

Research Article

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Incentive-Induced Social Tie and Subsequent Altruism and Cooperation

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Abstract: In this paper, we studied the spillover effects of cooperative and competitive incentive schemes on subsequent decisions involving altruism and cooperation. We collected data with a laboratory experiment where subjects were asked to perform Mini Dictator games and a Public Good game after playing an incentivized real effort task. We found that cooperative incentives foster higher subsequent altruism and cooperation as compared with competitive or individual incentives. By contrast, competitive incentives induced more envy towards competitor peers and more spiteful behaviour when giving implies a larger payoff for the recipient. The effect of incentives on altruism and cooperation was moderated by relative rank in the incentivized effort task and by individual level of impulsivity.

Keywords: incentive schemes; altruism; cooperation; competition

JEL Classification: D01; D64; D91; J01; J33; M52

1 Introduction

Competitive and cooperative incentive schemes are widely used in both public and private sectors (e.g. by educational institutions, public organizations and private companies) with the aim of increasing individual performance and, as a consequence, their total output. However, in addition to affecting immediate performance as they are intended to, incentive schemes also change the nature of

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subjects' social interaction and this, in turn, has an impact on job satisfaction, commitment to an organization and turnover (Barnes et al. 2011; Chiaburu and Harrison 2008; Ducharme and Martin 2000; Morgeson and Humphrey 2006; Morrison 2004; Skaalvik and Skaalvik 2011; Taylor and Westover 2011). Thus, not only do incentive schemes have short-run effects on productivity but they may also have spillover effects on subsequent decisions that, in turn, affect future productivity. In particular, other-regarding motives, social preferences or social norms that moderate the basic selfish tendency to maximize one's own payoffs may be different towards collaborators than they are towards competitors because they represent different types of peers. The change in social preferences due to incentive-induced social tie may represent a transmission mechanism. For example, a lower pro-social attitude towards peers, at school or at work, may reduce knowledge sharing or even entail sabotage driven by envious or spiteful behaviour, with significant consequences for future productivity.

In this paper, we studied whether and to what extent incentive schemes have spillover effects on subsequent decisions involving pro-social behaviour towards a subject's peers. Our aim is to contribute to the understanding of why the *same* people are often willing to help others at a personal cost in one situation while they harm other people in other situations.

We considered three incentive schemes: the first is an individual compensation scheme involving no interaction; the second is a relative reward scheme emerging whenever workers are offered career advancements or a bonus if they perform better than their colleagues, and the third is based on aggregate performance in which workers have to cooperate for the success of the team. We compare cooperative and competitive incentive schemes with an individual compensation scheme that does not affect coworkers' relationships because collaborators and competitors represent different types of peers and we want to study whether the priming of a different social relationship can influence altruism and pro-social behaviour in an unrelated environment.

We consider pro-social behaviour as people's willingness to benefit others and cooperate even in anonymous one-shot situations with incentives to behave selfishly and no possibilities for social influence. In particular, we focus on the concept of altruism, as expressed by a willingness to give away money in Mini Dictator Games, and cooperation, as expressed by the propensity to contribute to a common pool in a Public Good Game. Altruistic behaviour is sacrificing one's resources for the benefit of other known/unknown, identifiable or otherwise, subjects. The main resource which comes to mind is money (e.g. donating money to an organization). But altruism also entails also other resources, for example time (e.g. listening to others, helping elderly people with grocery shopping bags) or body parts (e.g. donating blood, plasma or organs). Likewise, cooperation is important because the inability

to work towards a common goal and free-riding on others' cooperation are hugely costly for society, in both the short and the long term (i.e. pollution, tax fraud).

Social ties are shown to be an important factor in determining the likelihood and amount of pro-social behaviour (Frey and Meier 2004; Meer 2011). The literature shows that contribution drops with social distance (Charness and Gneezy 2008; Rachlin and Jones 2008) and increases in proportion to the perceived "deservingness" of the recipient (Eckel and Grossman 1996). Ben-Ner and Kramer (2011) compared altruism involving several categories of peers by asking subjects to play 91 Dictator Games, each toward a different recipient characterized by one particular descriptor (such as 'is from Argentina' or 'is your brother in law') and then classified by the authors as kin, potential collaborator, potential competitor or neutral peer. They show that kin are treated most generously, followed by collaborators, neutrals, and competitors.

