ij} the amount that individual i (located in i) invests in location j. Total investments in location j are thus given by $G_j = \sum_i g_{ij}$. The payoff of player i is given by

$$\Pi_i = w_i - \sum_j g_{ij} + h \sum_{j \in N_i} G_j. \tag{4.1}$$

That is, each participant benefits from all investments made in her neighborhood. The productivity multiplier of the public good is set at $h = 0.5$ and thus satisfies the typical public good properties $h < 1$ and $nh > 1$ with $n = 3$ being the size of each neighborhood.

The experimental treatments vary the structure of the spatial neighborhoods and the endowment allocation. We consider two different neighborhood settings: a closed and an overlapping neighborhood setting. First, we consider a closed setting with with two sepa-

rated neighborhoods: $N_A = N_B = N_C = \{A, B, C\}$ and $N_D = N_E = N_F = \{D, E, F\}$. This structure thus corresponds to a typical three-player public goods game. The only differences with the typical public goods setup are the simultaneous presence of (and information about) another 3-persons group as well as the option to invest in any location within and outside their own neighborhood. Within this structure, we consider a treatment with homogeneous endowment (T1: CN_{hom}) and a treatment with endowment heterogeneity (T2: CN_{het}). Second, we study overlapping neighborhoods where the neighborhood of a player is composed of her location and her two direct neighbors within a circular network. That is, $N_A = \{A, B, F\}$, $N_B = \{A, B, C\}$, $N_C = \{B, C, D\}, \ldots, N_F = \{E, F, A\}$. With this, the six neighborhoods overlap each other and any player i is part of three neighborhoods: hers and the neighborhoods of her left- and right-hand side neighbors. Hence, each participant benefits from public good investments in her location, as well as the investments made in the location of her two neighbors. Conversely, investments in any location benefit three players.
Figure 4.1 illustrates the concept of these overlapping neighborhoods.



(a) Neighborhood of A

(b) Neighborhood of B

Figure 4.1 Example of overlapping neighborhoods in Treatments T3-T5.

Within this overlapping neighborhood structure, we again compare a homogeneous endowment setting (T3: ON_{hom}) with endowment heterogeneity. Importantly, the spatial distribution of endowments matters in this setting: we compare an alternating endowment setting (T4: ON_{alt}) where rich and poor individuals alternate (A, C, E having a low endowment; and B, D, F high endowment) and a clustered endowment setting (T5: ON_{clu}) where three direct neighbors (A, B, C) have a low endowment of w^L while the other three (D, E, F) have a high endowment w^H. Figure 4.2 provides a graphical representation of the spatial neighborhood settings in all five treatments.

Within our experiment, the endowments are measured in tokens, and the values chosen are $w^M = 30$ for the homogeneous treatments (T1 CN_{hom} and T3 ON_{hom}), and $w^L = 20$ and $w^H = 40$ in the heterogeneous treatments (T2 CN_{het}, T4 ON_{alt} and T5 ON_{clu}). The

features of all five treatments are summarized in Table 4.1.

Treatments	T1 CN_{hom}	T2 CN_{het}	T3 ON_{hom}	T4 ON_{alt}	T5 ON_{clu}
Neighborhoods	CN	CN	ON	ON	ON
Endowments	Hom	Het	Hom	Het	Het
	$w^M = 30$ (A,B,C,D,E,F)	$w^L = 20$ (B,D,F) $w^L = 40$ (A,C,E)	$w^M = 30$ (A,B,C,D,E,F)	$w^L = 20$ (B,D,F) $w^H = 40$ (A,B,C)	$w^L = 20$ (A,B,C) $w^H = 40$ (D,E,F)
Distribution	-	Alternating	-	Alternating	Clustered
Payoff	$\Pi_i = w_i - \sum_j g_{ij} + h \sum_{j \in N_i} G_j$				

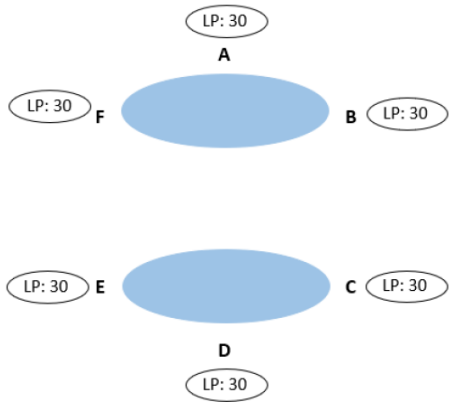
Table 4.1 Summary of features of all treatments.

4.2.2 Experimental Procedure

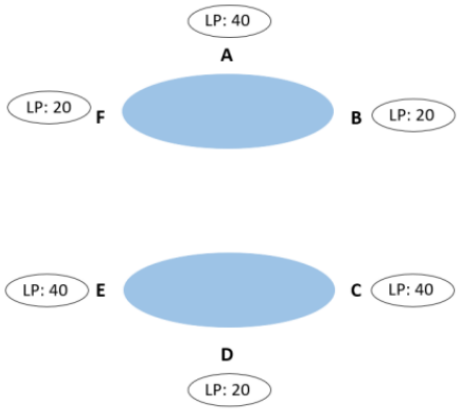
The experimental sessions took place as an in-person lab experiment in September and October 2023 at the Vienna Center for Experimental Economics of the University of Vienna. In total, we recruited 462 participants, resulting in 15 groups of 6 players in Treatments 2,3, and 4 and 16 groups of 6 players in Treatments 1 and 5. Participants took part in the study by coming in person to the lab facilities of the University of Vienna and were handled via the ORSEE software (Greiner, 2015). The experiment was coded using oTree (Chen et al., 2016), preregistered at the AEA RCT Registry (Koch et al., 2023) and got ethical approval by the Faculty of Business, Economics and Social Sciences of the University of Hamburg.[4]

Participants were first presented with the instructions of the experiment, which were followed by a set of control questions. After correctly answering all control questions, the participants were assigned into groups of six players. At the same time, they were also assigned a spatial location inside the group (A-F). Depending on the treatment and the position they were assigned to, their endowment w_i was determined. The group composition, spatial distribution and endowment levels were maintained during the ten rounds of the experiment. At the beginning of each round, all participants were given a new batch of tokens w_i. In the following, they were asked to allocate their endowment w_i in any of the locations A-F. Participants were allowed to invest in any number of locations, from none (thus keeping all tokens in their private account) to six (investing in

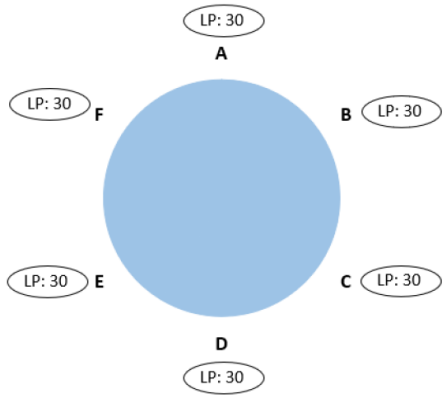
[4]Initially, the experiment was planned at the WiSo Research Lab at the Faculty of Business, Economics and Social Sciences of the University of Hamburg in early 2023. Due to recruitment problems post COVID and failing to come close to the required sample size, we decided to stop this data collection and to completely restart with a new data collection at the University of Vienna. Besides the location, no changes to the experimental design were made. The otherwise identical pre-registration from January 2023 can be found at `https://doi.org/10.1257/rct.10737-1.0`.



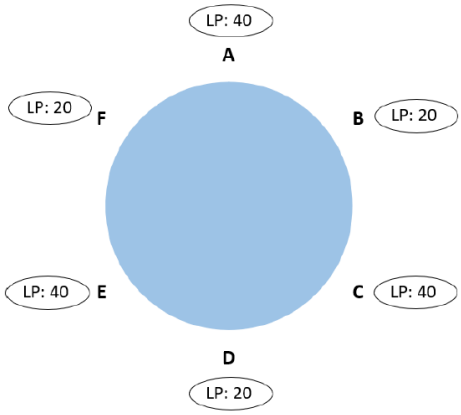
(a) Treatment T1: CN_{hom}



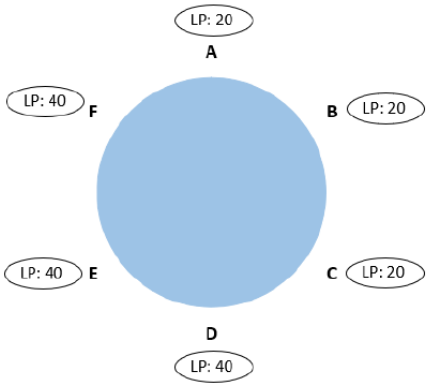
(b) Treatment T2: CN_{het}



(c) Treatment T3: ON_{hom}



(d) Treatment T4: ON_{alt}



(e) Treatment T5: ON_{clu}

Figure 4.2 Representation of the treatments T1-T5.

all locations). They could freely choose the amounts invested in the respective locations as long as an individual's total investments did not exceed her token allotment w_i. [5]

After each round, participants were provided with a feedback table. This table reported how many tokens each participant kept in her private account, the total investments made

[5] An interactive calculator was integrated into the game and gave direct intuitive feedback to participants' on the consequences of their investment decisions, i.e. of how many tokens are created at which locations through a player's investments, before they confirmed their decisions, see 4.5.3.

in each location, the total public good level provided in each neighborhood, the payoff from the public good investments in each respective neighborhood, and the final payoff of each player in that respective round (see Appendix 4.5.3). At the end of the experiment, one of the ten rounds was randomly chosen for payment. After the experimental game, participants were asked to answer a short questionnaire that provided additional information regarding socio-demographics, field of studies, risk behavior and perception of the experiment. The average payment per participant was 14.65 Euros and sessions lasted around 40 minutes.

4.2.3 Experimental Hypotheses

Payoff maximizers who take the investments of others as given, would evidently choose $g_{ij} = 0$ for all j as $h < 1$. In contrast, the maximization of total payoffs requires all agents to contribute their full endowment, i.e. $\sum_j g_{ij} = w_i$. A large literature has evolved that shows that positive contributions are made in linear public goods game and can be driven by, e.g., concerns for efficiency, warm-glow, reciprocity, inequality, etc.

We first note that a player i's own payoff does not depend on the specific investment location, i.e. as long as this investment is made at a location inside of her own neighborhood N_i, they all generate a return of h. In contrast, investments outside one's own neighborhood are much more costly as they do not trigger a return to the player herself. While such investments may occur due to distributional preferences, i.e. if players outside the own neighborhood are sufficiently poorer, we predict that a player confines her investments on her own neighborhood:

> **Hypothesis 1:**
> Players' investments in the public good are confined to their own neighborhood, i.e. $g_{ij} = 0$ for $j \notin N_i$.

We restrict the subsequent discussion on investment patterns on the location choices within a player's own neighborhood. Besides generating a return from the (local) public good, such investments may trigger reciprocal action by other players who benefit from these investments. Note that these may also be located *outside* of the player's neighborhood as the neighbor's neighbor benefits from investments at the neighbor's location. That is, while investments at one's own location may trigger reciprocal action by direct neighbors, investments at one's neighbors' locations may trigger investments by second degree neighbors.

Our closed neighborhood setting (Treatments 1 and 2) corresponds to the typical public

good setting where players can invest into only one public account.[6] Heterogeneity in endowments may thus be expected to be detrimental to voluntary contributions (e.g., Zelmer, 2003; Cherry et al., 2005; Heap et al., 2016). With heterogeneous endowments, different equity notions may conflict, e.g. equality in final payoffs vs. equity in terms of equal gains from the provision of the public goods. Addressing such equity concerns or attending to reciprocity concerns requires changes in the amount allocated to the public good.

The overlapping neighborhood setting is designed to allow for a more nuanced strategy space: instead of changing the *level* of the public good investment, players can adjust the *location* of their investments. Among efficient allocations, the distribution of payoffs can widely vary as investments in the overlapping neighborhood settings can take place in different locations. In the following, we discuss the role of efficiency and equity considerations as well as reciprocity motivations in the spatial setting to guide our hypotheses for investment decisions.

We first show that different distributional ideals are consistent with efficiency (as defined as maximizing the total payoff, i.e. having $\sum_j g_{ij} = w_i$).

Equality consistent with efficiency

As first reference, we explore conditions that realize *equal* payoffs to all players while achieving efficiency, i.e. all players having invested all their endowments. Here, $\sum_{j \in N_i} G_j$ must be identical for all i. Simple algebra yields the following result:

For an efficient allocation to generate equal payoffs, the total investments G_j at opposing sides of the virtual table need to be identical: $G_A = G_D$, $G_B = G_E$, and $G_C = G_F$.

Proof: see Appendix 4.5.1.

While equality of payoffs can thus be achieved by players investing all tokens in their own locations under endowment homogeneity (T3 ON_{hom}), equality in the treatments with endowment heterogeneity immediately requires at least some players to invest outside of their own location. The reason is that opposite ends of the table are occupied by different endowment positions in both treatments T4 ON_{alt} and T5 ON_{clu}).

The investment patterns to generate equality are not unique. Two possible transfer regimes for the alternating endowment settings are illustrated in Figure 4.3.

Importantly, as the first panel demonstrates, equality can be achieved by investment

[6] Even though players can in principle invest in all locations, investments outside their own neighborhood do not generate a return for them and thus are most costly.

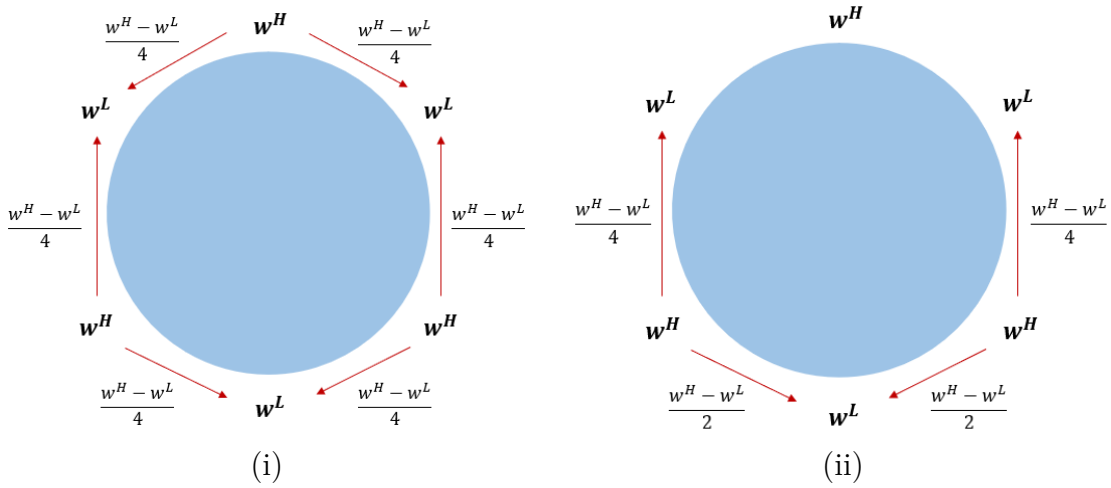


Figure 4.3 Two possible transfer regimes to obtain equality in the alternating endowment setting. The arrows indicate the investments by a player in the respective neighbor's location. The remaining tokens are invested in the own

patterns where a player invests the *same* amount in both of her neighbors' locations.

This is different in the clustered setting in T5 ON_{clu}. This can easily be seen as – following Lemma 4.2.3 – the total investment in high endowment locations (D,E,F) needs to be identical to the total investments in poor locations (A,B,C). As such, equality in payoffs requires a net transfer from rich to poor locations. Two possible transfer regimes are illustrated in Figure 4.4.

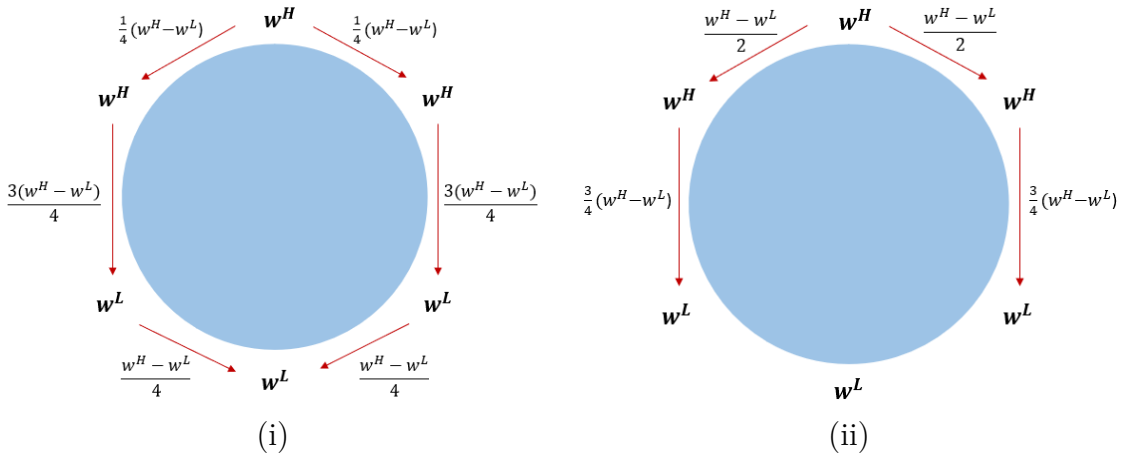


Figure 4.4 Two possible transfer regimes to obtain equality in the clustered endowment setting. Option (i) is only feasibly if $w^H \leq 5w^L$

Equity consistent with efficiency

As a second reference, we consider equitable allocation, i.e. those where the provision of public goods leads to equally sized payoff *gains* above the initial endowments. We derive the following lemma.

For an efficient allocation to generate equal payoff gains, the combined investments in the neighborhood of a rich player are given by $G^H = ((3h+1)w^H + (3h-1)w^L)/(2h)$, while those in the neighborhood of a poor player are given by $G^L = ((3h-1)w^H + (3h+1)w^L)/(2h)$. The specific investment patters are not uniquely determined, but satisfy:
(i) in the alternating setting, the difference in total investments at opposing poor and rich players' locations is given by $G^H - G^L = (w^H - w^L)/h$.
(ii) in the clustered setting, the difference in total investments at the center rich position and the center poor location is given by $G_E - G_B = (w^H - w^L)/h$. The total investments at corner players at opposing sides of the virtual table need to be identical: $G_A = G_D$ and $G_C = G_F$.

Proof: see Appendix 4.5.1.

The investment patterns are again not uniquely determined. Yet, the following pattern arises in the alternating setting: investments in poor players' locations are larger than those in rich players' locations. The intuition behind this result is that the former benefit two rich and one poor, while the latter benefit one rich and two poor players. Equity thus requires the net transfers from rich to poor players to be positive. This qualitative effect is similar in the clustered setting. Comparing the rich (D,E,F) and the poor (A,B,C) cluster, the former receives larger investments than the latter, yet the difference is smaller than the total endowment of rich vs. poor players. Thus, there again needs to be a net transfer from the rich to the poor.

Figure 4.5 provides examples for possible investment patterns in the alternating and clustered setting to obtain equity in payoff gains. In the alternating setting, equity can be obtained by low endowment players investing all their tokens in their own location and the high endowment players investing a portion $((1+h)(w^H - w^L)/(4h))$ in each of their poor neighbor's location.[7] In the clustered setting, equity requires a net transfer from the rich to the poor cluster - for our parameters $G^H - G^L = (w^H - w^L)/h < 3(w^H - w^L)$ as seen by comparing the payoffs to the respective center players.[8]

The above arguments show that allocations that reach efficiency, i.e. full investments by all players, are consistent with two extreme distributional ideals, namely payoff equality and equity as defined as equal payoff gains. We concentrate on investment patterns where each player only invests in her own neighborhood. However, as we cannot expect all players to fully contribute, the discussed investment patterns are only serving as two (likely

[7]Note that even when requiring symmetry, i.e. identical investment patterns by all rich and also by all poor players, only the net transfers are uniquely determined. Total investments in each poor player's location then need to be $(w^H + w^L)/2 + (w^H - w^L)/(2h)$, while the total investments in rich locations is $(w^H + w^L)/2 - (w^H - w^L)/(2h)$.

[8]With the additional symmetry assumption that both border rich receive the same total investment which, hence, also coincides with the border poor total investment, the net transfers are uniquely determined as displayed in Figure 4.5.

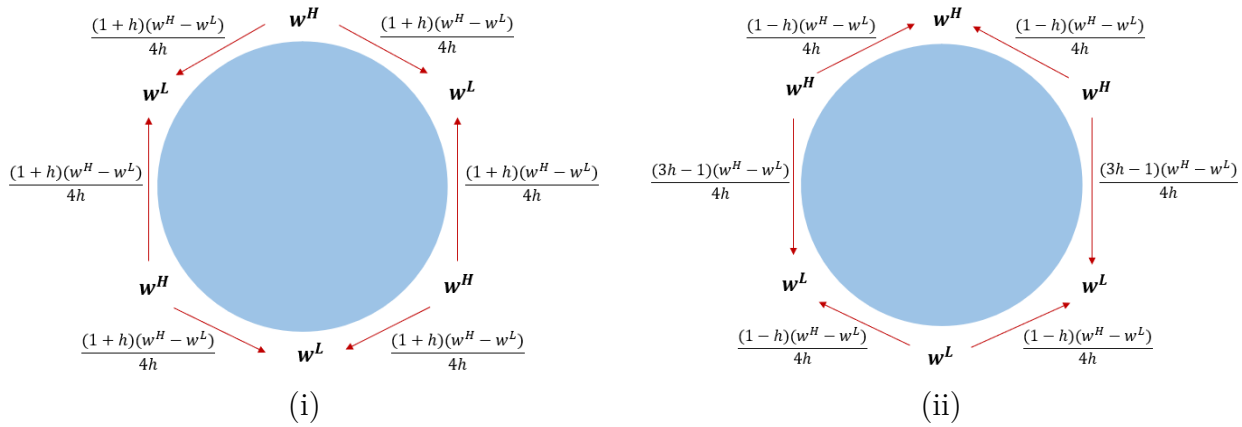


Figure 4.5 Possible transfers to obtain equal payoff gains beyond endowment (equity) in the (i) alternating and (ii) clustered setting. The arrows and values describe the net transfers with the remaining tokens being invested in the own location. The settings describe the symmetric equilbria, i.e. (i) symmetric transfers where in (i) all high endowment locations as well as all low endowment locations, respectively, receive identical total investments and in (ii) the total investments at all corner poor and rich locations are identical.

unrealistic) reference points. We thus now turn to potential motivations of individual investment decisions.

Individual behavioral motivations for investment decisions

We now discuss the effects of behavioral motivations, namely inequality concerns (e.g., Charness and Rabin, 2002; Fehr and Schmidt, 1999), equity concerns as well as reciprocity (e.g., Rabin, 1993; Dufwenberg and Kirchsteiger, 2004) on individual investment patterns.

Under endowment homogeneity, all these concerns essentially coincide in a typical public good setting (as in T1 CN_{hom}): if a player contributes more than another player, she typically receives a lower payoff. Inequality concerns as well as reciprocity considerations thus may lead to reduced contributions in response to a lower contribution of a group member. The overlapping neighborhood setting in T3, however, introduces another dimension how a player can react: instead of lowering her contributions, she can reallocate her investments away from the underperforming player, i.e. move her investments to the other neighbor who contributed more. Based on this argument, we formulate the following prediction:

Hypothesis 2:
In the overlapping neighborhood setting under endowment homogeneity (T3 ON_{hom}) average provision levels are more stable over time than in the closed neighborhood setting (T1 CN_{hom}). Participants change their level and the location of their investments in their neighborhood in response to the (relative)

contribution decisions of their neighbors.

Endowment heterogeneity in typical public good games can lower contributions (e.g., Kingsley, 2016). We thus expect a similar effect in the corresponding closed neighborhoods treatment (T2 CN_{het} vs. T1 CN_{hom}). Additionally, rich players are expected to invest more in absolute amounts, but a smaller relative share of endowments than poor players which potentially reflects different distributional ideals.

The introduction of the overlapping neighborhoods in the heterogeneous setting (T5 ON_{clu} and T4 ON_{alt} vs. T2 CN_{het}) allows participants to address distributional concerns not only by choosing their total level of investment, but also by choosing the locations of investments in their neighborhood. As long as endowment differences still persist, equality-oriented players can be expected to invest where their investments benefit the largest number of poor players. Rich players in T4 ON_{alt} thus should invest more in their own locations (thereby benefiting two poor players), while – based on the same argument – equality-oriented poor players may choose to invest a larger share in their (rich) neighbors locations than in their own. Similarly in T5 ON_{clu}, the center rich player is expected to invest a larger amount at her neighbors' locations, the border rich player can move investments to the poor neighbor, i,e. the poor border player. The poor players may move their investments primarily to the center poor player as then only poor players benefit.

Hypothesis 3:
The share of investments is larger in those locations in a player's neighborhood that benefit the largest number of poor players. Specifically, we expect to see differences between investments going to the left vs. right neighbor for border players in T5 ON_{clu}.

Players in overlapping neighborhood settings can thus address potentially different distributional ideals (e.g., equity, equality) by selecting the locations and not only the level of investments. Thus, one could also hypothesize that specifically rich players will contribute more than in the corresponding closed neighborhood setting:

Hypothesis 4:
Rich players are expected to contribute more in T4 ON_{alt} and T5 ON_{clu} than in T2 CN_{het}.

As under homogeneity, also the heterogeneous overlapping neighborhood structure allows to reciprocate on other players' investment decisions. Within our experiment, participants receive information about the number of tokens a player keeps in her account as well as

on the total investments in the respective locations. As such, no direct information is given on where a player invests. We thus anticipate that players potentially reciprocate on the total contributions of other players, likely focusing on the direct neighbors. We formulate the following prediction – resembling Hypothesis 2:

> **Hypothesis 5:**
> A player's investment in a neighbor's location is positively impacted by the total investments by the respective neighbor in the last period. The investments in her own location are positively correlated with total investments by both neighbors.

We note that both neighbors of a player have the same endowment in T4 ON_{alt} such that a player can directly compare the kindness of both players by considering their respective total investments. In T5 ON_{clu}, the two neighbors of border players have different endowments such that reciprocal actions may condition on the endowment of the respective neighbor.

4.3 Results

In the following, we first discuss the treatment effects on the average payoffs and their distribution, before discussing the underlying investment decisions. In doing so, we explore the underlying behavioral motivations. For our discussion, we primarily use non-parametric Wilcoxon rank-sum and Wilcoxon signed-rank tests to compare group averages, either for entire groups of six players or divided by endowment type. Those are complemented by panel regressions with individual random effects to account for the dynamics of behavior. Table 4.2 provides a summary statistics of the main outcome variables averaged by group for all treatments. Table 4.3 separates these by endowment types.[9]

4.3.1 Payoffs and Distribution

The average payoffs range from 36.17 in T3 ON_{hom} to 37.51 in T5 ON_{clu} (Table 4.2). We find that the overlapping neighborhood structure has no effect on average payoffs when compared to the corresponding closed neighborhood public good, neither for homogeneous endowments (T3 vs. T1, p=0.1510, Wilcoxon rank-sum test), nor under endowment heterogeneity (T4 vs. T2, p=0.9674; T5 vs. T2, p=0.9845). The heterogeneity of endowments

[9] Table 4.4 and Table 4.5 separate these summary statistics by round 1-5 vs. 6-10 in order to give provide information into the dynamics of behavior. We do not find treatment differences in this dynamics and thus concentrate on discussing the effects average across all 10 periods for the most part of the paper.

also does not lead to major changes of average payoffs in the closed-neighborhood setting (T2 vs. T1, p=0.9534) or the overlapping neighborhood treatments (T4 vs. T3, p=0.2496; T5 vs. T3, p=0.1102). We thus formulate the following result:

Result 1 *Neither the introduction of overlapping neighborhoods nor the heterogeneity of endowments affect average payoffs.*

While average payoffs do not differ, the overlapping neighborhood structure could also affect the distributional patterns under endowment heterogeneity. We first look at the effect of introducing overlapping neighborhoods (T4 ON_{alt} and T5 ON_{clu}) and compare them to the closed neighborhood treatment T3 ON_{hom}. Second, we distinguish between rich and poor in the overlapping neighborhood and compare the alternating (T4 ON_{alt}) with the clustered setting (T5 ON_{clu}). Table 4.3 summarizes the payoffs by endowment types.

We find that the introduction of overlapping neighborhoods or the specific endowment allocation in space does not affect poor participants (T4 vs. T2, p=0.6315; T5 vs. T2, p=0.3183; T5 vs. T4, p=0.5106). Yet, differences arise for the rich types: while the alternating setting is no different from a closed neighborhood setting (T4 vs. T2, p=0.3245), the clustered endowments benefit the rich on average (T5 vs. T2, p=0.0013). This increase in payoffs of rich participants in the clustered distribution translates to a higher payoff difference between rich and poor participants compared to the closed neighborhood treatment (T5 vs. T2, p=0.0597), while the payoff gap in the alternating endowment setting is not affected (T4 vs. T2, p=0.4363).

Result 2 *The payoff distribution is affected by spatial aspects: rich players benefit from clustered endowments relative to both alternating endowment settings and closed neighborhoods.*

The results above suggest that the spatial clustering of endowments benefits the rich, while not necessarily hurting the poor. A closer look reveals that differences exists depending on *which* location in an endowment cluster a player has. While the average payoff of rich in T5 ON_{clu} are 44.37 tokens, the center rich (location E) receives 46.44 tokens and thus more than the average border rich player (43.34 tokens, p=0.1046, Wilcoxon signed rank test). The increased inequality in T5 ON_{clu} due to the endowment cluster therefore solely benefits the center rich player (p=0.0245 vs. rich players in T4), while the rich border players have essentially the same payoff as in the alternating setting (p=0.2859 vs. rich players in T4). No such differences exist for the poor. In particular, the poor center player receives 29.59 tokens in T5 ON_{clu} and not significantly less than poor players in T2 CN_{het} (p=0.1751) or T4 ON_{alt} (p=0.2475).

Result 3 *The clustering of endowment types benefits the center rich player, but does not lead to less payoffs to any of the poor players than they receive in alternating overlapping or in closed neighborhoods.*

We thus see that – at least in our experimental setting of 3 poor and 3 rich players – endowment clusters do not necessarily hurt the poor players. We now turn to considering the underlying investment patterns in more detail in order to gain insights into the behavioral motivations of the respective types.

4.3.2 Investment Patterns

Table 4.2 summarizes the overall investment patterns, further separated by investments in a player's own location, the locations of direct neighbors, and other players outside the neighborhood. According to Hypothesis H1, we expect the latter to be negligible as such investments would not generate a return to the player. Indeed we find that only a small fraction of one's total investment is made outside one's neighborhood.

Yet, a substantial part of investment is going towards direct neighbors' locations. In fact, the amounts transferred to neighbors' locations on average exceed the investment at one's own location but clearly are split by the two direct neighbors. This is even the case in closed neighborhood treatments, T1 CN_{hom} and T2 CN_{het}, where the place of investment inside the group of three players has no effect on the provision of the public good as all players benefit likewise from any contribution's location. Yet, players in a group on average invest 62% in T1 CN_{hom} and 64% in T2 CN_{het} of their total investments at neighbors' locations – thereby essentially splitting investments among all players in their own neighborhood (even though the location does not matter here). In overlapping neighborhoods, this share is significantly smaller in T3 (49%, p=0.0298 vs. T1) and T4 (55%, p= 0.0555 vs. T2).[10]

Result 4 *Participants invest almost exclusively in their own neighborhood. They invest a substantial amount in direct neighbors locations. Yet, this share is smaller in overlapping neighborhood setting than in the closed neighborhood (where the location does not affect any player's payoff).*

In the homogeneous overlapping neighborhood treatment T3 ON_{hom}, this result suggests a larger concentration on ones own location, potentially to generate reciprocal action by

[10]The share is 57% in T5 ON_{clu} and thus not significantly different from the one in T2 CN_{het} or T4 ON_{alt}. Yet, the interpretation here is more difficult as the clustering of endowments leads to asymmetries in the endowments between left and right neighbors. We thus discuss investment patterns by location in more detail below.

both direct neighbors. Under endowment heterogeneity, this might be driven by distributional concerns as we discuss below. We therefore now investigate more closely the determinants of investment decisions and focus on two potential drivers: The role of distributional concerns under endowment heterogeneity (T2 CN_{het}, T4 ON_{alt}, T5 ON_{clu}) and the role of reciprocity.

Distributional concerns. Generally, we observe that rich players invest a significantly larger number of tokens (in absolute terms). Investments as share of initial endowments do not significantly differ between poor and rich types in any of the heterogeneous treatments (50% for poor vs. 48% for rich in T4; 55% vs. 47% in T5). These investment patterns lead to a reduction of the initial endowment inequality (20 vs. 40 tokens) in both absolute and relative terms (see Table 4.3).

While the closed neighborhood setting only allows to address distributional concerns by adjusting the *level* of investments, the overlapping neighborhood setting allows to gain insights into the behavioral motivations by studying the specific *location* of investments. When endowments alternate in T4 ON_{alt}, the ratio of total investments going to direct neighbors differs between rich and poor players (61% for poor, 52% for rich players, p=0.0742), see also Table 4.7. This is first evidence that distributional concerns matter in line with Hypothesis 3: investing in a rich player's location would benefit most, namely two poor players: specifically rich players invest a smaller share in their neighbors locations, thus benefiting a large share of poor players.

Table 4.6 summarizes the investment decisions by player types in the clustered setting. Figure 4.6 further illustrates these transfers made by a specific player position as well as the tokens received in a specific locations differentiated by endowment type. Due to the clusters, the options of players to benefit poor vs. rich players through investments in their neighborhood depend on the location of players. For example, the center rich player (location E) can invest in her own location and benefit only rich players, or invest in a neighbor's location to benefit two rich and one poor. The border rich players (location D and F) have the option to invest in a way to benefit only rich players (invest in E), two rich and one poor (invest in own location), or two poor and one rich (through investing in the poor neighbor's location). Table 4.7 reports the shares of investments going towards the specific neighbors. It reveals that specifically the rich border players differentiate between the identity of their two neighbors (one rich, one poor) and invest more in their poor neighbor's location (p=0.0443), thereby benefiting two poor players and themselves, instead of investing in their rich neighbor's location which would benefit only rich players. We thus again find some evidence that concerns for equality tend to be a driver of investment decisions. In contrast, the poor border players do not differentiate their investments in their neighbors' locations by their identity neither do any other players in the clustered network of T5 ON_{clu} differentiate transfers between their left and right neighbor.

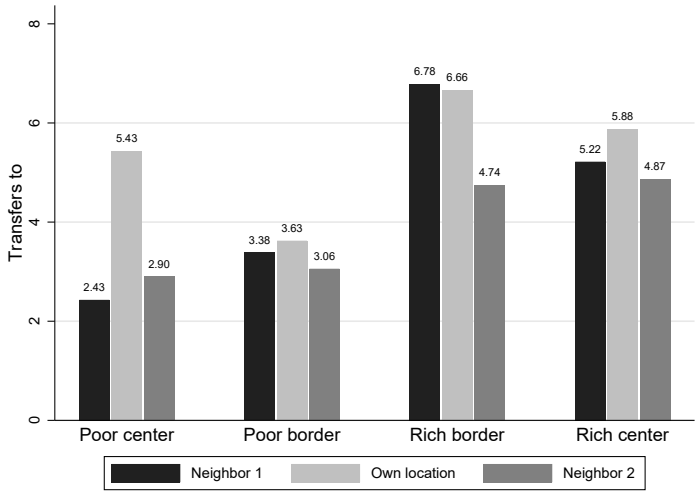


Figure 4.6 Summary of transfers made by endowment type in specific locations to i) own location, (ii) first neighbor, and iii) second neighbor in T5 ON_{clu}. Note that while both neighbors have the same endowment identity for the center players, the endowment identity differs between the border players' neighbors. Here, Neighbor 1 refers to the poor neighbor and Neighbor 2 to the rich neighbor.

Yet, investments might be governed by concerns for reciprocity in addition to equality concerns. As such, channeling investments primarily to the poor neighbor might affect the reciprocal action of the rich neighbor. We explore these reciprocal actions in two ways: first we compared the net transfers of public goods, i.e. how a player's investments benefit another player vs. how a player benefits through investments of the other player. Second, we have a closer look at the dynamics of investment decisions.

Figure 4.7 displays the net payoff transfers induced through public good investments in the different locations in T5 ON_{clu}. It is defined by the public good payoff that is triggered through a player's investments minus the payoff that this player receives from public good investments, i.e. in formal terms given by $h(3\sum_j g_{ij} - \sum_j \sum_{k \in N_i} g_{jk})$.[11] We see that rich players provide more tokens than they receive which leads to the reduction of inequality. Yet, this net transfer is mostly induced by the rich border players: the rich at the border transfer significantly more of their endowment in net terms compared to the rich at the center (p=0.0739), while we see no significant differences between the poor border and poor center players (p=0.3205). These investment patters form the rationale behind the payoff differences within endowment types as formulated in Result 3. Thus, the spatial structure is found to lead to inequalities within endowment types.

