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Beliefs and Perceptions  
in a Public Goods Game



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# ABSTRACT

## The Influence of Induced Care and Anger Motives on Behavior, Beliefs and Perceptions in a Public Goods Game\*

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This study analyzes the stability of preferences through the lens of psychological motives. We report the results of a public goods experiment in which subjects were induced with the motives of Care and Anger through autobiographical recall. Subjects' preferences, beliefs, and perceptions under each motive are compared with those of subjects experiencing a neutral autobiographical recall condition. We find that *Care* elicits significantly higher contributions than *Anger*, with *Control* treatment contributions in between. This is primarily driven by changes in conditional contribution schedules (measuring preferences) across treatments, though higher beliefs explain part of the effect that Care has on giving. These results are robust to checking for comprehension of the game's incentives. We also observe concomitant differences in attention to own and other's payoffs (using mouse tracking) as well as perceptions of the game's incentive structure (harmony) – particularly for subjects motivated by Anger. We interpret our findings as suggesting that people have access to multiple preferences that depend on how they perceive the decision context.

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## 1 Introduction

This paper presents an investigation into the stability of preferences through the lens of psychological motives. In line with a vast literature in motivation psychology (for an exemplary summary see Heckhausen and Heckhausen, 2006), our point of departure is that people are equipped with multiple motivation systems, each associated with different preferences which give direction to their behavior. In short, people are “multi-directed” and which motivation system is activated depends on the individuals’ interactions with their environment, especially their social environment. By implication, preferences are not unique and temporally stable, since individuals’ environments are subject to change, sometimes abrupt change. In contrast to standard economic theory, individuals are not identified entirely through their preferences, since these preferences arise from individuals’ interplay with their environment (Bosworth et al., 2016). We examine the phenomenon of multi-directedness by exploring the variability of contributions to public goods across contexts.

Much evidence has accumulated that different contexts such as frames, primes, or environmental cues elicit different contributions to public goods which present otherwise identical material and strategic incentives. By “context” we mean a combination of strategic incentives (i.e. a game) and the attending situational stimuli. Economists have typically sought to study how the game alone influences behavior. By contrast, behavioral economists have sought to understand how the non-strategic elements of context impact behavior holding the game fixed. Our study builds on this line of research.

The mechanisms underlying the effectiveness of contextual frames remain elusive however. We argue that different choices result from different motives and that different motives are elicited by different contexts. These motives influence behavior since specific motives are associated with specific preferences, beliefs and perceptions. Preferences affect behavior by shaping the objectives of decision making; beliefs do so by influencing the information set underlying the decision making; and perceptions do so by affecting people’s awareness of their choice set. We investigate how induced motives drive preferences, beliefs and perceptions in an identical public goods game.

A motive is a force that gives direction and energy to one’s behavior, thereby determining the objective of the behavior, as well as its intensity and persistence (see Elliot and Covington, 2001; following Atkinson, 1964). These motives depend on interactions between situations and personality characteristics and can selectively be activated in certain contexts by specific stimuli (see Mischel and Shoda, 1995; Roberts and Pomerantz, 2004; Emmons and McAdams, 1991; Pang, 2010; Heckhausen and Heckhausen, 2006). Therefore, people’s objectives (“preferences” in the terminology of economics)

depend on the motivational stimuli arising from the individual's context, the individual's appraisal of this context, and the individual's motivational responsiveness to this appraised context.

We report results of an experiment in which we induce the motives of Care and Anger through autobiographical recall. Participants were asked to recall memories in their life associated with particular motivational quality. Subjects in a comparable control condition were asked to write about recent or typical experiences of a neutral character. Following this, we collected contribution decisions, incentivized belief and norm assessments about contributions, mouse-tracking data about attention targeted towards respective payoffs and insights into perceptions about the strategic nature of a public goods game. We use these measures to test a number of predictions about preferences, perceptions and beliefs associated with the motives of Care and Anger in a public goods game.

On the one side, even though people pursue selfish goals at times that show no regard for others, people are able to be motivated to care for the well-being of other people (Mikulincer and Shaver, 2010). This Care motive is focused on supporting others, helping behavior, preventing others from harm and the desire to promote others' well-being (Crocker and Canevello, 2012). Its accompanying emotional facets can be described as feelings of warmth, love and concern for the others (Singer and Steinbeis, 2009). Anger, by contrast, is a key emotion with fundamentally different motivational implications than Care since it motivates antisocial behavioral tendencies (Lerner and Tiedens, 2006; Berkowitz, 1993). Anger has a high infusive potential: The affective state carries over from past anger-evoking events to unrelated situations and influences judgements and decisions in these new situations (Lerner and Tiedens, 2006).

Our analysis casts particular insight into how motives determine preferences in this game by analyzing conditional contribution schedules and types (per Fischbacher et al., 2001). In order to rule out that subject mis-perception of the game's incentives may underlie treatment differences, we additionally investigate preference changes within the subsample with the highest level of game comprehension.

Among subjects demonstrating full comprehension of the game's incentives we find that those motivated by Care contribute significantly more than those motivated by Anger. Descriptive and normative beliefs differ only slightly across the conditions; and subjects' conditional contribution schedules significantly differ by motivational state. This suggests that our treatments induced different preferences. In contrast to Fosgaard et al. (2015), we do not find that subject comprehension differs across our motivating states, or that this accounts for differences in contributions. Moreover,

we find suggestive evidence that subjects' perceptions and attention to the game's payoffs vary across our conditions. We therefore interpret our findings as suggesting that different contexts are associated with different motives, entailing different objectives (i.e. preferences), but also patterns of attention and perception.

The rest of the article is structured as follows: Section 2 reviews the relevant literatures in experimental economics and motivation psychology; Section 3 lays out the design of our experiment and states our hypotheses; Section 4 presents our results and Section 5 provides a concluding discussion.

## **2 Background**

### **2.1 Public goods**

Many of the important social problems faced by humanity (such as carbon emissions abatement and reduction of systemic financial risks) have the structure of public goods. Public goods are a social dilemma: groups of individuals face a conflict between the maximization of individual gains and the collective interest.

Public goods games have been studied extensively in the experimental economics literature (see Ledyard, 1995; Zelmer, 2003; Chaudhuri, 2011 for reviews). Participants are generally willing to finance public goods if others do as well (see Fischbacher et al., 2001); but contributions tend to decline from a start of just under half of subjects' endowments as the game is repeated (Chaudhuri, 2011).

There is also an extensive literature focusing on how subtle contextual factors may influence people's contributions as well as beliefs regarding others' contributions. Two broad strands have emerged: one documenting how labels affect the play of the public goods game and another regarding how the presentation of the game's incentive structure affects behavior. The first strand emphasizes that certain labels allow subjects to relate the game to familiar domains of life and employ similar strategies. Most prominently, researchers have found differences between labeling the public good as a "community," "team," or "donation" game on the one hand as contrasted with a "Wall St.," "investment," or "market" game on the other (Lieberman et al., 2004; Rege and Telle, 2004; Ferraro and Vossler, 2010; Dufwenberg et al., 2011; Ellingsen et al., 2012; Engel and Rand, 2014). The "cooperation" frames tend to elicit higher contributions than the "competition" frames, though not in all subject

pools (Dufwenberg et al.), with neutral frames being closer to the positively valenced frames (Engel and Rand).

A number of studies have also documented that “giving” to provide a public good elicits more cooperation than “taking” from a commonly shared resource even when the payoff structure is equivalent (most prominently Andreoni, 1995; see Cartwright, 2016 for a review). Cartwright’s meta-analysis suggests that the description of the incentives as entailing positive rather than negative externalities is responsible for this framing effect, and that shifts in reference points between take and give frames is likely not responsible. Similarly Cookson (2000) finds increased giving when instructions decompose the description of the private and social return to the public good.

The mechanisms underlying these framing effects for public goods have been explored to a limited extent. Dufwenberg et al. (2011) collect both first- and second-order beliefs in their framing experiments, and find that frames’ significant impact on beliefs mediates their effect on contributions. Similarly to Dufwenberg et al., Ellingsen et al. (2012) find that framing effects disappear for second movers in a sequential public goods game. Fosgaard et al. (2014; 2015) find that contribution strategies do not significantly differ across frames after excluding subjects who could not identify the selfish best-response and the social welfare maximizing strategies in a comprehension quiz; though Gächter et al. (mimeo) find contradictory results.

We argue that motives driven by behavioral and perceptual tendencies which are associated with emotions are a fruitful paradigm for studying how context may affect preferences in a public goods environment. That is, the context of a public good contribution decision emphasizes particular information, which then motivates particular choices when the individual perceives the game in a certain emotional state. This response prioritizes particular goals and therefore defines the action-outcome space.