Since peer interactions outlast the competitive/cooperative task, we are not interested in immediate productivity, but instead study the effect of incentives on subsequent decisions influenced by pro-social attitudes, with the potential to affect future productivity. Thus, our research questions were: do incentive schemes affect subsequent pro-social decisions? Does the variation in the nature of the social relationship, due to a competitive or a cooperative priming, influence pro-social behaviour towards the peer?

Our hypothesis was that cooperators would be treated more favorably than both random persons (individual compensation scheme) and competitors because teamwork should positively affect the social tie and induce a high level of attachment to the teammate. On the other hand, competitors would be treated less generously than collaborators because competition should induce hostile feelings with the competitors. As compared with a random person, competitors may be treated equally or worse depending on whether the feelings induced by a competitive social relationship are worse than pure indifference. While hypothesising a positive relationship between incentives based on team productivity and subsequent altruism and cooperation seems quite straightforward, the effect of competition is less clear-cut because pro-social attitudes towards a competitor are not necessarily lower than towards a random person and may even be strengthened by competition, for example if the recipient peer loses the tournament and the winner has equality concerns. Thus, empirical investigation in a controlled laboratory setting proves very useful.

We tested our hypothesis by conducting a laboratory experiment with three treatment conditions corresponding to the three compensation schemes used – piece-rate (Individual), equal-split-sharing-rule (Cooperative) and tournament (Competitive) – associated with the Coin Task, a real effort task which consists in recognizing the value and country of origin of a random sequence of Euro coins,

displayed on a computer screen (Gioia 2019). Altruism and attitudes towards cooperation are measured after the end of the incentivized effort task by asking subjects to perform 44 Mini Dictator Games (henceforth MDG) and a Public Good Game (henceforth PGG).

We found that participants in the Cooperative treatment show a higher level of altruism as compared both with the Individual and the Competitive treatments. By contrast, having experienced competition induces more envy towards competitor peers and more spiteful behaviour when giving implies a larger payoff for the recipient. We found a similar positive spillover of the cooperative incentive on subsequent pro-social behaviour also in terms of cooperation as individuals contribute more to a common pool shared with a cooperator.

In order to delve further into the possible drivers of our results we investigated heterogeneity by relative rank in the effort task and the individual level of impulsivity. When confronting highest and lowest performing peers, we found that giving in the Cooperative treatment was driven by the reciprocation intentions of teammates who contributed less to the group output. A cooperative social tie also reduced spiteful choices by the best performing subjects. As regards competitive incentives, winners tended to give more to losers and to contribute more to the public good when compared with the Individual treatment. As regards impulsivity, this strengthened the positive effect of cooperative incentives on the decision to give, regardless of its cost.

Studying the impact of different compensation schemes on subsequent altruism and cooperation makes three contributions to the existing economics literature. First, it offers new evidence on the consequences of implementing cooperative and competitive compensation schemes which have spillover effects on various subsequent decisions. Second, it improves our understanding of the importance of the social relationship, which should be taken into account also in circumstances where it is affected involuntarily. As a consequence, it sheds more light on the extent to which the characteristics of the environment and the social relationship can shape pro-social behaviour.

While most of the initial research on incentive schemes has focused on their impact on productivity in order to study whether they actually act as a motivation device, more recently the literature has investigated their spillovers and long-term consequences. For example, Anderson et al. (2007) highlighted that one of the negative consequences of competition between scientists is a worsening of their relationships entailing a decline in the free and open sharing of information and knowledge. On the other hand, Quigley et al. (2007) have shown that knowledge sharing and performance benefit from incentives that emphasize group performance. Borjas and Doran (2015) have shown that individual productivity increases after the loss of a competitor while positive knowledge spillovers are adversely affected by the

loss of a (high-quality) collaborator. Important contributions have also come from the peer effects literature which has studied the role of incentives on both immediate productivity and on subsequent decisions (for example involving risk) with the potential to affect future productivity, showing that when pay is based on team output there are positive peer effects, while with direct competition between workers there are negative peer effects (Brown 2011; Chan, Li, and Pierce 2014; Filippin and Gioia 2018; Gioia 2019; Herbst and Mas 2015; Smith 2013).¹