Result 5 *The net transfer from the rich to the poor cluster is triggered by rich participants located at the border whose transfers are significantly higher and more directed towards*

[11] For typical public good games which correspond to our closed neighborhood setting, this collapses to the differences in a players investments *minus* the other persons investments. In the overlapping neighborhood setting, the benefits that a player receives are governed by the location of others' investments such that the net transfer provides information beyond the simple comparison of total investment levels.

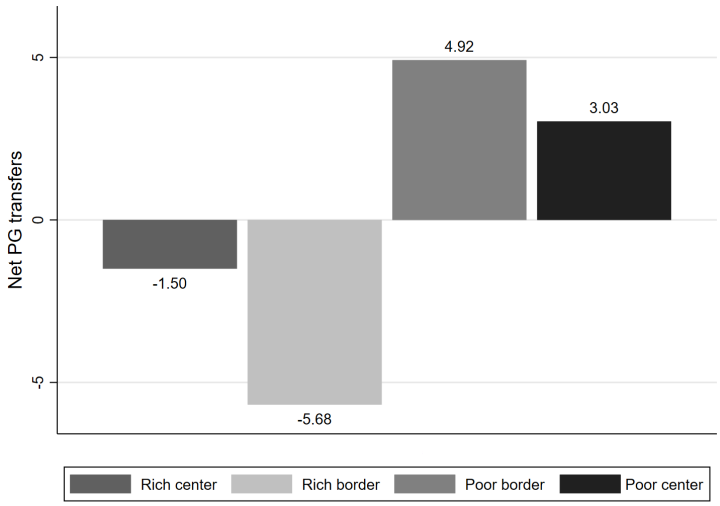


Figure 4.7 Average net transfers of participants in T5 ON_{clu}, (rounds 1-10).

poor neighbors.

Reciprocity. Apart from equality concerns, participants might be driven by reciprocal motivations when deciding *how much* and *where* to invest. We now report how individuals adapt their giving behavior depending on the actions of their direct neighbors in order to address Hypothesis H5. For this, we consider an individual's investment decision as a function of the neighbors' investment behaviors in the previous period, i.e. on how many tokens they kept. We consider the effect on both the level of the total investment as well as on the location of these investments at both direct neighbors' locations.

Table 4.8, Table 4.9, and Table 4.10 report the results from panel regressions with individual random effects regressions on individual investments with the appropriate lagged variables (controlling for the individual investments in the previous period as well as the total amounts kept in their respective private accounts by the left and the right neighbors).[12] We find clear evidence for reciprocal motivations. For all treatments, the total investment level of a player are affected by how many tokens both left and right neighbors kept in their own account (column (1)). Second, investments in the left (right) neighbor's location respond negatively to the amount kept by the left (right) neighbor, but are not affected by the action of the right (left) neighbor (columns (3) and (4)). We find consistent results for the difference in investments between the right and left neighbor (column (7)). Important to note is that in T3 ON_{hom} and T4 ON_{alt}, participants decrease investments also in their own location as a consequence of a neighbor keeping more to herself. This translates into the right (left) neighbor being hurt if the left (right) neighbor keeps more to herself (see columns (5) and (6)). This suggests that individuals facing a neighbor who

[12] As a robustness check, we also consider these models as a function of the relative shares of their endowments that neighbors keep in their account. These are reported in Table 4.11, Table 4.12, and Table 4.13. The results are robust.

is less prosocial and keeps more for herself, react by reducing the investments in all locations that benefit that neighbor. Yet, they do not move investments to the other neighbor but instead reduce total investments. As a consequence and contrary to the hypothesis H2, the overlapping neighborhood structure thus does not lead to a stronger stability of contributions over time and instead generates the typical declining trend of investments over time.[13]

Result 6 *Participants reciprocate over time on the investment decisions by their direct neighbors: when a neighbor keeps more tokens in her private account, players decrease investments (i) in their own location and (ii) in the location of the respective neighbor. As a consequence, both neighbors may receive less transfers.*

We thus find that the spatial setting allows players to exploit a much richer strategy space as the not only adjust their total *level* of investments, but also their investment *location* over time.

4.4 Conclusions

This study introduces a spatial element into a public goods experimental design. By relying on a specific network structure, the circular structure, we generate overlapping neighborhoods in which individuals benefit from public good investments in their own and their direct neighbors' locations. This structure is motivated by numerous examples that feature local public goods, e.g. local climate adaptation, maintaining the quality of green spaces or local security. As such, it is surprising that hardly any experimental evidence existent on how heterogeneity affects voluntary contribution decisions in spatial settings and that the few extant papers have focused on homogeneously-endowed players.

Theoretically, we show that when considering spatial elements, efficiency and different distributional ideals are consistent. Different to the typical public goods game, in this spatial network setting players cannot only decide *how much* but also *where* to invest. Thereby, they can choose who benefits from their investment. This becomes particularly important under endowment heterogeneity. Through their investments, players cannot only address distributional concerns, but also can implicitly punish or reward other players. Consistent with our theory, we find that players almost exclusively invest in their own neighborhood, i.e. in location where they themselves benefit from the public good provision.

The network setting also implies that the spatial distribution of endowments matters when those are heterogeneous. We compare a setting where rich and poor players alternate

[13] No significant treatment differences in the time trends of average payoff levels exist.

in space with a setting where they are clustered. Overall, our experiment shows that overlapping neighborhood structures do not have much impact on average payoffs, but affect the resulting payoff distributions. Typically the rich provide a larger absolute, but smaller relative amount and thereby reduce inequality. Yet, the costs of such transfers are unevenly distributed in clustered neighborhood setting: here, the rich located at the border provide significantly larger amounts than what they receive and place those investments particularly towards the poor neighbor. This differs significantly for rich center players' behavior who facilitate redistribution to a lower extent.

The overlapping neighborhood setting provides a richer strategy space to players. We show that the spatial pattern of their investments are driven by distributional goals as well as by reciprocal concerns. In reaction to the observed past investment decisions of their neighbors, players not only change the absolute *level* of their investment, but also their *location*.

Our study sheds first light on the role of endowment heterogeneity on voluntary public good provision in spatial settings. As inequality continues to rise, fostering cooperation and collaboration across heterogeneous players becomes ever more critical for public good provision, especially in locations of poor clusters. In our experiment, we focus on one specific spatial structure, namely a circular network. Further research could explore the role of endowment distributions in richer sets for spatial networks.

Bibliography

Allouch, N. (2015). On the private provision of public goods on networks. *Journal of Economic Theory*, 157:527–552.

Angelovski, A., Di Cagno, D., Güth, W., Marazzi, F., and Panaccione, L. (2018a). Behavioral spillovers in local public good provision: An experimental study. *Journal of Economic Psychology*, 67:116–134.

Angelovski, A., Di Cagno, D., Güth, W., Marazzi, F., and Panaccione, L. (2018b). Does heterogeneity spoil the basket? The role of productivity and feedback information on public good provision. *Journal of behavioral and experimental economics*, 77:40–49.

Avery, C. and Pathak, P. A. (2021). The distributional consequences of public school choice. *American Economic Review*, 111(1):129–152.

Banzhaf, S., Ma, L., and Timmins, C. (2019). Environmental justice: The economics of race, place, and pollution. *Journal of Economic Perspectives*, 33(1):185–208.

Barrett, S. (2001). International cooperation for sale. *European economic review*, 45(10):1835–1850.

Bramoullé, Y. and Kranton, R. (2007). Public goods in networks. *Journal of Economic theory*, 135(1):478–494.

Bramoullé, Y., Kranton, R., and D'amours, M. (2014). Strategic interaction and networks. *American Economic Review*, 104(3):898–930.

Cassar, A. (2007). Coordination and cooperation in local, random and small world networks: Experimental evidence. *Games and Economic Behavior*, 58(2):209–230.

Chan, K. S., Mestelman, S., Moir, R., and Muller, R. A. (1996). The voluntary provision of public goods under varying income distributions. *Canadian Journal of Economics*, pages 54–69.

Chan, K. S., Mestelman, S., Moir, R., and Muller, R. A. (1999). Heterogeneity and the voluntary provision of public goods. *Experimental Economics*, 2(1):5–30.

Charness, G. and Rabin, M. (2002). Understanding social preferences with simple tests. *The quarterly journal of economics*, 117(3):817–869.

Chen, D. L., Schonger, M., and Wickens, C. (2016). oTree—An open-source platform for laboratory, online, and field experiments. *Journal of Behavioral and Experimental Finance*, 9:88–97.

Cherry, T. L., Kroll, S., and Shogren, J. F. (2005). The impact of endowment heterogeneity and origin on public good contributions: Evidence from the lab. *Journal of Economic Behavior & Organization*, 57(3):357–365.

Dufwenberg, M. and Kirchsteiger, G. (2004). A theory of sequential reciprocity. *Games and Economic Behavior*, 47(2):268–298.

Epple, D. and Romano, R. E. (1998). Competition between private and public schools, vouchers, and peer-group effects. *American Economic Review*, pages 33–62.

Falk, A., Fischbacher, U., and Gächter, S. (2013). Living in two neighborhoods – social interaction effects in the laboratory. *Economic Inquiry*, 51(1):563–578.

Fehr, E. and Schmidt, K. M. (1999). A theory of fairness, competition, and cooperation. *The Quarterly Journal of Economics*, 114(3):817–868.

Fellner, G. and Lünser, G. K. (2014). Cooperation in local and global groups. *Journal of Economic Behavior & Organization*, 108:364–373.

Fellner-Röhling, G., Kröger, S., and Seki, E. (2020). Public good production in heterogeneous groups: An experimental analysis on the relation between external return and information. *Journal of Behavioral and Experimental Economics*, 84:101481.

Fischbacher, U., Schudy, S., and Teyssier, S. (2014). Heterogeneous reactions to heterogeneity in returns from public goods. *Social Choice and Welfare*, 43(1):195–217.

Gangadharan, L., Nikiforakis, N., and Villeval, M. C. (2017). Normative conflict and the limits of self-governance in heterogeneous populations. *European Economic Review*, 100:143–156.

Greiner, B. (2015). Subject pool recruitment procedures: Organizing experiments with ORSEE. *Journal of the Economic Science Association*, 1(1):114–125.

Hauser, O. P., Hilbe, C., Chatterjee, K., and Nowak, M. A. (2019). Social dilemmas among unequals. *Nature*, 572(7770):524–527.

Heap, S. P. H., Ramalingam, A., and Stoddard, B. V. (2016). Endowment inequality in public goods games: A re-examination. *Economics Letters*, 146:4–7.

Hofmeyr, A., Burns, J., and Visser, M. (2007). Income inequality, reciprocity and public good provision: An experimental analysis. *South African Journal of Economics*, 75(3):508–520.

Kesternich, M., Lange, A., and Sturm, B. (2014). The impact of burden sharing rules on the voluntary provision of public goods. *Journal of Economic Behavior & Organization*, 105:107–123.

Kingsley, D. C. (2016). Endowment heterogeneity and peer punishment in a public good experiment: Cooperation and normative conflict. *Journal of Behavioral and Experimental Economics*, 60:49–61.

Kirchkamp, O. and Nagel, R. (2007). Naive learning and cooperation in network experiments. *Games and Economic Behavior*, 58(2):269–292.

Koch, J., Lange, A., and Romero-Fernández, L. (2023). Public good provision in overlapping neighborhoods.

Kölle, F. (2015). Heterogeneity and cooperation: The role of capability and valuation on public goods provision. *Journal of Economic Behavior & Organization*, 109:120–134.

Kolstad, C. D. (2010). Equity, heterogeneity and international environmental agreements. *The BE Journal of Economic Analysis & Policy*, 10(2).

Lange, A. and Romero-Fernández, L. (2022). It's a small world: Effects of overlapping neighborhoods in the provision of public goods. *AEA RCT Registry https://www.socialscienceregistry.org/trials/9451*.

Lange, A., Schmitz, J., and Schwirplies, C. (2022). Inequality, role reversal and cooperation in multiple group membership settings. *Experimental economics*, 25(1):68–110.

Lippert, S. and Tremewan, J. (2021). Pledge-and-review in the laboratory. *Games and Economic Behavior*, 130:179–195.

Nikiforakis, N., Noussair, C. N., and Wilkening, T. (2012). Normative conflict and feuds: The limits of self-enforcement. *Journal of Public Economics*, 96(9-10):797–807.

Nosenzo, D., Quercia, S., and Sefton, M. (2015). Cooperation in small groups: The effect of group size. *Experimental Economics*, 18(1):4–14.

Rabin, M. (1993). Incorporating fairness into game theory and economics. *The American Economic Review*, pages 1281–1302.

Rosenkranz, S. and Weitzel, U. (2012). Network structure and strategic investments: An experimental analysis. *Games and Economic Behavior*, 75(2):898–920.

Thurber, A., Bohmann, C. R., and Heflinger, C. A. (2018). Spatially integrated and socially segregated: The effects of mixed-income neighbourhoods on social well-being. *Urban Studies*, 55(9):1859–1874.

Waichman, I., Requate, T., Karde, M., and Milinski, M. (2021). Challenging conventional wisdom: Experimental evidence on heterogeneity and coordination in avoiding a collective catastrophic event. *Journal of Environmental Economics and Management*, 109:102502.

Zelmer, J. (2003). Linear public goods experiments: A meta-analysis. *Experimental Economics*, 6(3):299–310.

4.5 Appendix

4.5.1 Proofs

Proof of Lemma 4.2.3:

Equal payoffs require that total investments in a neighborhood of any player are identical and thus given by $3(w^H + w^L)/2$ in any efficient situation as all endowment is invested. We thus have $G_A + G_B + G_C = G_B + G_C + G_D$ and thus $G_A = G_D$. The same argument can be used to show that opposing sides always have the same investment.

Proof of Lemma 4.2.3:

Denoting the total investments in a neighborhood of a poor (rich) player by G^L (G^H), equal payoff gains require $h(G^H - G^L) = w^H - w^L$. As $G^H + G^L = 3(w^H + w^L)$, we obtain $G^H = ((3h+1)w^H + (3h-1)w^L)/(2h)$ and $G^L = ((3h-1)w^H + (3h+1)w^L)/(2h)$.

(i) In the alternating setting, $G^L = G_A + G_B + G_C = G_C + G_D + G_E = G_E + G_F + G_A$ and $G^H = G_B + G_C + G_D = G_D + G_E + G_F = G_F + G_A + G_B$. Thus, we obtain $G^H - G^L = G_D - G_A = G_F - G_C = G_B - G_E$ and $G_C = G_F$.

(ii) In the clustered setting, $G^L = G_A + G_B + G_C = G_B + G_C + G_D = G_F + G_A + G_B$ and $G^H = G_C + G_D + G_E = G_D + G_E + G_F = G_E + G_F + G_A$. Thus, we obtain $G_A = G_D$ and $G_C = G_F$.

Equal gains requires $G^H - G^L = (w^H - w^L)/h$ which immediately implies that $G_F - G_B = (w^H - w^L)/h$.

4.5.2 Tables and Figures

	T1	T2	T3	T4	T5
VARIABLES	CN_{hom}	CN_{het}	ON_{hom}	ON_{alt}	ON_{clu}
Payoff	37.29	37.15	36.17	37.30	37.51
	(2.73)	(3.09)	(2.83)	(2.87)	(2.65)
Tokens kept	15.41	15.70	17.67	15.40	14.97
	(5.45)	(6.18)	(5.67)	(5.73)	(5.31)
Tokens invested	14.59	14.30	12.33	14.60	15.03
	(5.45)	(6.18)	(5.67)	(5.73)	(5.31)
- in own location	4.09	4.37	5.14	5.01	5.31
	(2.17)	(2.96)	(3.24)	(3.63)	(3.21)
- in neighbors' location	8.85	9.07	6.08	7.80	8.56
	(3.47)	(4.41)	(2.92)	(2.49)	(3.41)
- outside of neighborhood	1.65	0.86	1.11	1.79	1.16
	(1.82)	(0.93)	(1.17)	(1.41)	(0.74)
Observations	16	15	15	15	16

Table 4.2 Summary statistics for treatments T1 - T5 (averaged by group).

	T2	T4	T5
Poor	(sd)	(sd)	(sd)
Payoff	32.50	31.93	30.66
	(5.93)	(6.08)	(4.92)
Tokens kept	11.24	9.94	8.91
	(4.01)	(3.96)	(4.21)
Tokens invested	8.76	10.06	11.09
	(4.01)	(3.96)	(4.21)
- in own location	2.91	3.37	4.23
	(1.82)	(2.94)	(2.87)
- in neighbors' location	5.56	5.87	6.07
	(3.11)	(2.14)	(2.31)
- outside of neighborhood	0.28	0.82	0.79
	(0.46)	(1.19)	(1.08)
Rich	T2	T4	T5
Payoff	41.80	42.66	44.37
	(1.66)	(2.71)	(2.08)
Tokens kept	20.16	20.86	21.03
	(9.12)	(8.59)	(8.58)
Tokens invested	19.84	19.14	18.97
	(9.12)	(8.59)	(8.58)
-in own location	5.84	6.65	6.40
	(4.60)	(4.95)	(4.31)
- in neighbors' location	12.57	9.73	11.05
	(6.82)	(4.44)	6.13)
- outside of neighborhood	1.44	2.76	1.53
	(1.91)	(3.10)	1.28)
Difference of payoff	9.26	10.73	13.72
	(6.14)	(7.47)	(5.38)
Observations	15	15	16

Table 4.3 Summary statistics for treatments T2 CN_{het}, T4 ON_{alt} and T5 ON_{clu}, separated by endowment type (averaged by group).

	T1	T2	T3	T4	T5
Rounds 1-5	CN_{hom}	CN_{het}	ON_{hom}	ON_{alt}	ON_{clu}
PG provided	49.98	47.85	44.38	49.24	52.48
	(14.47)	(18.77)	(15.67)	(15.10)	(13.79)
Payoff	38.33	37.97	37.40	38.21	38.75
	(2.41)	(3.13)	(2.61)	(2.52)	(2.30)
Tokens kept	13.34	14.05	15.21	13.59	12.51
	(4.82)	(6.26)	(5.22)	(5.03)	(4.60)
Tokens invested	16.66	15.95	14.79	16.41	17.49
	(4.82)	(6.26)	(5.22)	(5.03)	(4.60)
-in own location	4.77	4.94	6.04	5.32	6.24
	(2.30)	(3.13)	(3.12)	(3.06)	(3.12)
-in neighbors' locations	9.86	9.95	7.49	9.25	10.12
	(3.14)	(4.65)	(3.45)	(2.72)	(3.37)
-outside of neighborhood	2.02	1.05	1.26	1.84	1.13
	(2.00)	(1.14)	(1.15)	(1.26)	(0.79)
Rounds 6-10	T1	T2	T3	T4	T5
PG provided	37.55	37.95	29.61	38.35	37.69
	(19.36)	(19.48)	(19.58)	(20.01)	(19.42)
Payoff	36.26	36.33	34.94	36.39	36.28
	(3.23)	(3.25)	(3.26)	(3.33)	(3.24)
Tokens kept	17.48	17.35	20.13	17.22	17.44
	(6.45)	(6.49)	(6.53)	(6.67)	(6.47)
Tokens invested	12.52	12.65	9.87	12.78	12.56
	(6.45)	(6.49)	(6.53)	(6.67)	(6.47)
-in own location	3.40	3.80	4.24	4.70	4.38
	(2.25)	(3.01)	(3.59)	(4.54)	(3.77)
-in neighbors' locations	7.85	8.18	4.66	6.35	7.00
	(4.25)	(4.43)	(3.08)	(2.47)	(3.90)
-outside of neighborhood	1.27	0.67	0.97	1.73	1.18
	(1.71)	(0.77)	(1.35)	(1.62)	(0.98)
Observations	16	15	15	15	16

Table 4.4 Summary of outcomes variables for each treatment, grouped at the group of 6 level. Separated by average value for rounds 1-5 and rounds 6-10.

VARIABLES	T2 (Rich) CN_{het}	T2 (Poor) CN_{het}	T4 (Rich) ON_{alt}	T4 (Poor) ON_{alt}	T5 (Rich) ON_{clu}	T5 (Poor) ON_{clu}
Payoff	42.06	33.88	43.50	32.91	45.52	31.97
	(2.22)	(6.38)	(2.22)	(5.48)	(2.48)	(5.26)
Tokens kept	18.15	9.95	18.91	8.26	17.97	7.04
	(9.12)	(4.62)	(7.64)	(3.44)	(8.16)	(3.81)
Tokens invested	21.85	10.05	21.09	11.74	22.03	12.96
	(9.12)	(4.62)	(7.64)	(3.44)	(8.16)	(3.81)
- in own location	6.60	3.28	7.05	3.60	7.51	4.98
	(4.48)	(2.58)	(4.36)	(2.47)	(4.85)	(2.63)
- in neighbors' locations	13.48	6.43	11.33	7.16	13.02	7.22
	(7.01)	(3.28)	(4.36)	(2.25)	(6.22)	(3.26)
- outside of neighborhood	1.77	0.33	2.71	0.97	1.50	0.76
	(2.26)	(0.51)	(2.82)	(1.25)	(1.32)	(0.99)

VARIABLES	T2 (Rich) CN_{het}	T2 (Poor) CN_{het}	T4 (Rich) ON_{alt}	T4 (Poor) ON_{alt}	T5 (Rich) ON_{clu}	T5 (Poor) ON_{clu}
Payoff	41.53	31.12	41.82	30.96	43.22	29.34
	(1.66)	(5.95)	(3.62)	(7.07)	(2.78)	(5.29)
Tokens kept	22.17	12.52	22.81	11.63	24.08	10.79
	(9.72)	(3.97)	(9.95)	(4.87)	(9.84)	(5.13)
Tokens invested	17.83	7.48	17.19	8.37	15.92	9.21
	(9.72)	(3.97)	(9.95)	(4.87)	(9.84)	(5.13)
- in own location	5.07	2.54	6.26	3.15	5.29	3.48
	(5.08)	(1.82)	(6.07)	(3.76)	(4.76)	(3.34)
- in neighbors' locations	11.66	4.70	8.13	4.57	9.07	4.93
	(7.12)	(3.07)	(4.73)	(2.55)	(6.88)	(2.10)
- outside of neighborhood	1.10	0.24	2.80	0.66	1.55	0.81
	(1.63)	(0.47)	(3.48)	(1.19)	(1.69)	(1.28)
Observations	15	15	15	15	16	16

Table 4.5 Comparing rich and poor participants' outcomes over time - separated in rounds 1-5 and 6-10.

VARIABLES	Rich Center	Rich Border	Poor Border	Poor Center
Payoff	46.44	43.34	31.19	29.59
	(5.02)	(3.14)	(6.00)	(5.48)
Tokens kept	22.64	20.22	9.22	8.31
	(11.25)	(7.97)	(4.06)	(6.58)
Tokens invested	17.36	19.78	10.78	11.69
	(11.25)	(7.97)	(4.06)	(6.58)
- in own location	5.88	6.66	3.63	5.43
	(3.72)	(5.08)	(2.07)	(6.26)
- in neighbors' locations	10.09	11.52	6.44	5.33
	(8.44)	(6.06)	(2.98)	(4.56)
- outside of neighborhood	1.40	1.59	0.71	0.93
	(2.22)	(1.79)	(1.15)	(2.44)
Endowment	20	20	40	40
Observations	16	16	16	16

Table 4.6 Summary statistics of treatment T5 ON_{clu} by location type.

	Share of investments going to ...				
	own location	neighbors' locations	poor neighbor	rich neighbor	diff p-value
T4 ON_{alt}					
Poor	0.30	0.61			
	(0.16)	(0.16)			
Rich	0.33	0.52			
	(0.14)	(0.15)			
T5 ON_{clu}					
Rich center	0.42	0.51			
	(0.30)	(0.28)			
Rich border	0.31	0.61	0.37	0.24	0.0443
	(0.21)	(0.23)	(0.20)	(0.08)	
Poor border	0.35	0.64	0.36	0.28	0.2979
	(0.14)	(0.24)	(0.22)	(0.10)	
Poor center	0.44	0.50			
	(0.33)	(0.32)			

Table 4.7 Share of total investments in own vs. neighbors' positions. For rich border and poor border types in T5 ON_{clu}, the investments at neighbors' positions are further differentiated by the identity of the neighbor, i.e. if targeting more poor or more rich players. For all other types, the two neighbors are symmetric such that we refrain from differentiating. Note that the shares do not add up to one due to the small (but negligible) transfers directed to locations outside of the neighborhood.

VARIABLES	(1) $invest_t$ (total)	(2) $invest_t$ (own)	(3) $invest_t$ (left)	(4) $invest_t$ (right)	(5) $invest_t$ (own+left)	(6) $invest_t$ (own+right)	(7) $invest_t$ (right-left)
$invest_{t-1}$ (own)	0.53***	0.54***	0.06	0.07*	0.60***	0.61***	0.02
	(5.42)	(5.69)	(1.25)	(1.68)	(9.77)	(9.72)	(0.70)
$invest_{t-1}$ (right)	0.24*	0.10	0.10**	0.41***	0.20***	0.52***	0.32***
	(1.77)	(1.44)	(2.56)	(4.00)	(2.72)	(8.78)	(3.26)
$invest_{t-1}$ (left)	0.34***	0.23***	0.35***	0.06	0.57***	0.28***	-0.29***
	(6.12)	(2.84)	(6.57)	(1.31)	(7.38)	(3.04)	(-5.67)
$keep_{t-1}$ (left)	-0.17***	-0.06*	-0.03**	0.01	-0.09***	-0.06**	-0.01
	(-3.90)	(-1.79)	(-2.54)	(0.31)	(-2.63)	(-2.28)	(-0.52)
$keep_{t-1}$ (right)	-0.21***	-0.03	-0.02	-0.06***	-0.04**	-0.09***	
	(-6.92)	(-1.51)	(-1.24)	(-2.99)	(-2.30)	(-3.75)	
$keep_{t-1}$ (right-left)							-0.05**
							(-2.21)
round	-0.21**	0.03	-0.06	-0.07	-0.02	-0.03	-0.01
	(-2.24)	(0.54)	(-1.27)	(-1.23)	(-0.35)	(-0.64)	(-0.16)
Constant	15.02***	2.30***	2.29***	2.47***	4.59***	4.77***	0.18
	(10.74)	(2.65)	(2.80)	(3.69)	(4.50)	(4.50)	(0.46)
n	90	90	90	90	90	90	90

Robust z-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4.8 Determinants of investments patterns of $player_i$ as a response to the investment levels of her neighbors (left and right) in the previous round, $_{t-1}$, for T3 ON_{hom}. Panel model with individual random effects, standard errors clustered at group level.

VARIABLES	(1) $invest_t$ (total)	(2) $invest_t$ (own)	(3) $invest_t$ (left)	(4) $invest_t$ (right)	(5) $invest_t$ (own+left)	(6) $invest_t$ (own+right)	(7) $invest_t$ (right-left)
$invest_{t-1}$ (own)	0.25***	0.53***	0.03	0.05**	0.56***	0.58***	0.02
	(2.74)	(6.26)	(0.81)	(2.48)	(10.49)	(7.50)	(0.54)
$invest_{t-1}$ (right)	0.19**	0.16**	0.07	0.44***	0.23***	0.59***	0.37***
	(1.99)	(2.10)	(1.39)	(6.43)	(3.58)	(6.01)	(5.80)
$invest_{t-1}$ (left)	0.01	-0.01	0.42***	0.12	0.40***	0.11	-0.30***
	(0.16)	(-0.14)	(9.12)	(1.47)	(5.67)	(0.99)	(-3.52)
$keep_{t-1}$ (left)	-0.13***	-0.06***	-0.05***	0.00	-0.11***	-0.05**	0.01
	(-2.89)	(-2.61)	(-3.02)	(0.04)	(-3.23)	(-2.01)	(0.31)
$keep_{t-1}$ (right)	-0.13***	-0.07***	0.00	-0.04***	-0.07***	-0.12***	
	(-3.48)	(-4.24)	(0.18)	(-2.91)	(-3.11)	(-5.58)	
$keep_{t-1}$ (right-left)							-0.04**
							(-2.18)
round	-0.60***	0.02	-0.20***	-0.16**	-0.18**	-0.15*	0.03
	(-5.24)	(0.26)	(-5.73)	(-2.46)	(-2.34)	(-1.80)	(0.52)
Constant	19.68***	3.44***	3.41***	2.98***	6.85***	6.42***	-0.43
	(10.22)	(3.41)	(7.79)	(3.62)	(5.86)	(5.29)	(-0.69)
n	90	90	90	90	90	90	90

Robust z-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4.9 Determinants of investments patterns of $player_i$ as a response to the investment levels of her neighbors (left and right) in the previous round, $_{t-1}$, for T4 ON_{alt}. Panel model with individual random effects, standard errors clustered at group level.

VARIABLES	(1) $invest_t$ (total)	(2) $invest_t$ (own)	(3) $invest_t$ (left)	(4) $invest_t$ (right)	(5) $invest_t$ (own+left)	(6) $invest_t$ (own+left)	(7) $invest_t$ (right-left)
$invest_{t-1}$ (own)	0.51***	0.56***	0.05**	0.07***	0.61***	0.63***	0.02
	(11.17)	(13.52)	(2.29)	(2.58)	(12.33)	(11.22)	(0.79)
$invest_{t-1}$ (right)	0.21**	0.14*	0.12***	0.44***	0.26***	0.58***	0.32***
	(2.55)	(1.81)	(3.32)	(10.69)	(3.28)	(6.18)	(5.29)
$invest_{t-1}$ (left)	0.32***	0.11	0.55***	0.18***	0.66***	0.29***	-0.37***
	(3.60)	(1.57)	(5.73)	(5.61)	(8.31)	(4.07)	(-3.90)
$keep_{t-1}$ (left)	-0.22***	-0.06**	-0.04***	0.02	-0.09***	-0.03	0.01
	(-5.04)	(-2.00)	(-4.01)	(1.38)	(-3.58)	(-1.39)	(0.66)
$keep_{t-1}$ (right)	-0.15***	-0.02	-0.01	-0.05***	-0.02	-0.07***	
	(-6.60)	(-0.93)	(-0.68)	(-4.20)	(-1.33)	(-3.06)	
$keep_{t-1}$ (right-left)							-0.04***
							(-2.91)
round	-0.36***	-0.12**	-0.01	-0.07	-0.13*	-0.18***	-0.06
	(-3.88)	(-2.18)	(-0.15)	(-1.13)	(-1.77)	(-3.13)	(-0.78)
Constant	16.95***	2.92***	1.52**	1.81***	4.44***	4.73***	0.29
	(16.00)	(5.67)	(2.31)	(2.66)	(5.14)	(4.93)	(0.46)
n	96	96	96	96	96	96	96

Robust z-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4.10 Determinants of investments patterns of player$_i$ as a response to the investment levels of her neighbors (left and right) in the previous round, $_{t-1}$, for T5 ON_{clu}.

VARIABLES	(1) $invest_t$ (total)	(2) $invest_t$ (own)	(3) $invest_t$ (left)	(4) $invest_t$ (right)	(5) $invest_t$ (own+left)	(6) $invest_t$ (own+right)	(7) $invest_t$ (right-left)
$invest_{t-1}$ (own)	0.53***	0.54***	0.06	0.07*	0.60***	0.61***	0.02
	(5.42)	(5.69)	(1.25)	(1.68)	(9.77)	(9.72)	(0.70)
$invest_{t-1}$ (right)	0.24*	0.10	0.10**	0.41***	0.20***	0.52***	0.32***
	(1.77)	(1.44)	(2.56)	(4.00)	(2.72)	(8.78)	(3.26)
$invest_{t-1}$ (left)	0.34***	0.23***	0.35***	0.06	0.57***	0.28***	-0.29***
	(6.12)	(2.84)	(6.57)	(1.31)	(7.38)	(3.04)	(-5.67)
$keep\_share_{t-1}$ (left)	-5.22***	-1.84*	-1.00**	0.18	-2.84***	-1.66**	-0.21
	(-3.90)	(-1.79)	(-2.54)	(0.31)	(-2.63)	(-2.28)	(-0.52)
$keep\_share_{t-1}$ (right)	-6.30***	-0.79	-0.51	-1.90***	-1.30**	-2.69***	
	(-6.92)	(-1.51)	(-1.24)	(-2.99)	(-2.30)	(-3.75)	
$keep\_share_{t-1}$ (right-left)							-1.39**
							(-2.21)
round	-0.21**	0.03	-0.06	-0.07	-0.02	-0.03	-0.01
	(-2.24)	(0.54)	(-1.27)	(-1.23)	(-0.35)	(-0.64)	(-0.16)
Constant	15.02***	2.30***	2.29***	2.47***	4.59***	4.77***	0.18
	(10.74)	(2.65)	(2.80)	(3.69)	(4.50)	(4.50)	(0.46)
	90	90	90	90	90	90	90

Robust z-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4.11 Determinants of investments patterns in T3 ON_{hom}. Panel model with individual random effects, standard errors clustered at group level.. *keep_share* variables are coded as rate of tokens kept of the original endowment

VARIABLES	(1) $invest_t$ (total)	(2) $invest_t$ (own)	(3) $invest_t$ (left)	(4) $invest_t$ (right)	(5) $invest_t$ (own+left)	(6) $invest_t$ (own+right)	(7) $invest_t$ (right-left)
$invest_{t-1}$ (own)	0.28***	0.54***	0.04	0.06***	0.58***	0.60***	0.02
	(3.13)	(6.63)	(1.00)	(3.08)	(11.75)	(7.92)	(0.56)
$invest_{t-1}$ (right)	0.20**	0.17**	0.07	0.45***	0.24***	0.61***	0.37***
	(2.19)	(2.16)	(1.49)	(6.83)	(3.70)	(6.51)	(5.89)
$invest_{t-1}$ (left)	0.03	0.01	0.43***	0.12	0.44***	0.13	-0.31***
	(0.32)	(0.07)	(9.53)	(1.52)	(6.04)	(1.24)	(-3.58)
$keep\_share_{t-1}$ (left)	-4.80***	-2.04***	-1.18***	-0.06	-3.22***	-2.10**	0.22
	(-3.33)	(-3.28)	(-2.59)	(-0.14)	(-4.13)	(-2.52)	(0.46)
$keep\_share_{t-1}$ (right)	-4.72***	-2.72***	-0.04	-0.94**	-2.75***	-3.66***	
	(-4.66)	(-4.78)	(-0.07)	(-2.05)	(-3.30)	(-5.76)	
$keep\_share_{t-1}$ (right-left)							-0.91
							(-1.38)
round	-0.53***	0.06	-0.19***	-0.16**	-0.13*	-0.10	0.03
	(-4.60)	(0.95)	(-4.88)	(-2.30)	(-1.73)	(-1.25)	(0.47)
Constant	19.80***	3.42***	3.18***	2.76***	6.60***	6.18***	-0.42
	(11.68)	(3.58)	(8.34)	(4.09)	(6.40)	(5.82)	(-0.85)
n	90	90	90	90	90	90	90

Robust z-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4.12 Determinants of investments patterns in T4 ON_{alt}. Panel model with individual random effects, standard errors clustered at group level. *keep_share* variables are coded as rate of tokens kept of the original endowment

VARIABLES	(1) $invest_t$ (total)	(2) $invest_t$ (own)	(3) $invest_t$ (left)	(4) $invest_t$ (right)	(5) $invest_t$ (own+left)	(6) $invest_t$ (own+right)	(7) $invest_t$ (right-left)
$invest_{t-1}$ (own)	0.51***	0.56***	0.04**	0.07**	0.60***	0.63***	0.03
	(11.23)	(13.67)	(2.07)	(2.56)	(11.87)	(11.35)	(0.95)
$invest_{t-1}$ (right)	0.20**	0.13*	0.11***	0.45***	0.24***	0.58***	0.34***
	(2.45)	(1.82)	(3.13)	(10.66)	(3.11)	(6.37)	(5.49)
$invest_{t-1}$ (left)	0.33***	0.11*	0.55***	0.17***	0.66***	0.28***	-0.38***
	(3.73)	(1.65)	(5.62)	(5.47)	(8.02)	(3.98)	(-3.87)
$keep\_share_{t-1}$ (left)	-6.76***	-2.22**	-0.95**	0.38	-3.17***	-1.83**	0.32
	(-4.07)	(-2.39)	(-2.39)	(0.84)	(-3.64)	(-2.05)	(0.48)
$keep\_share_{t-1}$ (right)	-4.41***	-0.35	-0.48	-1.48***	-0.83	-1.84**	
	(-4.94)	(-0.59)	(-1.13)	(-3.22)	(-1.22)	(-2.40)	
$keep\_share_{t-1}$ (right-left)							-1.01
							(-1.55)
round	-0.34***	-0.11**	-0.00	-0.06	-0.11	-0.16***	-0.05
	(-3.46)	(-2.03)	(-0.07)	(-1.02)	(-1.55)	(-2.79)	(-0.74)
Constant	16.82***	3.03***	1.59**	1.85***	4.62***	4.88***	0.26
	(15.27)	(5.31)	(2.27)	(2.74)	(5.00)	(5.03)	(0.39)
n	96	96	96	96	96	96	96

Robust z-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4.13 Determinants of investments patterns in T5 ON_{clu}. Panel model with individual random effects, standard errors clustered at group level. *keep_share* variables are coded as rate of tokens kept of the original endowment

4.5.3 Experimental Instructions

In the following, we demonstrate the experimental instructions for Treatment T4 ON_{alt}, translated into English (original experiment language was German). After displaying the instructions, we provide screenshots of the original experiment to show the exact display of the decision and feedback page (in German language).