## 2.2 Psychological background

In this section, we present insights from psychology that serve as necessary background information to analyze how cooperation in a public good context is affected by Anger and Care motives.<sup>1</sup> Specifically, we present empirical findings on behavioral, perceptual and cognitive tendencies

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<sup>1</sup> While our focus clearly rests on motivation, we note that emotions are associated with motives since one key function of emotions is to prepare oneself for action and give a direction to this action. Therefore, the behavioral impact of emotions lies in the activation of adaptive behavioral tendencies and their motivational underpinnings (Scherer, 2005). We further note that motives associated with a specific emotion may be activated when individuals confront particular eliciting situations (Lerner and Tiedens, 2006; Frijda, 1986; Keltner and Gross, 1999; Levenson, 1994; Oatley and Johnson-Laird, 1996).

associated with Anger and Care motives. These inform our hypotheses regarding behavior, perceptions and beliefs in public goods games in the next section.

### 2.2.1 Care: Psychological evidence and predictions

The Care motive<sup>2</sup> can be defined as a state arising from witnessing another's suffering and which motivates a subsequent behavioral tendency to help and to reduce another person's suffering. (Goetz et al., 2010; Condon and Feldman Barrett, 2013). Empathy, or the capacity to share the feelings of others, is a necessary prerequisite for Care motivation (Singer and Klimecki, 2014), but fundamentally differs from it in the dimension of behavioral tendencies due to the prosocial orientation of Care motives.

The Care motive is associated with prosocial preferences and a high attention to others' wellbeing. Furthermore, individuals who are motivated by Care show a reduced cognitive focus on one's own needs in favor for the other: It has been reported that participants even display costly helping despite a potential escape option (Batson et al., 1987, 1983). Batson and Shaw (1991) show that Care motivates altruistic behavior towards those in need even at the cost to the self.

Care-motivated individuals are especially attentive towards "(...)suffering, responsibility, vulnerability, and other harm-related concerns, (...)" (Goetz et al., 2010). Furthermore, Care-motivated individuals feel cooperative with others and seek possibilities to fulfill their needs through cooperation with other people. Therefore, Care-motivated individuals perceive desired outcomes as having a nonzero-sum or win-win quality. They feel responsible for others and view themselves as an origin of others' wellbeing (Crocker and Canevello, 2012).

Since Care motivation leads people to create environments in which cooperation flourishes, these actions increase their beliefs that others in this environment will be cooperative as well (Crocker and Canevello, 2012). These facets of the Care motive make it a promising candidate to investigate how this motive drives behavior, perceptions and beliefs in a social dilemma context due to their clearly pro-social characteristics.

We synthesize these insights about the Care motive below:

- *Preferences under Care:* Care motive leads to behavior that is directed at reducing harm for other individuals even if this comes at a cost to oneself.

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<sup>2</sup> Our notion of Care motivation has elsewhere been denominated under "compassion" (Goetz et al., 2010; Condon and Feldman Barrett, 2013; Crocker and Canevello, 2012). As Crocker and Canevello note: "Compassionate goals implicitly or explicitly involve caring". We will therefore use the term Care motive in the remainder of this text.

- *Perceptions under Care*: Subjects under *Care* display an increased attention towards other's wellbeing and a decreased focus towards own needs. Subjects focus on how to reach an outcome that is advantageous for all involved parties and which is obtained through cooperation when they encounter new contexts with an active *Care* motive.
- *Beliefs under Care*: Subjects under *Care* that act in accordance with this motive, believe that other subjects will also follow the *Care* motive.

### 2.2.2 Anger: Psychological Evidence and Predictions

The Anger motive is associated with the corresponding emotional state of anger (Ekman, 1992; Novaco and Taylor, 2000; Averill, 1982). Anger can lead to antisocial behavioral tendencies such as aggression (Lerner and Tiedens, 2006; Berkowitz, 1993). Moreover, anger becomes the main driver of behavior and cognition when a person senses threatening behavior from an outside force and takes action in order to stop it (DiGiuseppe and Tafrate, 2007). Hence, anger generally motivates actions that remove the problematic components of a situation (Frijda et al., 1989).

The Anger motive leads individuals to help less (Rudolph et al., 2004) and prefer antisocial welfare decisions (Small and Lerner, 2008). Moreover, in a literature review on anger, Van Kleef et al. (2008) conclude that the Anger motive tends to motivate individuals to pursue more competitive behavior, thus potentially increasing the focus on how one's own payoff compares with another's. Of special interest to our study is that anger is associated with a high *infectious* potential: The affective state carries over from past anger-evoking events to unrelated situations and influences judgements and decisions in these new situations (Lerner and Tiedens, 2006). This is demonstrated by the finding that individuals who are motivated by Anger do not discriminate between recipients in their punitive reactions (Lerner et al., 1998). Further, the Anger motive influences depth of reasoning and conditionality of behavior of angry individuals. The Anger motive has also been associated with shallower depth of reasoning and more heuristic responses in combination with hostile inferences (Tiedens, 2001).

In terms of perceptual tendencies related to the Anger motive, there is evidence that when people associate an object with anger, then they are more likely to desire this object (Aarts et al., 2010). Also, the Anger motive has been associated with the *appreciation* of injustice (Smith and Lazarus, 1990). Furthermore, perceived injustice has been associated with the motivation to restore justice and to devote more cognitive resources to the goal of restoring justice (Lerner and Tiedens, 2006). In another study, it has further been found that subjects who were motivated by Anger had different perceptions of routine events and public policy preferences than sad subjects (Lerner et al., 2003).

The Anger motive has also been found to influence beliefs. Evidence from social psychology indicates that Anger leads people to believe that they will get what they want in the context of social relations and other areas (Lerner and Keltner, 2001; Lerner et al., 2003; Lerner and Keltner, 2000).

Hence, the Anger motive elicits behavior, perceptions and beliefs that are associated with a clear anti-social direction in a social dilemma context which makes it an ideal candidate to be juxtaposed to the Care motive in order to study the context-dependence of preferences.

The insights about the Anger motive lead to the following predictions about preferences, perceptions and beliefs for subjects under the *Anger* treatment in the public goods game:

- *Preferences under Anger:* Anger motivates antisocial and more competitive behavior that leads to antisocial consequences in terms of welfare. The Anger motive can lead to heuristic decision making.
- *Perceptions under Anger:* Subjects under *Anger* display an increased attention towards perceived injustice in their disfavor. They also show increased attention towards outcomes that they desire. The Anger motive can limit the depth of reasoning which can lead to a bias in perception.
- *Beliefs under Anger:* Subjects under *Anger* believe that they will get what they desire.

### 3. Experimental design

Subjects make contribution decisions in a standard linear one-shot public goods game in groups of 2 participants. Subjects are informed that they will never learn about the identity of their other group member. The payoff structure is symmetric and entails a marginal per capita return (MPCR) of 0.75. Each subject  $i$  is endowed with €10 of which they must decide how much  $c_i \in \{0, \dots, 10\}$  in whole Euro amounts to contribute to the public good. The monetary payoff for subject  $i$  is

$$\pi_i = 10 - c_i + 0.75 \times (c_i + c_j) \quad (1)$$

where  $c_i$  is subject  $i$ 's contribution to the public good and  $c_j$  is the contribution of  $i$ 's other group member  $j$  to the public good. This gives a payoff of €10 for each group member in the Nash equilibrium in which no subject contributes anything and €15 for each subject in the Social optimum where both group members contribute their entire endowment. The highest possible payoff if  $i$  contributes everything and  $j$  completely free-rides is €17.50 for  $j$  whereas the lowest possible payoff for  $i$  is €7.50.

Each treatment of our experiment consists of two sessions which are run back-to-back. First, a motive induction session induces the motives of Care or Anger (or did not induce a motive in the case of the

Control). Motives are induced through an autobiographical recall technique in which subjects write essays about personal experiences relevant to the respective motive that is induced (Frijda et al., 1989, Mauro et al., 1992). Subjects are paid a fixed amount of €4.50 for the motivation induction session, which lasts around 30 minutes. Our design relies on the assumption that subjects' activated angry or caring motivational states (associated with angry and caring emotions, respectively) will carry over to an abstract cooperation problem that contains a stranger as another group member. There is strong evidence that emotions have the ability to focus one's cognition not only towards what initially led to the feeling of the affective state but also to unrelated events. This finding is called the carryover of incidental emotion (Lerner and Tiedens, 2006; Bodenhausen, 1993; Loewenstein and Lerner, 2003). We also know that the effects of emotions can drive choices when the decision environment contains real monetary incentives (Lerner et al., 2004) and even in the presence of incentives to disregard irrelevant influences. Moreover, the autobiographical recall technique has also been used in the experimental economics literature, examples are Lin et al. (2006), Kausel and Connolly (2014), Elliott et al. (1998) Derbaix and Vanhamme (2003); see also: Rand et al., (2012). This method has the advantage that subjects can freely associate personal memories that they actually experienced with this task without the experimenter imposing a potentially unfamiliar frame on them that they may find hard to relate to their own experiences. Furthermore, this procedure is highly portable across motives, which allows us to use an identical induction method for all three treatments.