Welcome to our experiment!

General information

In this experiment you can earn money depending on your decisions and the decisions of the other participants.

Please read the instructions carefully to understand the rules of the experiment.

Payment during the experiment is calculated in LabPoints (LP). The exchange between LP and Euro is 2,5:1, i.e. 1 LP is exchanged for 0.40 €.

At the end of the experiment you will fill in a questionnaire. In total, the experiment will take about 60 minutes. Your answers will be treated anonymously. If you leave the experiment early, you will not receive any compensation.

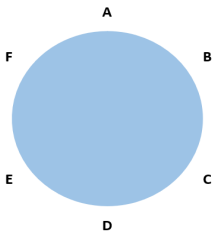
Rules

Locations and neighbourhoods

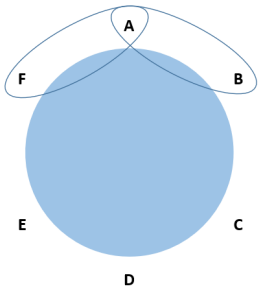
You play in a group of 6 participants in total, i.e. you and 5 other people. The 6 participants take a seat at a virtual round table, with each participant having his or her fixed location. Each group member faces the same decision problem. All decisions in this experiment are anonymous.

They play a game that is played over 10 separate and independent rounds. At the end, one of the 10 rounds is randomly selected and used to calculate the payoffs.

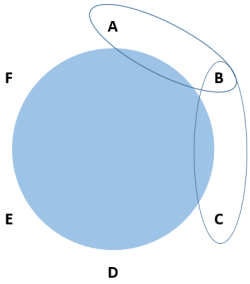
To maintain anonymity, you, i.e. your location at the virtual table, are identified by a letter (between A and F) that remains constant over all rounds:



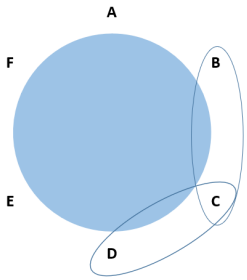
Depending on the location, the participants have different neighbours. For example, the neighbourhood of the player at location A is F-A-B:



The neighbourhood of the player at location B is A-B-C:

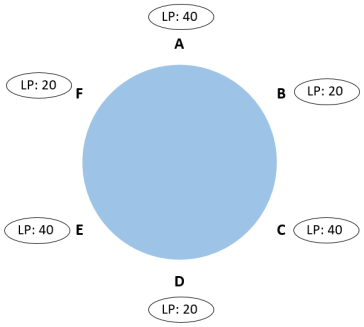


The neighbourhood of the player at location C is B-C-D (etc.):



Equipment and investments

Three players in the group start each round with 40 LP credited to their private account, while the other three start with 20 LP each. Specifically, players A, C and E each receive 40 LP, while players B, D and F each receive 20 LP.



Each player decides individually how many LP they want to keep on their private account and how many they want to invest in locations A, B, C, D, E or F. **Each player can thus invest in all locations A to F.**

The sum of a player's investments may not exceed his initial endowment of (40 or 20).

The investments of all players are added up. The total investment at a location is thus the sum of the investments made by the six players at that location.

The total investments at each location have different effects on the payout of the players.

The total investment at a location generates a payout for the player at that location as well as the respective two neighbours. This means that a player at one location benefits from the total investments at his own location as well as the locations of the two neighbours. Investments in other locations do not generate a payout for that player.

Payout

Your payout at the end of the game is made up of the following parts:

- the number of LP you still have in your private account.

- 0.5 times the total investments made at your location.

- 0.5 times the total investments made at your right-hand neighbour's location,

- 0.5 times the total investments at the location of your left-hand neighbour,

Calculation: Private account balance + investment payout (0.5 x sum of investments in neighbourhood)

A player's payout is thus determined by 0.5 times (50%) the investments in the player's neighbourhood (at his location and at the locations of the respective two neighbours). Conversely, each LP invested in a location thus generates a total payout of 1.5LP: 0.5LP each for the player of the location, as well as the respective left and right neighbour.

For example, let us assume that 40LP has been invested at location D and 20LP and 40LP at the two neighbouring locations C and E respectively. Then the sum of the total investment of the neighbourhood C-D-E is equal to 20+40+40=100. Player D receives 50% of the total investment at his location, as well as 50% of the total investment at the location of his two neighbours, i.e. a payout of 0.5 times (20+40+40) = 0.5 times 100LP = 50LP. Added to this is the payout of the remaining LP on his private account. The payout of all players is calculated analogously, i.e. depending on the remaining amount on the respective private account, investments at one's own location and investments at the locations of the respective two neighbours.

More payout examples

Use the following examples to familiarise yourself further with the calculation of the payout of the game. Your understanding of this will be tested in the knowledge questions.

1. You have an initial endowment of 40LP and invest nothing in your own location and nothing in other locations. Assume that the total investment in your location is 10 (someone else has invested in your location), in your right neighbour's location is 20LP and in your right neighbour's location is 20LP. Then the total investment in your neighbourhood is 50LP.

   Your payout is therefore (40 - 0) + 0.5 x 50 = 40 + 25 = 65 LP.

2. You have an initial endowment of 20 LP and invest 15 LP in your own location and 5 LP in your left neighbour's location. Assume that the total investment in your location is 30, that in your left neighbour's location is 20 and that in your right neighbour's location is 40. Then the total investment in your neighbourhood is 90LP.

   Your payout is therefore (20 - 20) + 0.5 x 90 = 0 + 45 = 45 LP.

Feedback

After each round in which you and your 5 group members decide at the same time, all players will be informed about how much each player has in his personal account and about the total investment at each location. You will be shown the following exemplary feedback table of the respective rounds:

Participant Location	Initial equipment	Remains in private account	Total investments in location	Sum of investments in the neighborhood	Payoff from investment *(0.5*Sum of investment in neighbourhood)*	Total payout location
A	40	15	15	55 (A,B,F)	27,5	42,5
B	20	10	15	40 (A,B,C)	20	30
C	40	30	10	32 (B,C,D)	16	46
D	20	18	7	42 (C,D,E)	21	39
E	40	0	25	57 (D,E,F)	28,5	28,5
F	20	10	25	65 (E,F,A)	32,5	42,5

Remember that the total payout amount is calculated as follows:

"Total payout" = "Remaining LP in private account" + 0.5 x "Sum of investments at your site and your neighbours' two sites. ".

Summary of instructions

- You play 10 rounds in a group of 6 players.
- You are told which location you have (A to F), accordingly which are your two neighbours and what the initial equipment of all players per round is (40 or 20). Players A, C, E receive 40 LP; players B, D, F receive 20 LP. This remains constant throughout the game.
- In each round
    - You and the other players decide simultaneously and independently of each other how many of your (40 or 20) LP you will invest in which locations.
    - All players are informed about how much each player has kept in his private account and what the total investment at the locations is.
    - Your payout is the sum of what you have kept in your private account PLUS 0.5 times the sum of your neighbour's investment, i.e. the sum of the total investment in your location plus the locations of your two neighbours.
- The game is repeated for a total of 10 rounds and at the end one round is randomly drawn for the payout.
- Finally, you will be asked some questions about yourself.

Control questions

If you have read all the instructions and have no doubts, please answer the following control questions:

1) If you retain 10LP in your private account and the total investment in your location is 10LP and in your left and right neighbour's locations is 20LP and 15LP respectively, what is your payout in this round? (CORRECT ANSWER C)

Calculation: Remaining private account + payout investment (0.5 x sum of investments in neighbourhood)

a) 12,5 b) 22,5 c) 32,5 d) 50

2) If you retain 0LP in your private account and the total investment in your location is 40 and in your left and right neighbour's locations is 0 and 0 respectively, what is your payout this round? [CORRECT ANSWER B]

Calculation: Remaining private account + payout investment (0.5 x sum of investments in neighbourhood)

a) 12,5 b) 20 c) 37,5 d) 50

3) How many players form a neighbourhood? [CORRECT ANSWER B]

a) 4 b) 3 c) 6 d) 8

4) Do the neighbours of a group change between rounds? [CORRECT ANSWER B]

a) Yes b) No

5) Which locations can you invest in? [CORRECT ANSWER B]

a) Only at your own site

b) At each site

c) At your site and those of your neighbours

d) Only at your neighbours' site

6) Who benefits from an investment in your location? [CORRECT ANSWER D]

a) Nobody

b) Only you

c) Everybody

d) You and your two neighbours

7) From which investment do you benefit more: 10LP in your location or 10LP in your left neighbour's location? You profited: [CORRECT ANSWER A]

a) Equally

b) More by investing in your location

c) More by investing in my left neighbour's location

8) Assuming you are player A, what changes if you invest in the location of your right-hand neighbour, player F, instead of your location? [CORRECT ANSWER C]

a) Nothing

b) You profit less

c) Now your other right neighbour (player B) no longer profits but the other neighbour of player F (player E)

d) Player F profits more

The experiment begins as soon as all participants have answered these questions.

Screenshots of Original Experiment, Treatment T4 ON_{alt}) - Decision Page

ENTSCHEIDUNGSBILDSCHIRM RUNDE 1:

Sie sind Spieler C.

Die Ausstattung der Spieler A, C und E beträgt 40. Die Ausstattungen der Spieler B, D und F betragen 20.

Ihr Standort ist C. Ihre Anfangsausstattung ist 40.

Denken Sie daran, dass sich Ihre Auszahlung aus der Summe folgender Werte ergibt

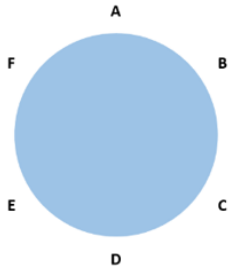
- *Die Anzahl der LP, die auf Ihrem persönlichen Konto verbleiben.*
- *Dem 0,5-fachen der Summe der Investitionen an Ihrem Standort und den Standorten Ihres linken und rechten Nachbarn.*

Wie viele LPs von Ihrem persönlichen Konto möchten Sie in dieser Runde an den jeweiligen Standorten investieren? (Die Summe darf Ihre Anfangsausstattung (40) nicht überschreiten.)

Standort	Ausstattung des Spielers am Standort	Nachbarschaft	Meine Investition in den Standort	Auszahlung an Spieler an den Standorten aufgrund meiner Investitionen
A	40			5
B	20	**Nachbar**	10	15
C	40	**Sie**	20	20
D	20	**Nachbar**	10	15
E	40			5
F	20			0
		Gesamtinvestitionen diese Runde:	**40**	
		Verbleib auf Ihrem Privatkonto:	**0**	

Screenshots of Original Experiment, Treatment T4 ON_{alt}) - Feedback Page (with hypothetical numbers inserted)

ZUSAMMENFASSUNG BILDSCHIRM RUNDE 1



Teilnehmer-Standort	Anfangs-ausstattung	Verbleib auf Privatkonto	Gesamt-investition am Standort	Summe Investition Nachbarschaft	Auszahlung Investition *(0,5*Summe Investition Nachbarschaft)*	Gesamt-auszahlung Standort
A	40	40	10	20 (F,A,B)	10,0	50,0
B	20	20	10	40 (A,B,C)	20,0	40,0
C	40	0	20	40 (B,C,D)	20,0	20,0
D	20	20	10	80 (C,D,E)	40,0	60,0
E	40	0	50	60 (D,E,F)	30,0	30,0
F	20	0	0	60 (E,F,A)	30,0	30,0

Weiter

Chapter 5

Bluffing in Charitable Giving – An Experiment on Indirect Signalling.

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Abstract

People often care about how they are perceived by others. Yet, while engaging in many different behaviours, not all behaviours are observed. Thus, behaviours may influence people's image not only directly, but also indirectly by changing other people's beliefs about unobserved behaviours. This project examines the use of indirect signals in the context of charitable giving. Under different levels of observability, participants decide (i) how much to donate to charity, and (ii) what charities to donate to. We mimic charitable giving in the field by making it costly to spread donations among many charities. We find that donors respond to such costs by giving to fewer charities. Yet, when donors are observed and evaluated only regarding what charities they give to, they (correctly) anticipate that spectators infer larger donations from more charities. Some donors use this strategically by making numerous tiny donations, whereby they indirectly signal that they are altruistic. This wasteful "altruistic bluff" disappears once spectators also observe the amounts donated to each charity. Thus, our study shows that individuals use indirect signals to strategically influence their public image. This has implications for organisational design, as even seemingly unimportant behaviours may be influenced by reputational concerns if they correlate with important, unobserved behaviours.

Keywords: Signalling, Observability, Charitable Giving, Altruism

JEL: C91, D01, D61, D64, D91, L31,

5.1 Introduction

As social beings, humans are heavily influenced by how others perceive and evaluate them (Fiske, 2018). From an early age, we learn that how we behave matters for whether other people think of us as friendly or unfriendly, honest or deceitful, intelligent or stupid, etc. We learn that the impression we make – our public image – matters for our interactions with others throughout our education, at the workplace, and in our social lives. And we learn that conforming with social norms will often help us get along with other people. This social motivation has many positive effects because the desire to improve our public image can prompt us to act prosocially. Thus, when individuals are observed, they often become more cooperative (Grimalda et al., 2016), increase donations (Lacetera and Macis, 2010; Karlan and McConnell, 2014), and volunteer more (Linardi and McConnell, 2011). Yet, such studies only focus on one behaviour (e.g. donated amounts) and its related character trait (e.g. altruism). Far less attention has been paid to the empirically relevant case where individuals engage in more than one behaviour and care about the image they obtain from the combination of behaviours. If in those cases not all behaviours are observed, signalling takes two forms (as illustrated in Figure 5.1): behaviours influence public image *directly*, and they influence public image *indirectly* by changing people's beliefs about the unobserved behaviours. For example, employees might frequently be seen at their desks working late. Such behaviour can directly signal dedication and hard work, but it can also be an indirect signal about the employees' (unobserved) productivity. Students may intentionally carry textbooks and highlighters and sit at the front row in class to signal their (unobserved) effort in their studies. And citizens may show their social engagement through charity sticker on cars or "vanity" license plates that show them as e.g. "voluntary firefighters" to signal something about their (unobserved) prosocial activities.

In this paper, we study indirect signalling through the case of charitable giving, as previous research has demonstrated that social motivation greatly influences donations to charity (e.g. Agerström et al., 2016; Krupka and Croson, 2016; House, 2018). The desire to appear altruistic could however lead donors to give in inefficient ways if doing so leads to a better public image. Thus, we aim to answer the following questions: how do individuals adapt their giving behaviour to different levels of observability? And how do individuals consider efficiency losses from spreading their donations to many charities?

To address these research questions, we build a conceptual framework and provide experimental evidence on whether social motivation can have negative effects when individuals seek to manipulate their public image. Participants decide under different levels of observability (i) how much to donate to charity and (ii) how many charities to give to. We mimic charitable giving in the field by including fixed processing costs for each additional

charity participants give to.[1] To see whether people are concerned about inefficiency in giving to multiple charities, we compare a treatment with no transaction costs (*NoCost*) to a treatment in which donors incur transaction costs for each additional charity they give to (*Private*). Then, we compare *Private* with different levels of observability to test for indirect signalling. In *PublicN*, donors are informed that two spectators will judge them after observing their decision about how many charities they give to and that the spectators will assign them (non-monetary) feedback points. Importantly, this treatment allows for indirect signalling, as people might signal how much they donated by means of how many charities they donated to.[2] Finally, in *PublicNAmount* donors are informed that the spectators will observe and evaluate also the total amount donated to charity, thereby precluding indirect signalling.

We derive three key results from our study: first, we find that efficiency matters. We observe that donors decrease the number of charities they give to when each donation comes with a fixed transaction cost. Second, we find that the extent to which donors are observed matters for their donation behaviour. Specifically, some donors engage in wasteful, indirect signalling when only the number of charities is observed. They do so because they (correctly) anticipate that spectators infer greater total donations from a larger number of charities. With such partial observability, donors can improve their image by engaging in an "altruistic bluff", in which they give tiny donations to many charities in order to signal that they are altruistic. This preference for being viewed as altruistic thus becomes more important to donors than appearing efficiency-oriented. Such altruistic bluffing works, as spectators approve of making donations to several charities. Yet, altruistic bluffing does not occur when spectators see both the number of charities and the amounts donated. Third, when both the number of charities and amounts donated are observed, we find that donors do not change their total donations compared to when amounts are not observed. We discuss potential reasons for the lack of an effect, including that the price of improving one's image is higher when donations are also observed, as donors can then no longer improve their image by making several tiny donations.

This study makes two important contributions to the literature. The primary contribution of this paper is to show empirically that individuals engage in wasteful indirect signalling to improve their public image. Previous theoretical studies have examined multidimen-

[1] In the field, donors often give to several charities, which is inefficient as a large part of the processing costs are independent of the size of the donation (Ahmed et al., 2016; Bloom, 2016). Depending on the method of payment, the fixed costs typically range between USD 0.2 and 3.6 with donations via traditional channels (mail, cheque, etc.) being more costly than online payment (see e.g. Give Lively and The Big Give). While processing costs may be considered modest for any one donation, they lead to huge losses in the aggregate as 160 million donors on average give to 4.3 charities every year in the US alone (Blackbaud Institute, 2018; YouGov, 2022).

[2] The case of partial observability, where spectators see the charities that a person has donated to but not amounts, is often relevant, as many charities enable donors to signal that they donated by social media posts, badges, cards, or other small gifts.

sional signalling games, where individuals engage in multiple behaviours to send signals about multiple unobserved characteristics (e.g. Quinzii and Rochet, 1985; Engers, 1987). Yet, existing empirical papers focus only on image concerns for one behaviour, showing e.g. that image concerns can make individuals behave more prosocially (Freeman, 1997; Batson, 1998). In the case of charitable giving, individuals also tend to be influenced by others' views and behaviour, as social norms have been shown to affect donations (Croson and Shang, 2008; Bicchieri and Xiao, 2009; Shang and Croson, 2009; Krupka and Weber, 2013; Drouvelis and Marx, 2021). In this study, we decompose signalling into its direct and indirect components. By doing so, we show how signalling may also occur for behaviours that are not relevant for reputation per se if the observed behaviours correlate with relevant unobserved behaviours. In addition, we demonstrate that indirect signalling can lead social motivation to have negative consequences for society even in situations where people improve their public image from prosocial behaviour such as giving to charity.[3]

A secondary contribution of this paper relates to the literature on charitable giving. To the best of our knowledge, we are the first to study how donors decide how many charities to give to when increasing the number of charities involves an efficiency loss in the form of processing costs. Recent years have seen an increased focus on the efficiency of charities (Singer, 2009; Null, 2011) and the role of overhead costs (Gregory and Howard, 2009; Gneezy et al., 2014). Yet, the efficiency costs from giving to multiple charities remains understudied, as most studies focus primarily on the donated amounts (Andreoni and Payne, 2013; Saeri et al., 2022). Some studies exogenously vary the number of recipients and show that total donations increase with more charities, but at a decreasing rate (e.g. Andreoni, 2007; Soyer and Hogarth, 2011; Chiang and Hsu, 2019, but see also Bolton et al., 1998).[4] Relatedly, other studies examine competition between charities and whether giving to one charity crowds out donations to others (e.g. Reinstein, 2011; Corazzini et al., 2015; Lange and Stocking, 2012; Gee and Meer, 2019). Yet, in this paper we make the choice about the number of recipients endogenous. In doing so, we address an important source of efficiency loss that charities face but which has received little attention in the literature: the transaction costs of spreading donations to multiple charities (see Footnote 1).

This paper proceeds as follows: section 5.2 presents a conceptual framework that explains

[3]Related to our study, Butera and Horn (2020) study the effect of providing public information about the effectiveness of charities. They find that donors use signals about higher quality of charities to donate less while appearing to contribute to the charitable output. Whereas Butera and Horn (2020) study donors' decision to give conditioned on efficiency, we study the choice about whether to give in an efficient manner. In addition (and in contrast to Butera and Horn, 2020), we examine how spectators judge donors' decisions, and we elicit beliefs to obtain more direct measures of donors' intentions to manipulate their public image.

[4]One exception to the fixed set of recipients is Fehérová et al. (2022), who allow some participants to choose whether they want to give to one or three charities (without efficiency concerns). They find that this autonomy induces more individuals to donate, but it does not increase the average amount donated.

how indirect signalling may occur when an individual engages in multiple behaviours. In Section 5.3, we detail the experimental design and our hypotheses. We present the main results in Section 5.4 and discuss further results in Section 5.5, including how the spectators respond to the signals of donors, what other motives donors may have for spreading their donations, and how behaviour in our experiment correlates with relevant psychological traits. The Appendix includes experimental instructions, as well as further results, tables, and figures.

5.2 Conceptual Framework

In the following, we explain how indirect signalling may occur in situations where individuals engage in more than one behaviour simultaneously. Our notation is general, as the idea of indirect signalling is general, but we use the frame of charitable giving to reflect the experiment presented in Section 5.3.

5.2.1 Setting

Consider an individual i who makes two decisions, a and b ($a \in A \subset \mathbb{R}$, $b \in B \subset \mathbb{R}$). To tie the model to our experiment, we consider a to be total donations to charities, and b to be the number of charities one donates to.[5] When deciding on a and b, we follow Bénabou and Tirole (2006) and assume that individuals have both extrinsic, intrinsic, and reputational motives. We denote by $x(a,b)$ the individual's monetary payoff from the combination of a and b, with both actions weakly reducing payoff ($x'_a \leq 0, x'_b \leq 0$; $x''_{aa} = 0, x''_{bb} = 0$), e.g. by giving to charity. We assume that both actions involve cognitive costs $C(a,b)$, $C'_a, C'_b > 0$, which are convex ($C''_{aa} \geq 0$, $C''_{bb} \geq 0$) and separable ($C''_{ab} = 0$). Such costs could for example be the effort required to decide how much and to what charities to give to (Huck and Rasul, 2010; Knowles and Servátka, 2015).

We represent the psychological benefits of the joint decision (a,b) by the function $g(a,b,\alpha,\beta)$, where α and β are sensitivities towards the two behaviours, drawn independently from a continuous and bounded distribution f. Individuals know their own sensitivities, but they need to infer sensitivities of others from their decisions (as explained below). We assume that individual i receives utility from both a and b ($g'_a, g'_b \geq 0$), that the marginal utilities from a and b are decreasing ($g''_{aa}, g''_{bb} < 0$), and that the marginal utility is increasing in the sensitivities ($g''_{a\alpha}, g''_{b\beta} > 0$, which is the standard single-crossing condition). In the case of charitable giving, this means that individual i receives utility from giving to charity

[5] For the examples provided in the Introduction, a could e.g. be productivity or effort in studying, and b the act of staying late in the office or always bringing one's books to the front of the classroom.

(from pure or impure altruism, Andreoni, 1989; Crumpler and Grossman, 2008) and from giving to more charities (Sharps and Schroeder, 2019; Schmitz, 2021). Because spreading donations to more charities is inefficient in this setting, we expect β to be inversely correlated with concerns for efficiency.

Finally, individual i may care about her reputation $R(a,b)$, which we model as the beliefs that spectators have about α and β. Specifically, the spectators infer α and β from the information set Ω, which could entail either full observability ($\Omega = \{a,b\}$), partial observability ($\Omega = \{a\}$ or $\Omega = \{b\}$), or nothing ($\Omega = \{\varnothing\}$). In sum, the individual receives the following utility:

$$U(a,b) = x(a,b) + g(a,b,\alpha,\beta) - C(a,b) + \gamma_a E(\alpha|\Omega) + \gamma_b E(\beta|\Omega), \tag{5.1}$$

where $R(a,b) \equiv \gamma_a E(\alpha|\Omega) + \gamma_b E(\beta|\Omega)$, and $\gamma_a, \gamma_b \geq 0$ are sensitivities towards the reputations for α and β, respectively.

The individual decides on (a,b) by maximising Equation 5.1 with respect to a and b. This yields the following first-order conditions that implicitly characterise the optimal levels a^* and b^*:

$$g'_a + r_a = C'_a - x'_a \tag{5.2}$$

$$g'_b + r_b = C'_b - x'_b \tag{5.3}$$

where $r_a \equiv \gamma_a \frac{\partial E[\alpha|\Omega]}{\partial a} + \gamma_b \frac{\partial E[\beta|\Omega]}{\partial a}$, and $r_b \equiv \gamma_a \frac{\partial E[\alpha|\Omega]}{\partial b} + \gamma_b \frac{\partial E[\beta|\Omega]}{\partial b}$ are the partial effect of a and b on $R(a,b)$.

5.2.2 Effect of Observability

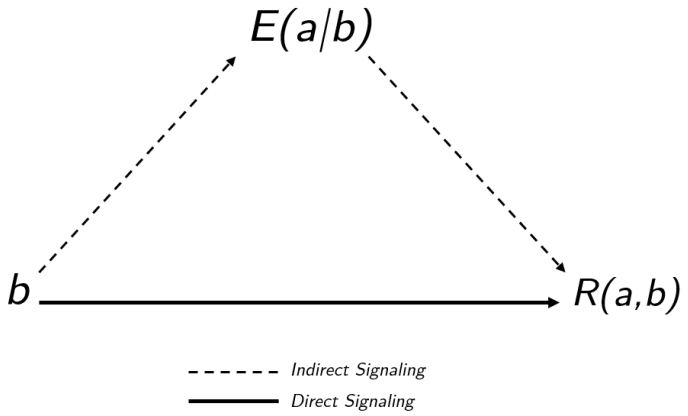
In the following, we provide intuition based on the conceptual framework. We discuss further details in Appendix 5.7.1 and refer the reader to the seminal work of Quinzii and Rochet (1985) and Engers (1987) for comprehensive models of multidimensional signalling.

In the case of no observability ($\Omega = \{\varnothing\}$), we assume that behaviour does not influence reputation ($r_a = r_b = 0$). Individual i chooses the optimal levels of a and b to equate the marginal psychological benefits (g'_a and g'_b) with the marginal monetary and cognitive costs ($C'_a - x'_a$ and $C'_b - x'_b$, respectively). Then, an increase in α (β) leads to an increase in a (b). In the example of charitable giving, this means that people who are more altruistic give greater amounts to charity, and people who care more about spreading donations between charities give to more charities. The interplay between α (β) and b (a) depends on the sign of g''_{ab}, and this is less straight-forward to determine ex ante, as we discuss in

Appendix 5.7.1.

When choices are observed ($\Omega = \{a, b\}$), the sign of r_a and r_b will determine how observability influences the optimal levels of a and b compared to the case of no observability. For simplicity, we restrict our attention to pure-strategy Perfect Bayesian equilibria, and we assume that, ceteris paribus, there is a monotonic, increasing relationship between α (β) and a (b), which is anticipated by the spectators, as beliefs are accurate in equilibrium. In the context of charitable giving, these assumptions imply that, holding all other things equal, people who are more altruistic give more to charity, and people who care more about spreading donations between charities give to more charities.

Figure 5.1 Indirect Signalling



In the case of full observability ($\Omega = \{a, b\}$), a and b may influence reputation in two ways. Observing a influences beliefs about α, but it may also influence beliefs about β, depending on the sign of g''_{ab} (and vice-versa for b). Intuitively, if $g''_{ab} > 0$, an individual may decide on a high level of a both due to a high α and a high b. Thus, a high a and a low b send a stronger signal about α than a high a and a high b. The sign of r_a and r_b will then depend on the relative concerns for the reputation of α (γ_a) and β (γ_b). In the case of charitable giving, previous studies show that individuals are more concerned about *how much* donors give than *how* they give (Berman et al., 2018), implying that $\gamma_a > \gamma_b$. Then, $r_a > 0$, meaning that giving greater amounts provides a good reputation, while the sign of r_b is ambiguous.

In the case of partial observability ($\Omega = \{a\}$ or $\Omega = \{b\}$), we distinguish between *direct signalling* and *indirect signalling*. In the case where only b is observed (as in our experiment), direct signalling comes from the effect that b has on $R(a, b)$ from b itself, and indirect signalling is the effect that b has on $R(a, b)$ via the beliefs about a (illustrated in Figure 5.1). Such indirect signalling is not present with full observability, as the spectators here also observe a. With partial observability, on the contrary, the indirect channel may matter greatly: if $g''_{ab} > 0$, a greater b correlates with a greater a, which in turn predicts a greater α (and vice-versa for $g''_{ab} < 0$). For the example of charitable giving, this means

that spectators who see a larger number of charities would infer that the total donations are greater and therefore believe that the person is more altruistic. Thus, in contrast to the case of full observability, $r_b > 0$ could occur even if neither donors nor spectators care about b per se. For charitable giving, this implies that even if neither donors nor the spectators care about the number of charities donors give to, observing the number of charities may influence donor behaviour if (i) donors care about their reputation from the (expected) amounts they donate, and (ii) there is a common belief that donors who give to many charities tend to donate more. Under partial observability, the beliefs about the relation between a and b will therefore be of great importance, and we measure these both for the spectators (first-order beliefs) and donors (second-order beliefs) in the experiment, which we now proceed to explain.

5.3 Experimental Design

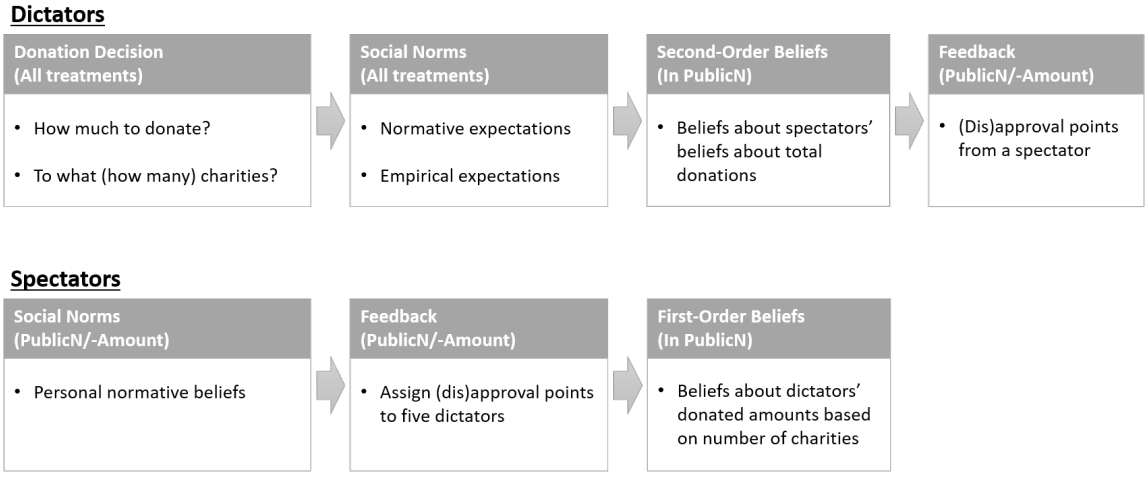
We run an online experiment to examine (i) whether individuals consider efficiency losses from spreading their donations to many charities, and (ii) how individuals adapt their giving behaviour to different levels of observability. The experiment consists of four parts and a survey (see Figure 5.2). First, one group of participants ('dictators' and in the text also referred to as 'donors') make decisions about how much to donate and how many charities to donate to. In different treatments, dictators make their decisions under either no, partial, or full observability. Second, we measure social norms for the donation decisions by eliciting normative and empirical expectations. Third, we elicit first- and second-order beliefs of participants in the treatment with partial observability. Fourth, a second group of participants ('spectators') provide non-monetary (dis)approval points to the dictators based on what they observe. Finally, participants complete a survey.[6]

5.3.1 Donation Decision

Setting. The main part of our experiment is a modified dictator game, in which dictators choose (i) how much of EUR 100 they want to donate to charities or keep for themselves and (ii) how many charities they want to give to. Here, we use the large nominal stakes of EUR 100 to make it meaningful for donors to distribute the money to several causes. Participants are informed that 10 dictators are randomly chosen and their charity decisions implemented (for validation of the random payment procedure, see e.g. Bolle, 1990; Cox et al., 2008; Charness et al., 2016; Clot et al., 2018).

[6]In all treatments, we make sure that participants understand the donation decision, the transaction costs, and the level of observability with a series of control questions that all must answer correctly in order to continue with the experiment.

Figure 5.2 Timeline of the experiment



When making their decisions, participants see a list of 49 charities divided into the following seven topics: Health, Rights, Environment, Development Aid, Youth and Children, Security, and Women Advocacy.[7] Specifically, they see the list of seven topics, and clicking on any topic will show the seven charities within that topic. If donors click on a charity, they see two sentences that describe the activities of the charity as well as a small picture that represents the topic (for a graphical illustration as well as to see the list of all charities and their descriptions, please see Appendix **??**). To preclude order effects, we present the different topics in random order, and we randomise the appearance of the charities under each topic.

All 49 charities have received a top rating in the CharityWatch efficiency ranking, and we inform participants about this to mitigate that donors give to multiple charities in order to reduce the risk of their donations being spent inefficiently.

Treatments. We divide participants into a total of four treatments (see Table 5.1). First, we test in two treatments without observation whether individuals care about the efficiency loss of donating to many charities. Specifically, dictators in the *NoCost* treatment are informed that the entire amount that they donate will be received by the respective charities. In contrast, dictators in the *Private* treatment are informed that they have to pay a transaction cost of EUR 1 for each additional charity they give to (reflecting the fixed costs of donating in the field, cf. Footnote 1).[8] Comparing giving behaviour between *NoCost* and *Private* sheds light on the influence of transaction costs. Notably, if dictators do not adapt their behaviour to transaction costs, it would reduce the scope

[7] With the comprehensive list of 49 possible charities, we aim to induce an impression of an overwhelming number of possible targets for donations, reflecting how donors may feel about selecting charities in the field.

[8] When effectuating the payments to the charities, the actual transaction costs of the charities were covered by the experimenters.

for the dictators to send signals by spreading their donations, as mimicking the 'desirable type' would be perceived to be cheap.

Second, we introduce two further treatments with observation to examine how individuals adapt their giving behaviour to different levels of observability. Both observed treatments include transaction costs, so the benchmark without observation is the *Private* treatment. In the *PublicN* treatment, dictators are informed prior to their allocation decision that two spectators will judge them after observing what charities they give to and that the spectators will learn their last name (Charness and Gneezy, 2008; see Samek and Sheremeta, 2014, Regner and Riener, 2017, and Fromell et al., 2020, for similar manipulations).[9] The spectators observe the list of charities that dictators give to and evaluate the decisions by sending feedback through non-monetary (dis)approval points (similar to e.g. Deffains et al., 2019), which we describe further in Section 5.3.4. In the *PublicNAmount* treatment, spectators additionally observe the amounts donated to each charity. Comparing *Private*, *PublicN*, and *PublicNAmount* sheds light on how the level of observability causally influences behaviour when an individual engages in two behaviours simultaneously.

Table 5.1 Treatment Overview

Treatments	Costs	Observed
NoCost	-	-
Private	1 per charity	-
PublicN	1 per charity	Charities
PublicNAmount	1 per charity	Charities & Donated Amounts

5.3.2 Social Norm Elicitation

We further examine the role of social motivation by eliciting social norms, which are informative of what behaviours individuals think are socially desirable. To measure social norms directly, we first recruit a separate sample ('social norm eliciters') and present them with the decisions of the dictators. Each social norm eliciter only sees the decisions in one of the four treatments, and we ask them how much they think a person *ought* to give and to how many charities. By using a separate sample rather than the dictators to elicit these 'personal normative beliefs' (Bicchieri, 2017), we reduce biases in these responses that would occur e.g. from self-justification.

In the main study, we then elicit the normative and empirical expectations of the dictators for both the total donations and the number of charities donated to. Specifically, after making their own choices, dictators are asked what they think the median responses among the social norm eliciters are (normative expectations), and dictators are asked what they

[9]To increase the statistical power for the main comparisons between dictators, each spectator observes five dictators, and pairs of spectators evaluate the same five dictators.

think the median decision among dictators is (empirical expectations).[10] This belief elicitation is incentivised: we draw at random either the questions related to normative or empirical expectations, and participants receive EUR 0.5 if they correctly guess the number of charities and the amount donated (with a margin of error of EUR ±3).[11]

After the questions related to normative and empirical expectations, dictators state their beliefs about how much they think dictators on average donated to each of the seven topics. These belief elicitations are incentivised, as one topic is drawn at random, and dictators earn EUR 0.5 if their guess is correct (±3). These questions shed light on a possible coordination problem in giving, to which we return in Section 5.5.2.

5.3.3 Second-Order Beliefs

As explained in Section 5.2, the case of partial observability (*PublicN*) allows for indirect signalling. Yet, the direction of the indirect signalling effect depends on the (expected) relation between the two behaviours. To shed light on this, we ask dictators (spectators) in *PublicN* about their second-order (first-order) beliefs about the total donations based on the number of charities. Specifically, we ask spectators to guess the total amount donated by the dictator based on the number of charities she donates to. This question is incentivised as we randomly draw one guess for each spectator, and the spectator additionally earns EUR 0.5 if she correctly guesses the amount donated (± EUR 3). We then elicit second-order beliefs from the dictators by asking them to state what the first-order beliefs of the spectators are. This question comes as a surprise to not influence the previous decision, and it is incentivised as the dictator may additionally earn EUR 0.5 if she correctly guesses the beliefs of the spectators (± EUR 3). The elicitation of first- and second-order beliefs provides a test for whether dictators expect that their decision about how many charities to donate to influences the spectators' beliefs about total donations.