In a second decision-making session following directly after the motive induction, subjects view example calculations, make unconditional and conditional contribution decisions, state their beliefs and norms about contributions and state their impressions of the game under the influence of the just-induced motive.

We implement several procedural design features intended to reduce potential experimenter-demand effects (EDEs). Different experimenters administer each session and are only in the lab for the duration of their respective session. The experimenter administering the second session is blind to the motive induction conducted in the first session. Subjects are also recruited separately for each session. Only subjects who have already signed up for the first session are then invited to the second. The recruitment email for the second session is sent from a different researcher, and states that it will take place directly after the one that they have already signed up for. Subjects are not required to participate in both sessions. Subjects who wish to participate only in the first session leave the lab with the experimenter for that session and are paid for their participation. We therefore collect no choice data from these subjects. Likewise, some subjects who sign up for the first session but are sent away

because they show up late are allowed to participate in the second session if free places are available. We do not report data from these subjects. Around 90% of the subjects that take part in the first session stay in the lab for the second session. No deception is used in our experiment. We never explicitly tell the subjects that the two sessions are independent from one another. Our instructions do not explicitly frame the public good and attempt to use “neutral” language throughout. Therefore, our procedure enables us to study the influence of our motive inductions on decisions using non-deceptive obfuscation (as suggested by Zizzo, 2010) in order to reduce potential EDE’s.

### **3.1 Details about the autobiographical recall method**

At the beginning of the first session, subjects are informed that the data we collect from them cannot be matched with their identity. After subjects sit down, instructions (see supplementary materials) for the first part are distributed to them. These are read out loud by the experimenter. For all three treatments of the autobiographical recall sessions, subjects are instructed to write a total of two personal essays about particular situations that they have experienced in the past. The topics of the situations that subjects are asked to recall are selected to represent particular aspects of the target motive we seek to induce. After the instructions are read out, the experimenter reads out a corresponding example essay to the subjects meant to exemplify the length and depth of such an essay and which treated the same aspect of the targeted motivation<sup>3</sup> that subjects are asked to write about. This takes approximately 3 minutes. After the example essay is read out, subjects are told to imagine their personal memory as vividly as possible for two minutes. After this reflection time, subjects write down their personal essay for 8 minutes. Subjects complete this procedure twice, with two different topics per motive induction treatment. For the Care motive induction, the two topics are 1) a situation in which subjects either helped or thought about helping another person even though this person may not have expected to be helped and 2) a situation in which subjects felt compassion and feelings of warmth for another person as well as the motivation to improve that other person’s wellbeing. Subjects are not specifically asked to invoke experiences specifically related to cooperation in a social dilemma. In the induction for the Anger motive the topics are 1) a situation that frustrated the subject but where the subject was not responsible for the cause of the frustration and 2) a situation of verbal harassment or insult. In the control condition, subjects are asked to recall and write down 1) the course of a typical day in their lives and 2) a description of what they did yesterday. Subjects write two essays on different topics in order to increase the chance that each subject can recall a relevant motive-inducing memory. We choose “frustration” and “experience of being insulted or harassed” as

essay topics for the *Anger* treatment because angry reactions represent an aversive response when individuals perceive their physical or psychological integrity to be threatened. Previous findings in the motivational psychology literature suggest that dangerous stimuli such as harassment (Berkowitz and LePage, 1967) as well as situations leading to frustration (Kornadt, 1984, Herrero et al., 2010) represent such threats to physical or psychological integrity that can elicit angry responses. The autobiographical recall topics for the Care motive induction follow precisely from the stated definition and insights about compassionate states above. Our autobiographical recall induction method has been previously validated in a pilot study. Results of this can be found in the appendix.

### 3.2 Hypotheses and design details of decision-making session

This subsection presents the hypotheses that we sought to test in the public goods game in the second session of the experiment. These follow from the behavioral and perceptual tendencies of our target motives outlined in the previous section and relates them concretely to the public goods game.

*Hypothesis 1 – Unconditional contributions: Subjects under Care (unconditionally) contribute significantly more to the public good than subjects under Anger, while contributions under Control to lie between the two other treatments*

In our experiment, subjects make only one contribution decision because we are interested in how the motive inductions affect subjects' preferences. This rules out that behavior may be driven by learning effects about others' types and hence strategic considerations, or reputation formation effects that might occur in repeated play. In the decision session, we collect the information of interest from subjects according to the following sequence. At the beginning of this session, the experimenter distributes the instructions and reads them out loud. The first explicit decision task is the contribution decision to the public good. However, before subjects enter their unconditional contribution decision we implicitly collect data on how subjects' attention to their own and their other group members' hypothetical payoffs vary between treatments. In particular, we randomly generate example contributions and record how often subjects look at the resulting payoffs to themselves vs. the resulting payoffs to their other group member using a mouse tracking interface within z-Tree (Fischbacher, 2007). Concretely, we present them with two randomly generated examples showing their own payoff and their partner's payoff in two boxes onscreen. For these two examples, the resulting payoffs from the example contributions only become visible to the subjects if they hover over the respective boxes with the mouse and only for as long as the mouse arrow is over the box. Subjects

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<sup>3</sup> A translated (from German) version of the example essays can be found in the supplementary materials.

are informed about this in the instructions. At the same time, we use this element in the study to present subjects with payoff example calculations with the purpose to increase their comprehension of the game. Since we want to limit the amount of time between inducing a motive and the public goods game, we find this preferable to a pre-game comprehension quiz. Our insights from the previous section lead us to test the following hypothesis regarding this data:

*Hypothesis 2 – Attention: Both Care and Anger increase subjects’ attentions to the others’ payoffs relative to Control.*

Directly after these two mouse-over example screens, subjects decide how much to contribute to the public good. Once subjects enter this unconditional contribution decision we ask subjects whether they perceive the decision environment of the public goods game as either a cooperative or a competitive context. This elicitation seeks to investigate whether the perception of respective utilities in an otherwise identical situation varies with the induced motive. The public goods game is one of mixed incentives – i.e. incentives are not completely aligned since free-riding increases one’s own payoff at the expense of the other, but incentives are not completely opposed since both players benefit from higher mutual contribution levels. At the individual level it depends on the subject’s belief about the other group member’s contribution as well as the nature of the subjects’ (social) preferences how harmonious the interests in the public goods game are perceived. Similar to Zizzo and Tan (2007), subjects are asked to indicate in a binary choice whether they perceive the public goods game to be more similar to a purely cooperative game that provides strategic complementarity (a pure coordination game) or to a purely competitive game with substitutability in strategies (matching pennies)<sup>4</sup>. This decision is not incentivized. Since the Care motive increases one’s focus on mutually beneficial outcomes and Anger motive leads to an increase in competitive objectives we test the following hypothesis about perceptions:

*Hypothesis 3 – Perceptions: Care subjects perceive the nature of the public goods game as significantly more cooperative than Control subjects. Subjects under Anger perceive the game as significantly more competitive than both Control and Care subjects.*

Subsequently, we elicit subject’s beliefs about their other group member’s contribution to the public good. These are incentivized as in Gächter and Renner (2010). Subjects are asked how many Euros they think their other group member has previously put into the group account. If a subject guesses the other’s contribution correctly, she earns an additional 1 Euro. Incorrect guesses are not rewarded.

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<sup>4</sup> The descriptions used may be found in the supplementary materials.

In general, we want to stress our hypothesis that the presence of a distinct motive is associated with distinct behavior, or *preferences*. That is, the motive induction primarily affects preferences. We do not hypothesize that the motive inductions act as equilibrium selection devices, guiding choices by influencing what subjects think their other group members will do (Rabin, 1998; Fehr and Schmidt, 2006; Ellingsen et al., 2012). In order to rule this out, we elicit subjects' beliefs under the different treatments in addition to the unconditional contribution decision. We also seek to investigate whether subjects' beliefs are correlated with contribution decisions at the individual level. As we have seen in the previous section, the evidence in the case of *Anger* points in two directions concerning beliefs that subjects under *Anger* could hold. On the one hand, angry individuals expect to get what they want. Assuming that subjects prefer a higher payoff over a lower payoff and that subjects under *Anger* expect that their counterparts are angry too and hence expect the same, it could be the case that angry subjects infer that no other angry subject will contribute much. On the other hand, their depth of reasoning may be limited by their state, which rather contradicts the formulation of a directed hypothesis. Caring subjects however believe that their own prosocial behavior leads others to also act prosocially. Following from Hypothesis 1 regarding *Care*, we therefore hypothesize the following regarding beliefs:

*Hypothesis 4 – Descriptive beliefs: Care subjects believe that their other group member has contributed more to the public good relative to this belief under Control.*

Following this belief elicitation, the amount that subjects think that both they and their other group member *should* have contributed (contribution norm) is elicited. If both members of the same group enter an identical contribution norm independent from each other, both are paid an additional Euro and receive no additional payment otherwise. This incentivization mechanism mirrors that of Krupka and Weber (2013). Again, no clear prediction emerges about what angry subjects should perceive the norm to be. Concerning how subjects motivated by *Care* perceive contribution norms, we hypothesize that they will perceive full contribution as the salient cooperative norm. We therefore seek to test the following hypothesis about perceived norms:

*Hypothesis 5 – Normative beliefs: Care subjects will report higher contribution norms than Control subjects.*

After this elicitation of contribution norms, the experiment continues by eliciting subjects' conditional contribution schedules. Following Fischbacher et al. (2001), we ask subjects how they would change their contribution if they knew how much their other group member had contributed. Without knowing how much their other group member actually contributed, subjects fill in a contribution table

in a strategy method design (Selten, 1967). Subjects indicate for each of the 11 possible contributions that their other group member could have made how much they would want to contribute in response. Additionally, we categorize subjects into different types of conditional contributors based on their conditional contribution schedule. Subjects have an incentive to state their true preferences in the conditional contribution schedule, because for one randomly-selected subject within each group the conditional contribution decisions are carried out to determine the final payoff and not the initial contribution decision. We seek to test the following conjectures about the shares of different conditional contribution types: We expect fewer conditional contributors and “pure altruists” among the angry subjects, but more free-riders, hump-shaped contributors and other contributors relative to *Control* subjects. *Care* on the other side can be expected to lead to a lower proportion of free-riders and a higher proportion of purely altruistic conditional contribution types compared to *Control* and *Anger*. In general, we hypothesize the following conditional contribution behavior:

*Hypothesis 6 – Conditional contributions: Subjects motivated by Care display a higher conditional contribution for a fixed contribution of the other team member than both Control and Anger subjects.*

Finally, subjects are asked to complete four comprehension questions involving payoff calculations about the game. These comprehension questions are placed at the end of the decision-making session because we want the actual contribution decision to come as soon as possible after the motive induction. We do not want to risk that induced motives might be crowded out with a cognitively demanding task such as arithmetic. We investigate whether the induced motives lead to differences in the comprehension of the incentives of the public goods game. If, after the whole experimental procedure of contribution decision, perception of the game, beliefs, norms and conditional contribution decision a subject cannot correctly compute payoff outcomes, it is very likely that this subject has not understood the game. Making correct inferences about the motivation behind observed behavior is problematic as recently pointed out and investigated by Cason and Plott, (2014). After subjects complete their work on these tasks, they are called one by one into another room to receive their payment from the study privately. Upon payment each subject is free to leave.

#### 4. Results

Data were collected over the months of March and April 2016. Subjects came from the University of Kiel subject pool and studied diverse subjects. The experiment was organized and administered with the software hroot (Bock et al., 2014) and programmed with the software z-Tree (Fischbacher, 2007). In total 184 subjects participated in both the motive induction and public goods sessions. Of these, 57

participated in the *Control* treatment, 62 in the *Anger* induction treatment, and 65 in the *Care* induction treatment. Subjects earned on average €18.20 combined for the two sessions, which together lasted around 90 minutes.

45% of subjects were male and 55% were female. There are no significant gender differences across the three treatments.

Comprehension of the public goods games' payoffs was widely distributed in our subject pool. The quiz had four questions. The mean number of incorrectly answered questions under *Control* were 0.8 ( $sd = 1$ ), under *Anger* 0.7 ( $sd = 1.1$ ) and under *Care* 0.9 ( $sd = 1$ ). According to ranksum<sup>5</sup> tests none of the pairwise comparisons in the number of incorrectly answered questions produce significant differences between treatments. It should also be noted that none of the distributions over shares of subjects that made a certain amount of mistakes (0 – 4) differs in pairwise comparisons across our treatments. Also, over all three treatments, the distribution of scores is not significantly different from one another, both insights stem from Fisher's exact tests.

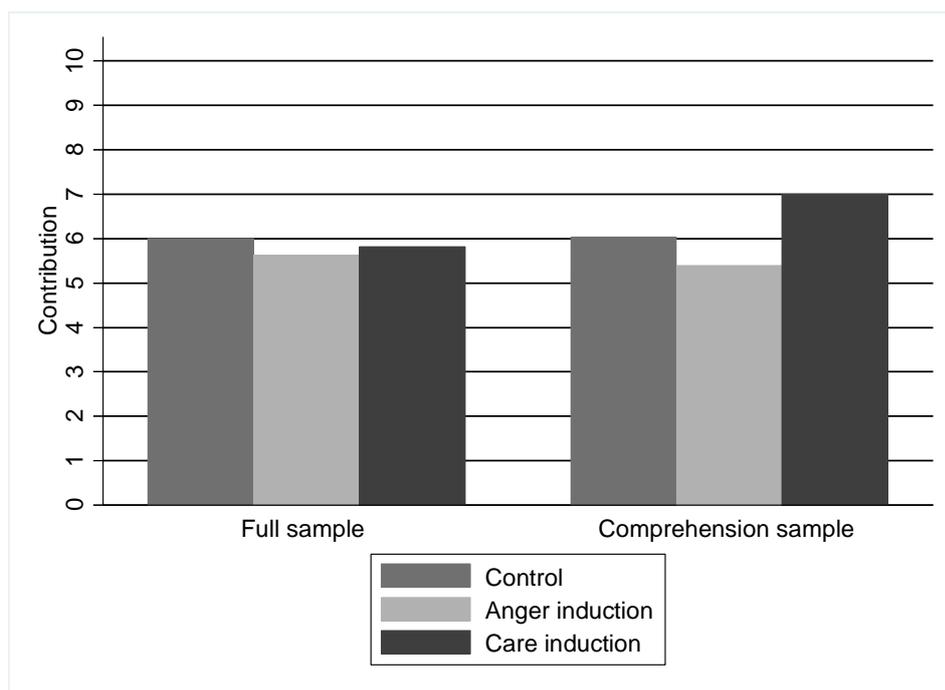
Unfortunately however, only 97 of the 184 subjects correctly calculated payoffs on all of the post-game comprehension questions. We have strong reasons to expect that the effect of different motives on choices will only manifest for those who fully understood the game. This is because motives concern the objectives of choice. Choices made by those who did not understand the game do not convey information about their objectives. For this reason, we report results for both the full sample, as well as the subsample of participants who passed the comprehension quiz and whose native language was German (one additional subject is excluded on this basis). We denote this the "comprehension sample," and henceforth emphasize the results for these subjects.

*Result 1: In the comprehension sample, subjects under Care contribute significantly more than subjects under Anger, with Control condition subjects clearly in the middle. Hypothesis 1 is therefore supported in the comprehension sample.*

Figure 1 displays the mean contribution levels across the three treatments. In the full sample there are no significant differences, with mean contribution rates of €6.00, €5.63, and €5.82 in the control, anger induction, and care induction treatments, respectively. In the comprehension sample by contrast, average contributions are €6.03, €5.39, and €7.00 in the control, anger induction and care induction treatments, respectively. Contributions in the care induction treatment are significantly higher than in the anger induction treatment at the  $p=.039$  level according to a rank sum test. Figure 2 shows the full

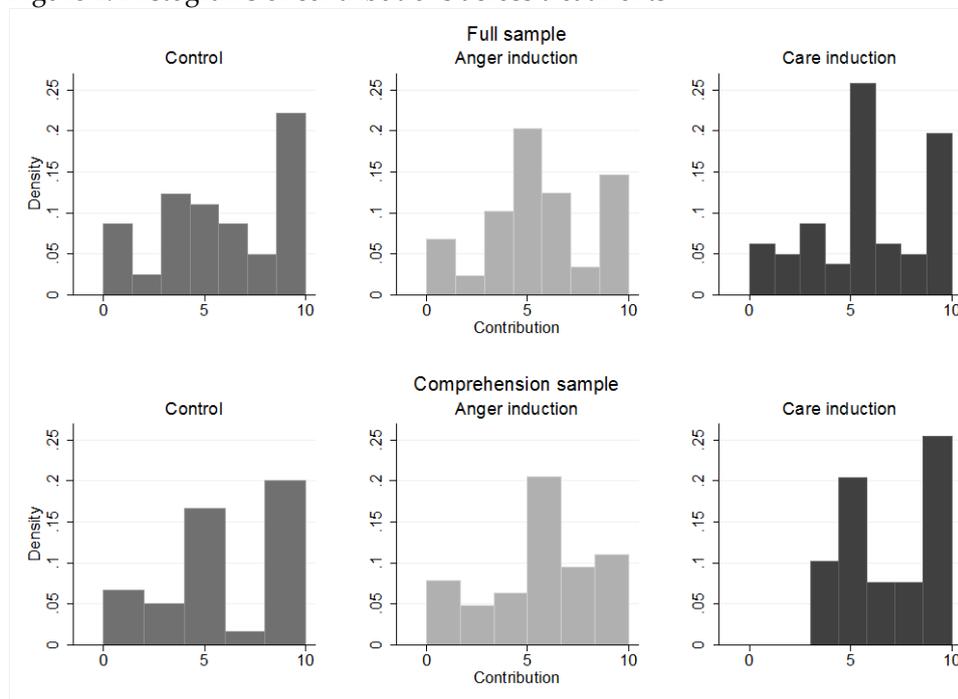
histograms of contributions by treatment for both the full and comprehension samples. As can be seen especially for the comprehension sample, there are fewer contributions of €10 in the anger induction treatment relative to control, as well as fewer €0 contributions in the care induction treatment relative to control.