[10] Prior to this page in the experiment, all participants read an explanation of what a median is, see examples from sets of numbers, and show in a control question that they are able to find the median in a series of numbers.

[11] Throughout the experiment, we use the interval method of belief elicitation (Dufwenberg and Gneezy, 2000; Charness and Dufwenberg, 2006) for uncovering beliefs about amounts donated. Previous research suggests that simple, incentivised elicitation methods are often more suitable than complex methods (Charness et al., 2021), despite the theoretical superiority of the latter methods, as they are easy for participants to understand. Moreover, using this simple method enables us to elicit many different beliefs (also related to second-order beliefs and in the survey described below) without making the task too tedious and time-consuming for participants.

5.3.4 Feedback

After participants answer questions related to social norms, spectators in *PublicN* and *PublicNAmount* observe the decisions by the dictators and evaluate them on a 6-point scale. We use the German high school grading system, which is a 6-point scale ranging from "very good" to "insufficient". This is a grading system that is well-known to all participants and therefore used in other experiments with German samples (e.g. Barrett and Dannenberg, 2016). For ease of interpretation, we recode the variable ex post such that a higher rating is more favourable.

5.3.5 Survey

At the end of the experiment, participants answer demographic questions about their gender, age, field of study, and how many hours they have volunteered in the past year. We then elicit several measures to explore factors beyond our conceptual framework that may influence the dictators' decisions. First, they answer a question about their general risk preferences (Dohmen et al., 2011). Second, participants rate on a 5-point Likert scale how important they think supporting each of the seven topics is. Third, they answer two questions about their preferences for spreading donations.[12] Fourth, they answer the 10-item Self-Importance of Moral Identity scale (Aquino et al., 2002), which measures the degree to which a person wants to possess moral qualities (Internalisation) and the degree to which a person believes that her actions communicate being moral to others (Symbolisation). We standardise responses to all the attitudinal controls as proportions of maximum possible (POMP) scores, ranging between zero and one, to enable an easy interpretation despite using different scale lengths (Cohen et al., 1999; Mellenbergh, 2019).[13]

5.3.6 Procedure

The experiment was conducted between March and May 2023 as an online experiment of the experimental laboratory of the University of Hamburg. We recruited a total of 826 individuals, of whom 804 completed the experiment. Of these, 585 were dictators,

[12] One concern is whether the treatments influence participants' responses to the questions about preferences for spreading donations (cf. post-treatment bias, Montgomery et al., 2018). Yet, we find no differences across treatments for these questions, risk preferences, the Self-Importance of Moral Identity scale, nor the average perceived importance of the seven topics (Kruskal-Wallis test, all $p's > .208$, cf. Appendix 5.27).

[13] We use POMP scores rather than standardised (z) scores, as the responses to the 'spread for efficiency' question and the Internalisation subscale are skewed (test for skewness: $p = .045$ and $p < .001$, D'Agostino and Belanger, 1990; Royston, 1991). Such skewness can make the z scores misleading (Cohen et al., 1999).

132 were spectators, and 87 were social norm eliciters. [14] Yet, 10 dictators in *PublicN* fail to provide consistent answers to the questions about second-order beliefs, leaving us with a main sample of 794 individuals.[15] In the main sample, 36 percent were male, and the mean age was 26 years. We provide sample characteristics and summary statistics in Tables 5.5 and 5.6.

For completing the study, dictators (social norm eliciters and spectators) received a show-up fee of EUR 4.5 (3) in addition to the payment for the incentivised belief elicitation questions and the payment to the 10 randomly selected dictators. The median earnings of the experiment were EUR 4.5, and the median completion time was 21 minutes.

5.3.7 Hypotheses

Drawing on our conceptual framework, we now explain our pre-registered hypotheses about how transaction costs and observability influence giving behaviour. First, we compare *NoCost* and *Private* to shed light on the role of transaction costs. Previous research indicates that many people have a preference for giving to multiple charities even if some charities are more effective than others (Sharps and Schroeder, 2019; Schmitz, 2021). Yet, other studies demonstrate that people care about their donations not being wasteful, e.g. by avoiding paying too much for administration (Meer, 2014; Portillo and Stinn, 2018). Similarly, another study points to a productivity-driven substitution pattern across charities, yet this effect becomes weaker the more dissimilar the charities are (Ek, 2017). This suggests a trade-off between giving to multiple charities and giving in an efficient manner. Such a trade-off has not yet been studied in a setting where donors decide how many charities to give to when increasing the number of charities involves an efficiency loss (in the form of transaction costs). Yet, if the trade-off exists, we expect dictators to give to fewer charities when each donation involves transaction costs, as such costs makes it more wasteful to spread donations. This leads to our first hypothesis:

[Efficiency] Dictators on average give to more charities in *NoCost* than in *Private*.

We then turn to the effects of observability. Importantly, we expect indirect signalling to influence behaviour differently depending on the (expected) correlation between the two decisions (which in our conceptual framework is given by the sign of g''_{ab}, see Section 5.2). In the pre-registration, we therefore conditioned the direction of the following hypotheses

[14] We oversampled the number of dictators in *Private*, *PublicN*, and *PublicNAmount* (168-170) compared to *NoCost* (77) to ensure sufficient power for the contrasts between different levels of observability. With this sample size, we expected based on power simulations to have a power of .8 to detect a difference in the number of charities of 1 and in total donations of EUR 6.5.

[15] The first and second-order belief elicitations provide a comprehension check. For example, if a spectator observes (no) donations to a charity, then believing that total donations are (not) zero suggests that the spectator did not understand the task.

on the expected correlation between the two decisions. Looking at the first- and second-order beliefs that we elicit in the *PublicN* treatment, we find that spectators believe that dictators who donated to more charities donated larger amounts (Spearman's $\rho = .530$, $p < .001$), and dictators anticipate this relation (Spearman's $\rho = .404$, $p < .001$). This suggests that $g''_{ab} > 0$, and we use this to formulate the following hypotheses.

With $g''_{ab} > 0$, increasing the number of charities in *PublicN* has two effects (as explained in Section 5.2): it influences reputation from observing a greater b (direct effect), and it influences reputation from through the spectator beliefs about total amounts (indirect effect). If individuals are more concerned about *how much* donors give than *how* they give (Berman et al., 2018), then the indirect effect should outweigh the direct effect, leading to an increase in the number of charities that dictators donate to in *PublicN*. In contrast, the comparison between *Private* and *PublicNAmount* is not clear ex ante. On the one hand, dictators may be motivated to decrease b in *PublicNAmount* to make their giving a greater signal about a. On the other hand, as explained below, we expect total donations to be greater in *PublicNAmount* than in *Private*. With $g''_{ab} > 0$, this should make dictators in *PublicNAmount* increase the number of charities they give to compared to *Private*. Due to these opposite effects, we do not include a hypothesis comparing the number of charities in *Private* and *PublicNAmount*. Thus, we arrive at our second hypothesis:

[Number of Charities]

1. The average number of charities participants give to is greater in *PublicN* than in *Private*.
2. The average number of charities participants give to is greater in *PublicN* than in *PublicNAmount*.

We expect total donations to be greater in *PublicNAmount* than in *PublicN* and *Private* because when donations are observed, giving more is a signal of greater altruism ($\frac{\partial E(\alpha|\Omega=\{a,b\})}{\partial a} > 0$). Furthermore, for $g''_{ab} > 0$, total donations should be greater in *PublicN* than in *Private*. This is because b is greater in *PublicN* (cf. Hypothesis 5.3.7), which leads g'_a to be greater in *PublicN* than in *Private*, which in turn increases total donations. Our hypothesis regarding total donations is therefore as follows:

[Total Donations]

1. On average, participants donate more in *PublicNAmount* than in *PublicN*.
2. On average, participants donate more in *PublicNAmount* than in *Private*.
3. On average, participants donate more in *PublicN* than in *Private*.

5.4 Results

We now present the results on how participants respond to the inclusion of transaction costs and the (partial or full) observation by spectators. In doing so, we follow the pre-analysis plan exactly, as we "run regressions with (i) no controls, (ii) demographic controls (age, gender, field of study, and hours of volunteering the past year), and (iii) controls also for attitudes (two questions on preferences for diversification, internalisation, and symbolisation)." Our preferred specification is (iii), as adding the relevant control variables increases the efficiency and statistical power of our analysis. Hypotheses 5.3.7 and 5.3.7 (henceforth H1 and H2) concern differences in the number of charities that dictators donate to. As the number of charities is count data (i.e. non-negative integers), we pre-registered to use negative binomial regressions. To test Hypothesis 5.3.7 (henceforth H3), we rely on tobit regressions, as the total donations are censored data between 0 and 100 (with the upper limit depending on how many charities dictators choose to donate to in the treatments with transaction costs). For robustness, we here also consider the nonparametric Mann-Whitney U-test (henceforth MWU-test, Wilcoxon, 1945; Mann and Whitney, 1947) and the semiparametric Symmetrically Censored Least Squares estimator (henceforth SCLS test Powell, 1986). Table 5.7 provides descriptive statistics, and Figures 5.5 and 5.6 show how donations were allocated across topics and charities.

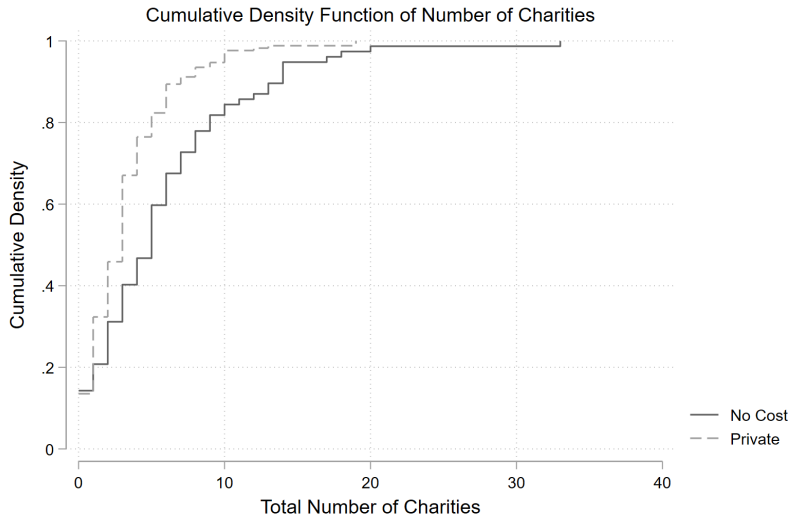
In Section 5.5, we discuss evaluations by spectators, why donors may have an intrinsic preference for giving to multiple charities, and how our results correlate with the Internalisation and Symbolisation subscales of the Self-Importance of Moral Identity scale.

5.4.1 Effect of Transaction Costs

The first hypothesis states that donors should respond to transaction costs by reducing the number of charities they give to. Comparing *NoCost* and *Private*, this is what we see: donors in *NoCost* on average give to 5.82 charities, whereas in *Private* they only give to 3.27 charities on average (see Figure 5.3). Table 5.2 documents that this difference is statistically significant for all levels of controls (all $p's < .001$). The table reports the results of negative binomial regressions in the form of incidence rate ratios (irr). The irr is .59, which means that the average number of charities donated to in *Private* is .59 times the average number of charities in *NoCost*. Because this is significantly lower than 1, it implies that the average number of charities is lower in *Private* than in *NoCost*. Alternatively, holding all control variables at their means, the predicted number of charities donated to in *NoCost* is 5.19, and the predicted value for *Private* is 3.05.

A closer look at the data reveals that the treatment difference is driven by a change on the

Figure 5.3 Total Charities in NoCost vs. Private



Notes: the figure presents the cumulative density function (or empirical distribution function) of the dictators' decision about how many charities to give to, shown separately for *Private* and *NoCost*.

Table 5.2 Transaction Costs and the Number of Charities (H1)

	(1)	(2)	(3)
Private	0.56***	0.55***	0.59***
	(0.07)	(0.07)	(0.07)
Demographic Controls	No	Yes	Yes
Attitudinal Controls	No	No	Yes
Observations	247	247	247

Notes: negative binomial regressions with the number of charities as the dependent variable. The demographic controls are age, gender, field of study, and volunteering. The attitudinal controls are preferences for spreading donations (two questions) and the two subscales of the Self-Importance of Moral Identity scale. Coefficients are incidence rate ratios.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

intensive rather than the extensive margin. That is, we find no effect of transaction costs on the number of dictators who decide to make positive donations. In both *NoCost* and *Private*, 86 percent of dictators donate to charity, and there are no significant differences when adding control variables (logit regression, $p = .995$).[16] Rather, we find a large difference in how many charities dictators give to conditional on them making positive donations. In negative binomial regressions using only the donors who make a positive donation, we find a highly significant treatment difference for all levels of control (irr= .59, $p < .001$). Intuitively, holding all control variables at their means, the predicted average number of charities in *NoCost* is 6.19, and the predicted value for *Private* is 3.68. We sum up the results on H5.3.7 as follows:

[16]The share of participants who donate some of the EUR 100 endowment seems relatively high; yet, many participants donate rather small amounts, such that 21-24 percent of donors in our study give at most 10 percent of their endowment.

Result 1 *Individuals give to fewer charities when they have to pay transaction costs for each charity they give to. This effect is driven by a change in donation behaviour among the individuals who give (intensive margin) and not by the number of individuals who give (extensive margin).*

5.4.2 Bluffing under Partial Observability

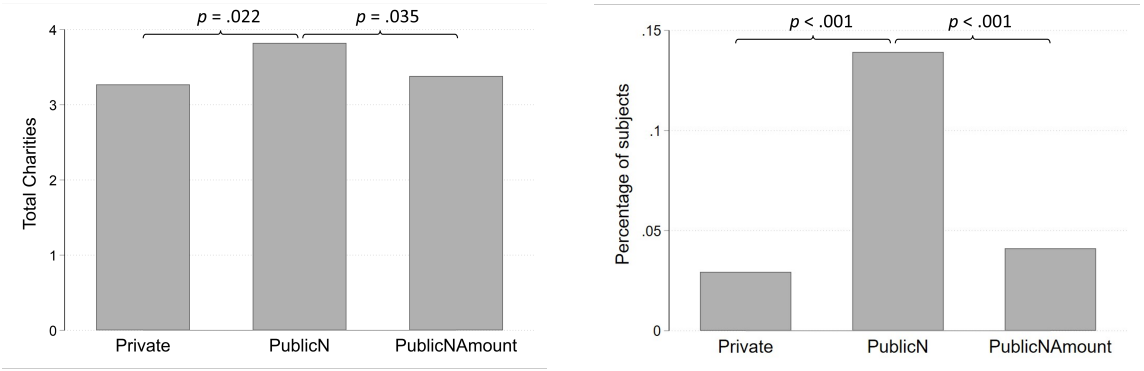
The second hypothesis states that donors give to more charities when spectators only observe what charities they give to. In the following, we test this hypothesis and discuss the results.

PublicN vs. Private. Comparing *PublicN* and *Private*, we indeed find that donors on average give to more charities when spectators only observe what charities donors give to (3.82, *PublicN*) than when there is no observation (3.27, *Private*), cf. Figure 5.4a. Looking at negative binomial regressions, this effect is statistically significant ($p = .022$, cf. Table 5.3). The coefficient (irr) is 1.21, and this implies that the average number of charities donated to in *PublicN* is 1.21 times the average number of charities in *Private*. Because this is significantly greater than 1, it implies that the average number of charities is larger in *PublicN* than in *Private*. Alternatively, one could examine the predicted values in the two treatments when holding all control variables at their means. Here, we find a predicted average number of charities of 3.68 in *PublicN*, which is significantly larger than the 3.04 in *Private*. With the transaction cost of EUR 1 per donation, this corresponds to an increase in total transaction costs of 17 percent.

The treatment difference is driven by a change in the extensive rather than the intensive margin. That is, adding partial observability leads more participants to donate to charity, but it does not change the average number of charities donors give to conditional on positive donations. Thus, we find that while 86 percent of donors give to charity in *Private*, this number increases to 96 percent in *PublicN*. This difference is statistically significant for all levels of control (logit regressions, all $p's < .003$). In contrast, we find no difference in the number of charities that donors give to conditional on positive donations (negative binomial regressions, all $p's > .339$).

PublicN vs. PublicNAmount. The data also suggest that donors give to more charities in *PublicN* (3.82) than in *PublicNAmount* (3.38), cf. Figure 5.4a. While this difference fails to reach statistical significance without any control variables ($p = .136$), it becomes statistically significant in our preferred specification, where demographic and attitudinal controls increase the efficiency of the estimate without notably changing the irr ($p = .035$,

Figure 5.4 Donations to Charities and Observability



(a) Average Number of Charities

(b) Donors Making Small Donations

Notes:

figure (a) shows the average number of charities that dictators donate by treatment. p-values are obtained from negative binomial regressions with all control variables. Figure (b) shows the percentage of donors who make donations that are smaller than EUR 3 by treatment. p-values are obtained from logit regressions with all control variables.

cf. Table 5.3). The irr is 1.17, and this implies that the average number of charities donated to in *PublicN* is 1.17 times the average number of charities in *PublicNAmount*. This translates into predicted values at the mean of all control variables of 3.62 in *PublicN* and 3.09 in *PublicNAmount*, corresponding to an increase in total transaction costs of 15 percent.

Again, the treatment difference is driven by a change in the extensive rather than the intensive margin. Whereas 85 percent of donors in *PublicNAmount* donate to charitiy, this number increases significantly to 96 percent in *PublicN* (logit regressions, all $p's < .001$). We find no difference in the number of charities that donors give to conditional on positive donations (negative binomial regressions, all $p's > .624$). We summarise the results as follows:

Result 2 *Dictators give to more charities when spectators observe the number of charities donated to (partial observability) compared to situations of no or full observability.*

Discussion of Results. As demonstrated above, our data suggest that adding image concerns to the donation decision has an effect primarily by inducing donations from the dictators who would otherwise not have donated. In terms of our conceptual framework, this implies that introducing reputational concerns, $R(a, b)$, is important for changing the behaviour of donors whose intrinsic motivation, g, was not large enough to induce giving. If the results are truly driven by dictators trying to manipulate their public image, we would expect that such dictators give strategically to improve their reputation at the lowest possible costs. Dictators in *PublicN* achieve this by making many small donations, as spectators only see the number of charities and not the amounts donated. In an exploratory analysis, we do find this type of "bluffing" in charitable giving especially among

Table 5.3 Observability and the Number of Charities (H2)

	PublicN vs. Private			**PublicN vs. PublicNAmount**		
	(1)	(2)	(3)	(4)	(5)	(6)
PublicN	1.17*	1.20**	1.21**	1.13	1.14	1.17**
	(0.10)	(0.11)	(0.10)	(0.09)	(0.10)	(0.09)
Demographics	No	Yes	Yes	No	Yes	Yes
Attitudes	No	No	Yes	No	No	Yes
Observations	328	328	328	328	328	328

Notes: negative binomial regressions with the number of charities as the dependent variable. The demographic controls are age, gender, field of study, and volunteering. The attitudinal controls are preferences for spreading donations (two questions) and the two subscales of the Self-Importance of Moral Identity scale. The corresponding table with all control variables is shown in Appendix 5.7 (Tables 5.9). Coefficients are incidence rate ratios.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

dictators in *PublicN*. As seen in Figure 5.4b, the share of dictators making donations less than EUR 3 is significantly greater in *PublicN* than in both *Private* and *PublicNAmount* (logit: both $p's < .001$).[17] The 14 percent of dictators in *PublicN* who give donations less than EUR 3 make on average 3.6 such donations. We summarise this result as follows:

Result 3 *When spectators only observe what charities a donor has given to but not the donated amounts (partial observability), some individuals use this strategically by making many tiny donations.*

5.4.3 Full Observability

The third hypothesis relates to how observability affects the amounts that dictators donate. In the following, we go through each subhypothesis in turn and document that there are no significant treatment differences in donated amounts.

PublicNAmount vs. PublicN. H5.3.7.1 states that dictators should donate more on average in *PublicNAmount* than in *PublicN*. Yet, we find little difference with average donations of EUR 45.23 in *PublicNAmount* and EUR 44.64 in *PublicN*. Testing for differences in tobit regressions, we find no statistically significant difference regardless of the level of controls (all $p's > .615$, cf. Table 5.4). We also find no statistically significant difference using the MWU-test ($p = .985$) and the SCLS estimator ($p = .774$).

[17] As this is an exploratory analysis, we determined the cut-off for how large a "small donation" is a posteriori. The effect is significant for the *Private* vs. *PublicN* comparison for cut-offs in the range (0,4); for the *PublicN* vs. *PublicNAmount* comparison, it is significant for cut-offs in the range (0,11).

PublicNAmount vs. Private. H5.3.7.2 states that dictators should donate more on average in *PublicNAmount* than in *Private*. Yet, while dictators donate slightly more in *PublicNAmount* (EUR 45.23) than in *Private* (EUR 40.22), this difference is not statistically significant for any level of control (tobit, all $p's > .219$, cf. Table 5.4). The difference is also not statistically significant in any robustness test (MWU: $p = .180$, SCLS: $p = .146$).

PublicN vs. Private. Finally, H5.3.7.3 states that dictators donate more on average in *PublicN* than in *Private*. While donors give slightly more in *PublicN* (EUR 44.64) than in *Private* (EUR 40.22), this is not statistically significant (tobit: all $p's > .117$ cf. Table 5.4, MWU: $p = .216$, SCLS: $p = .220$). We summarise the results in this section as follows:

Result 4 *The total amounts that dictators give to charity are not affected by neither full nor partial observability of the spectators.*

Table 5.4 Observability and Total Donations (H3)

PublicNAmount vs. PublicN			
PublicNAmount	-1.17	-1.58	-1.90
	(3.91)	(3.93)	(3.78)
Demographic Controls	No	Yes	Yes
Attitudinal Controls	No	No	Yes
Observations	328	328	328
PublicNAmount vs. Private			
PublicNAmount	4.84	3.83	2.79
	(3.93)	(4.01)	(3.92)
Demographic Controls	No	Yes	Yes
Attitudinal Controls	No	No	Yes
Observations	340	340	340
PublicN vs. Private			
PublicN	5.94	5.15	4.34
	(3.78)	(3.80)	(3.73)
Demographic Controls	No	Yes	Yes
Attitudinal Controls	No	No	Yes
Observations	328	328	328

Notes: tobit regressions with total donations as the dependent variable. The demographic controls are age, gender, field of study, and volunteering. The attitudinal controls are preferences for spreading donations (two questions) and the two subscales of the Self-Importance of Moral Identity scale. Corresponding tables with all control variables are shown in Appendix 5.7 (Tables 5.10-5.12). Coefficients are average partial effects, robust standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Discussion of Results. In this section, we have shown that the level of observability did not significantly influence the total donations made by the dictators. This somewhat

contradicts a literature demonstrating that people tend to donate more when they are observed (e.g. Lacetera and Macis, 2010; Karlan and McConnell, 2014). Yet, Bradley et al. (2018) document in a meta-analysis that effects of observation tend to be largest in in-person labs, whereas we run an online experiment. One reason to expect a smaller effect in an online study is the "online disinhibition effect" (Joinson, 1998, 2003; Suler, 2004; Lapidot-Lefler and Barak, 2012). This theory builds on social psychology and the notion of "inhibition", which occurs when people constrain their behaviour due to worries about public evaluation, anxiety about social situations, or other reasons for self-consciousness (Zimbardo, 1977). Already Joinson (1998) noted that on the Internet, one could see disinhibition stemming from a "reduction in concerns for self-presentation and the judgement of others" (p. 44). We aimed at reducing such feeling of anonymity in the current experiment by showing the dictators' names to the spectators. Yet, we speculate that dictators still put less value on reputational concerns in our setting compared to in-person lab experiments. In terms of our conceptual framework, this implies that the costs of giving ($-x'_a$) may be too large compared to the reputational concerns (γ_a).

Another reason for the lack of significant effects on donated amounts could be that dictators anticipate that while giving increases evaluations, it does so with a decreasing effect. That is, while donors may increase donations from e.g. EUR 20 to 40 and see an increase in their evaluations, increasing donations from e.g. EUR 80 to 100 has almost no effect on evaluations (discussed in Section 5.5.1).

These explanations – online disinhibition and the decreasing effect of donations on evaluations – suggest that the perceived reputational benefits of donating larger amounts may be limited. But why, then, do we observe individuals who send wasteful, indirect signals to strategically manipulate their public image by increasing the number of charities they give to (cf. Section 5.4.2)? One notable difference is that the cost of manipulating one's signal in *PublicN* is much lower: a dictator may engage in "bluffing" and send a signal by donating e.g. only EUR 1 to a charity. In contrast, spectators in *PublicNAmount* call the dictators' bluff, as they see also the amounts donated. Therefore, it is much more costly for dictators to manipulate their public image in *PublicNAmount* than in *PublicN*. If demand for a favourable image is price sensitive, we speculate that such a cost-benefit explanation can reconcile the different results for H5.3.7 and H5.3.7.

5.5 General Discussion

In the preceding section, we demonstrated that (i) dictators change their giving behaviour when there are transaction costs, (ii) dictators give to more charities when spectators observe only the number of charities that they give to, (iii) some individuals strategically

give many tiny donations ("bluffing") to manipulate their public image, and (iv) dictators do not change the total amounts they donate depending on the level of observability.

In the following, we report a number of results from exploratory analyses. First, we show that bluffing works in that a larger number of charities improves the evaluations awarded by spectators. Second, we show that dictators who give to multiple charities tend to do so out of a preference for donating to different topics, that the dictators do not behave as if they perceive the giving situation as a coordination problem, and that they do not strategically choose what topics they support when being observed. Third, we report correlations between giving patterns by dictators and the subscales of the Self-Importance of Moral Identity scale, providing suggestive evidence that the two giving decisions tap into relevant psychological constructs.

In the Appendix 5.7.4, we discuss gender differences and show that (i) women tend to give to more charities and that this is explained by differences in preferences for spreading donations as well as differences in self-importance of moral identity, (ii) women tend to give larger amounts, and (iii) men are more responsive to the *PublicN* treatment. We further discuss the social norms related to the two giving decisions, documenting i.a. that even with transaction costs, there is a normative expectation that donors ought to give to more than one charity.

5.5.1 Spectator Responses – Bluffing Works

In the following, we explore how spectator evaluations depend on the total donations of the dictator and the number of charities that the dictator donates to. In doing so, we examine spectator evaluations using OLS regressions. We cluster on the level of the pair of spectators evaluating the same five dictators.[18] First, we analyse spectator evaluations in *PublicNAmount*. Here, spectators observe both donations and charities, and this thereby allows us to examine what matters for the spectators in their evaluations. Second, we examine spectator evaluations in *PublicN*, and we show that spectator evaluations are influenced via their first-order beliefs about the total donations.

PublicNAmount: What Do Spectators Value? We first examine spectator evaluations in *PublicNAmount*. Including both observed donations and observed charities in the regression yields a highly significant effect of observed donations ($\beta = .034$, $p < .001$), whereas the effect of observed charities is not statistically significant ($\beta = .048$, $p = .229$). The magnitudes and significance are unaffected by the level of control (cf. Table 5.13).

[18] Our results are robust to instead clustering on the level of the individual spectator, and the results are robust to adding spectator-fixed effects.

The result has the interpretation that going from no donations to the maximum possible donations improves evaluations by 3.24 on a 6-point scale.

From the spectator evaluations, we also see that while giving more leads to an improved evaluation, it does so at a decreasing rate (see Figure 5.7). To formally test for such nonlinearity, we include (total donations)^2 and (total charities)^2 in the regression. We find that the relation between total donations and spectator evaluations is indeed nonlinear: across all levels of control, the squared total donations is negative and highly significant (all $p's < .001$, cf. Table 5.14), and the linear term remains highly significant ($\beta = .080$, all $p's < .001$). On the contrary, neither total charities nor the square of total charities is statistically significant. The interpretation of the nonlinearity in total donations is that changing one's total donations from e.g. EUR 10 to 20 is associated with an improved average evaluation of .66, whereas an increase from e.g. EUR 70 to 80 is only associated with an improved average rating of .09.

One potential concern with the above regressions is the strong correlation between total donations and total charities in *PublicNAmount*. Specifically, the Pearson's r between total donations and total charities is .531 ($p < .001$, Spearman's $\rho = .587$, $p < .001$), and such collinearity may reduce our ability to statistically detect how each of the two variables is associated with spectator evaluations. To counteract this problem, we examine the two variables in turn. Specifically, we first conduct three OLS regressions of evaluations on total donations, holding the number of charities within $\{1,2\}$, $\{3,4\}$, and $\{5,6\}$, respectively. In all three intervals, the coefficient on total donations is statistically significant (all $p's < .014$, cf. Table 5.15), and the average coefficient is $\beta = .025$. That is, holding charities almost constant, every additional euro donated on average leads to an approved evaluation of .025 on a 6-point scale (shown visually in Figure 5.8). Second, we conduct six regressions of evaluations on total charities, holding the total donations within the intervals $[10,24]$, $[25,39]$, $[40,54]$, $[55,69]$, $[70,84]$, and $[85,100]$, respectively. We find no positive, statistically significant relation in any of the intervals (cf. Table 5.16), and the average coefficient is $\beta = -.015$ (shown visually in Figure 5.9). That is, holding donations within narrow bounds, we overall find no effect of total charities on evaluations.

In sum, we find that under full observability, spectators do not respond to the number of charities that dictators donate to. In contrast, spectators give better evaluations to dictators who donate larger amounts, although at a decreasing rate.

PublicN: The Effect of Bluffing. We next look at spectator evaluations in *PublicN*. Estimating an OLS regression with only the observed charities, we now find a positive and significant effect of increasing total charities on spectator evaluations ($\beta = .154$, $p = .007$), and this is unaffected by the level of control (cf. Table 5.17). Hence, increasing the number

of charities one donates to leads to an improved evaluation. Testing for nonlinearities as before, we also here see a decreasing effect: the coefficient on the squared term is negative and statistically significant for all levels of controls (all $p's < .001$, cf. Table 5.18), and allowing for the nonlinearity increases the coefficient on observed charities to $\beta = .676$ (all $p's < .001$). The interpretation of this nonlinearity is that increasing the number of charities from e.g. 1 to 3 is associated with an improved evaluation of .986, whereas increasing the number of charities from e.g. 5 to 7 is only associated with an improved evaluation of .255.

Yet, a closer look at the data indicates that while spectators in *PublicN* approve of dictators who give to more charities, they do so because they believe the dictators have given larger amounts and not because of the number of charities per se. We find a strong, positive correlation between the number of charities dictators give to and the first-order beliefs of the spectators about how much the dictators donated (repeated measures correlation $r_{rm} = .589$, $p's < .001$). That is, spectators correctly anticipate a positive relation between total donations and the number of charities, but they overestimate this relation compared to the actual Pearson's $r = .347$. In a regression of spectator evaluation on both the number of charities and the spectators' first-order beliefs about donations, we find that the effect of observed charities diminishes substantially and loses its statistical significance ($\beta = .028$, $p = .590$), whereas the effect of first-order beliefs is highly significant ($\beta = .026$, $p < .001$, cf. Table 5.17). This is corroborated by a mediation analysis: the effect from the number of charities to evaluations goes solely through first-order beliefs as a mediator ($p < .001$), while the direct effect is insignificant ($p = .103$, cf. 'indirect-only mediation', Zhao et al., 2010). In sum, these results confirm the finding above, namely that spectators award dictators who donate large amounts, but they care less about the number of charities, i.e. how the amounts are donated.

5.5.2 Why Do Donors Spread Donations?

In Section 5.4, we demonstrated that dictators give to fewer charities when there are transaction costs associated with each donation and that some dictators are motivated by reputational concerns to increase the number of charities they give to. Yet, a general result is that dictators are willing to pay additional transaction costs in order to donate to more than one charity (cf. Table 5.7), and we see this also in the *Private* treatment, which includes transaction costs but no observation by spectators. In our conceptual framework, we posit that one reason for donors to spread their donations is that they receive utility from giving to multiple charities (e.g. from warm glow). In this section, we further explore why donors may have a preference for donating to more than one charity.

Preference for Diversification. In our study, we found that dictators tend to diversify donations across different charities. While this may relate to a more general diversification bias in decision-making (Read and Loewenstein, 1995; Fox et al., 2005; Baron and Szymanska, 2011) even when this is inefficient (Null, 2011), we also find that the tendency to diversify donations correlates with self-reported preferences for diversification. Specifically, we ask all participants to rate their agreement with the statements "It is important to spread one's donations to reduce the risk that a particular charity will miss out" and "It is important to spread one's donations to reduce the risk that donations will be spent inefficiently".[19] In all treatments and in the total sample, we find that agreement with the statement that a particular charity should not miss out strongly predicts giving to more charities (negative binomial regressions, all $p's < .044$, cf. Table 5.19). The interpretation for the whole sample is that going from 'Completely Disagree' to 'Completely Agree' leads to an increase of 143 percent in the number of charities a dictator donates to. Opposingly, agreement with the statement that spreading reduces the risk of inefficiency is always insignificant (all $p's > .115$).[20]

A Preference for Multiple Topics. Another possible reason for giving to multiple charities is that it enables donors to support different topics. Specifically, charities that operate under similar causes are closer to being substitutes, and one may speculate that donors would be less willing to pay additional transaction costs for donating to different but interchangeable charities (e.g. Berman et al., 2018). If this is true in our setting, it would imply that donors who give to more charities choose these from different rather than the same topic. This is indeed what we find (see Figure 5.14).

In *PublicN* and *PublicNAmount*, donors may also try to support the causes that they think the spectators care about. Indeed, we find that dictators on average give to more topics in *PublicN* than in *Private* (negative binomial regression, all $p's < .005$, cf. 5.20). In contrast, the difference in the average number of topics between *PublicN* and *PublicNAmount* is smaller and only becomes marginally statistically significant when including all control variables (all $p's > 0.075$, cf. 5.21).[21] This suggests that observation can lead individuals

[19] As noted in Section 5.3, we sought to make it clear to all participants that giving to multiple charities is inefficient in our setting, so we informed them that all charities had been picked from a list of highly efficient charities. Yet, we included this question in case participants may e.g. doubt the validity of such charity ratings.

[20] One problem with correlating the number of charities with responses to the statements is that agreement with the two statements is highly correlated (Pearson's $r = .455$, $p < .001$). Yet, regressing the total number of charities on the responses separately, we find that the coefficient on 'spreading such that a charity does not miss out' is significantly greater than the coefficient on 'spreading to reduce inefficiency' (Wald test, $p < .001$).

[21] Looking instead at within-topic diversification for the topics that donors select, we find no significant difference between *PublicN* and *Private* (MWU-test, $p = .471$). But dictators in *PublicN* on average give to more charities within the topics they donate to than dictators in *PublicNAmount* (1.25 vs. 1.05, $p = .044$).

to spread their donations between more topics.[22]

No Coordination Problem. Another reason for donating to different charities is that dictators may wish to donate to the charities/topics that receive few donations from others. Viewed jointly for all dictators, the giving decision would in this respect be a coordination game, where dictators seek to coordinate on giving in such a way that the charities/topics that the dictators find important receive donations. Intuitively, if all dictators bundle their giving into a single donation to increase efficiency, there is an increased risk that some of the causes that the dictators deem worthy do not receive funding. This gives rise to strategic uncertainty, and dictators may diversify their donations in order to reduce this uncertainty.

To test whether dictators view the giving decision as a coordination problem, we use the participants' beliefs about the mean donations to each of the seven topics. Specifically, if participants seek to give to topics that others do not give to, we should see a negative relation between the share a donor allocates to a topic and how much the dictator believes that others give to the topic. Yet, we find the opposite effect: looking only at the dictators who donate positive amounts, we find for all seven topics a positive relation between the share of donations a person allocates to the topic and the expected share of others' donations accruing to the topic (Spearman's $\rho \in [.208; .402]$, all $p's < .001$, cf. Figure 5.10). This suggests that dictators do not view the giving decision as a coordination problem; rather, the data are in line with a false-consensus effect (Ross et al., 1977), where dictators believe that there is a consensus to support exactly the topics they find most deserving.

Strategic Choice of Charities? Observability could also change donation behaviour by making dictators give to those charities or topics that they believe spectators find important rather than donating to the topics they themselves find important. In other words, observability may change 'what' charities are being donated to in addition to 'how many' charities.

A first test of this channel is to see whether dictators prefer to give to different topics when they are observed compared to when they are not observed. A visual examination suggests that there is no difference in the relative donations made to each topic across the treatments (see Figure 5.11). This impression is confirmed statistically: in 21 pairwise

[22]Regarding total donations, we show in the Appendix that there is no difference across treatments in the aggregate distribution of donations between topics (see Figure 5.11). Specifically, the topics 'Environment' and 'Children & Youth' are the two most popular across all treatments, 'Security' receives the lowest support with below 5% in all treatments, and the remaining topics ('Health', 'Rights', 'Women Advocacy', and 'Development Aid') fall somewhere in between.

treatment comparisons (with and without controls), we only find one statistically significant comparison; subjects in *PublicNAmount* allocate less of their total donations to the topic of health (fractional regression, $p = .048$).