Figure 1: Average contributions across treatments



<sup>5</sup> Two-sided *p*-values are reported throughout.

Figure 2: Histograms of contributions across treatments



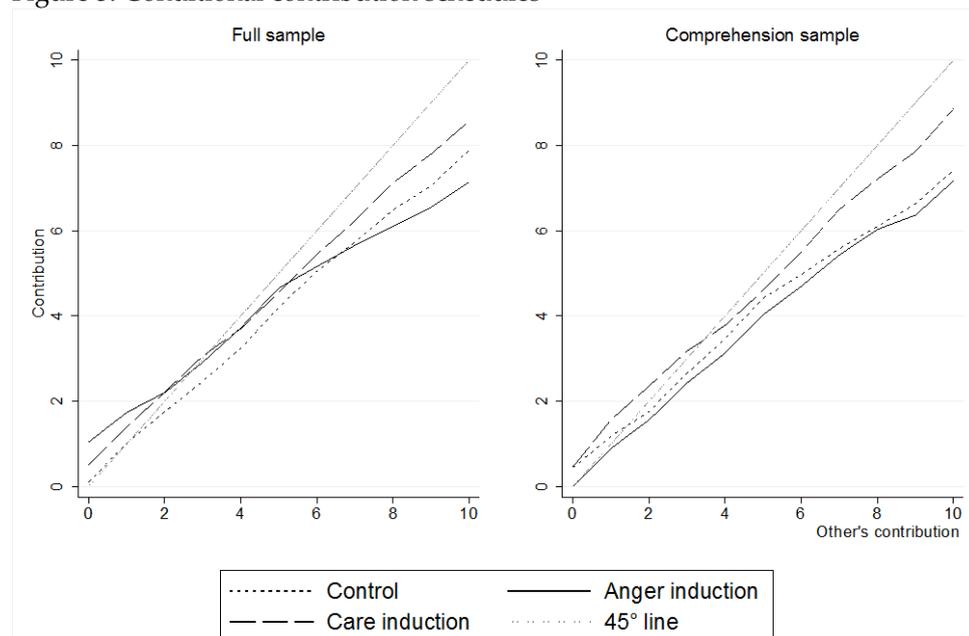
In the following, we expand on this result by documenting the induced motives' effects on preferences, beliefs, and perceptions.

*Result 2: Subjects' preferences, as elicited by their conditional contribution schedules, differ significantly across induced motives in the comprehension sample, and to a lesser extent also in the full sample. The Care induction treatment leads to significantly more pro-social preferences.*

Figure 3 plots subjects' contribution schedules averaged across all subjects in each treatment. The mean contribution schedules for each treatment are graphed, with the full sample in the left panel and the comprehension sample in the right. In the full sample, contributions are slightly higher in the care induction than in the *Control* treatment at all hypothesized partner contributions, with around the same slope. Subjects in the anger induction treatment give slightly higher than those in the other treatment at low partner contributions and lower than those in the control or care induction treatments at higher contributions (i.e. the slope is shallower). In the comprehension sample, care-induced subjects give the most at all hypothesized partner contributions, followed by anger-induced subjects and then by *Control* subjects. There are significant pairwise differences (at the 10% level) between care-induced subjects and *Control* subjects at hypothetical partner contributions of €0, €6, €7, €8, €9 and €10 in the comprehension sample according to ranksum tests. There is also a significant difference between care-induced and anger-induced subjects in the full sample for a hypothetical

partner contribution of €10 (at  $p=.05$ ) and between the anger-induced and *Control* subjects in the full sample for a hypothetical partner contribution of €0 ( $p=.09$ ).

Figure 3: Conditional contribution schedules



We have also categorized each subject according to the pattern displayed in their contribution schedule. All subjects fit exactly one of five types. The most common type, which we denote “Conditional contributor” is assigned to all subjects whose contribution schedules display a significantly positive (at the 1% level) Spearman rank correlation between own and partner’s contribution. “Free riders” give €0 across the range of partner contributions. Similarly, “Pure altruists” give some positive amount that does not vary across the range of hypothesized partner contributions. The second-most common type, “Hump contributors,” have a contribution schedule that is increasing up to some hypothesized partner contribution, and then decreasing as contributions go higher. These types are known in the literature (see seminaly Fischbacher et al., 2001). A small proportion of subjects did not fit into one of these standard types and were classified as “Other.” Figure 4 illustrates the typical contribution behavior by type.

Figure 4: Contribution types

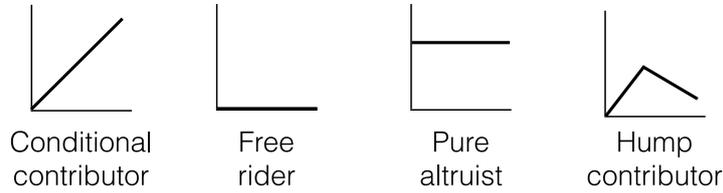


Figure 5: Conditional contribution types across treatments

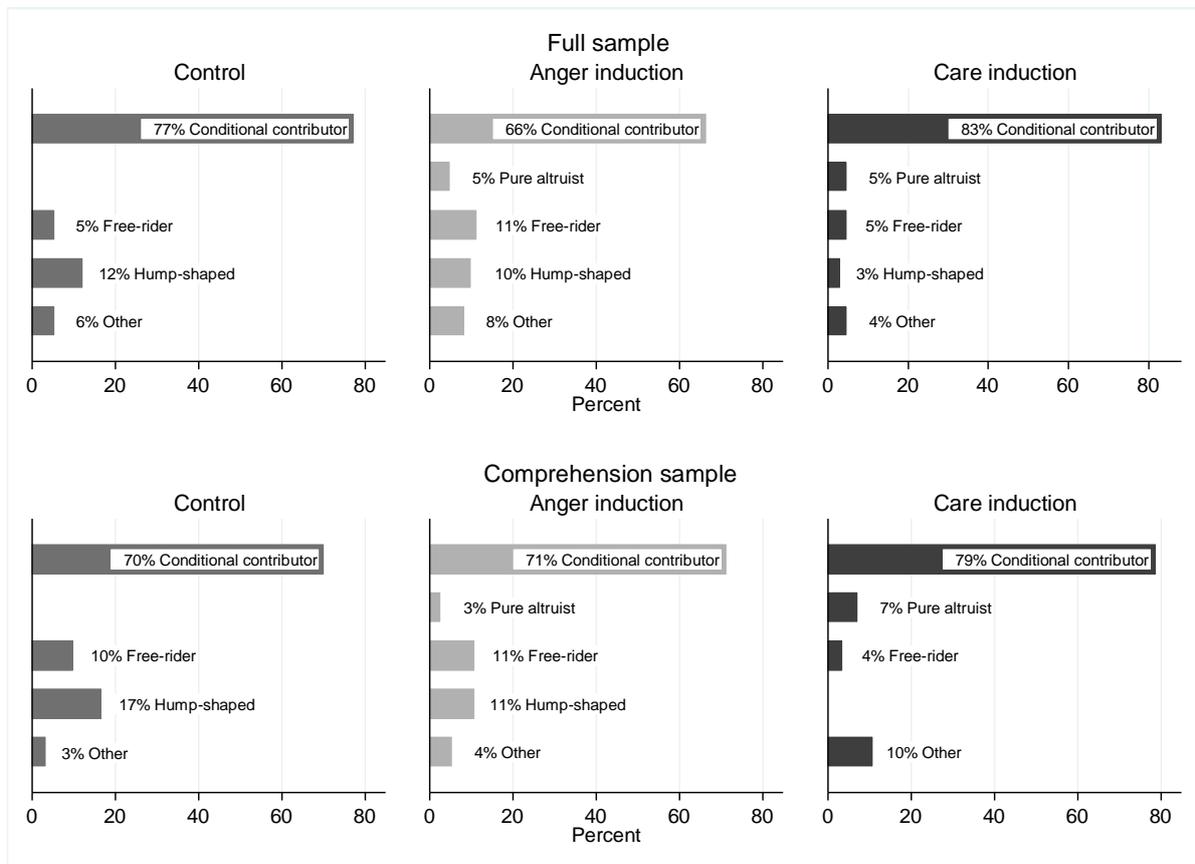


Figure 5 breaks down the sample by these conditional contribution types. In the full sample, conditional contributors constitute 77% of the *Control* treatment subjects, 66% of the anger-induced subjects and 83% of the care-induced subjects. The difference between the share of conditional contributors is significant at  $p=.03$  according to a ranksum test in this sample. The *Control* treatment features no pure altruists, this is marginally significantly different from the shares of pure altruists in the anger and care induction treatments for the full sample (both having just under 5% pure altruists, significant at the  $p=.09$  and  $p=.10$  levels respectively). The anger induction treatment has a slightly greater proportion of free riders (11% vs. 5% and 5% in the control and care induction treatments, respectively), though these differences are not significant. The care induction treatment is also notable

for having fewer hump contributors (3% vs. 12% and 10% in the control and anger induction treatments, respectively). The difference between the share of hump contributors in the control and care induction treatments is significant at  $p=.05$ .

In the comprehension sample, conditional contributors constitute 70% of the *Control* treatment subjects, 71% of the anger-induced subjects and 79% of the care-induced subjects. Purely altruistic contribution schedules are seen in 7% of the *Care* treatment subjects vs. 3% in the *Anger* treatment while there are no pure altruists in the *Control* condition. We see fewer free riders and hump contributors in the care induction treatment. Free riders constitute 4% of the care-induced vs. 10% and 11% of the control and anger induction treatments, respectively; and hump contributors constitute 0% of the care-induced vs. 17% and 11% of the control and anger induction treatments, respectively. The number of hump contributors remain significantly different between the care induction and both the control and anger induction treatments (at  $p=.03$  and  $p=.08$  respectively). Furthermore, we find significant differences when the distribution over all conditional contribution types is compared between the *Care* and the *Control* treatments. These two distributions differ at  $p=.04$  according to a Fisher's exact test. Moreover, the joint distribution over all conditional contribution types under the *Anger* and *Control* treatments differs from the distribution under *Care* at  $p=.06$ , indicating that subjects under the *Care* treatment have a different set of objectives than those under *Control* and to a lesser extent, *Anger*.

*Result 3: Subjects' elicited descriptive and normative beliefs do not significantly differ across induced motives in either the full or comprehension sample, though in the comprehension sample both descriptive and normative beliefs are somewhat (but insignificantly) higher under the care induction treatment.*

Figure 6: Beliefs and norms

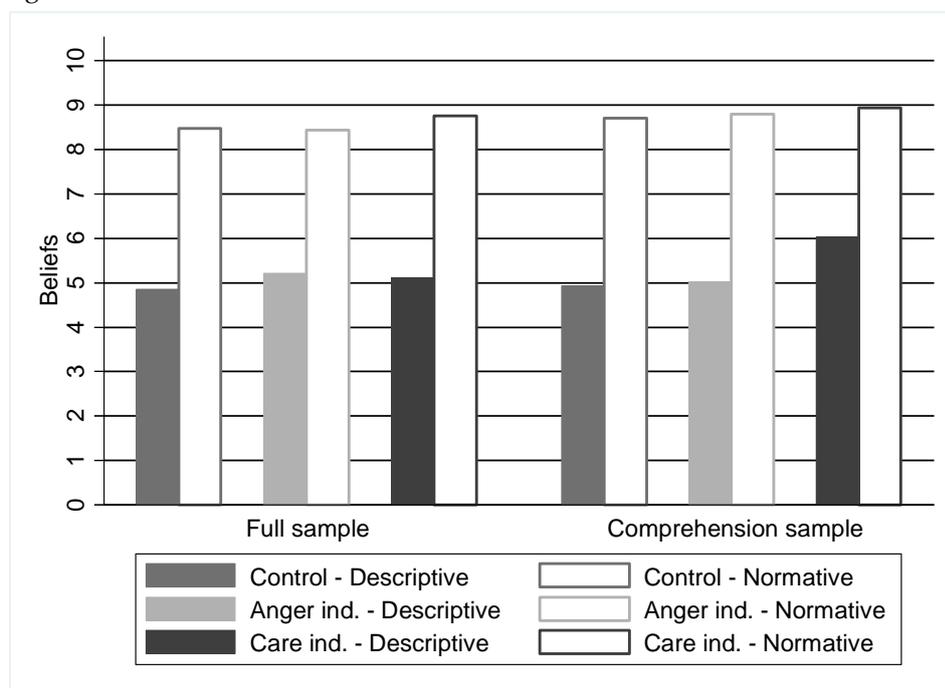


Figure 6 displays elicited beliefs about the actual contribution of subjects' partners (descriptive expectations, solid bars) as well as subject's perceptions of the normative contribution levels. While subjects thought on average that they should contribute between €8 and €9, they thought that others would contribute around €4.50 to €6.00 on average. In the *Control* treatment subjects thought others would contribute €4.86 on average in the full sample and €4.93 in the comprehension sample. Similarly in the anger induction treatment subjects thought their partner would contribute €5.21 on average in the full sample and €5.03 in the comprehension sample. Subjects in the care induction treatment thought their partners would contribute €5.11 in the full sample and €6.04 in the comprehension sample. While beliefs are highest among care-induced subjects in the comprehension sample, there are no statistically significant pairwise differences in beliefs between treatments according to rank sum tests.

Normative expectations are similar across treatments. In the *Control* treatment subjects perceived the normative contribution level to be €8.47 on average in the full sample and €8.70 on average in the comprehension sample. Subjects in the anger induction treatment perceived normative expectations to be €8.44 in the full sample and €8.79 in the comprehension sample. Care-induced subjects perceived them to be €8.75 and €8.93 in the full and comprehension samples, respectively. Likewise, no statistically significant pairwise differences in perceived norms between treatments were found by rank sum tests.

Figure 7: Empirical relationships between contributions and beliefs/norms

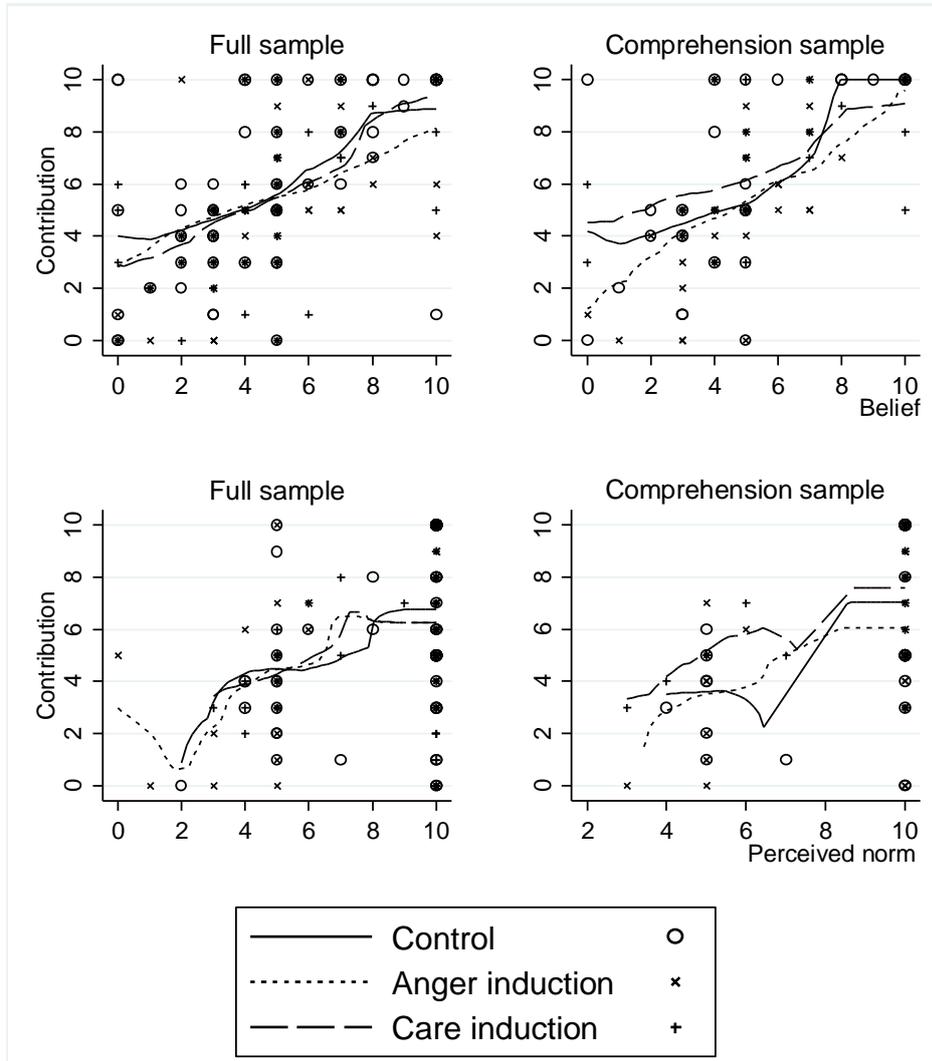


Figure 7 plots contributions against elicited beliefs (top row) and norms (bottom row). Local polynomial regressions are plotted for visual comparison of the empirical contribution schedules across the different treatments. In the full sample both contributions and beliefs are very spread out but a definite positive relationship between the two is evident. Contributions are slightly higher in the *Control* treatment than the anger induction treatments at a range of beliefs. Contributions are also higher in the care induction treatment than the anger induction treatment at high beliefs. In the comprehension sample a clearer picture emerges. At low beliefs, contributions are highest for the care-induction treatment, followed by the *Control* treatment and then the anger induction treatment. At higher contribution levels the relationship between the *Control* and *Care* treatments reverses.