A second test of whether observability changes 'what' charities dictators give to is to examine how important the topics are, to which the dictators donate. Recall from Section 5.3 that our survey asks all participants to rate how important they think each of the topics is (see Appendix 5.27 for evidence that there is no post-treatment bias for these questions). Computing the relative importance rating for each topic, we consider the case where dictators give to topics to which they assign a weight less than 1/7; that is, donations to topics that dictators think are less important than the average topic. If we found that dictators in *PublicN* are more likely to give to topics they find relatively unimportant, it could suggest that the dictators sought to give in a way appreciated by the spectators. Yet, we find no difference in the likelihood that dictators donate to topics they consider relatively unimportant (Fisher's exact tests: *PublicN* vs. *Private*, $p = .359$; *PublicN* vs. *PublicNAmount*, $p = .434$).

5.5.3 Behaviour Correlates with Self-Importance of Moral Identity

In the survey, participants answer the 10-item Self-Importance of Moral Identity scale (Aquino et al., 2002). This scale measures how important moral identity is for a person's self-definition, defining morality as the combined set of the following traits: caring, compassionate, fair, kind, generous, helpful, hardworking, honest, and friendly. Of the 10 items in the SIMI scale, five measure the degree to which a person wants to possess moral qualities (Internalisation), and five items measure the degree to which a person believes that their actions communicate being moral to others (Symbolisation).

We find that dictators with an above-median score in Internalisation tend to donate more than dictators with a below-median score (tobit, $p < .001$, cf. Table 5.22). The size of the effect is such that having an above-median Internalisation score predicts an increase in total donations of EUR 13. Opposingly, we find no significant correlation between Symbolisation and total donations ($p = .664$). These results mirror those of Hansson et al. (2022), who find that Internalisation but not Symbolisation predicts greater donations to charity. Yet, looking at the number of charities donors give to, the pattern is reversed: we find no significant correlation with scores on Internalisation (negative binomial regression, $p = .196$, cf. Table 5.23), but Symbolisation is a highly significant predictor ($p = .001$). The interpretation of this effect is that having an above-median Symbolisation score predicts an increase in the number of charities of 25 percent. Interestingly, of the treatments where

giving to multiple charities involves transaction costs, only the association in *PublicN* reaches statistical significance ($p = .016$).

These results suggest that the two decisions, total donations and the number of charities, tap into distinct psychological constructs. Whereas total donations is related to the desire to posses moral qualities, the number of charities is related to the desire to communicate being moral to others.

5.6 Conclusion

In this paper, we provide empirical evidence that individuals engage in indirect signalling to improve their public image. In the context of charitable giving, we first show that donors care about efficiency: they reduce the number of charities they give to when each donation entails transaction costs. Yet, when donors are observed and evaluated only based on what charities they give to, they (correctly) anticipate that spectators will infer greater donated amounts from a larger number of charities. Some donors use this strategically and engage in a wasteful "altruistic bluff", whereby they make numerous tiny donations to signal that they are altruistic. Such bluffing is not possible when spectators also observe total donations. In this case, donors do not adapt how many charities they give to, suggesting that the number of charities does not influence donors' public image *directly*. Rather, how many charities one supports can influence public image *indirectly* through changing beliefs about total donations when donated amounts are not observable.

Therefore, we propose decomposing signalling into its direct and indirect components. By doing so, it becomes evident that signalling can also occur for behaviours that bear no reputational effects per se if the observed behaviours correlate with relevant unobserved behaviours. As we show in this paper, indirect signalling can lead to efficiency losses even when people improve their public image from prosocial behaviour such as giving to charity. Our study also offers potential ways for institutions to mitigate wasteful indirect signalling: for example, organisations may seek to remove the observed signal (as in our *Private* treatment) or make the relevant behaviour observed (as in *PublicNAmount*).

Yet, our study also has some limitations that are important for interpreting our results. First, our study draws on only one sample, and it is not clear how the results generalise to other samples or cultures. Notably, because we consider indirect signalling, populations may behave differently not only due to different preferences for a certain behaviour, but also due to different correlations between observed and unobserved behaviours.

Second, our study uses an online lab setting, in which donors signal to anonymous spectators. It is probable that the incentives for signalling are greater in field settings that

involve face-to-face interaction and long-run reputation-building. In addition, our setting exogenously imposes a level of observability on the participants. This is interesting from a practical perspective, as e.g. organisations may decide the extent to which workers are monitored, and charities or companies may allow their customers to send signals of different informational value after donations or purchases. In other field domains, however, individuals self-select into different degrees of observability, e.g. by choosing what to tell friends or what to post on social media. Because such self-selection increases the scope for manipulating one's public image, it could be that it reduces the signalling value of observed behaviours. An interesting avenue for future research is therefore to examine how selection into different levels of observability occurs and how such selection influences the credibility of the signals being sent.

Bibliography

Agerström, J., Carlsson, R., Nicklasson, L., and Guntell, L. (2016). Using descriptive social norms to increase charitable giving: The power of local norms. *Journal of Economic Psychology*, 52:147–153.

Ahmed, U., Lorenz, C., Mahlstein, K., McDaniel, C., and Schropp, S. (2016). Understanding the Costs of Chariable Giving. PayPal White Paper, PayPal.

Andreoni, J. (1989). Giving with impure altruism: Applications to charity and ricardian equivalence. *Journal of Political Economy*, 97(6):1447–1458.

Andreoni, J. (2007). Giving gifts to groups: How altruism depends on the number of recipients. *Journal of Public Economics*, 91(9):1731–1749.

Andreoni, J. and Payne, A. A. (2013). Chapter 1 - Charitable Giving. In Auerbach, A. J., Chetty, R., Feldstein, M., and Saez, E., editors, *Handbook of Public Economics*, volume 5 of *Handbook of Public Economics, Vol. 5*, pages 1–50. Elsevier.

Aquino, Karl, and Reed, Americus II (2002). The self-importance of moral identity. *Journal of Personality and Social Psychology*, 83(6):1423–1440.

Baron, J. and Szymanska, E. (2011). Heuristics and biases in charity. In *The Science of Giving: Experimental Approaches to the Study of Charity*, Society for Judgment and Decision Making Series, pages 215–235. Psychology Press, New York, NY, US.

Barrett, S. and Dannenberg, A. (2016). An experimental investigation into 'Pledge and review' in climate negotiations. *Climatic Change*, 138(1):339–351.

Batson, C. D. (1998). Altruism and prosocial behavior. In Gilbert, D. T., Fiske, S. T., and Lindzey, G., editors, *The Handbook of Social Psychology*, volume 2, pages 282–316. New York: McGraw-Hill.

Bénabou, R. and Tirole, J. (2006). Incentives and prosocial behavior. *American Economic Review*, 96(5):1652–1678.

Benartzi, S. and Thaler, R. H. (2001). Naive Diversification Strategies in Defined Contribution Saving Plans. *American Economic Review*, 91(1):79–98.

Berman, J. Z., Barasch, A., Levine, E. E., and Small, D. A. (2018). Impediments to Effective Altruism: The Role of Subjective Preferences in Charitable Giving. *Psychological Science*, 29(5):834–844.

Bicchieri, C. (2017). *Norms in the Wild*. New York, NY: Oxford University Press.

Bicchieri, C. and Xiao, E. (2009). Do the right thing: But only if others do so. *Journal of Behavioral Decision Making*, 22(2):191–208.

Blackbaud Institute (2018). The Next Generation of American Giving. *Blackbaud Institute*.

Bloom, P. (2016). *Against Empathy - The Case for Rational Compassion*. Ecco, Harper Collins Publishers.

Bolle, F. (1990). High reward experiments without high expenditure for the experimenter? *Journal of Economic Psychology*, 11(2):157–167.

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

Bradley, A., Lawrence, C., and Ferguson, E. (2018). Does observability affect prosociality? *Proceedings of the Royal Society B: Biological Sciences*, 285(1875):20180116.

Butera, L. and Horn, J. (2020). "Give less but give smart": Experimental evidence on the effects of public information about quality on giving. *Journal of Economic Behavior & Organization*, 171:59–76.

Charness, G. and Dufwenberg, M. (2006). Promises and Partnership. *Econometrica : journal of the Econometric Society*, 74(6):1579–1601.

Charness, G. and Gneezy, U. (2008). What's in a name? Anonymity and social distance in dictator and ultimatum games. *Journal of Economic Behavior & Organization*, 68(1):29–35.

Charness, G., Gneezy, U., and Halladay, B. (2016). Experimental methods: Pay one or pay all. *Journal of Economic Behavior & Organization*, 131:141–150.

Charness, G., Gneezy, U., and Rasocha, V. (2021). Experimental methods: Eliciting beliefs. *Journal of Economic Behavior & Organization*, 189:234–256.

Chiang, Y.-S. and Hsu, Y.-F. (2019). The asymmetry of altruistic giving when givers outnumber recipients and vice versa: A dictator game experiment and a behavioral economics model. *Journal of Economic Psychology*, 73:152–160.

Cleveland, W. S. (1979). Robust Locally Weighted Regression and Smoothing Scatterplots. *Journal of the American Statistical Association*, 74(368):829–836.

Clot, S., Grolleau, G., and Ibanez, L. (2018). Shall we pay all? An experimental test of Random Incentivized Systems. *Journal of Behavioral and Experimental Economics*, 73:93–98.

Cohen, P., Cohen, J., Aiken, L. S., and West, S. G. (1999). The problem of units and the circumstance for POMP. *Multivariate Behavioral Research*, 34(3):315–346.

Corazzini, L., Cotton, C., and Valbonesi, P. (2015). Donor coordination in project funding: Evidence from a threshold public goods experiment. *Journal of Public Economics*, 128:16–29.

Cox, J. C., Sadiraj, K., and Sadiraj, V. (2008). Implications of trust, fear, and reciprocity for modeling economic behavior. *Experimental Economics*, 11(1):1–24.

Croson, R. and Konow, J. (2009). Social preferences and moral biases. *Journal of Economic Behavior & Organization*, 69(3):201–212.

Croson, R. and Shang, J. Y. (2008). The impact of downward social information on contribution decisions. *Experimental Economics*, 11(3):221–233.

Crumpler, H. and Grossman, P. J. (2008). An experimental test of warm glow giving. *Journal of Public Economics*, 92(5):1011–1021.

D'Agostino, R. B. and Belanger, A. (1990). A suggestion for using powerful and informative tests of normality. *The American Statistician*, 44(4):316–321.

Deffains, B., Espinosa, R., and Fluet, C. (2019). Laws and norms: Experimental evidence with liability rules. *International Review of Law and Economics*, 60:105858.

Dohmen, T., Falk, A., Huffman, D., Sunde, U., Schupp, J., and Wagner, G. G. (2011). Individual risk attitudes: Measurement, determinants, and behavioral consequences. *Journal of the European Economic Association*, 9(3):522–550.

Drouvelis, M. and Marx, B. M. (2021). Dimensions of donation preferences: The structure of peer and income effects. *Experimental Economics*, 24(1):274–302.

Dufwenberg, M. and Gneezy, U. (2000). Measuring Beliefs in an Experimental Lost Wallet Game. *Games and Economic Behavior*, 30(2):163–182.

Ek, C. (2017). Some causes are more equal than others? The effect of similarity on substitution in charitable giving. *Journal of Economic Behavior & Organization*, 136:45–62.

Engers, M. (1987). Signalling with Many Signals. *Econometrica : journal of the Econometric Society*, 55(3):663–674.

Fehérová, M., Heger, S., Péliová, J., Servátka, M., and Slonim, R. (2022). Increasing autonomy in charitable giving: The effect of choosing the number of recipients on donations. *Economics Letters*, 217:110701.

Fiske, S. T. (2018). *Social Beings: A Core Motives Approach to Social Psychology*. Hoboken, NJ: John Wiley & Sons, Inc.

Fox, C. R., Ratner, R. K., and Lieb, D. S. (2005). How Subjective Grouping of Options Influences Choice and Allocation: Diversification Bias and the Phenomenon of Partition Dependence. *Journal of Experimental Psychology: General*, 134:538–551.

Freeman, R. B. (1997). Working for Nothing: The Supply of Volunteer Labor. *Journal of Labor Economics*, 15(1, Part 2):S140–S166.

Fromell, H., Nosenzo, D., and Owens, T. (2020). Altruism, fast and slow? Evidence from a meta-analysis and a new experiment. *Experimental Economics*, 23(4):979–1001.

Gee, L. K. and Meer, J. (2019). The Altruism Budget: Measuring and Encouraging Charitable Giving.

Gneezy, U., Keenan, E. A., and Gneezy, A. (2014). Avoiding overhead aversion in charity. *Science (New York, N.Y.)*, 346(6209):632–635.

Gregory, A. and Howard, D. (2009). The nonprofit starvation cycle. *Stanford Social Innovation Review*, 7(4):49–53.

Grimalda, G., Pondorfer, A., and Tracer, D. P. (2016). Social image concerns promote cooperation more than altruistic punishment. *Nature Communications*, 7(1):12288.

Hansson, K., Persson, E., and Tinghög, G. (2022). Voting and (Im)Moral behavior. *Scientific Reports*, 12(1):22643.

House, B. R. (2018). How do social norms influence prosocial development? *Current Opinion in Psychology*, 20:87–91.

Huck, S. and Rasul, I. (2010). Transactions Costs in Charitable Giving: Evidence from Two Field Experiments. *The B.E. Journal of Economic Analysis & Policy*, 10(1).

Joinson, A. (1998). Causes and implications of disinhibited behavior on the Internet. In *Psychology and the Internet: Intrapersonal, Interpersonal, and Transpersonal Implications*, pages 43–60. Academic Press, San Diego, CA, US.

Joinson, A. N. (2003). *Understanding the Psychology of Internet Behaviour: Virtual Worlds, Real Lives*. Basingstoke and New York: Palgrave Macmillan.

Karlan, D. and McConnell, M. A. (2014). Hey look at me: The effect of giving circles on giving. *Journal of Economic Behavior & Organization*, 106:402–412.

Karlan, D. and Wood, D. H. (2017). The effect of effectiveness: Donor response to aid effectiveness in a direct mail fundraising experiment. *Journal of Behavioral and Experimental Economics*, 66:1–8.

Knowles, S. and Servátka, M. (2015). Transaction costs, the opportunity cost of time and procrastination in charitable giving. *Journal of Public Economics*, 125:54–63.

Krupka, E. L. and Croson, R. T. A. (2016). The differential impact of social norms cues on charitable contributions. *Journal of Economic Behavior & Organization*, 128:149–158.

Krupka, E. L. and Weber, R. A. (2013). Identifying social norms using coordination games: Why does dictator game sharing vary? *Journal of the European Economic Association*, 11(3):495–524.

Lacetera, N. and Macis, M. (2010). Social image concerns and prosocial behavior: Field evidence from a nonlinear incentive scheme. *Journal of Economic Behavior & Organization*, 76(2):225–237.

Lange, A. and Stocking, A. (2012). The Complementarities of Competition in Charitable Fundraising. Working Paper, Congressional udget Office, Washington, DC.

Lapidot-Lefler, N. and Barak, A. (2012). Effects of anonymity, invisibility, and lack of eye-contact on toxic online disinhibition. *Computers in Human Behavior*, 28(2):434–443.

Linardi, S. and McConnell, M. A. (2011). No excuses for good behavior: Volunteering and the social environment. *Journal of Public Economics*, 95(5):445–454.

Mann, H. B. and Whitney, D. R. (1947). On a test of whether one of two random variables is stochastically larger than the other. *The Annals of Mathematical Statistics*, 18(1):50–60.

Meer, J. (2014). Effects of the price of charitable giving: Evidence from an online crowdfunding platform. *Journal of Economic Behavior & Organization*, 103:113–124.

Mellenbergh, G. J. (2019). Unstandardized effect sizes. In *Counteracting Methodological Errors in Behavioral Research*, pages 219–227. Springer International Publishing, Cham.

Metzger, L. and Günther, I. (2019). Making an impact? The relevance of information on aid effectiveness for charitable giving. A laboratory experiment. *Journal of Development Economics*, 136:18–33.

Montgomery, J. M., Nyhan, B., and Torres, M. (2018). How Conditioning on Posttreatment Variables Can Ruin Your Experiment and What to Do about It. *American Journal of Political Science*, 62(3):760–775.

Null, C. (2011). Warm glow, information, and inefficient charitable giving. *Journal of Public Economics*, 95(5):455–465.

Portillo, J. E. and Stinn, J. (2018). Overhead aversion: Do some types of overhead matter more than others? *Journal of Behavioral and Experimental Economics*, 72:40–50.

Powell, J. L. (1986). Symmetrically trimmed least squares estimation for tobit models. *Econometrica : journal of the Econometric Society*, 54(6):1435–1460.

Quinzii, M. and Rochet, J.-C. (1985). Multidimensional signalling. *Journal of Mathematical Economics*, 14(3):261–284.

Read, D. and Loewenstein, G. (1995). Diversification bias: Explaining the discrepancy in variety seeking between combined and separated choices. *Journal of Experimental Psychology: Applied*, 1:34–49.

Regner, T. and Riener, G. (2017). Privacy Is Precious: On the Attempt to Lift Anonymity on the Internet to Increase Revenue. *Journal of Economics & Management Strategy*, 26(2):318–336.

Reinstein, D. A. (2011). Does One Charitable Contribution Come at the Expense of Another? *The B.E. Journal of Economic Analysis & Policy*, 11(1).

Ross, L., Greene, D., and House, P. (1977). The "False consensus effect": An egocentric bias in social perception and attribution processes. *Journal of Experimental Social Psychology*, 13(3):279–301.

Royston, P. (1991). Comment on Sg3.4 and an improved D'Agostino test. *Stata Technical Bulletin 3: 23-24 (Reprinted in Stata Technical Bulletin Reprints)*, 1:110–112.

Saeri, A. K., Slattery, P., Lee, J., Houlden, T., Farr, N., Gelber, R. L., Stone, J., Huuskes, L., Timmons, S., Windle, K., Spajic, L., Freeman, L., Moss, D., Behar, J., Schubert, S., Grundy, E. A. C., and Zorker, M. (2022). What Works to Increase Charitable Donations? A Meta-Review with Meta-Meta-Analysis. *VOLUNTAS: International Journal of Voluntary and Nonprofit Organizations*.

Samek, A. S. and Sheremeta, R. M. (2014). Recognizing contributors: An experiment on public goods. *Experimental Economics*, 17:673–690.

Schmitz, J. (2021). Is Charitable Giving a Zero-Sum Game? The Effect of Competition Between Charities on Giving Behavior. *Management Science*, 67(10):6333–6349.

Shang, J. and Croson, R. (2009). A Field Experiment in Charitable Contribution: The Impact of Social Information on the Voluntary Provision of Public Goods. *The Economic Journal*, 119(540):1422–1439.

Sharps, D. L. and Schroeder, J. (2019). The preference for distributed helping. *Journal of Personality and Social Psychology*, 117:954–977.

Singer, P. (2009). *The Life You Can Save: Acting Now to End World Poverty*. The Life You Can Save: Acting Now to End World Poverty. Random House, New York, NY, US.

Soyer, E. and Hogarth, R. (2011). The size and distribution of donations: Effects of number of recipients. *Judgment and Decision Making*, 6:616–628.

Suler, J. (2004). The Online Disinhibition Effect. *CyberPsychology & Behavior*, 7(3):321–326.

Wilcoxon, F. (1945). Individual comparisons by ranking methods. *Biometrics Bulletin*, 1(6):80–83.

YouGov (2022). Half of Americans say they have donated money to charity in the past year. *YouGov*.

Zhang, Z., Zhu, S., Mink, J., Xiong, A., Song, L., and Wang, G. (2022). Beyond Bot Detection: Combating Fraudulent Online Survey Takers. *Proceedings of the ACM Web Conference 2022 (WWW '22), April 25–29, 2022, Lyon, France*, pages 1–11.

Zhao, X., Lynch Jr., J. G., and Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *Journal of Consumer Research*, 37(2):197–206.

Zimbardo, P. G. (1977). *Shyness: What Is It and What to Do about It*. London: Pan Books.

5.7 Appendix

5.7.1 Conceptual Framework

In this section, we provide further details about the analysis of the conceptual framework presented in Section 5.2.

Benchmark: No Observability ($\Omega = \{\varnothing\}$). As explained in Section 5.2, we assume that unobserved behaviour does not influence reputation; that is, if $\Omega = \{\varnothing\}$, then $r_a = r_b = 0$. Then, the optimal decisions are implicitly defined by $g'_a = C'_a - x'_a$ and $g'_b = C'_b - x'_b$. Due to the concavity of g and convexity of $C - x$, this leads to a positive relation between α (β) and a (b). How b (a) is associated with α (β) depends on the sign of g''_{ab}. In the case of charitable giving, spreading one's donations across many charities is inefficient (cf. Footnote 1), and we therefore assume that β is inversely related to efficiency concerns. Yet, there is mixed evidence on the relation between efficiency and donations (Karlan and Wood, 2017): for example, Butera and Horn (2020) find that many donors give less when the charities are efficient, as giving to efficient charities allows donors to save money while maintaining a high charitable output ($g''_{ab} > 0$). In contrast, Metzger and Günther (2019) find that information about aid effectiveness increases donations for high-impact projects and decreases donations for low-impact projects ($g''_{ab} < 0$). Without knowing the sign of g''_{ab} a priori, we instead note from Equations 5.2 and 5.3 that (i) $g''_{ab} = 0$ implies no effect of α (β) on b (a), (ii) $g''_{ab} > 0$ implies that an increase in α (β) leads to an increase in b (a), and (iii) $g''_{ab} < 0$ implies that an increase in α (β) leads to a decrease in b (a).

Signalling and Indirect Signalling. With observability, we allow for $r_a \neq 0$ and $r_b \neq 0$. As noted in Section 5.2, we restrict our attention to pure-strategy Perfect Bayesian equilibria, and we assume a monotonic, increasing relationship between α (β) and a (b), which is anticipated by the spectators (i.e. $\frac{\partial E[\alpha|a\in\Omega]}{\partial a} > 0, \frac{\partial E[\beta|b\in\Omega]}{\partial b} > 0$).

In the case of full observability ($\Omega = \{a,b\}$), a and b both influence $R(a,b)$ by their positive relations to α and β, respectively. In addition, there may be a relation between α (β) and b (a), depending on the sign of g''_{ab}. Intuitively, if $g''_{ab} > 0$, an individual may decide on a high level of a both due to a high α and a high b. Thus, a high a and a low b send a stronger signal about α than a high a and a high b. That is, $\frac{\partial E[\alpha|\Omega=\{a,b\}]}{\partial b} < 0$ (and likewise $\frac{\partial E[\beta|\Omega=\{a,b\}]}{\partial a} < 0$). The relative concerns for α (γ_a) and β (γ_b) then determines the sign of r_a and r_b. As explained in Section 5.7.1, $\gamma_a > \gamma_b$ is likely to hold in our experiment on charitable giving. Then, $r_a > 0$, meaning that giving greater amounts provides a good reputation, while the sign of r_b is ambiguous

and may even be negative if $\gamma_a > -\gamma_b \frac{\partial E[\beta|\Omega=\{a,b\}]}{\partial b} \cdot \left(\frac{\partial E[\alpha|\Omega=\{a,b\}]}{\partial b}\right)^{-1}$. Naturally, $g''_{ab} < 0$ would lead to the opposite case. If $g''_{ab} = 0$, i.e. if the psychological benefits received from both behaviours are independent, we assume that there is no reputational spill-overs ($\frac{\partial E[\beta|\Omega=\{a,b\}]}{\partial a} = \frac{\partial E[\alpha|\Omega=\{a,b\}]}{\partial b} = 0$), as α and β are drawn independently. In this case, $r_a > 0$ and $r_b > 0$ follows from the positive relation between α (β) and a (b).

The case of partial observability ($\Omega = \{a\}$ or $\Omega = \{b\}$) leads us to distinguish between *direct signalling* and *indirect signalling*. As explained in Section 5.2, indirect signalling is the effect that b has on $R(a,b)$ via the beliefs about a. This channel is not present when the spectators observe a. If $g''_{ab} > 0$, then $\frac{\partial E[a|\Omega=\{b\}]}{\partial b} > 0$, which in turn leads to $\frac{\partial E[\alpha|\Omega=\{b\}]}{\partial b} > 0$. That is, whereas a greater b, ceteris paribus, predicted a smaller α in the case of full observability ($\frac{\partial E[\alpha|\Omega=\{a,b\}]}{\partial b} < 0$), the opposite may thus be true in the case of partial observability.

5.7.2 Tables and Figures

Table 5.5 Sample characteristics

	Freq.	Percent
Gender		
Female	512	64.5
Male	282	35.5
Field of Study		
Natural Sciences	190	23.9
Social Sciences	93	11.7
Humanities	115	14.5
Economics	167	21.0
Medicine	22	2.8
Law	111	14.0
Other	96	12.1
Volunteering in the Previous Year		
0 Hours	272	34.3
1-5 Hours	133	16.8
5-10 Hours	96	12.1
10-20 Hours	81	10.2
20-30 Hours	50	6.3
More Than 30 Hours	162	20.4
Total	794	100.0

Table 5.6 Summary statistics by Treatment and Role

	NoCost	Private	PublicN	PublicNAmount	Total
Dictators					
Risk preferences	0.46	0.50	0.52	0.49	0.50
Spread Donations for Equality	0.49	0.45	0.43	0.46	0.45
Spread Donations for Efficiency	0.44	0.42	0.39	0.41	0.41
Internalisation	0.83	0.82	0.83	0.83	0.83
Symbolisation	0.39	0.42	0.41	0.44	0.42
Spectators					
Risk preferences	.	.	0.53	0.51	0.52
Spread Donations for Equality	.	.	0.53	0.42	0.47
Spread Donations for Efficiency	.	.	0.47	0.44	0.46
Internalisation	.	.	0.88	0.85	0.87
Symbolisation	.	.	0.40	0.44	0.42
Social Norm Eliciters					
Risk preferences	0.52	0.43	0.47	0.47	0.47
Spread Donations for Equality	0.47	0.36	0.35	0.44	0.41
Spread Donations for Efficiency	0.36	0.32	0.27	0.35	0.33
Internalisation	0.82	0.85	0.85	0.86	0.84
Symbolisation	0.44	0.39	0.40	0.40	0.41

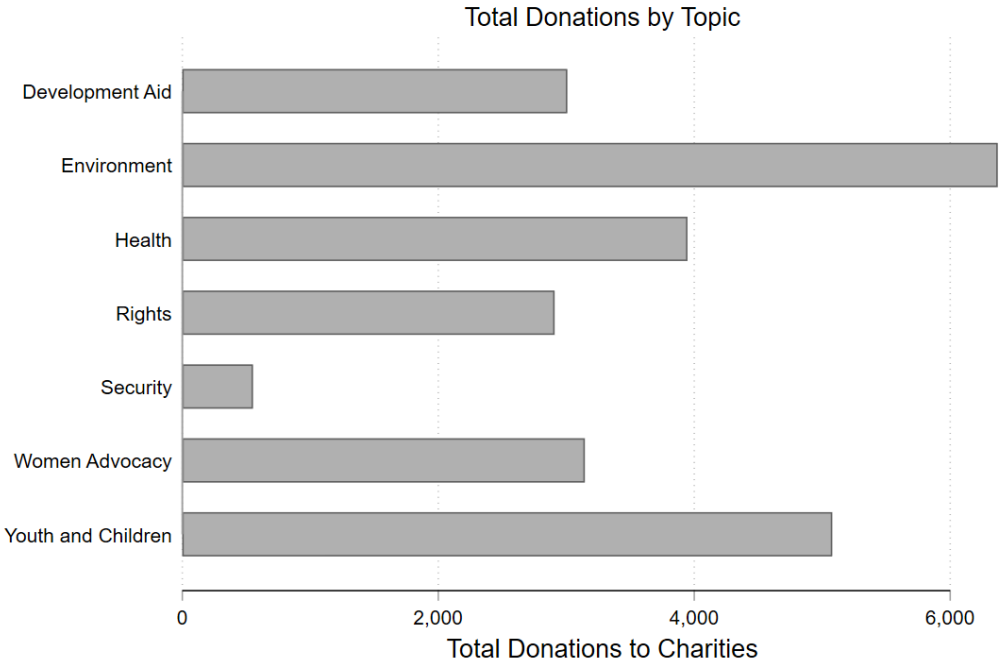
Notes: the table shows the average values by treatment and role. All variables are standardised as proportions of maximum possible (POMP) scores with 0 (1) being the lowest (highest) possible score. 'Spread Donations for Equality' refers to agreement with the statement "It is important to spread out one's donations to reduce the risk that any specific charity misses out on funds". 'Spread Donations for Efficiency' refers to agreement with the statement "It is important to spread out one's donations to reduce the risk that the donations are used inefficiently". Internalisation and Symbolisation are the subscales of the Self-Importance of Moral Identity scale.

Table 5.7 Descriptive Statistics

	NoCost	Private	PublicN	PublicNAmount	Total
Observations (Dictators)	77	170	158	170	575
Donations					
Actual Donations	44.55	40.22	44.64	45.23	43.50
Norm. Exp. Donations	55.35	49.89	52.92	55.05	52.98
Emp. Exp. Donations	41.69	42.66	43.17	42.56	42.64
Charities					
Actual Charities	5.82	3.27	3.82	3.38	3.80
Norm. Exp. Charities	9.60	6.18	4.96	6.59	6.42
Emp. Exp. Charities	7.38	5.65	4.59	4.58	5.27

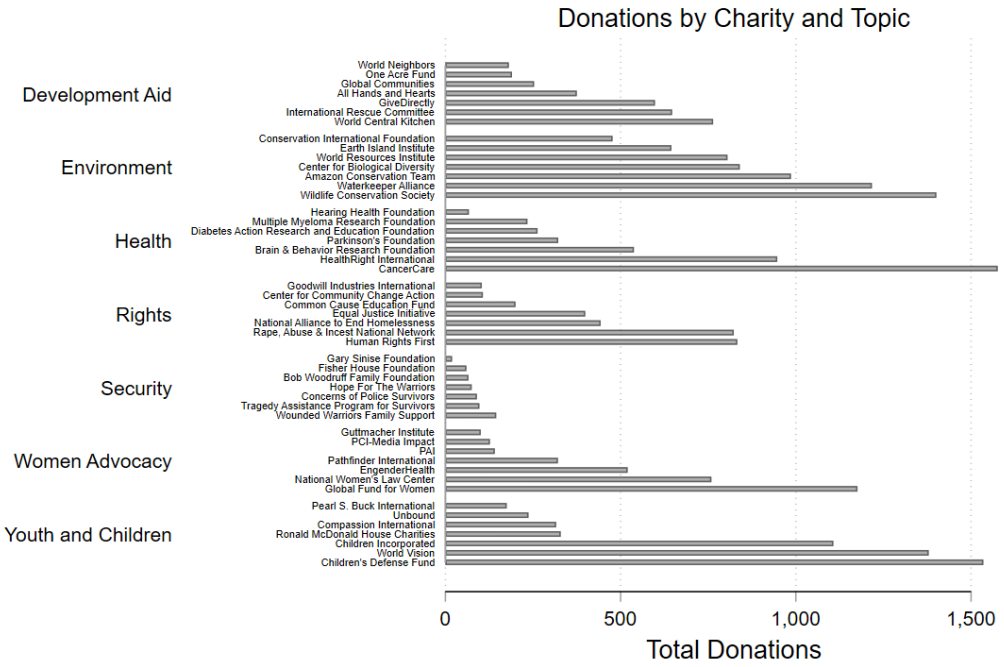
Notes: the table shows average values for each treatment and combining all treatments. Actual Donations and Actual Charities refer to the total donations (excl. transaction costs) and the total number of charities that dictators chose to give to. Norm. (Emp.) Exp. is the normative (empirical) expectations elicited by the dictators after the donation decision. Note that we deliberately randomised fewer dictators into the *NoCost* treatment to obtain more power for the comparisons between levels of observability, cf. the pre-registration. The reason for the lower number of observations in *PublicN* than in *Private* and *PublicNAmount* is that *PublicN* includes an additional control question, cf. Section 5.3.3.

Figure 5.5 Total Donations Across Topics



Notes: this figure shows the total donations to each of the seven topics, pooling all treatments.

Figure 5.6 Total Donations Across Charities



Notes: this figure shows the total donations to each charity, grouped by the seven topics. The figure pools donations from all treatments.