The empirical relationship between contributions and elicited norms is a bit harder to discern. A large majority of subjects identified full contribution as a relevant norm, but these subjects contribute a

wide range of amounts to the public good. No differences in contribution-norm schedules is apparent in the full sample, but it appears that *Care* subjects in the comprehension sample tend to give slightly more at all elicited norm levels. No differences in slope (i.e. sensitivity to elected norms) is apparent.

*Result 4: Observed differences in beliefs do not fully mediate the observed differences in contributions.*

Table 1 provides evidence on whether the small differences in elicited descriptive beliefs might mediate the differences in contributions across treatments. In the first two columns, contributions in the full and comprehension samples respectively are regressed on two indicator variables for the anger induction and care induction treatments (the *Control* treatment is the base category). The estimated coefficients reproduce the mean differences noted above. The difference between the coefficients on the care induction and anger induction dummies is significant at the  $p=.02$  level for the comprehension sample. In the next two columns, each subject's elicited belief is added to the regressions of contributions on treatment dummies. Here we see that the difference in contributions between the care induction and anger induction treatments is smaller, though still significant at the  $p=.10$  level. We therefore conclude that changes in beliefs are only partially responsible for the observed changes in contributions, and only for the care induction treatment<sup>6</sup>. This corroborates evidence presented above from the conditional contribution schedules.

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<sup>6</sup> Interestingly, we find that by plugging subject's beliefs into their contribution schedule to generate an "expected contribution," there are small differences in consistency between this expected contribution and actual contributions across treatments in the full sample. The average absolute deviation between actual and predicted contributions is 2.21 in the *Control* treatment, 2.29 in the *Anger* induction treatment, but only 1.69 in the *Care* induction treatment. The self-consistency difference is significant at the  $p=.09$  level between the *Care* and the *Control* treatments for the full sample.

Table 1: Regressions of contributions by treatment, controlling for beliefs

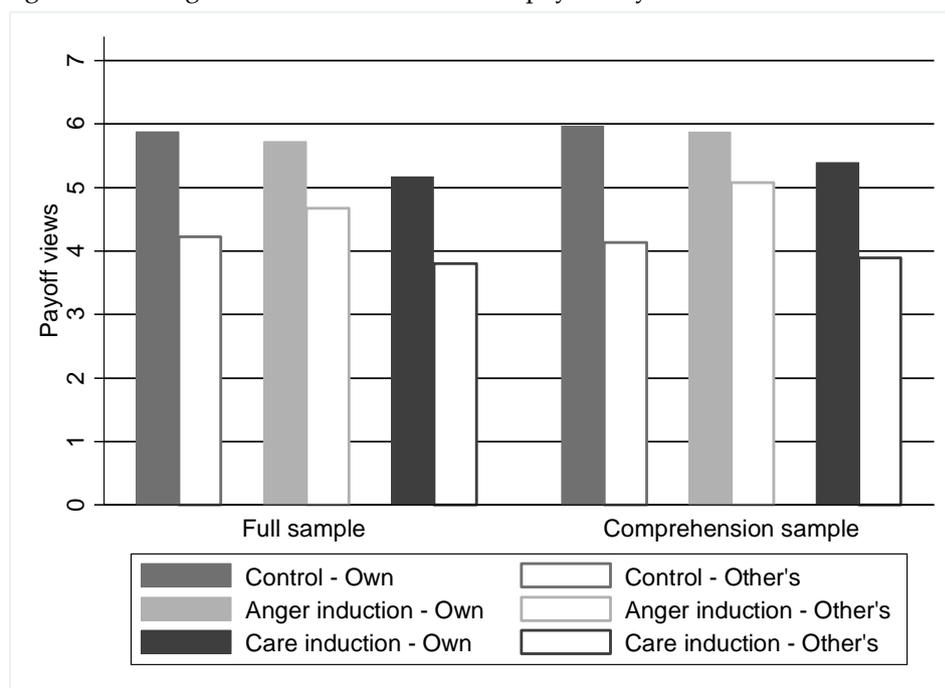
Equation	1	2	3	4
<i>Anger</i>	-.371 (.572)	-.639 (.801)	-.613 (.459)	-.708 (.599)
<i>Care</i>	-.185 (.576)	.967 (.801)	-.356 (.451)	.149 (.602)
Belief			.692*** (0.68)	.742*** (.085)
Constant	6.00 (.438)	6.03 (.638)	2.64 (.527)	2.37 (.777)
Full sample	X		X	
Comprehension sample		X		X
<i>N</i>	184	96	184	96
<i>R</i> <sup>2</sup>	.002	.046	.404	.469

Robust standard errors in parentheses. \*\*\* indicates significance at the  $p=.01$  level.

*Result 5: Different induced motives are associated with different patterns of attention. In particular Care-motivated subjects show less self-focus and Anger-motivated subjects show more other-focus.*

Figure 8 displays subject's attention to their own and other's payoffs as displayed on the example calculation screen. The solid bars show the average number of views for subjects' own payoffs, while the outlined bars show the corresponding number of views for the other's payoff. Across all treatments subjects pay more attention to their own payoffs. In the full sample, own payoff views decline from an average of 5.88 in the *Control* treatment to 5.73 in the anger induction and 5.17 in the care induction treatments. Care-motivated subjects in the full sample view their own payoff significantly less often than those in the *Control* treatment (at  $p=.089$  according to a rank sum test). In the comprehension sample a similar pattern emerges with 5.97 own payoff views on average in the *Control* treatment, 5.87 in the anger induction treatment and 5.39 in the care induction treatment.

Figure 8: Average views of own and other's payoffs by treatment



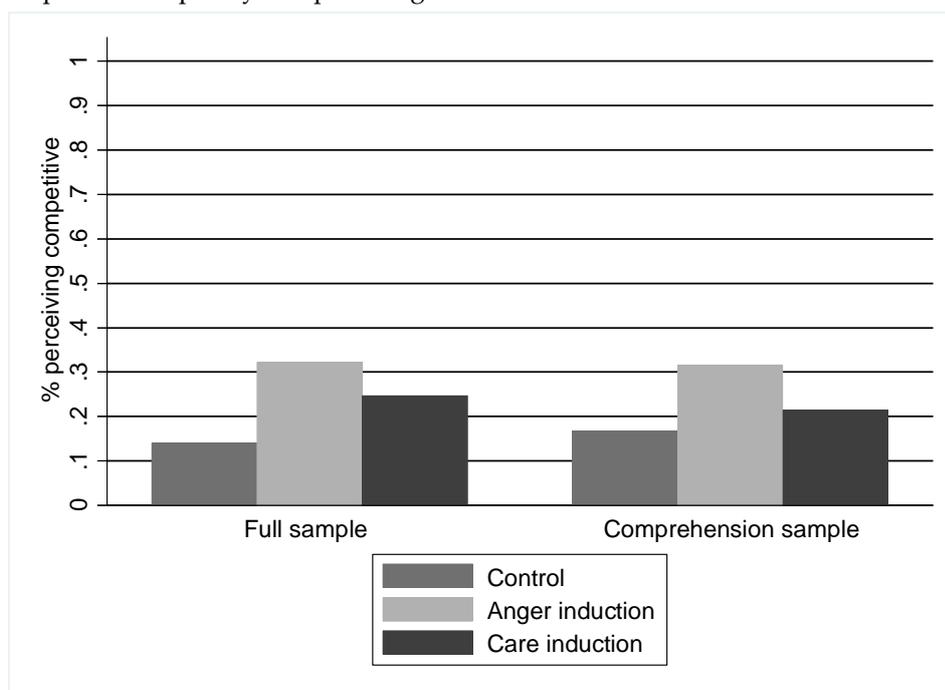
Views of the other subject's payoff are highest for the anger induction treatment. In the full sample subjects viewed the other's payoff 4.23 times on average, while they viewed it 4.68 times on average in the anger induction treatment. Subjects in the care induction treatment viewed the other's payoff 3.8 times on average. In the comprehension sample views of the other's payoff were 4.13, 5.08 and 3.89 times on average in the control, anger induction, and care induction treatments respectively. It should be noted that none of these differences are significant according to rank sum tests. It may also seem puzzling that anger-induced subjects pay the most attention to their partner's payoff, but there is a significant positive correlation ( $\rho=0.28$  in the full and  $\rho=0.33$  in the comprehension sample, both significant at 5%) between the difference in displayed payoffs for subjects in the anger induction treatment and subject's subsequent contributions, but not in either the control or care induction treatments. Since anger-induced subjects are significantly more affected by implied differences in payoffs, it makes some sense that they would pay more attention to their partner's payoffs.

*Result 6: The motive of Anger is associated with weakly greater competitive perceptions of game incentives.*

Figure 9 displays the relative proportions of subjects in each treatment who state that they think the public goods game to be more similar to a purely competitive (matching pennies) rather than a purely cooperative (pure coordination) game. A large majority of subjects in all treatments consider the public good game to be more cooperative than competitive. The biggest majority is in the *Control* treatment, in which only 14% of subjects consider it competitive in the full sample and 17% in the

comprehension sample. A slightly higher proportion of subjects in the care induction treatment consider the game to be more competitive – 25% in the full sample and 21% in the comprehension sample. Subjects in the anger induction treatment are the most likely to consider the game to be more competitive than cooperative. Fully 32% percent consider it to be more competitive in the full sample and also 32% in the comprehension sample. That is, anger-induced subjects were nearly twice as likely to consider the game to be more competitive than subjects in the *Control* treatment. Significant differences are detectable only between the control and anger induction treatments for the full sample (at  $p=.02$ ).

Figure 9: Fraction of subjects reporting the public good game to be more similar to a purely cooperative or purely competitive game



## 5. Concluding discussion

The aim of this paper is to assess experimentally the influence of psychological motives on economic decisions in a public goods game. We present evidence showing that this influence occurs through three channels: (1) preferences, (2) beliefs and (3) perceptions. In the experiments described above, we induce these motives through autobiographical recall. The results of our experiments show that subjects' social preferences concerning cooperation in public goods games depend significantly on whether they are motivated by Care or Anger motives. In particular, these effects are strongest for subjects that show perfect comprehension of the game's incentive structure.

We were able to causally investigate this channel through observing a one-shot interaction, eliciting incentivized beliefs about other's contribution, eliciting conditional contribution schedules that control for beliefs and assessing subject's comprehension of the game's incentives. The Care motive elicits greater willingness to contribute to public goods than the Anger motive. Moreover, conditional contribution schedules under *Care* are higher and significantly higher for high contributions of the other group member. For subjects under *Anger* demonstrating full comprehension of the game's incentives, we find the lowest conditional contribution schedule and the highest proportion of free-riders. A weak directional change in beliefs about contributions cannot fully mediate these effects that Care and Anger motives have on contributions. Furthermore, subjects motivated by Anger perceive the game as more competitive and are most attentive towards hypothetical displayed payoff differences. Therefore, we find evidence that different motives are associated with different social preferences as well as different perceptual and attentional tendencies.

Our results suggest that people's willingness to act in the public interest depends significantly on motivational states that may change flexibly in response to changes in social contexts. While this study focused on two specific motives, Care and Anger, these results indicate that the effects that further motives like the needs for achievement, affiliation and power or fear have on social preferences warrants further study. The influence of motives on economic decisions is ignored in mainstream neoclassical microeconomic analysis, where preferences are assumed to be internally consistent, temporally stable (sufficiently for revealed preference experiments to be performed) and context-independent. The preferences implied by different psychological motives, by contrast, need not be internally consistent with one another; motives can change abruptly through time; and they are highly context-dependent.

Traditionally, economists are interested in predicting how people respond to incentives. We are now increasingly coming to realize that we have to understand how social contexts that are generated for example by business cultures, current narratives in the media, values held in societies and education, all interact with the individual in a certain decision environment in order to guide chosen outcomes. Since individuals find themselves in a permanent and evolving reflexive interplay with these contexts and these contexts influence each other; they also influence the effectiveness of standard economic incentives. To this end, the policy implications of our results are important. Whereas conventional neoclassical analysis focuses on policies that affect people's economic incentives, our analysis suggests that policy analysis should take into account how the reflexive interplay between individual characteristics and the environment interact in a decision context of interest, since the outcome of this

interaction that determines decisions, beliefs and perceptions within the context. Therefore, how a decision context is designed, influences the effectiveness of standard economic incentives and vice versa. Consequently, economic policies cannot be assessed independently of social policies, though thus far they have usually been assessed in isolation from one another. This is precisely because human action is context dependent and new economic policies always are applied to a certain social context that interacts with the individual and motivates his or her behavior.

We find the strongest evidence for preference changes due to Anger and Care motives in the subsample of those who have fully comprehended the incentives of the public goods game. This stands in stark contrast to the arguments of e.g. Dufwenberg et al. (2011) or Fosgaard et al (2014, 2015) who argue that public goods contributions vary with frames only because the frames influence subject beliefs or misconceptions about the payoff structure. However, our results indicate that different motives influence behavior in the context of the public goods game and that the respective motive currently appraised has no effect on comprehension across motives, but also that this in fact lets us observe a change in objectives under different motives and not simply heuristic decision making. We therefore conclude that objectives themselves differ across environments, and that this may explain differences in cooperation across contexts. Future research should focus on how commonly-studied frames influence behavior by accounting for the psychological affect and motivational state changes they entail.

### **Acknowledgements**

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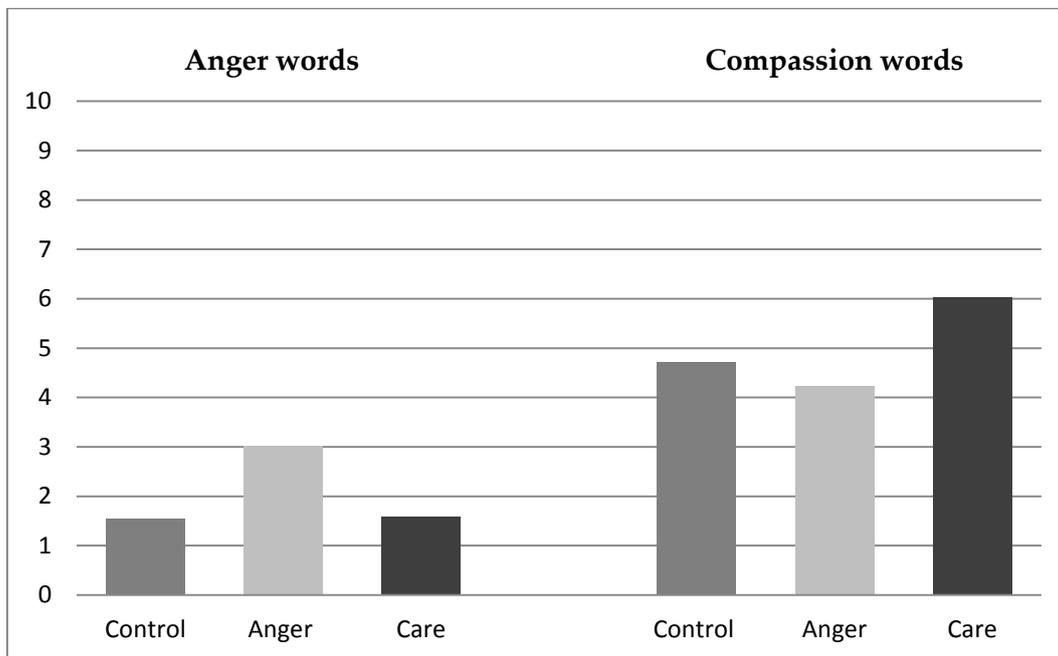
## Appendix

Description and results of the Induction method validation pilot.

Prior to the experiment reported in this article, we validated the autobiographical recall procedure intended to activate the motivational states of Anger or Compassion in subjects. This was done in a separate set of pilot sessions which used the procedures described in Section 3, but which did not involve a subsequent public goods game. Subjects were rather asked to rate the degree to which they felt a number of affect- and motivation-related adjectives described themselves following the essay writing task. This was done on pen and paper. In particular, subjects indicated with a mark on a continuous scale ranging from “not at all” on the one side to “very much” on the other, “to which degree they feel like one of the following motivations and emotions in this very moment”. Each subject rated themselves in this way for 22 adjectives. These adjectives comprised words related to anger motives (5 words), compassion motives (5), fear motives (5), achievement motives (5), as well as the two feelings happy and sad. A complete list of words can be obtained upon request, and were developed to elicit motivational states by (Chierchia et al., mimeo).

Data were collected between September and November 2016. Subjects came from the Kiel University subject pool and studied diverse subjects. In total 133 subjects participated in this pilot. Of these, 45 participated in the control treatment, 41 in the Anger induction treatment, and 44 in the Compassion induction treatment. Three of these subjects have been excluded from analysis because they did not have a sufficient command of the German language. Since each subject rated themselves along 5 different words in the motivational categories of interest, we compare the mean ratings per subject in each motivational category by means of Somers' D, which is a variant of the ranksum test accounting for clustering at the subject level. We find that the Compassion treatment increases self-reported ratings of Compassion words compared to Control at  $p = .005$ . We also find that the Anger treatment increases self-reported ratings on Anger words compared to Control at  $p < .0000$ . We therefore conclude that our autobiographical recall procedure successfully activates Anger and Compassion motives.

Figure A1: Results of autobiographical recall induction method – validation pilot



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