Table 5.8 Transaction Costs and the Number of Charities (H1)

	(1)	(2)	(3)
Private	0.56***	0.55***	0.59***
	(0.07)	(0.07)	(0.07)
Age		0.97**	0.98**
		(0.01)	(0.01)
Male		0.79*	0.90
		(0.10)	(0.11)
Social Sciences		0.85	0.83
		(0.18)	(0.16)
Humanities		0.83	0.84
		(0.16)	(0.15)
Economics		0.84	0.86
		(0.15)	(0.14)
Medicine		0.82	0.78
		(0.28)	(0.26)
Law		1.19	1.09
		(0.24)	(0.20)
Other Field of Study		1.04	0.96
		(0.25)	(0.22)
1-5 Hours, Volunteering		1.28	1.28
		(0.24)	(0.22)
5-10 Hours, Volunteering		1.33	1.08
		(0.25)	(0.20)
10-20 Hours, Volunteering		0.99	0.89
		(0.20)	(0.18)
20-30 Hours, Volunteering		1.17	0.91
		(0.27)	(0.20)
More Than 30 Hours, Volunteering		1.27	1.09
		(0.22)	(0.19)
Spread Donations for Equality			2.13***
			(0.45)
Spread Donations for Efficiency			0.76
			(0.15)
Internalisation (SIMI)			2.52**
			(1.13)
Symbolisation (SIMI)			2.56***
			(0.75)
Observations	247	247	247

Notes: negative binomial regressions with the number of charities as the dependent variable. The baseline is a person in the *NoCost* treatment who studies Natural Sciences and does not volunteer (0 Hours). Coefficients are incidence rate ratios.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5.9 Observability of the Number of Charities (H2)

	PublicN vs. Private			**PublicN vs. PublicNAmount**		
	(1)	(2)	(3)	(4)	(5)	(6)
PublicN	1.17*	1.20**	1.21**	1.13	1.14	1.17**
	(0.10)	(0.11)	(0.10)	(0.09)	(0.10)	(0.09)
Age		0.98**	0.97***		1.01	1.00
		(0.01)	(0.01)		(0.01)	(0.01)
Male		0.98	1.06		0.86	0.98
		(0.09)	(0.09)		(0.08)	(0.08)
Social Sciences		1.23	1.18		1.04	1.01
		(0.19)	(0.17)		(0.16)	(0.14)
Humanities		1.08	1.06		1.05	1.03
		(0.16)	(0.14)		(0.15)	(0.13)
Economics		1.11	1.08		0.99	0.96
		(0.15)	(0.13)		(0.13)	(0.11)
Medicine		0.91	0.93		0.70	0.79
		(0.23)	(0.22)		(0.22)	(0.23)
Law		1.20	1.10		0.99	1.03
		(0.18)	(0.15)		(0.14)	(0.13)
Other Field of Study		1.02	0.98		1.03	1.04
		(0.16)	(0.14)		(0.13)	(0.12)
1-5 Hours, Volunteering		1.02	0.94		0.91	0.80*
		(0.14)	(0.12)		(0.12)	(0.09)
5-10 Hours, Volunteering		1.20	1.03		1.07	0.82
		(0.17)	(0.14)		(0.15)	(0.11)
10-20 Hours, Volunteering		0.93	0.79		0.84	0.68***
		(0.15)	(0.12)		(0.13)	(0.09)
20-30 Hours, Volunteering		1.07	0.86		0.95	0.79
		(0.19)	(0.15)		(0.17)	(0.12)
More Than 30 Hours, Volunteering		1.02	0.92		0.93	0.82*
		(0.13)	(0.11)		(0.10)	(0.08)
Spread Donations for Equality			2.15***			2.60***
			(0.34)			(0.35)
Spread Donations for Efficiency			1.08			1.35**
			(0.17)			(0.18)
Internalisation (SIMI)			1.00			1.17
			(0.31)			(0.33)
Symbolisation (SIMI)			2.12***			1.74***
			(0.45)			(0.34)
Observations	328	328	328	328	328	328

Notes: negative binomial regressions with the number of charities as the dependent variable. The baseline for Specifications (1-3) is a person in the *Private* treatment who studies Natural Sciences and does not volunteer (0 Hours). The baseline for Specifications (4-6) is a person in the *PublicNAmount* treatment who studies Natural Sciences and does not volunteer (0 Hours). Coefficients are incidence rate ratios.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5.10 Total Donations, PublicNAmount vs. PublicN (H3.1)

	(1)	(2)	(3)
PublicNAmount	-1.17	-1.58	-1.90
	(3.91)	(3.93)	(3.78)
Age		-0.32	-0.23
		(0.41)	(0.40)
Male		-10.27**	-6.84*
		(4.16)	(4.07)
Social Sciences		8.40	4.62
		(7.25)	(7.02)
Humanities		4.83	3.49
		(6.65)	(6.45)
Economics		-2.74	-2.10
		(5.91)	(5.71)
Medicine		-24.99*	-25.32*
		(13.79)	(13.40)
Law		-9.56	-9.60
		(6.45)	(6.23)
Other Field of Study		1.48	1.16
		(6.16)	(6.00)
1-5 Hours, Volunteering		-4.73	-7.47
		(5.96)	(5.83)
5-10 Hours, Volunteering		0.40	-4.18
		(6.90)	(6.82)
10-20 Hours, Volunteering		-1.50	-2.76
		(6.83)	(6.80)
20-30 Hours, Volunteering		6.70	1.04
		(8.09)	(7.97)
More Than 30 Hours, Volunteering		2.03	0.69
		(5.16)	(5.26)
Spread Donations for Equality			29.04***
			(7.08)
Spread Donations for Efficiency			-12.84*
			(6.98)
Internalisation (SIMI)			38.57***
			(14.22)
Symbolisation (SIMI)			3.01
			(10.00)
Observations	328	328	328

Notes: tobit regressions with total donations as the dependent variable. The baseline is a person in the *NoCost* treatment who studies Natural Sciences and does not volunteer (0 Hours). Coefficients are average partial effects, robust standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5.11 Total Donations, PublicNAmount vs. Private (H3.2)

	(1)	(2)	(3)
PublicNAmount	4.84	3.83	2.79
	(3.93)	(4.01)	(3.92)
Age		-0.59	-0.50
		(0.36)	(0.35)
Male		-9.37**	-4.34
		(4.28)	(4.33)
Social Sciences		2.85	1.01
		(7.73)	(7.55)
Humanities		6.92	6.86
		(6.59)	(6.44)
Economics		5.37	5.75
		(5.80)	(5.66)
Medicine		-4.81	-3.51
		(12.36)	(12.21)
Law		-1.85	-2.55
		(6.70)	(6.53)
Other Field of Study		8.15	9.93
		(7.56)	(7.40)
1-5 Hours, Volunteering		-3.65	-4.78
		(6.04)	(5.96)
5-10 Hours, Volunteering		-0.48	-4.45
		(6.79)	(6.82)
10-20 Hours, Volunteering		0.49	-1.01
		(6.73)	(6.78)
20-30 Hours, Volunteering		4.50	-1.96
		(8.15)	(8.20)
More Than 30 Hours, Volunteering		4.11	1.17
		(5.59)	(5.73)
Spread Donations for Equality			18.86**
			(7.47)
Spread Donations for Efficiency			-11.16
			(7.37)
Internalisation (SIMI)			38.95***
			(14.91)
Symbolisation (SIMI)			14.89
			(9.80)
Observations	340	340	340

Notes: tobit regressions with total donations as the dependent variable. The baseline is a person in the *NoCost* treatment who studies Natural Sciences and does not volunteer (0 Hours). Coefficients are average partial effects, robust standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5.12 Total Donations, PublicN vs. Private (H3.3)

	(1)	(2)	(3)
PublicN	5.94	5.15	4.34
	(3.78)	(3.80)	(3.73)
Age		-0.98***	-0.90***
		(0.35)	(0.34)
Male		-9.23**	-6.06
		(3.96)	(3.98)
Social Sciences		7.67	5.39
		(6.63)	(6.51)
Humanities		5.16	4.14
		(6.24)	(6.12)
Economics		-2.42	-2.48
		(5.61)	(5.55)
Medicine		0.56	-4.40
		(10.08)	(10.02)
Law		-0.99	-2.82
		(6.45)	(6.33)
Other Field of Study		8.13	6.58
		(6.53)	(6.44)
1-5 Hours, Volunteering		-3.90	-3.65
		(5.78)	(5.73)
5-10 Hours, Volunteering		-3.04	-5.40
		(6.08)	(6.08)
10-20 Hours, Volunteering		1.92	-0.04
		(6.65)	(6.66)
20-30 Hours, Volunteering		-1.07	-4.55
		(7.63)	(7.70)
More Than 30 Hours, Volunteering		6.61	5.73
		(5.29)	(5.51)
Spread Donations for Equality			9.06
			(7.27)
Spread Donations for Efficiency			-6.64
			(7.37)
Internalisation (SIMI)			44.63***
			(14.16)
Symbolisation (SIMI)			5.10
			(9.53)
Observations	328	328	328

Notes: tobit regressions with total donations as the dependent variable. The baseline is a person in the *NoCost* treatment who studies Natural Sciences and does not volunteer (0 Hours). Coefficients are average partial effects, robust standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

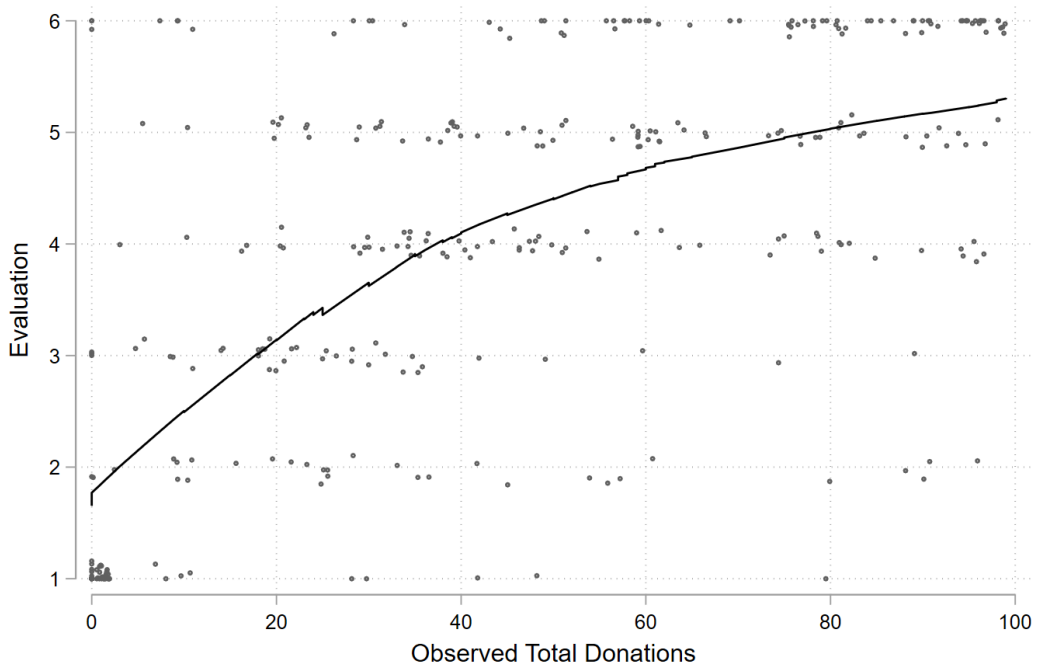
Table 5.13 Spectator Evaluations, PublicNAmount

	(1)	(2)	(3)
Observed Donation	0.03***	0.03***	0.03***
	(0.00)	(0.00)	(0.00)
Observed Charities	0.06	0.05	0.05
	(0.05)	(0.04)	(0.04)
Age		0.03	0.03
		(0.03)	(0.03)
Male		-0.37	-0.38
		(0.23)	(0.26)
Social Sciences		-0.68**	-0.73**
		(0.30)	(0.34)
Humanities		-0.93*	-1.00*
		(0.55)	(0.54)
Economics		-0.54	-0.43
		(0.33)	(0.31)
Medicine		-0.52	-0.69
		(0.46)	(0.60)
Law		-0.09	-0.10
		(0.38)	(0.42)
Other Field of Study		-0.38	-0.40
		(0.33)	(0.33)
1-5 Hours, Volunteering		-0.30	-0.25
		(0.35)	(0.35)
5-10 Hours, Volunteering		0.06	0.08
		(0.30)	(0.29)
10-20 Hours, Volunteering		0.09	0.10
		(0.30)	(0.29)
20-30 Hours, Volunteering		0.95***	0.99**
		(0.35)	(0.37)
More Than 30 Hours, Volunteering		-0.52	-0.52
		(0.40)	(0.38)
Spread Donations for Equality			-0.39
			(0.41)
Spread Donations for Efficiency			-0.21
			(0.46)
Internalisation (SIMI)			0.66
			(1.24)
Symbolisation (SIMI)			-0.14
			(0.61)
Constant	2.27***	2.00**	1.77
	(0.19)	(0.96)	(1.43)
Observations	330	330	330

Notes: OLS regressions with spectator evaluations as the dependent variable. The baseline is a person in the *NoCost* treatment who studies Natural Sciences and does not volunteer (0 Hours). Standard errors are clustered at the level of pairs of spectators.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

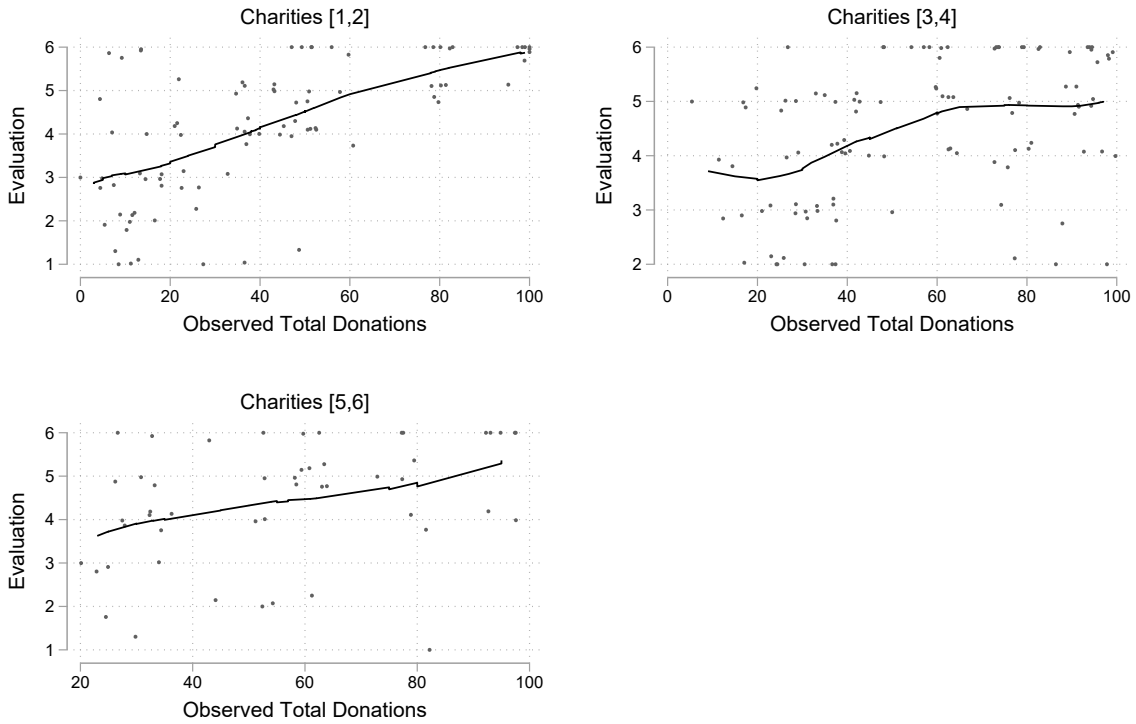
Spectator Evaluations

Figure 5.7 Diminishing Effect From Total Donations



Notes: locally weighted regression, using Cleveland's (1979) tricube weighting function and bandwidth 0.8.

Figure 5.8 Evaluations and Total Donations



Notes: locally weighted regression, using Cleveland's (1979) tricube weighting function and bandwidth 0.8.

Table 5.14 Nonlinearity in Spectator Evaluations, PublicNAmount

	(1)	(2)	(3)
Observed Donation	0.0743***	0.0774***	0.0798***
	(0.0113)	(0.0099)	(0.0090)
(Observed Donation)^2	-0.0004***	-0.0005***	-0.0005***
	(0.0001)	(0.0001)	(0.0001)
(Observed Charities)	0.0503	0.0428	0.0293
	(0.1120)	(0.0970)	(0.0951)
(Observed Charities)^2	-0.0035	-0.0034	-0.0024
	(0.0064)	(0.0062)	(0.0060)
Age		0.0403	0.0379
		(0.0305)	(0.0321)
Male		-0.3891*	-0.3853
		(0.2298)	(0.2523)
Social Sciences		-0.6291*	-0.6863*
		(0.3179)	(0.3554)
Humanities		-0.8982	-0.9901*
		(0.5531)	(0.5459)
Economics		-0.5325	-0.3996
		(0.3285)	(0.3046)
Medicine		-0.3966	-0.6021
		(0.4025)	(0.5458)
Law		0.0246	0.0185
		(0.3691)	(0.4107)
Other Field of Study		-0.5202	-0.5279
		(0.3323)	(0.3251)
1-5 Hours, Volunteering		-0.3343	-0.2695
		(0.3395)	(0.3304)
5-10 Hours, Volunteering		-0.0280	-0.0017
		(0.2922)	(0.2825)
10-20 Hours, Volunteering		-0.0098	0.0001
		(0.2868)	(0.2803)
20-30 Hours, Volunteering		0.8313**	0.8715**
		(0.3362)	(0.3595)
More Than 30 Hours, Volunteering		-0.6498	-0.6344
		(0.4201)	(0.3877)
Spread Donations for Equality			-0.4244
			(0.3935)
Spread Donations for Efficiency			-0.2653
			(0.4712)
Internalisation (SIMI)			0.8966
			(1.1851)
Symbolisation (SIMI)			-0.1524
			(0.5901)
Constant	1.7846***	1.3658	0.9688
	(0.2065)	(0.9688)	(1.3729)
Observations	330	330	330

Notes: OLS regressions with spectator evaluations as the dependent variable. The baseline is a person in the *NoCost* treatment who studies Natural Sciences and does not volunteer (0 Hours). Standard errors are clustered at the level of pairs of spectators.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5.15 Evaluations and Total Donations, PublicNAmount

	(Charities $\in \{1,2\}$)	(Charities $\in \{3,4\}$)	(Charities $\in \{5,6\}$)
Observed Donations	0.03***	0.02***	0.02**
	(0.00)	(0.01)	(0.01)
Constant	2.73***	3.31***	3.29***
	(0.21)	(0.34)	(0.42)
Observations	88	108	50

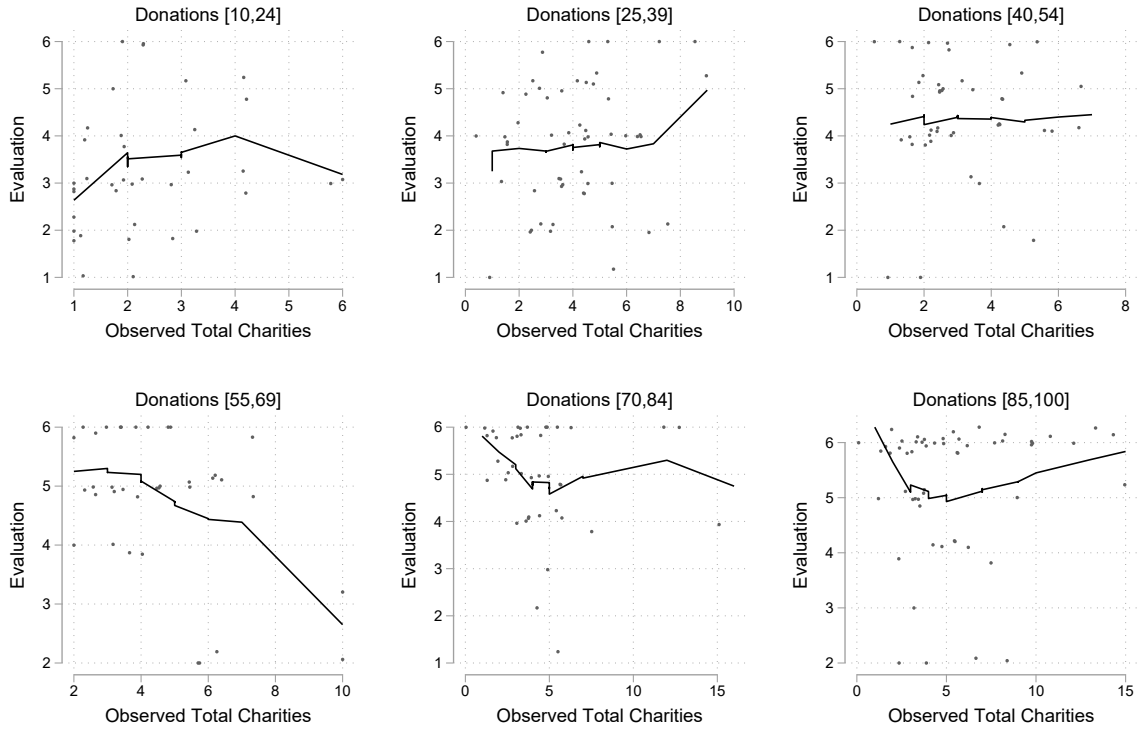
Notes: OLS regressions with spectator evaluations as the dependent variable. Standard errors are clustered at the level of pairs of spectators.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5.16 Evaluations and Total Charities, PublicNAmount

	(Donations ∈ [10,24])	(Donations ∈ [25,39])	(Donations ∈ [40,54])
Observed Charities	0.16	0.11	-0.02
	(0.17)	(0.14)	(0.09)
Constant	2.90***	3.35***	4.45***
	(0.42)	(0.60)	(0.33)
Observations	37	55	45
	(Donations ∈ [55,69])	(Donations ∈ [70,84])	(Donations ∈ [85,100])
Observed Charities	-0.32***	-0.04	0.02
	(0.09)	(0.07)	(0.04)
Constant	6.27***	5.17***	5.11***
	(0.39)	(0.30)	(0.32)
Observations	36	41	55

Notes: OLS regressions with spectator evaluations as the dependent variable. Standard errors are clustered at the level of pairs of spectators.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 5.9 Evaluations and Total Charities



Notes: locally weighted regression, using Cleveland's (1979) tricube weighting function and bandwidth 0.8.

Table 5.17 Spectator Evaluations, PublicN

	(1)	(2)	(3)	(4)	(5)	(6)
Observed Charities	0.15***	0.16***	0.15***	0.05	0.04	0.03
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
FirstOrderBeliefs				0.02***	0.02***	0.03***
				(0.00)	(0.00)	(0.00)
Age		0.00	0.00		0.01	0.00
		(0.02)	(0.02)		(0.02)	(0.02)
Male		-0.07	-0.09		0.08	0.09
		(0.21)	(0.23)		(0.19)	(0.22)
Social Sciences		0.02	-0.07		-0.22	-0.32
		(0.32)	(0.30)		(0.30)	(0.34)
Humanities		0.56**	0.46		0.54**	0.45
		(0.26)	(0.33)		(0.24)	(0.28)
Economics		-0.09	-0.13		0.20	0.21
		(0.27)	(0.28)		(0.28)	(0.28)
Medicine		-0.00	-0.13		-0.34	-0.57
		(0.31)	(0.44)		(0.26)	(0.46)
Law		-0.12	-0.19		0.05	0.01
		(0.22)	(0.22)		(0.22)	(0.21)
Other Field of Study		0.10	0.03		0.12	0.09
		(0.28)	(0.31)		(0.30)	(0.37)
0 Hours, Volunteering		0.00	0.00		0.00	0.00
		(.)	(.)		(.)	(.)
1-5 Hours, Volunteering		-0.17	-0.18		-0.34	-0.37
		(0.25)	(0.25)		(0.25)	(0.24)
5-10 Hours, Volunteering		-0.56**	-0.48*		-0.54**	-0.42*
		(0.26)	(0.27)		(0.21)	(0.23)
10-20 Hours, Volunteering		-0.33	-0.36		-0.79***	-0.81***
		(0.30)	(0.31)		(0.19)	(0.18)
20-30 Hours, Volunteering		0.25	0.21		-0.19	-0.20
		(0.69)	(0.71)		(0.52)	(0.53)
More Than 30 Hours, Volunteering		-0.49	-0.41		-0.63*	-0.54*
		(0.37)	(0.46)		(0.32)	(0.31)
Spread Donations for Equality			-0.28			-0.09
			(0.46)			(0.41)
Spread Donations for Efficiency			0.10			0.22
			(0.41)			(0.36)
Internalisation (SIMI)			0.79			1.97*
			(1.08)			(1.16)
Symbolisation (SIMI)			-0.16			-0.73
			(0.59)			(0.58)
Constant	3.88***	3.88***	3.44***	3.27***	3.11***	1.70
	(0.24)	(0.66)	(0.88)	(0.23)	(0.65)	(1.01)
Observations	326	326	326	326	326	326

Notes: OLS regressions with spectator evaluations as the dependent variable. The baseline is a person in the *NoCost* treatment who studies Natural Sciences and does not volunteer (0 Hours). Standard errors are clustered at the level of pairs of spectators.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5.18 Nonlinearity in Spectator Evaluations, PublicN

	(1)	(2)	(3)
Observed Charities	0.6645***	0.6653***	0.6756***
	(0.1114)	(0.1147)	(0.1178)
(Observed Charities)^2	-0.0447***	-0.0448***	-0.0457***
	(0.0088)	(0.0090)	(0.0092)
Age		0.0012	-0.0090
		(0.0163)	(0.0218)
Male		0.0236	0.0081
		(0.2067)	(0.2149)
Natural Sciences		0.0000	0.0000
		(.)	(.)
Social Sciences		0.0276	-0.1514
		(0.2992)	(0.2699)
Humanities		0.5725**	0.4754
		(0.2476)	(0.3189)
Economics		-0.2133	-0.3328
		(0.2365)	(0.2433)
Medicine		-0.1418	-0.2644
		(0.2691)	(0.3862)
Law		-0.1468	-0.2462
		(0.2131)	(0.2166)
Other Field of Study		0.0482	-0.0684
		(0.2872)	(0.2928)
1-5 Hours, Volunteering		-0.2465	-0.2564
		(0.2288)	(0.2219)
5-10 Hours, Volunteering		-0.4326*	-0.3422
		(0.2229)	(0.2319)
10-20 Hours, Volunteering		-0.2646	-0.4188
		(0.2820)	(0.3151)
20-30 Hours, Volunteering		0.2357	0.2174
		(0.7568)	(0.7885)
More Than 30 Hours, Volunteering		-0.2897	-0.2170
		(0.3363)	(0.4130)
Spread Donations for Equality			-0.4570
			(0.4672)
Spread Donations for Efficiency			0.4542
			(0.3554)
Internalisation (SIMI)			0.7445
			(0.9744)
Symbolisation (SIMI)			-0.0312
			(0.5734)
Constant	2.9704***	3.0426***	2.7652***
	(0.2857)	(0.6792)	(0.8536)
Observations	326	326	326

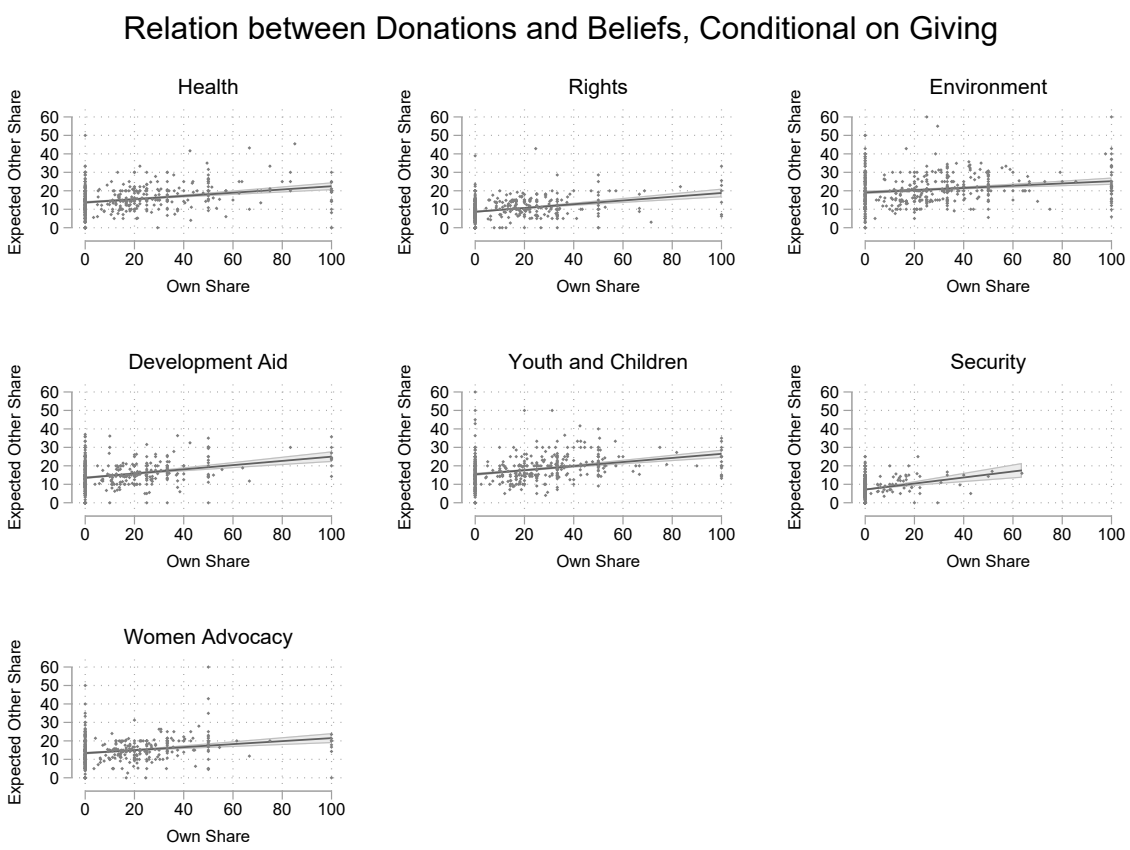
Notes: OLS regressions with spectator evaluations as the dependent variable. The baseline is a person in the *NoCost* treatment who studies Natural Sciences and does not volunteer (0 Hours). Standard errors are clustered at the level of pairs of spectators.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5.19 Preferences for Diversification and the Number of Charities

	NoCost	Private	PublicN	PublicNAmount	All
Spread Donations for Equality	2.28**	2.01***	2.37***	2.85***	2.44***
	(0.93)	(0.52)	(0.45)	(0.59)	(0.29)
Spread Donations for Efficiency	0.77	0.85	1.34	1.33	1.00
	(0.26)	(0.22)	(0.25)	(0.26)	(0.12)
Age	1.01	0.96***	0.99	1.01	0.99
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Male	0.68*	0.96	1.04	0.90	0.95
	(0.15)	(0.14)	(0.11)	(0.12)	(0.07)
Social Sciences	0.58	1.09	1.06	0.99	0.97
	(0.19)	(0.26)	(0.18)	(0.23)	(0.11)
Humanities	0.75	1.03	0.95	1.10	0.97
	(0.22)	(0.23)	(0.16)	(0.21)	(0.10)
Economics	0.76	1.04	1.07	0.92	0.96
	(0.26)	(0.20)	(0.16)	(0.16)	(0.09)
Medicine	0.66	0.98	0.94	0.33	0.80
	(0.55)	(0.35)	(0.27)	(0.35)	(0.17)
Law	0.81	1.37	0.80	1.24	1.09
	(0.27)	(0.31)	(0.14)	(0.23)	(0.12)
Other Field of Study	1.01	0.90	0.99	1.07	1.04
	(0.34)	(0.28)	(0.14)	(0.21)	(0.11)
1-5 Hours, Volunteering	1.41	1.17	0.69**	0.90	0.96
	(0.48)	(0.24)	(0.11)	(0.15)	(0.10)
5-10 Hours, Volunteering	0.76	1.17	0.91	0.80	0.94
	(0.26)	(0.25)	(0.14)	(0.17)	(0.10)
10-20 Hours, Volunteering	0.77	0.96	0.73*	0.70*	0.77**
	(0.28)	(0.22)	(0.13)	(0.14)	(0.09)
20-30 Hours, Volunteering	0.74	1.08	0.69*	0.90	0.86
	(0.26)	(0.29)	(0.14)	(0.21)	(0.11)
More Than 30 Hours, Volunteering	0.82	1.28	0.76**	0.88	0.91
	(0.27)	(0.27)	(0.10)	(0.14)	(0.09)
Internalisation (SIMI)	7.42**	1.21	0.81	1.72	1.53*
	(6.19)	(0.65)	(0.29)	(0.76)	(0.38)
Symbolisation (SIMI)	4.61***	2.00**	2.02***	1.58	2.10***
	(2.71)	(0.66)	(0.54)	(0.45)	(0.34)
NoCost					1.69***
					(0.17)
PublicN					1.19**
					(0.10)
PublicNAmount					0.99
					(0.08)
Observations	77	170	158	170	575

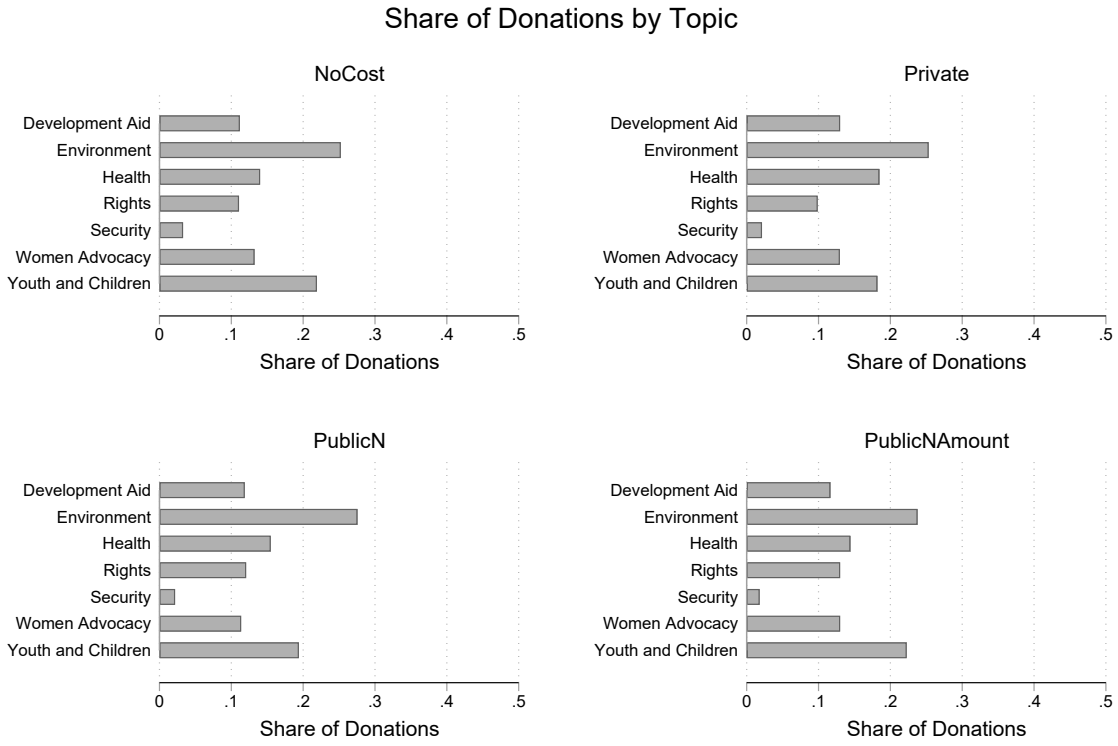
Notes: negative binomial regressions with the number of charities as the dependent variable. The baseline is a person who studies Natural Sciences and does not volunteer (0 Hours). Coefficients are incidence rate ratios.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 5.10 Evaluations and Total Charities



Notes: the figure shows for each of the seven topics the relation between the share of a dictator's donations is allocated to the topic and how much the dictator beliefs that others give on average to the topic. The grey bounds show 95 percent confidence intervals for a linear fit.

Figure 5.11 Distributions of Donations by Treatment



Notes: the figure shows for each treatment the share of total donations within that treatment that accrues to each of the seven topics.

Table 5.20 Number of Topics, Private vs. PublicN

	(1)	(2)	(3)
PublicN	1.25***	1.23***	1.24***
	(0.09)	(0.09)	(0.09)
Age		0.98**	0.98***
		(0.01)	(0.01)
Male		0.95	1.03
		(0.07)	(0.08)
Natural Sciences		1.00	1.00
		(.)	(.)
Social Sciences		1.18	1.13
		(0.15)	(0.14)
Humanities		1.14	1.08
		(0.14)	(0.12)
Economics		1.00	0.98
		(0.11)	(0.11)
Medicine		0.85	0.81
		(0.19)	(0.17)
Law		1.09	1.01
		(0.14)	(0.12)
Other Field of Study		1.19	1.15
		(0.15)	(0.13)
0 Hours		1.00	1.00
		(.)	(.)
1-5 Hours, Volunteering		0.99	0.93
		(0.11)	(0.10)
5-10 Hours, Volunteering		1.10	0.97
		(0.13)	(0.11)
10-20 Hours, Volunteering		1.01	0.88
		(0.13)	(0.11)
20-30 Hours, Volunteering		0.89	0.75*
		(0.14)	(0.11)
More Than 30 Hours, Volunteering		1.01	0.94
		(0.10)	(0.10)
Spread Donations for Equality			1.86***
			(0.25)
Spread Donations for Efficiency			1.00
			(0.14)
Internalisation (SIMI)			1.41
			(0.39)
Symbolisation (SIMI)			1.70***
			(0.31)
Observations	328	328	328

Notes: negative binomial regressions with the number of topics as the dependent variable. The baseline is a person in the *Private* treatment who studies Natural Sciences and does not volunteer (0 Hours). Coefficients are incidence rate ratios.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5.21 Number of Topics, PublicN vs. PublicNAmount

	(1)	(2)	(3)
PublicN	1.11	1.11	1.13*
	(0.08)	(0.08)	(0.08)
Age		1.00	1.00
		(0.01)	(0.01)
Male		0.90	1.00
		(0.07)	(0.07)
Social Sciences		1.12	1.07
		(0.14)	(0.13)
Humanities		1.23*	1.18
		(0.14)	(0.13)
Economics		1.02	0.97
		(0.11)	(0.10)
Medicine		0.62	0.67
		(0.19)	(0.20)
Law		0.98	1.00
		(0.12)	(0.12)
Other Field of Study		1.21*	1.19*
		(0.13)	(0.13)
1-5 Hours, Volunteering		0.95	0.85
		(0.10)	(0.09)
5-10 Hours, Volunteering		1.07	0.88
		(0.13)	(0.10)
10-20 Hours, Volunteering		1.02	0.88
		(0.12)	(0.11)
20-30 Hours, Volunteering		1.11	0.93
		(0.16)	(0.13)
More Than 30 Hours, Volunteering		0.98	0.88
		(0.09)	(0.08)
Spread Donations for Equality			2.19***
			(0.27)
Spread Donations for Efficiency			1.17
			(0.14)
Internalisation (SIMI)			1.58*
			(0.42)
Symbolisation (SIMI)			1.52**
			(0.27)
Observations	328	328	328

Notes: negative binomial regressions with the number of topics as the dependent variable. The baseline is a person in the *PublicNAmount* treatment who studies Natural Sciences and does not volunteer (0 Hours). Coefficients are incidence rate ratios.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5.22 Self-Importance of Moral Identity and Total Donations

	NoCost	Private	PublicN	PublicNAmount	All
High Internalisation	37.43***	7.77	13.51**	12.09**	12.81***
	(11.02)	(5.90)	(5.85)	(5.85)	(3.18)
High Symbolisation	-5.99	5.97	-0.79	-0.19	1.40
	(10.67)	(5.99)	(5.82)	(5.98)	(3.22)
Male	-22.24**	-5.06	-5.42	-6.07	-6.68**
	(10.22)	(5.93)	(5.53)	(6.22)	(3.20)
Age	-0.11	-1.09**	-1.01*	0.43	-0.51*
	(0.98)	(0.44)	(0.59)	(0.60)	(0.28)
Social Sciences	-29.76*	-2.54	10.48	5.68	-1.73
	(15.25)	(10.01)	(9.09)	(11.28)	(5.34)
Humanities	1.96	4.06	3.38	6.88	1.93
	(14.28)	(8.83)	(8.98)	(9.25)	(4.89)
Economics	-23.20	4.27	-14.49*	4.33	-2.48
	(14.11)	(7.85)	(8.28)	(8.26)	(4.36)
Medicine	-72.39*	8.59	-21.10	-49.91*	-13.41
	(40.15)	(13.73)	(14.81)	(29.00)	(9.34)
Law	-35.59**	5.33	-9.51	-7.20	-8.63*
	(15.48)	(9.42)	(8.51)	(9.02)	(4.97)
Other Field of Study	2.61	18.43	-2.06	1.70	5.03
	(16.25)	(12.07)	(7.66)	(9.68)	(5.09)
1-5 Hours, Volunteering	-0.28	-1.53	-2.26	-10.56	-4.30
	(14.89)	(8.32)	(8.18)	(8.33)	(4.54)
5-10 Hours, Volunteering	-37.75**	-4.75	-7.17	-0.08	-7.13
	(15.71)	(8.81)	(8.60)	(10.73)	(5.10)
10-20 Hours, Volunteering	10.10	3.10	-3.77	-3.55	-1.23
	(16.17)	(9.16)	(9.41)	(9.42)	(5.14)
20-30 Hours, Volunteering	-14.85	-5.56	-3.76	3.14	-2.96
	(16.53)	(10.75)	(10.57)	(11.81)	(6.06)
More Than 30 Hours, Volunteering	17.36	10.56	3.18	-1.01	3.21
	(15.23)	(8.44)	(6.99)	(7.59)	(4.23)
Spread Donations for Equality	47.25**	-0.97	20.75**	38.88***	25.80***
	(19.36)	(10.78)	(10.19)	(10.28)	(5.64)
Spread Donations for Efficiency	-25.30	-3.78	-7.64	-15.44	-13.76**
	(16.02)	(10.95)	(10.34)	(9.65)	(5.50)
NoCost					4.15
					(4.85)
PublicN					4.90
					(3.89)
PublicNAmount					2.71
					(3.84)
Observations	77	170	158	170	575

Notes: tobit regressions with total donations as the dependent variable. High Internalisation (Symbolisation) is a dummy variable taking the value 1 if the participant has an above-median score on the Internalisation (Symbolisation) subscale. The baseline is a person who scores in the bottom half of the Internalisation and Symbolisation subscales of the Self-Importance of Moral Identity scale, who studies Natural Sciences, and who does not volunteer (0 Hours). Coefficients are incidence rate ratios.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.7.3 Robustness

Sample Restrictions. In the main analysis, we included all participants who completed all parts of the experiment and passed all control questions (including the test for second-order beliefs in *PublicN*). In the following, we examine the robustness of our results to employing stricter, non-preregistered screeners. First, we exclude participants who provided inconsistent responses to the norm elicitation questions. Here, participants are asked about their beliefs about total donations including transaction costs (when these apply) and their beliefs about the number of charities. In *Private*, *PublicN*, and *PublicNAmount*, the transaction costs of EUR 1 imply that donations should be strictly larger than the number of charities, and we thus exclude 19 participants from the main sample for whom this was not the case. Second, as we run an online experiment, one potential concern is the use of bots in aiding participants. As suggested by Zhang et al. (2022), participants with an odd-numbered screen resolution are potential bots, and this leads to the further exclusion of 20 participants. Third, we exclude participants who answered any control question wrong more times than there were possible multiple choice answers. This can occur since we do not inform participants about what question(s) they get wrong. This leads to the exclusion of further 15 participants. Fourth, we wanted to exclude participants who were flagged by an experimenter in a lab session for needing extensive additional explanation, suffering from technical difficulties, or the like. Yet, while there were seven such participants in our sample, they were all excluded by the previous screeners. Hence, we arrive at a restricted sample of 740 participants.

Across all hypotheses, we find no change in the qualitative conclusions when adding additional sample restrictions. At our preferred level of control (cf. our pre-registration), the incidence ratio for Hypothesis 5.3.7 changes from .59 to .61, the incidence ratio for Hypothesis 5.3.7.1 changes from 1.21 to 1.18, and the incidence ratio for Hypothesis 5.3.7.2 changes from 1.17 to 1.15. For all these cases, the incidence ratios remain statistically significant despite the loss of power from using fewer observations (although the contrast between *PublicN* and *PublicNAmount* now yields $p = .052$). For Hypothesis 5.3.7.1, 5.3.7.2, and 5.3.7.3, the average partial effects change from -1.90, 2.79, and 4.34 to -2.66, 3.10, and 4.24, respectively. In none of these cases do the regressions on the restricted sample yield significant effects.

Table 5.23 Self-Importance of Moral Identity and the Number of Charities

	NoCost	Private	PublicN	PublicNAmount	All
High Internalisation	1.48*	0.97	1.00	1.14	1.09
	(0.34)	(0.14)	(0.11)	(0.14)	(0.08)
High Symbolisation	1.59*	1.18	1.30**	1.11	1.25***
	(0.40)	(0.16)	(0.14)	(0.14)	(0.09)
Male	0.63**	0.92	1.03	0.88	0.93
	(0.15)	(0.14)	(0.11)	(0.12)	(0.07)
Age	1.02	0.96***	0.99	1.01	0.99
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Social Sciences	0.65	1.14	1.03	1.00	0.97
	(0.22)	(0.28)	(0.17)	(0.23)	(0.11)
Humanities	0.72	1.08	0.93	1.04	0.95
	(0.22)	(0.24)	(0.15)	(0.20)	(0.10)
Economics	0.78	1.10	1.07	0.91	0.97
	(0.27)	(0.22)	(0.16)	(0.16)	(0.09)
Medicine	0.57	1.07	0.95	0.29	0.81
	(0.50)	(0.39)	(0.28)	(0.30)	(0.18)
Law	0.82	1.44	0.76	1.20	1.09
	(0.28)	(0.33)	(0.13)	(0.22)	(0.12)
Other Field of Study	1.00	0.95	0.94	1.06	1.02
	(0.35)	(0.30)	(0.14)	(0.21)	(0.11)
1-5 Hours, Volunteering	1.40	1.20	0.71**	0.91	0.99
	(0.49)	(0.24)	(0.11)	(0.15)	(0.10)
5-10 Hours, Volunteering	0.70	1.22	0.95	0.80	0.96
	(0.25)	(0.26)	(0.15)	(0.17)	(0.11)
10-20 Hours, Volunteering	0.84	1.04	0.76	0.72*	0.81*
	(0.33)	(0.24)	(0.14)	(0.14)	(0.09)
20-30 Hours, Volunteering	0.83	1.22	0.70*	0.93	0.91
	(0.31)	(0.32)	(0.14)	(0.22)	(0.12)
More Than 30 Hours, Volunteering	1.03	1.38	0.78*	0.91	0.97
	(0.34)	(0.28)	(0.11)	(0.14)	(0.09)
Spread Donations for Equality	2.58**	2.12***	2.32***	2.88***	2.49***
	(1.12)	(0.55)	(0.44)	(0.60)	(0.30)
Spread Donations for Efficiency	0.75	0.87	1.43*	1.37	1.04
	(0.26)	(0.22)	(0.27)	(0.27)	(0.12)
NoCost					1.65***
					(0.17)
PublicN					1.18*
					(0.10)
PublicNAmount					0.98
					(0.09)
Observations	77	170	158	170	575

Notes: negative binomial regressions with the number of charities as the dependent variable. High Internalisation (Symbolisation) is a dummy variable taking the value 1 if the participant has an above-median score on the Internalisation (Symbolisation) subscale. The baseline is a person who scores in the bottom half of the Internalisation and Symbolisation subscales of the Self-Importance of Moral Identity scale, who studies Natural Sciences, and who does not volunteer (0 Hours). Coefficients are incidence rate ratios.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5.24 Transaction Costs and the Number of Charities (H1), Restricted Sample

	(1)	(2)	(3)
Private	0.60***	0.58***	0.61***
	(0.08)	(0.07)	(0.07)
Demographic Controls	No	Yes	Yes
Attitudinal Controls	No	No	Yes
Observations	230	230	230

Notes: negative binomial regressions with the number of charities as the dependent variable. The demographic controls are age, gender, field of study, and volunteering. The attitudinal controls are preferences for spreading donations (two questions) and the two subscales of the Self-Importance of Moral Identity scale. Coefficients are incidence rate ratios.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5.25 Observability and the Number of Charities (H2), Restricted Sample

	PublicN vs. Private			**PublicN vs. PublicNAmount**		
	(1)	(2)	(3)	(4)	(5)	(6)
PublicN	1.12	1.17*	1.18**	1.09	1.10	1.15*
	(0.10)	(0.11)	(0.10)	(0.09)	(0.09)	(0.09)
Demographics	No	Yes	Yes	No	Yes	Yes
Attitudes	No	No	Yes	No	No	Yes
Observations	302	302	302	304	304	304

Notes: negative binomial regressions with the number of charities as the dependent variable. The demographic controls are age, gender, field of study, and volunteering. The attitudinal controls are preferences for spreading donations (two questions) and the two subscales of the Self-Importance of Moral Identity scale. Coefficients are incidence rate ratios.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5.26 Observability and Total Donations (H3), Restricted Sample

PublicNAmount vs. PublicN			
PublicNAmount	-0.84	-1.55	-2.66
	(3.95)	(3.94)	(3.81)
Demographic Controls	No	Yes	Yes
Attitudinal Controls	No	No	Yes
Observations	304	304	304
PublicNAmount vs. Private			
PublicNAmount	5.11	4.13	3.10
	(3.92)	(4.00)	(3.94)
Demographic Controls	No	Yes	Yes
Attitudinal Controls	No	No	Yes
Observations	314	314	314
PublicN vs. Private			
PublicN	5.90	4.80	4.24
	(3.86)	(3.88)	(3.80)
Demographic Controls	No	Yes	Yes
Attitudinal Controls	No	No	Yes
Observations	302	302	302

Notes: tobit regressions with total donations as the dependent variable. The demographic controls are age, gender, field of study, and volunteering. The attitudinal controls are preferences for spreading donations (two questions) and the two subscales of the Self-Importance of Moral Identity scale. Coefficients are average partial effects, robust standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Further, we document that there is no evidence of post-treatment bias in the attitudinal variables that we elicit in the survey part of the experiment. Post-treatment bias is a concern that arises when control variables are elicited after the treatment manipulation, as the treatment manipulation could influence the control variables and thereby distort the statistical inference. In the following, we consider possible treatment differences in risk preferences, answers to the two questions about preferences for spreading donations, answers to the two subscales of the SIMI scale, and the average perceived importance of the seven topics.

We first test for statistical differences when comparing all treatments simultaneously. This has the advantage of reducing the number of tests, thereby reducing the risk of Type I errors. Using the nonparametric Kruskall-Wallis test, we find no statistical differences in any of the aforementioned variables (all $p's > .208$).

Second, we examine all contrasts between treatments in all of the control variables. This analysis has the benefit of capturing differences between treatments in cases where e.g. three of the four treatments are sufficiently similar that the Kruskall-Wallis test does not find overall differences. The disadvantage is that we now conduct six tests for six variables, which implies a potentially inflated Type I error rate. The resulting p-values from Mann-Whintey U-tests are shown in Table 5.27. We find no statistically significant differences, but we do find two marginally statistically significant differences. As this is to be expected with 36 tests, we conclude that we find no evidence of post-treatment bias.

Table 5.27 Post-Treatment Bias, Pairwise Treatment Comparisons

(a) Risk Preferences

	NoCost	Private	PublicN
NoCost	.	.	.
Private	0.235	.	.
PublicN	0.051	0.346	.
PublicNAmount	0.238	0.911	0.431

(b) Spread for Equality

	NoCost	Private	PublicN
NoCost	.	.	.
Private	0.358	.	.
PublicN	0.147	0.469	.
PublicNAmount	0.370	0.968	0.431

(c) Spread for Efficiency

	NoCost	Private	PublicN
NoCost	.	.	.
Private	0.821	.	.
PublicN	0.302	0.253	.
PublicNAmount	0.619	0.695	0.518

(d) Internalisation

	NoCost	Private	PublicN
NoCost	.	.	.
Private	0.464	.	.
PublicN	0.948	0.372	.
PublicNAmount	0.861	0.444	0.888

(e) Symbolisation

	NoCost	Private	PublicN
NoCost	.	.	.
Private	0.315	.	.
PublicN	0.594	0.547	.
PublicNAmount	0.059	0.332	0.084

(f) Perceived Importance

	NoCost	Private	PublicN
NoCost	.	.	.
Private	0.984	.	.
PublicN	0.201	0.131	.
PublicNAmount	0.217	0.119	0.979

Notes: the tables show p-values for each pairwise comparison between all treatments for the six variables. p-values stem from Mann-Whitney U-tests.

5.7.4 Discussion

The Role of Social Norms As explained in Section 5.3.2, we elicit normative and empirical expectations from the dictators about both the number of charities and the total donations. In the following, we first present the expectations of the dictators and compare these with the actual decisions made by the dictators.

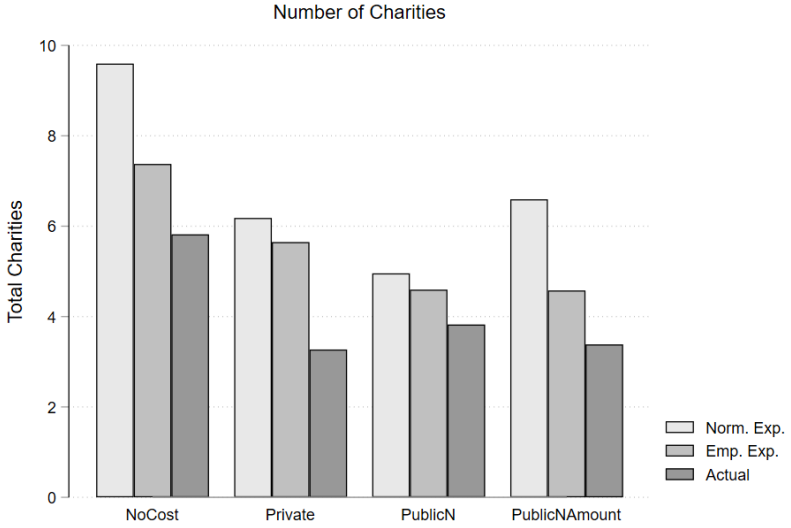
Charities. We first examine the normative and empirical expectations related to the decision about how many charities to give to. As seen in Figure 5.12, we find in all treatments that the average normative and empirical expectations are considerably greater than one. That is, dictators on average believe that (i) a separate sample has stated that they believe one ought to give to more than one charity, and (ii) the median dictator gives to more than one charity. Because giving to only one charity is the most efficient way of giving in our setting, this suggests that dictators on average expect others to assign importance to giving to multiple charities. This corroborates earlier findings in the literature that individuals tend to care more about *giving* than giving *efficiently* (Berman et al., 2018; Metzger and Günther, 2019). In comparing the average decisions made by

dictators to their expectations, we use negative binomial regressions while clustering on the level of the dictator. We find that the average decision made by dictators falls short of both the normative and empirical expectations in all treatments (all $p's < .053$).

Yet, comparing normative and empirical expectations between *NoCost* and *Private* shows that both expectations decrease with transaction costs. That is, dictators believe that when there are transaction costs, others state that one ought to give to fewer charities and other donors actually give to fewer charities on average (negative binomial regressions, both $p's < .001$).

In sum, we find that there is a norm of giving to multiple charities, but the average normative and empirical expectations decrease when there are transaction costs.

Figure 5.12 Expectations Related to Number of Charities



Notes: the figure presents the average normative and empirical expectations of the number of charities in each treatment and compares this to the actual donation pattern on average.

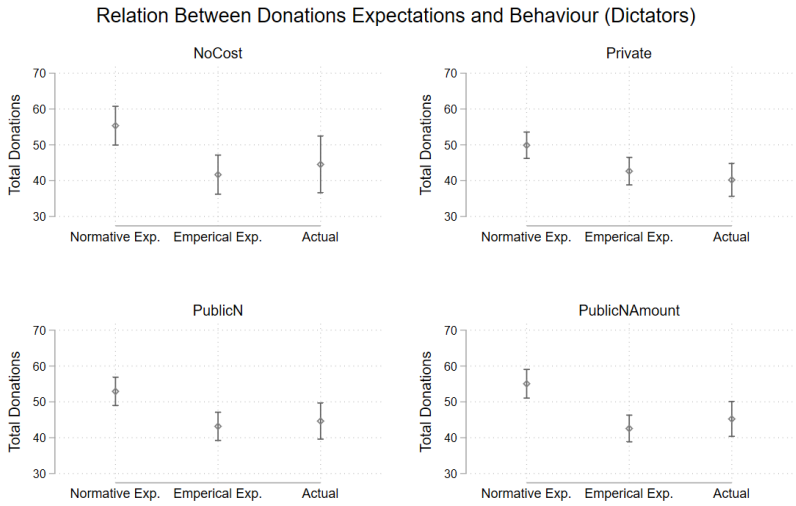
Donations. We next look at the normative and empirical expectations about the total donations. As seen in Figure 5.13, dictators in all treatments have normative expectations that exceed both the empirical expectations and actual donations (Wilcoxon signed-rank tests, all $p's < .017$). Thus, while dictators on average have normative expectations of donations of EUR 50-55 across all treatments, empirical expectations are only EUR 42-43 and actual donations EUR 40-45. In contrast, the average empirical expectations are aligned with the average donations (Wilcoxon signed-rank tests, all $p's > .216$).

Looking instead across treatments, we find in general no differences in normative expectations (MWU-test, $allp's > .370$), but the contrast between *Private* and *PublicNAmount* is marginally statistically significant (MWU-test, $p = .059$). In terms of empirical expectations, we find no difference among any treatments (MWU-test, all $p's > .719$). That

is, we find that neither expectation responds to the introduction of transaction costs nor observability.

In sum, we find in all treatments that normative expectations exceed both empirical expectations and average donations. The treatments do not influence any of the two expectations.

Figure 5.13 Expectations Related to Donations



Notes: the figure presents average normative and empirical expectations about the total donations in each treatment and compares this to the total donations made by donors on average. The bars display 95 percent confidence intervals.

Spectators. Lastly, we asked spectators in both *PublicN* and *PublicNAmount* about their personal normative beliefs, i.e. how many charities they think dictators ought to give to and how much they think dictators ought to give. For the number of charities, we find median responses in both treatments of 4 and 3, respectively. That is, in both treatments spectators believe that one ought to give to more than 1 charity, suggesting a preference for spreading donations. The answers in the two treatments are not statistically significantly different (negative binomial regression, $p = .597$). With regards to total donations, the median in both treatments is EUR 55, and answers are not statistically significantly different (MWU-test, $p = .748$).

Gender Differences. In this section, we report gender difference in giving behavior, i.e. number of charities and total amount, and how this relates to existing literature. Information about preferences for efficiency and equality as well as the Self-Importance of Moral Identity scale allows us to identify underlying mechanisms for such gender differences. Finally, we provide results on differences between men and women as regard the responsiveness to partial observability.

Preferences for Spreading Donations. First, we find that women are more likely to agree to the statement "It is important to spread one's donations to reduce the risk of any organisation coming up short". The interpretation of the coefficient is that men tend to score 0.1 lower in their agreement on a scale from 0 ("Strongly disagree") to 1 ("Strongly agree"), and the difference is statistically significant for all levels of control (OLS regressions, all $p's < .038$, cf. Table 5.29). In contrast, we find no gender differences in agreement with the statement "It is important to spread out your donations to reduce the risk that donations will be spent inefficiently" (OLS regressions, all $p's > .358$).

Table 5.29 Gender and Preferences for Spreading Donations

	Spread for Efficiency			**Spread for Equality**		
Male	-0.03	-0.02	-0.01	-0.09***	-0.08***	-0.06**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Constant	0.42***	0.25***	0.19	0.48***	0.36***	0.14
	(0.02)	(0.08)	(0.13)	(0.02)	(0.08)	(0.13)
Observations	498	498	498	498	498	498
Demographic Controls	No	Yes	Yes	No	Yes	Yes
Attitudinal Controls	No	No	Yes	No	No	Yes

Notes: OLS regressions with spread preferences as dependent variable, transformed to Proportion of Maximum Possible, and robust standard errors in parentheses. The regressions exclude the NoCost treatment, as this treatment does not involve transaction costs of spreading donations, but results are robust to including this.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Self-Importance of Moral Identity. Second, we find that women score higher on both subscales of the 10-item Self-Importance of Moral Identity (SIMI) scale. Specifically, the SIMI scale elicits the degree to which a person wants to possess moral qualities (Internalisation) and the degree to which a person believes that their actions communicate being moral to others (Symbolisation). For Internalisation, we find that women score 0.04 higher than men on a scale from 0 to 1, and this difference is statistically significant for all levels of control (OLS regressions, all $p's < .014$, cf. Table 5.30). For Symbolisation, the difference is 0.08 on a scale from 0 to 1 (OLS regressions, all $p's < .001$, cf. Table 5.30). That is, women in general state that morality is more important for their self-identity, and this is true for both their desire to possess moral qualities and to communicate being moral.

Differences in Charities and Donations. We now turn to the actual behaviour of men and women in the role of dictators. Here, we find that men tend to give to 16 percent fewer charities (negative binomial regression, $p = .016$), and men on average donate EUR 11.44 less than women (average partial effect, tobit regression, $p < .001$). While both differences remain statistically significant when including demographic controls, only the difference in average donations remain when also including attitudinal controls (average partial effect of EUR 6.45, $p = .044$), whereas the difference in the number of charities becomes statistically insignificant ($p = .494$), cf. Tables 5.31 and 5.32. This reduction of the estimated difference and statistical significance can be explained by the fact that both

Table 5.30 Gender and Self-Importance of Moral Identity

	Internalisation			Symbolisation		
Male	-0.04***	-0.04***	-0.03**	-0.08***	-0.07***	-0.06***
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
Constant	0.84***	0.87***	0.85***	0.45***	0.32***	0.26***
	(0.01)	(0.03)	(0.03)	(0.01)	(0.05)	(0.06)
Observations	575	575	575	575	575	575
Demographic Controls	No	Yes	Yes	No	Yes	Yes
Attitudinal Controls	No	No	Yes	No	No	Yes

Notes: OLS regressions with SIMI subscales as dependent variable, transformed to Proportion of Maximum Possible, and robust standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

preferences for spreading donations, Internalisation, and Symbolisation to some extent predict the donation patterns by the dictators. Hence, the gender differences in attitudes towards spreading donations and the self-importance of morality explain gender differences in the number of charities and partly explains gender differences in total donations.

These results extend previous findings on gender differences in charitable giving. First, Bloom (2016) describes that women in general give to more charities than men when giving is influenced by empathy, and women have been shown to be less concerned about efficiency than men (Croson and Konow, 2009). Our results corroborate these findings and suggest that the gender differences can be explained by (i) the different preferences for giving to multiple charities out of a fear that some charities might miss out and (ii) how important the moral identity of the genders is.

Responsiveness to Treatments. Finally, we look at how responsive men and women are to the *PublicN* treatment, which allows for indirect signalling. As our study is powered to test for main effects and not interaction effects, we pool all other treatments to increase statistical power. In doing so, we find that women do not respond to the *PublicN* treatment; the incidence rate ratio is .92 and statistically indistinguishable from 1 (negative binomial regression, $p = .442$), and this is unaffected by the level of control, cf. Table 5.33. In contrast, the incidence rate ratio for men is 1.35, and this difference is marginally statistically significant ($p < .062$) and unaffected by the level of control, cf. Table 5.33. This implies that men are more responsive to the *PublicN* treatment than women in increasing the number of charities they give to (although from a lower baseline as shown above).

Table 5.31 Gender and the Number of Charities

	(1)	(2)	(3)
Male	0.84**	0.85**	0.95
	(0.06)	(0.06)	(0.07)
Private	0.57***	0.56***	0.59***
	(0.06)	(0.06)	(0.06)
PublicN	0.68***	0.67***	0.70***
	(0.07)	(0.07)	(0.07)
PublicNAmount	0.58***	0.58***	0.59***
	(0.06)	(0.06)	(0.06)
Age		0.99	0.99
		(0.01)	(0.01)
Social Sciences		1.00	0.97
		(0.13)	(0.11)
Humanities		0.97	0.97
		(0.11)	(0.10)
Economics		0.95	0.96
		(0.10)	(0.09)
Medicine		0.77	0.80
		(0.18)	(0.17)
Law		1.11	1.09
		(0.13)	(0.12)
Other Field of Study		1.03	1.04
		(0.12)	(0.11)
1-5 Hours, Volunteering		1.04	0.96
		(0.11)	(0.10)
5-10 Hours, Volunteering		1.14	0.94
		(0.13)	(0.10)
10-20 Hours, Volunteering		0.88	0.77**
		(0.11)	(0.09)
20-30 Hours, Volunteering		1.05	0.86
		(0.15)	(0.11)
More Than 30 Hours, Volunteering		1.02	0.91
		(0.10)	(0.09)
Spread Donations for Equality			2.44***
			(0.29)
Spread Donations for Efficiency			1.00
			(0.12)
Internalisation (SIMI)			1.53*
			(0.38)
Symbolisation (SIMI)			2.10***
			(0.34)
Observations	575	575	575

Notes: negative binomial regressions with the number of charities as the dependent variable. The baseline is a person in the *NoCost* treatment who studies Natural Sciences and does not volunteer (0 Hours). Coefficients are incidence rate ratios.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5.32 Gender and Total Donations

	(1)	(2)	(3)
Male	-11.44***	-10.87***	-6.45**
	(3.20)	(3.25)	(3.19)
Private	-6.38	-5.82	-4.51
	(5.04)	(5.01)	(4.83)
PublicN	0.92	-0.03	0.29
	(5.09)	(5.07)	(4.88)
PublicNAmount	-1.41	-1.88	-1.86
	(5.04)	(5.05)	(4.87)
Age		-0.59**	-0.48*
		(0.29)	(0.28)
Social Sciences		0.45	-1.86
		(5.52)	(5.30)
Humanities		2.87	2.58
		(5.06)	(4.86)
Economics		-3.05	-1.93
		(4.51)	(4.34)
Medicine		-10.53	-13.09
		(9.60)	(9.28)
Law		-8.79*	-9.03*
		(5.14)	(4.93)
Other Field of Study		4.83	5.13
		(5.26)	(5.07)
1-5 Hours, Volunteering		-3.75	-5.27
		(4.69)	(4.54)
5-10 Hours, Volunteering		-2.86	-7.45
		(5.16)	(5.08)
10-20 Hours, Volunteering		-0.69	-2.12
		(5.26)	(5.19)
20-30 Hours, Volunteering		0.31	-5.65
		(6.16)	(6.08)
More Than 30 Hours, Volunteering		4.19	1.97
		(4.22)	(4.30)
Spread Donations for Equality			23.81***
			(5.64)
Spread Donations for Efficiency			-13.77**
			(5.51)
Internalisation (SIMI)			51.76***
			(11.18)
Symbolisation (SIMI)			9.11
			(7.62)
Observations	575	575	575

Notes: Average partial effects from tobit regressions with total donations as dependent variable, robust standard errors in parentheses. The baseline is a person in the *NoCost* treatment who studies Natural Sciences and does not volunteer (0 Hours).
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5.33 Gender and Responsiveness to PublicN

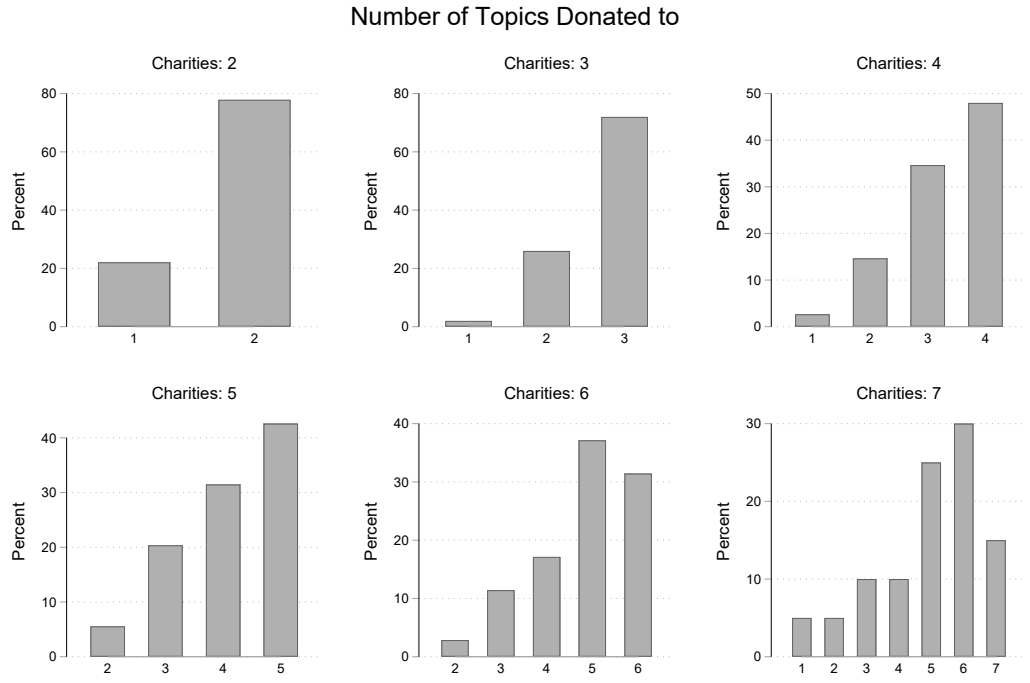
	(1)	(2)	(3)
Male	0.75***	0.76***	0.86*
	(0.07)	(0.07)	(0.07)
PublicN	0.92	0.91	0.95
	(0.09)	(0.09)	(0.09)
Male × PublicN	1.35*	1.36*	1.33*
	(0.22)	(0.22)	(0.20)
Demographic Controls	No	Yes	Yes
Attitudinal Controls	No	No	Yes
Observations	575	575	575

Notes: negative binomial regressions with the number of charities as the dependent variable. The demographic controls are age, gender, field of study, and volunteering. The attitudinal controls are preferences for spreading donations (two questions) and the two subscales of the Self-Importance of Moral Identity scale. Coefficients are incidence rate ratios.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

1/N Heuristic. Of the dictators who donate to more than one charity, 42 percent apply a naive form of diversification, in which they give the same share of their donations to each of the charities they donate to (cf. the 1/N heuristic, Benartzi and Thaler, 2001). One might suspect that the tendency to use a 1/N heuristic is lower in *PublicNAmount*, as donors have the opportunity to signal to the spectators what charities are relatively more important. Yet, if anything, the opposite seems to be true: in *PublicNAmount*, 50 percent of dictators who give to more than one charity use the 1/N heuristic; the respective shares for the other treatments is 37-42 percent.

Diversification Across Topics. Figure 5.14 pools all treatments and shows the distribution of how many topics dictators gave to, separated by how many charities the dictators donate to (from 2 to 7). For instance, among the 100 dictators who gave to three charities, 72 picked those charities from three different topics, 26 picked them from two different topics, and the remaining 2 dictators picked them from the same topic. For all dictators who gave to 2-5 charities, picking each charity from its own topic is the mode of the distribution. For the dictators who gave to 6 or 7 charities, the mode is instead to give to one less topic than the number of charities, i.e. 5 or 6, respectively. This suggests that dictators who give to more charities tend to choose these from different topics.

Figure 5.14 Donations Spread Across Topics



Notes: this figure pools all treatments and shows the distribution of the number of topics dictators donate to, separated by the number of charities the dictators donated to (from 2 to 7). For instance, the top left graph shows the distribution of the number of topics for the dictators who gave to two charities. Of these dictators, 78 percent donated to two different topics, whereas 22 percent donated to two charities within the same topic.

5.7.5 Instructions

On the next pages, we include the instructions for a participant who is randomly assigned to the *PublicNAmount* treatment. As this study features three different roles, we will display the instructions for all three roles within the *PublicNAmount* treatment in the following order: dictators, spectators, and social norm eliciters. Note that the survey is identical for all three roles and is therefore only shown in the version for the dictator. Importantly, one interactive design feature requires further explanation: on the 'Decision' page for the dictators, participants are presented with a list of seven general topics from which they can choose charities for donation. To open the list of the seven charities that belong to each topic, participants click on the plus sign next to the topic. To receive further information about a specific charity and to make a donation, participants then need to click on any specific charity name so that a window pops up with a short description of the charity and a blank field to enter a donation amount to the charity. The order of the seven topics and the order of the seven charities within each topic was randomized for each participant. The list of all topics, charities, and their respective explanations can be found directly after the instruction.

Role: DICTATORS

Introduction & Game

Welcome to the experiment. You are invited to participate in a research study of the University of Hamburg's experimental laboratory, which explores decision making. Following the experiment, we ask you to answer a survey that asks, for example, about your background (gender, age, etc.) and other social attitudes.

Your participation should take about 15-25 minutes, which should be done in one go. If you complete the study to the end, you will receive the following compensation:

1. A fixed remuneration of 4.50€ for your participation.
2. A potential payout of up to 1.50€, depending on the accuracy of your estimate information.
3. A potential payout of up to 100€, depending on your donation decision and the random principle.

   → A total of 10 people will be drawn for the allowances from (3).

Please note that this study contains several questions that relate directly to your understanding of the choices you are making. In accordance with laboratory research, you must answer these control questions correctly in order to participate in the study.

If you have any questions about this research study or your participation, please contact Juliane Koch, University of Hamburg, by email at juliane.koch@uni-hamburg.de. Thank you very much for your participation!

Rules

You have been randomly selected for the role of donation decision maker. For your decision- making task, you will be presented with a long list of charities that have **all** received **a TOP efficiency rating* according to CharityWatch.** We will show you these as examples in the next step. The charities cover the following areas:

1. Topic: Health
2. Topic: Justice (Legal) Aid
3. Topic: Environment and Animals
4. Topic: International Development Relief
5. Topic: Youth and Children
6. Topic: Security
7. Topic: Women Advocacy

You will receive a **starting amount of 100€**** and are to decide which charities you want to donate which amount to. Your total donation amount will be deducted from your 100€ and thus not paid out to you, but donated to your selected charities).

*A TOP efficiency rating means, among other things, that the charity has low administrative and marketing costs so that almost all donations go to its actual purpose, that the charity has a high transparency status, etc.

**At the end of the game, 10 participants will be drawn for whom the decision made will come into effect, i.e. the additional payment of the 100€ to the participants themselves and/or a pro-rata/complete payment to the charities chosen by the 10 people.

Rules

Important Notes: Please note the following two points:

1. *Per charity you want to donate to, you pay a **transaction cost of 1€!** This means that the more charities are selected, the higher the transaction costs and therefore the lower the total amount that can be donated.*

Example calculations:

Example 1: You

- donate 5€ to charity X → donation that charity X receives: 5€

➔ *Transaction cost generated: 1€*
➔ *Remaining in your private account: **94€** (100€-5€-1€*

Example 2: You

- donate 5€ to charity X → donation that charity X receives: 5€
- donate 10€ to charity Y → donation that charity Y receives: 10€
- donate 25€ to charity Z → donation that charity Z receives: 25€

➔ *Transaction cost generated: 3€*
➔ *Remaining in your private account: **57€** (100€-5€-10€-25€-3€)*

2. *Two other people in this study learn to which charity you donate, as well as what amounts. **Together with the information to which charities you donated and how much, the two observers learn your name and assess your behavior**. However, this assessment has no influence on your payout.*

Charity list – example

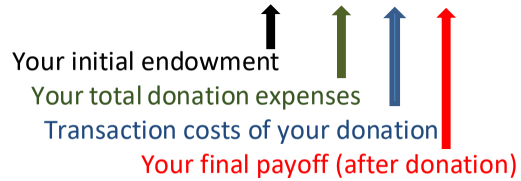
Health	**+**
Environment	**+**
World Resource Institute	**-**
Conservation International Foundation	
Center for Biological Diversity	
Wildlife Conservation Society	
Waterkeeper Alliance	
Earth Island Institute	
Amazon Conservation Team	
Rights	**+**
Development Aid	**+**
Youth and Children	**+**
Security	**+**
Women Advocacy	**+**

Topic: Environment

Donation to Charity
Waterkeeper Alliance: 5€

Evaluation of your decision - example

After your donation you will still have the following amount in your private account: 100€ - x - y = Z€



The following information was displayed to the observers: J. Koch donates the following amounts to the following charities:

i. Charity XY: _____€
ii. Charity XYZ: _____€
→ *Generates transaction costs of* _____*€*

The observers evaluated your decision as follows (rating based on German school grades; 1: very good, 2: good, 3: satisfactory, 4: sufficient, 5: insufficient, 6: poor):

Observer 1 evaluates your decision as follows: _____

Observer 2 evaluates your decision as follows: _____

Control questions

Question 1: Suppose you donate 10€ to charity X and 10€ to charity Y, how much transaction costs do you pay?

O 1€ O 2€ O 5€ O 20€

Question 2: Suppose you donate 5€ to charity X, how much will remain in your private account?

O 95€ O 94€ O 100€ O 0€

Question 3: Suppose you donate 2€ to charity X, 15€ to charity Y, 23€ to charity Z, how much will remain in your private account?

O 57€ O 60€ O 85€ O 0€

Question 4: Which information of your decision do two observing players of this study see and evaluate?

O Observers see and evaluate which charities you have donated to, as well as the amounts.

O Observers see and evaluate which charities you donated to, but not which amounts.

O Observers see and evaluate what values you have donated, but not to which charities.

Start of the experiment

Decision

We now ask you to make the following decision (100€ starting amount):

→ How much of the 100€ would you like to donate to which charity?

(Please enter any amount between 0 and 100 that you would like to donate to each charity. Click on the **+** to see the respective charity of the topics and click on them to learn more about each charity and make a donation).

Health	**+**
Rights	**+**
Environment	**+**
Development Aid	**+**
Youth and Children	**+**
Security	**+**
Women Advocacy	**+**

O I do not wish to donate to any of the above charities.

After your donation you will still have the following amount in your private account: 100€ - x€ - y€ = _____€

The following information is displayed to the observers:

J. Koch donates the following amounts to the following charities:

1) Charity XY: _____€
2) Charity XYZ: _____€

→ *Generates transaction costs of:* _____*€*

Assessments

On the next page we will ask you to estimate the answers of other participants, for which you can earn extra money. Here we will ask you for the median (central value) of other participants' answers. The median (central value) is the value that separates the lower half of the answers from the upper half of the answers. The following two examples illustrate this:

1) Consider the numbers {1, 3, 3, 6, 7, 8, 9}. Here, 6 is the median because there are exactly three numbers less than 6 and three numbers greater than 6.

2) Consider the numbers {2, 7, 5, 3, 1}. Here, 3 is the median because there are exactly two numbers smaller than 3 (1, 2) and two numbers larger than 3 (5, 7). This is easily seen by sorting the numbers from small to large: {1, 2, 3, 5, 7}

We ask you the following control question to make sure you understand what the median is:
Consider the numbers {20, 1, 6, 4, 2}.
What is the median of these numbers? _____

Assessments

1) An additional group of people was recruited and familiarized with your decision-making situation. They were asked how much one ***ought*** to donate and among how many charities one ***ought*** to divide the donation. What do you think was the answer of this group of people to the following questions? You can earn extra money for your correct assessment*:

   a) What do you think was the (median) response of the additional group of people to the question: how much should each decision maker donate in total?
   _____**€** (Please indicate a number between 0-100€).

   b) What do you think was the (median) response of the additional group of people to the question: to how many charities should each decision maker divide their donation value?
   _____**€** (Please indicate a number between 0-49 charities).

2) Consider all the decision makers in this game who have to decide how many charities to divide their donation among. What do you think the ***actual*** values are? You can earn extra money for your correct guess*:

   d) How much does each decision maker donate in total (median, transaction costs included)?
   _____**€** (Please indicate a number between 0-100€).

   e) How many charities do decision makers divide their donation value among (median)?
   _____**€** (Please indicate a number between 0-49 charities).

*One of your guess answers from each 1) and 2) will be randomly drawn for the payout. If you guess the actual values correctly (+/-3€), you will be paid an additional 0.50€ each.

Assessments

3) Consider all the people who faced the same decision as you, whether and how to donate 100 euros. In your estimation, how much did the subjects donate on average to [issue]? (E.g. On average, the other participants donated 10€ to 'International Development Relief'). For your correct estimation you can earn extra money*.

	Average total donation of other participants for this theme in €
Environment	
Health	
Security	
Development Aid	
Rights	
Women Advocacy	
Youth and Children	

*One of your guess answers will be randomly drawn for the payout. If you correctly guess the actual value at this value (+/-3€), you will be paid an additional 0.50€.

Please wait until the observers have submitted their evaluations.
Please note that observers evaluate the decisions of several participants.

Evaluation of your decision

After your donation you will still have the following amount in your private account: 100€ - xy - z = _____€

The following information was displayed to the observers: J. Koch donates the following amounts to the following charities:

1) Charity XY: _____€
2) Charity XYZ: _____€

→J.Koch generates transaction costs of z€

The observers rated your decision as follows (rating based on German school grades; 1: very good, 2: good, 3: satisfactory, 4: sufficient, 5: insufficient, 6: poor):

Observer 1 rates your decision as follows : _____

Observer 2 evaluates your decision as follows : _____

Survey

Finally, we will ask you a few questions. We would like to ask you to answer them carefully.

1. Please specify your gender.
□ Male
□ Female
□ Diverse

2. Please indicate your year of birth:

3. Please indicate your field of study.
□ Natural sciences
□ Social sciences
□ Humanities
□ Economics
□ Medicine
□ Law
□ Other

4. How many hours did you volunteer last year approximately?
□ 0 hours
□ 1-5 hours
□ 5-10 hours
□ 10-20 hours
□ 20-30 hours
□ More than 30 hours

5. Please tell us how willing or unwilling you are to take risks in general.

Please use the scale from 0 to 10, where 0 means "not at all willing to take risks" and 10 means "very willing to take risks". You can use the values between 0 and 10 to grade your assessment.

Not at all willing to take risks										Very willing to take risks
0	1	2	3	4	5	6	7	8	9	10

6. Please tell us how willing or unwilling you are to take risks in general.

Again, please indicate your answer on a scale of 1 to 5, where 1 means you find the topic "not at all important" and a 5 means you find the topic "very important".

	Not important at all				Very important
	1	2	3	4	5
Environment and Animals					
Health					
Security					
International Development Relief					
Justice (Legal) Aid					
Women Advocacy					
Youth and Children					

7. How much do you agree with the following statement: "It is important to spread out your donations to reduce the risk that a particular charity will miss out."

   Please indicate your assessment on a scale from 1 ("I strongly disagree") to 5 ("I strongly agree").

I do not agree at all					I agree completely
0	1	2	3	4	5

8. How much do you agree with the following statement: "It is important to spread your donation to reduce the risk of donations being spent inefficiently. "

   Please indicate your assessment on a scale from 1 ("I strongly disagree") to 5 ("I strongly agree").

I do not agree at all					I agree completely
0	1	2	3	4	5

9. The following characteristics can be used to describe a person:
***Caring, compassionate, fair, kind, generous, helpful, hardworking, honest and friendly*.**

The person with these characteristics could be you or someone else. Imagine what a person with such characteristics might think, feel, and do. Once you have a clear picture of such a person, answer the following questions on the scale from 1 ("strongly disagree") to 5 ("strongly agree")

Statements	Do not agree at all					Fully agree
	0	1	2	3	4	5
I would feel good if I were a person who had these qualities.						
Being someone who has these qualities is an important part of who I am.						
I would be ashamed to be a person who has these qualities.						
Having these qualities is not really important to me.						
I very much wish to have these qualities.						
I often wear clothes that identify me as a person with these characteristics.						
The things I do in my free time (e.g., hobbies) clearly identify me as a person with these characteristics.						
The types of books and magazines I read identify me as having these characteristics.						
The fact that I have these qualities is communicated to others through my membership in certain organizations.						
I am actively involved in activities that communicate to others that I have these qualities.						

Thank you for your participation. Your Payout:

- You will receive 4,50€ as a fixed payout for your participation
- Once all participants in this study have completed the experiment, it will be evaluated whether you will receive the additional payout of €1.50 for your accurate estimates during the experiment and survey;
- Furthermore, at this time we will also draw lots to determine whether or not your decision of splitting the €100 between you and the potential charities will take effect.

Your preliminary payout for the experiment is = 4,50€, for your estimation tasks you can earn up to 1,50€ additionally, and your total payout can be more depending on your donation decision (e.g. a person who donates 50€ can earn a total of 50€ + 4,50€ + 1,50€ = 55,00€). We will inform you about this as soon as all participants have completed the experiment.

Thank you for your participation!

You will receive your fixed payout within the next 15 labor days, the potential additional payout can take up to a month.

Role: SPECTATORS

Introduction & Game

Welcome to the experiment. You are invited to participate in a research study of the University of Hamburg's experimental laboratory, which explores decision making. Following the experiment, we ask you to answer a survey that asks, for example, about your background (gender, age, etc.) and other social attitudes. Your participation should take about 15-25 minutes, which should be done in one go. If you complete the study to the end, you will receive a fixed remuneration of 4.50€ for your participation.

Please note that this study contains several questions that relate directly to your understanding of the choices you make. In accordance with laboratory research, you must answer these control questions correctly in order to participate in the study.

If you have any questions about this research study or your participation, please contact Juliane Koch, University of Hamburg, by email at juliane.koch@uni-hamburg.de. Thank you very much for your participation!

Rules

You have been randomly selected for the role of observer and evaluator of the decision makers.

For the donation task, the decision makers are presented with a long list of charities that have **all** received **a TOP efficiency rating* according to CharityWatch.** We show you these as examples in the next step. The charities cover the following areas:

1. Topic: Health
2. Topic: Rights
3. Topic: Environment
4. Topic: Development Aid
5. Topic: Youth and Children
6. Topic: Security
7. Topic: Women Advocacy

The decision makers receive a **starting amount of 100€**** and are asked to decide which charities they want to donate which amount to. Their total donation amount will be deducted from their 100€ and thus not paid out to them, but donated to their selected charities.

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*A TOP efficiency rating means, among other things, that the charity has low administrative and marketing costs, so that almost all donations benefit its actual purpose, that the charity has a high transparency status, etc.

**At the end of the game, 10 of these participants will be drawn by lot, for which the decision made will come into effect, i.e. the additional payment of the 100€ to the participants themselves and/or a pro-rata/complete payment to the charities chosen by the 10 people.

Rules

Important Notes: Please note the following two points:

1. *Per charity to which the decision makers want to donate, they pay **transaction costs of 1€**!*

Example calculations:

Example 1: The decision maker donates

- *5€ to charity X → donation that charity X receives: 5€*

➔ *Transaction costs: 1€*

➔ *Remaining in the private account of the decision maker: 94€ (100€-5€-1€)*

Example 2: The decision maker donates

- *5€ to charity X → donation that charity X receives: 5€*
- *10€ to charity Y → donation that charity Y receives: 10€*
- *25€ to charity Z → donation that charity Z receives: 25€*

➔ *Transaction costs: 3€*

➔ *Remaining in the private account of the decision maker: 57€ (100€-5€-10€-25€-3€)*

2. *The decision makers know that they are being observed and evaluated for their decision by you. You as observer will learn which charities the decision makers donate to, as well as the amounts. Together with the information to which charities the decision makers donated and how much, you learn the decision makers' last names and judge their behavior. However, this assessment has no influence on the final payout of the decision makers.*

Charity list - example

Health	**+**
Environment	**+**
World Resource Institute	**-**
Conservation International Foundation	
Center for Biological Diversity	
Wildlife Conservation Society	
Waterkeeper Alliance	
Earth Island Institute	
Amazon Conservation Team	
Rights	**+**
Development Aid	**+**
Youth and Children	**+**
Security	**+**
Women Advocacy	**+**

Topic: Environment

Donation to Charity
Waterkeeper Alliance: 5€

Control questions

Question 1: Suppose the decision maker you are evaluating donates 10€ to charity X and 10€ to charity Y, how much transaction costs does this player pay?

O 1€ O 2€ O 5€ O 20€

Question 2: Assume that the decision maker you are evaluating donates 5€ to charity X, how much will remain in his private account:

O 95€ O 94€ O 100€ O 0€

Question 3: Suppose the decision maker you are evaluating donates 2€ to charity X, 15€ to charity Y, 23€ to charity Z, how much will remain in his private account:

O 57€ O 60€ O 85€ O 0€

Question 4: What information of the decision of the player you are evaluating do you see and evaluate?

O You can see and evaluate to which charities the players have donated, as well as the amounts.

O You can see and evaluate which charities players have donated to, but not the amounts.

O You can see and evaluate which values the players have donated, but not to which charities.

Assessment

1) Consider all the decision makers in this game who have to decide how many charities to divide their donation among.

a) In your opinion, how much ***should*** each decision maker donate in total? _____€ (Please enter a value between 1-100€).

b) In your opinion, how many charities ***should*** decision makers divide their donation value among? ____charities (Please enter a value between 1-49 charities).

Start of the experiment

Please wait until the players make their donation decision.

Your evaluation decision

Please rate the donation behavior of the following five people using the German school grades (1: very good, 2: good, 3: satisfactory, 4: sufficient, 5: insufficient, 6: poor):

1. J. Koch donates the following amounts to the following charities:
1) Charity XY: _____€
2) Charity XYZ: _____ €

→ Generates transaction costs of 2€

Your Evaluation of Player 1's Giving Behavior, J. Koch: _____ (school grade rating, 1-6).

2. J. Kaiser donates the following amounts to the following charities:
1) Charity XY: _____€
2) Charity XYZ: _____€
3) Charity XYZW: _____€

→ Generates transaction costs of 3€

Your Evaluation of Player 2's Giving Behavior, J. Kaiser: _____ (school grade rating, 1-6).

3. Etc.

Survey

Please see version ‘Role: DICTATORS’

Thank you for your participation. Your payout:

You will receive 4.50€ as a fixed payout for your participation

Thank you for your participation!

You will receive your fixed payout within the next 15 business days.

Role: SOCIAL NORM ELICITORS

Introduction & Game

Welcome to the experiment. You are invited to participate in a research study of the University of Hamburg's experimental laboratory, which explores decision making. Following the experiment, we ask you to answer a survey that asks, for example, about your background (gender, age, etc.) and other social attitudes.

Your participation should take about 15 minutes, which should be done in one go. If you complete the study to the end, you will receive a fixed payment of 3€ for your participation.

Please note that this study contains several questions that relate directly to your understanding of the choices you are making. In accordance with laboratory research, you must answer these control questions correctly in order to participate in the study.

If you have any questions about this research study or your participation, please contact Juliane Koch, University of Hamburg, by email at juliane.koch@uni-hamburg.de. Thank you very much for your participation!

Rules

You have been selected for the role of 'social norm elicitor'. Before we ask you which donation behavior you think should be chosen, we would like to introduce you to the situation of the decision makers.

For the donation task, the decision makers are presented with a long list of charities that have **all** received **a TOP efficiency rating* according to CharityWatch.** We show you these as examples in the next step. The charities cover the following areas:

1. Topic: Health
2. Topic: Rights
3. Topic: Environment
4. Topic: Development Aid
5. Topic: Youth and Children
6. Topic: Security
7. Topic: Women Advocacy

The decision makers receive a **starting amount of 100€**** and are asked to decide which charities they want to donate which amount to. Their total donation amount will be deducted from their 100€ and thus not paid out to them, but donated to their selected charities.

---

*A TOP efficiency rating means, among other things, that the charity has low administrative and marketing costs, so that almost all donations benefit its actual purpose, that the charity has a high transparency status, etc.

**At the end of the game, 10 of these participants will be drawn by lot, for which the decision made will come into effect, i.e. the additional payment of the 100€ to the participants themselves and/or a pro-rata/complete payment to the charities chosen by the 10 people.

Rules

Important Notes: Please note the following two points:

1. *Per charity to which the decision makers want to donate, they pay **transaction costs of 1€**!*

Example calculations:

Example 1: The decision maker donates

- *5€ to charity X → donation that charity X receives: 5€*

→ *Transaction costs: 1€*

→ *Remaining in the private account of the decision maker: 94€ (100€-5€-1€)*

Example 2: The decision maker donates

- *5€ to charity X → donation that charity X receives: 5€*
- *10€ to charity Y → donation that charity Y receives: 10€*
- *25€ to charity Z → donation that charity Z receives: 25€*

→ *Transaction costs: 3€*

→ *Remaining in the private account of the decision maker: 57€ (100€-5€-10€-25€-3€)*

2. *The decision makers are knowingly evaluated by observers for their behavior. Observers learn which charities the decision makers donate to, as well as the amounts. Together with the information to which charities the decision makers donated and how much, the observers learn the decision makers' last names and judge their behavior. However, this assessment has no influence on the final payout of the decision makers.*

Charity list - example

Health	+
Environment	+
World Resource Institute	-
Conservation International Foundation	
Center for Biological Diversity	
Wildlife Conservation Society	
Waterkeeper Alliance	
Earth Island Institute	
Amazon Conservation Team	
Rights	+
Development Aid	+
Youth and Children	+
Security	+
Women Advocacy	+

Topic: Environment

Donation to Charity
Waterkeeper Alliance: 5€

Control questions

Question 1: Suppose the decision maker donates 10€ to charity X and 10€ to charity Y, how many transaction costs does he pay?

O 1€ O 2€ O 5€ O 20€

Question 2: Suppose the decision maker donates 5€ to charity X, how much will remain in his private account?

O 95€ O 94€ O 100€ O 0€

Question 3: Suppose the decision maker donates 2€ to charity X, 15€ to charity Y, 23€ to charity Z, how much will remain in his private account?

O 57€ O 60€ O 85€ O 0€

Question 4: What information of the decision maker's decision does the observer see and evaluate?

O The observer sees and evaluates which charities the decision makers have donated to, as well as the amounts.

O The observer sees and evaluates which charities the decision makers donated to, but not which amounts.

O The observer sees and evaluates which values the decision makers have donated, but not to which charities.

Assessment

1. Consider all the decision makers in this game who have to decide how many charities to divide their donation among.

a) In your opinion, how much ***should*** each decision maker donate in total? _____€ (Please enter a value between 1-100€).

b) In your opinion, how many charities ***should*** decision makers divide their donation value among? _____charities (Please enter a value between 1-49 charities).

Survey

Please see version ‘Role: DICTATORS’

Thank you for your participation. Your payout:

You will receive 3€ as a fixed payout for your participation

Thank you for your participation!

You will receive your fixed payout within the next 15 business days.

In the following, we provide the list of all 49 charities and the respective explanations that participants saw when clicking on their names.

1. Health

    - CancerCare: CancerCare is a non-profit organization that provides financial, emotional and practical support to people with cancer and their families. The organization offers free counseling services, such as psychotherapy, as well as financial assistance for medical bills and other needs.
    - Multiple Myeloma Research Foundation: The Multiple Myeloma Research Foundation is a non-profit organization dedicated to promoting research and education in the field of multiple myeloma disease. The organization works closely with scientists and physicians to find better treatment options and a cure for the disease.
    - Brain & Behavior Research Foundation: The Brain & Behavior Research Foundation is a non-profit organization dedicated to advancing research and education in the field of neurological and mental disorders. The organization supports scientists and physicians who are working to develop new treatments and a better understanding of these disorders.
    - Diabetes Action Research and Education Foundation: The Diabetes Action Research and Education Foundation is a non-profit organization dedicated to fighting diabetes and its complications through education, research and support for people with diabetes and their families. The organization provides education and resources for people with diabetes to help them manage their diabetes.
    - Hearing Health Foundation: The Hearing Health Foundation is a non-profit organization dedicated to protecting and improving hearing health. The organization promotes research and education in the field of hearing health and works closely with professionals and those affected to develop better treatment methods and prevention strategies.
    - Parkinson's Foundation: The Parkinson's Foundation is a non-profit organization dedicated to improving the lives of people with Parkinson's and their families through education, research and support. The organization works closely with scientists and physicians to find better treatments and a cure for the disease.
    - HealthRight International: HealthRight International is a non-profit organization that aims to support people in developing countries with healthcare, human rights and education. It works with local partners to develop and im-

plement cost-effective solutions that provide the greatest possible benefit to the community.

2. Environment

   - Amazon Conservation Team: The Amazon Conservation Team works to protect and conserve the Amazon rainforest and its inhabitants by strengthening the connection between nature and culture.It supports indigenous communities in managing their land and works with governments and other partners to protect the rainforest.
   - Center for Biological Diversity: The Center for Biological Diversity is an environmental organization that works to protect endangered species and their habitats.It works to influence political decisions, change laws and regulations and raise awareness of the need to protect species and the climate.
   - Conservation International Foundation: The Conservation International Foundation works worldwide to conserve biodiversity and find solutions to pressing environmental problems. It works with governments, communities, businesses and other partners to develop innovative solutions for a sustainable future.
   - Earth Island Institute: The Earth Island Institute is an international organization dedicated to the protection of the environment and human rights. It supports environmental projects around the world and works to influence policy decisions and raise awareness of environmental issues.
   - Waterkeeper Alliance: The Waterkeeper Alliance works to ensure clean water for all. It supports local communities in monitoring and defending their water resources and works with governments and other partners to strengthen the protection of water resources worldwide.
   - World Resources Institute: The World Resources Institute is a global think tank working for a sustainable future.It works to influence policy decisions, develop innovative solutions to environmental and development problems and raise awareness of the need for a sustainable future.
   - Wildlife Conservation Society: The Wildlife Conservation Society works to prevent the loss of species and their habitats through practical projects and political lobbying. They campaign for a future in which people and wildlife can live together in harmony and sustainability.

3. Development Aid

   - All Hands and Hearts: All Hands and Hearts is committed to rebuilding and protecting communities after disasters. Volunteers work directly with affected communities to help them recover quickly.

- GiveDirectly: GiveDirectly transfers money directly to needy families in developing countries to enable them to determine and meet their own needs. This innovative method of poverty alleviation has proven to be effective, cost efficient and well managed through transparency and monitoring.
- Global Communities: Global Communities works with communities worldwide to help them improve their living conditions and circumstances. Global Communities is committed to sustainable development and a strong future for all.
- International Rescue Committee: International Rescue Committee (IRC) works in over 40 countries to provide humanitarian aid and support to people affected by war, conflict and natural disasters. They also work to bring refugees back to their homes and help them resume their lives.
- One Acre Fund: One Acre Fund works with poor farming families in Africa to help them improve their crop yields and increase their income. They provide financial services, training and local supplies to help farmers gain access to the resources and skills they need to improve their crops.
- World Central Kitchen: World Central Kitchen specializes in providing safe and healthy meals in crisis areas and after natural disasters. World Central Kitchen works with local communities to ensure that people in need are provided with hot meals.
- World Neighbors: World Neighbors is an international development organization focused on improving lives in rural communities.It works closely with local partners and communities to achieve sustainable improvements in health, nutrition and economic opportunities.

4. Women Advocacy

- Global Fund for Women: The Global Fund for Women is an international organization dedicated to promoting the rights and equality of women and girls worldwide. It supports local groups and initiatives to improve the living conditions and human rights of women.
- National Women's Law Center: The National Women's Law Center is an organization that advocates for the rights of women and girls. It fights against discrimination and for the improvement of the legal framework in order to promote gender equality.
- EngenderHealth: EngenderHealth is an international organization that advocates for the health and rights of women and girls in developing countries. It provides medical services and educational programs to improve reproductive health and well-being.

- Guttmacher Institute: The Guttmacher Institute is a research and education organization that focuses on sexual and reproductive health and rights. It collects and analyzes data to inform policy makers about women's needs and rights.
- PAI: PAI is an international organization that works to promote the reproductive rights and health of women and girls. It works with governments, civil society and other partners to support the implementation of laws and programs.
- Pathfinder International: Pathfinder International is an international organization dedicated to improving the reproductive health and rights of women and girls. It provides medical services, education and advocacy to promote gender equality.
- PCI-Media Impact: PCI-Media Impact works to promote the rights and well-being of women. It uses audiovisual media to disseminate information and stories that help promote women's rights and gender equality and empower women in leadership positions.

5. Rights

- Center for Community Change Action: Center for Community Change Action works to improve the lives of disadvantaged communities through advocacy and organizing. It is a nonprofit organization dedicated to social and economic justice.
- Equal Justice Initiative: The Equal Justice Initiative is a nonprofit organization that works for fair and just criminal justice and the protection of the rights of prisoners and convicts. They advocate for reforms that improve access to justice for all.
- Human Rights First: Human Rights First works to defend and promote human rights worldwide. The non-profit organization advocates for political refugees and the persecuted by using legal and political means.
- Rape, Abuse & Incest National Network: Rape, Abuse & Incest National Network (RAINN) is a non-profit organization that provides support to victims of sexual crimes and their families. They also operate a national hotline for victims of sex crimes and offer information and resource programs.
- Goodwill Industries International: Goodwill Industries International (National Office) is a non-profit organization dedicated to improving employment opportunities and economic self-sufficiency for people with barriers. They offer programs and services to increase the abilities of people with disabilities.

- Common Cause Education Fund: Common Cause Education Fund is a nonprofit organization that advocates for political reform and transparent government. They work to improve political participation and transparency and advocate for political reforms that strengthen the understanding of democracy.
- National Alliance to End Homelessness: National Alliance to End Homelessness is a nonprofit organization that works to ensure that people who are homeless or at risk of becoming homeless have access to affordable housing and support services. They work on policy reforms and programs aimed at ending homelessness.

6. Youth and Children

- Children Incorporated: Children Incorporated supports children in poverty through educational programs and access to basic needs. They work in locations worldwide.
- Children's Defense Fund: The Child Defense Fund is an organization that advocates for the rights and well-being of children. It works to protect children from neglect, abuse and exploitation and to promote their development through education and family support programs.
- Compassion International: Compassion International works to lift children out of poverty by providing education, health care and spiritual nurturing. This is done through a network of local church partners in developing countries.
- Pearl S. Buck International: Pearl S. Buck International promotes understanding and cooperation between cultures through educational programs and projects to improve the lives of women and children in Asia.
- Ronald McDonald House Charities: The Ronald McDonald House Charities provide support and a temporary home for sick children and their families while they receive medical treatment. They operate houses in several countries worldwide.
- Unbound: Unbound empowers children in poverty to improve their lives through education, business opportunities and spiritual support. They work in countries in Latin America, Asia and Africa.
- World Vision: World Vision works to eradicate poverty and injustice by equipping communities with the resources and skills they need to build a better future. This is done through education programs, healthcare and humanitarian aid worldwide, especially for children and young people.

7. Security

- Concerns of Police Survivors: Concerns of Police Survivors (COPS) supports survivors of police officers killed in the line of duty by providing financial and emotional support. The organization works to ensure that these survivors can lead a normal life again.
- Hope For The Warriors: Hope For The Warriors is a charity organization dedicated to supporting war veterans and their families. It offers special programs and services to support women in the armed forces and women veterans who are dealing with traumatic experiences and injuries.
- Bob Woodruff Family Foundation: The Bob Woodruff Family Foundation assists injured veterans and their families in readjusting to civilian life upon their return. It offers a variety of resources and services to ease the transition.
- Fisher House Foundation: The Fisher House Foundation supports war-injured soldiers and their families by providing them with free overnight accommodations near military hospitals and medical facilities.
- Gary Sinise Foundation: The Gary Sinise Foundation supports injured war veterans and their families by providing emotional and financial support and facilities for their reintegration into civil society.
- Tragedy Assistance Program for Survivors: Tragedy Assistance Program for Survivors (TAPS) provides a variety of resources and services to survivors of military service members killed in action to help them cope with their loss and reintegrate into civilian society.
- Wounded Warriors Family Support: Wounded Warriors Family Support assists wounded warriors and their families to lead fulfilling lives after their injury by providing financial and emotional support and facilities.

Anhang der Dissertation

Liste der aus dieser Dissertation hervorgegangenen Veröffentlichungen

Chapter 2:

Status: nicht publiziert. (Geplante Einreichung Q3, 2024.)

Chapter 3:

Status: eingereicht.

Chapter 4:

Status: nicht publiziert. (Geplante Einreichung Q3, 2024.)

Chapter 5:

Status: nicht publiziert. (Geplante Einreichung Q3, 2024.)

Abstract

This thesis comprises an introductory chapter followed by four distinct but connected articles. The common thread of this dissertation is twofold: First, the common methodological framework of this dissertation builds on the use of economic experiments. Second, the four chapters are connected thematically as they all investigate collective action problems w.r.t. cooperation or prosociality and how decision-making in such situations is impacted by institutional factors. While Chapter 2 looks at cooperation and the influence of social norms in a field setting, Chapter 3 and 4 present cooperation dilemma where individuals face inequality. Lastly, Chapter 5 also studies social norms in prosocial decision-making, yet in a slightly different setting of charitable giving.

Chapter 2 examines the willingness to contribute to inter-community climate funds in a lab-in-the-field experiment in Bougainville, Papua New Guinea. Specifically, in a 2 x 2 between-subject design individuals decide whether to contribute to a climate adaptation effort that would protect them from a potential natural disaster. The treatments vary i) the identity of the other player (in-group vs. out-group) and ii) whether or not the player is observed by a local village authority while taking the decision. The results are threefold: First, I observe lower contribution levels when individuals interact with out-group members. Second, observation shows to have a positive effect on contribution levels. Lastly, the out-group discrimination disappears when interacting with observation, i.e. being observed by a village authority increases contribution levels in the out-group setting.

Chapter 3 investigates the role of cost uncertainty in a 'pledge and review' setting as known from the Paris Agreement. In an online laboratory experiment, participants are first asked to state a non-binding pledge before entering five contribution rounds. The treatments vary i) when contribution costs are being revealed (before or after the pledge making), ii) whether or not players are subject to a review process in which they provide approval/disapproval points to each others' pledges and contribution levels, and ii) whether they have homogeneous or heterogeneous endowments. The results show that whenever costs are uncertain and reviews are absent, people make rather conservative pledges. A review process increases pledge levels, but does not necessarily improve later cooperation. When costs are initially uncertain, benefits only accrue in homogeneous groups, but not when high and low cost players interact.

Chapter 4 deals with spatial allocations of rich and poor in a network linear public goods setting. In an in-person laboratory experiment, we investigate individuals' contribution and redistribution behavior depending on whether i) they are in a closed or overlapping neighborhood, ii) they act as a homogeneous or heterogeneous group and in the latter

case whether iii) the spatial allocation - clustered (poor, poor, poor, rich, rich, rich) vs. alternating (poor, rich, poor, rich, poor, rich) - matters. We find that participants do invest in others' locations, yet mainly in a way in which they themselves benefit. For clustered networks, we observe that rich players located at the border trigger most of the redistribution to the poor cluster. Lastly, we observe that participants are motivated by reciprocity as they reduce (increase) investments and thereby punish (reward) neighbors who contributed less (more).

Chapter 5 examines the use of indirect signals in the context of charitable giving. We investigate how individuals respond to different levels of observability when they decide (i) how much to donate to charity, and (ii) what charities to donate to. We mimic charitable giving in the field by making it costly to spread donations among many charities. We find that donors respond to transaction costs by reducing the number of charities they give to. However, when donors are observed and evaluated based solely on the number of charities they give to, they (correctly) anticipate that spectators will infer larger donations from more charities. Some donors use this strategically by making numerous small donations, whereby they indirectly signal that they are altruistic. Yet, this costly "altruistic bluff" disappears once spectators also observe the amounts donated to each charity.

Zusammenfasssung

Die vorliegende Arbeit besteht aus einem Einführungskapitel, gefolgt von vier verschiedenen, aber miteinander verbundenen Artikeln. Der Zusammenhang zwischen den Artikeln dieser Dissertation bezieht sich auf zwei Aspekte: Erstens stützt sich der gemeinsame methodische Rahmen dieser Dissertation auf die Verwendung von ökonomischen Experimenten. Zweitens sind die vier Kapitel thematisch miteinander verbunden, da sie alle Probleme kollektiven Handelns in Bezug auf Kooperation oder Prosozialität untersuchen und wie die Entscheidungsfindung in solchen Situationen von institutionellen Faktoren beeinflusst wird. Während Kapitel 2 die Kooperation und den Einfluss sozialer Normen als Feldstudie untersucht, stellen Kapitel 3 und 4 das Kooperationsdilemma dar, in dem Individuen mit Ungleichheit konfrontiert sind. Kapitel 5 untersucht ebenfalls den Einfluss sozialer Normen auf prosoziale Entscheidungen, allerdings in einem etwas anderen Umfeld, dem Kontext des wohltätigen Spendens.

Kapitel 2 untersucht die Bereitschaft, zu interkommunalen Klimafonds beizutragen, in einem Labor-im-Feld-Experiment in Bougainville, Papua-Neuguinea. In einem 2 x 2-Zwischensubjekt-Design entscheiden Individuen, ob sie zu einer Klimaanpassungsmaßnahme beitragen wollen, die sie vor einer potenziellen Naturkatastrophe schützen würde. Die Gruppen variieren i) bzgl. der Identität des jeweils anderen Spielers (In-Gruppe vs. Außen-Gruppe) und ii) ob die Spieler während ihrer Entscheidungen von einer lokalen Dorfautorität beobachtet werden oder nicht. Die Ergebnisse gliedern sich in drei Teile: Erstens beobachte ich ein niedrigeres Beitragsniveau, wenn Individuen mit Mitgliedern der Außen-Gruppe interagieren. Zweitens zeigt sich, dass die Beobachtung einen positiven Effekt auf den Beitrag hat. Schließlich verschwindet die Diskriminierung durch die Außengruppe, wenn sie mit der Beobachtung interagiert, d.h. wenn man von einer Dorfautorität beobachtet wird, steigt das Beitragsniveau in der Außen-Gruppe.

In Kapitel 3 wird die Rolle der Kostenunsicherheit in einem "Versprechen und Überprüfungs-Mechanismus" untersucht, wie es aus dem Pariser Klima Abkommen bekannt ist. In einem Online-Laborexperiment werden die Teilnehmenden zunächst gebeten, ein unverbindliches Versprechen abzugeben, bevor sie an fünf Beitragsrunden teilnehmen. Die Gruppen unterscheiden sich in Bezug auf i) den Zeitpunkt der Offenlegung der Beitragskosten (vor oder nach der Abgabe des Versprechens), ii) die Frage, ob die Teilnehmer einem Überprüfungsprozess unterliegen, in dem sie die Zusagen und die Beitragshöhe der anderen Teilnehmer mit Punkten bewerten, und ii) die Frage, ob sie homogene oder heterogene Anfangsausstattungen haben. Die Ergebnisse zeigen, dass Individuen eher konservative Versprechen abgeben, wenn die Beitragskosten unsicher sind und es keine Überprüfungen gibt. Ein Überprüfungsverfahren erhöht die Höhe der Versprechen, verbessert aber nicht unbedingt die spätere Zusammenarbeit. Wenn die Beitragskosten anfänglich un-

sicher sind, ergeben sich nur in homogenen Gruppen Vorteile, nicht aber, wenn Spieler mit ungleichen Beitragskosten zusammenarbeiten.

Kapitel 4 befasst sich mit der räumlichen Allokation von Arm und Reich in einem Netzwerk linearem öffentlichen Gut Spiel. In einem in-persona Laborexperiment untersuchen wir das Beitrags- und Umverteilungsverhalten von Individuen in Abhängigkeit davon, ob sie sich i) in einer geschlossenen oder überlappenden Nachbarschaft befinden, ii) als homogene oder heterogene Gruppe agieren und für den letzteren Fall, ob iii) die räumliche Verteilung - gebündelt (arm, arm, arm, reich, reich, reich) vs. alternierend (arm, reich, arm, reich, arm, reich) - eine Rolle spielt. Wir stellen fest, dass die Teilnehmenden zwar in die Standorte anderer investieren, jedoch hauptsächlich in einer Weise, die ihnen selbst zugute kommt. Bei gebündelten Netzwerken beobachten wir, dass vor allem reiche Spieler an der Grenze des Clusters, den größten Teil der Umverteilung zum armen Cluster beitragen. Schließlich stellen wir fest, dass die Teilnehmer durch Reziprozität motiviert sind, da sie ihre Investitionen reduzieren (erhöhen) und damit die Nachbarn bestrafen (belohnen), die weniger (mehr) beigetragen haben.

Kapitel 5 befasst sich mit der Verwendung indirekter Signale im Zusammenhang mit Wohltätigkeitsspenden. Wir untersuchen, wie Individuen auf verschiedene Beobachtungsstufen reagieren, wenn sie entscheiden, (i) wie viel sie für wohltätige Zwecke spenden, und (ii) an welche Wohltätigkeitsorganisationen sie spenden. Wir ahmen das Spenden in der Praxis nach, indem wir es kostspielig machen, Spenden auf viele Wohltätigkeitsorganisationen zu verteilen. Wir stellen fest, dass die Spender auf die Transaktionskosten reagieren, indem sie die Anzahl der Wohltätigkeitsorganisationen, an die sie spenden, verringern. Werden die Spender jedoch ausschließlich bezüglich der Anzahl der Wohltätigkeitsorganisationen beobachtet und bewertet, die sie unterstützen, gehen sie (richtigerweise) davon aus, dass die Beobachtenden auf größere Spenden schließen, wenn an eine größere Anzahl an Wohltätigkeitsorganisationen gegeben wurde. Einige Spender nutzen dies strategisch, indem sie zahlreiche kleine Spenden tätigen und damit indirekt signalisieren, dass sie altruistisch sind. Diese kostspielige ”altruistische Täuschung” verschwindet jedoch, sobald die Beobachtenden auch die einzelnen Spendenbeträge sehen.

Erklärung

Hiermit erkläre ich, Juliane Koch, dass ich keine kommerzielle Promotionsberatung in Anspruch genommen habe. Die Arbeit wurde nicht schon einmal in einem früheren Promotionsverfahren angenommen oder als ungenügend beurteilt.

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Eidesstattliche Versicherung

Ich, Juliane Koch, versichere an Eides statt, dass ich die Dissertation mit dem Titel:

„Human Behavior and Public Goods Provision – Empirical Essays in Behavioral and Environmental Economics."

selbst und bei einer Zusammenarbeit mit anderen Wissenschaftlerinnen oder Wissenschaftlern gemäß den beigefügten Darlegungen nach § 6 Abs. 3 der Promotionsordnung der Fakultät für Wirtschafts- und Sozialwissenschaften vom 18. Januar 2017 verfasst habe. Andere als die angegebenen Hilfsmittel habe ich nicht benutzt.

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Selbstdeklaration bei kummulativen Dissertationen

Konzeption / Planung: Formulierung des grundlegenden wissenschaftlichen Problems, basierend auf bisher unbeantworteten theoretischen Fragestellungen inklusive der Zusammenfassung der generellen Fragen, die anhand von Analysen oder Experimenten/Untersuchungen beantwortbar sind. Planung der Experimente/ Analysen und Formulierung der methodischen Vorgehensweise, inklusive Wahl der Methode und unabhängige methodologische Entwicklung.

Durchführung: Grad der Einbindung in die konkreten Untersuchungen bzw. Analysen.

Manuskripterstellung: Präsentation, Interpretation und Diskussion der erzielten Ergebnisse in Form eines wissenschaftlichen Artikels.

Die Einschätzung des geleisteten Anteils erfolgt mittels Punkteinschätzung von 1 – 100 %.

Für den ersten Artikel (Chapter 2) liegt die Eigenleistung für

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