The incentives adopted in the work environment have also been found to shape social preferences. Rotemberg (1994) has shown that the strategic complementarities entailed by team production provide a necessary condition for altruism to evolve among co-workers and this, in turn, may increase future productivity. A positive relationship between cooperative incentives and social preferences has been demonstrated also by several field studies. For example, Burks, Carpenter, and Goette (2006) collected data from bicycle messengers showing that those paid on commission are more likely than those paid hourly or with cooperative incentives to be classified as egoists in a sequential prisoner's dilemma experiment. Positive spillover effects of team based incentives (and negative spillovers of more competitive work environments) have also emerged from data on fishermen (Carpenter and Seki 2005; Jang and Lynham 2015). Since our data is from a laboratory experiment in which the incentivized task is exactly the same for everyone and the incentive scheme is exogenously given, our contribution to this literature is clean and causal evidence of the spillover effects of competitive and cooperative incentives as compared with individual compensation. Most importantly, we were able to distinguish the effect of incentives on altruism, envious and spiteful behaviour and on cooperation as expressed by voluntary contribution to a public good shared with cooperators/competitors.

Our experiment is close in spirit to the work of Chen and Li (2009) who studied the effect of group identity on social preferences. Their experimental scheme included asking participants to perform five MDGs. While they induced group identity by means of painting preferences, we have modified the nature of the social relationship by priming ties that can actually arise on work environments and affect also job satisfaction and future productivity. Our aim was to simulate a real work environment in which subjects engage in relationships with other employees in their own firm with whom they may interact either competitively or cooperatively or independently of their own compensation. Our experiment also to some extent resembles the study of Guala and Filippin (2017) as regards the MDGs definition and analysis. Guala and Filippin (2017) made two important contributions to the

¹ Other experimental studies for sequential spillover effects are Cason, Savikhin, and Sheremeta (2012), Cason and Gangadharan (2013), Albert et al. (2007), and Liu et al. (2019).

study of the role of group identity on pro-social behaviour: first, they extended the space of self/other allocations used to elicit attitudes towards redistribution; second, they tested the 'social preferences' versus 'heuristic' theoretical approach to identity effects. They highlighted the importance of considering different types of games (i.e. distributive choices with a different opportunity cost for the dictator). They also suggested that group identity has a modest effect on distributive choices, which is limited to particular types of games, and that it is a framing effect, highly dependent on contextual factors that can easily be displaced by alternative decision heuristics. The authors induced group identity using a cooperative task (i.e. memorising a poem) and labeling groups as 'Blue' or 'Red'. We contributed by priming the cooperative nature of the social relationship and comparing the three types of social tie that are likely to arise in a work environment. Furthermore, since subjects interacted only via computer and all of them worked simultaneously (while in Guala and Filippin (2017) they interacted in person and the recipients waited quietly at their desks while dictators took decisions), incentive-induced tie is the only information that subjects had when deciding. In contrast with Guala and Filippin (2017), we found that when participants were more aware of the cooperative relationship linking them to the recipient, the effect of the nature of the social relationship was robust across the various types of games.

Moreover, we have also contributed to the literature studying the non-separability of economic incentives and social preferences (among others Bénabou and Tirole 2006; Bowles and Hwang 2008; Bowles and Polania-Reyes 2012; Faravelli and Stanca 2014; Kreps 1997 for a review). This literature enquired into whether and when explicit economic incentives designed to promote pro-social behaviour are actually counterproductive and less effective. When this happens, incentives and social preferences are substitutes (crowding-out). Possible mechanisms explaining this sort of interaction are that incentives may provide information about the person who implemented the incentive, they may frame the decision situation by suggesting appropriate behaviour, they may compromise the sense of autonomy, of control-averse individuals in particular, or, over time, affect the process by which people learn new preferences (Bowles and Polania-Reyes 2012). We have added to this literature by showing that commonly used compensation schemes – typically targeting a performance improvement rather than a strengthening of pro-social attitudes – do in fact affect altruism, envy, spite and cooperation among peers.

Finally, the variation in the nature of the social relationship induced by our treatments can be seen as a sort of priming whereby subjects when making their pro-social decisions receive a cue on the tie they are supposed to have with the recipient (which is called either teammate, competitor or random person) that could activate mental concepts or norms of behaviour in the particular situation. Therefore, we have also contributed to the literature using the priming technique to

study the causal effect of the environment on individual preferences. Among others, Benjamin, Choi, and Fisher (2016) and Shariff and Norenzayan (2007) studied the effect of religious identity primes on altruism; Benjamin, Choi, and Strickland (2010) used priming to analyze the effects of ethnic, racial, and gender identity norms on time and risk preferences; Cohn, Maréchal, and Noll (2015) examined the role of a prisoner's criminal identity on rule violating behaviour and Al-Ubaydli et al. (2013) studied the effects of priming participants using phrases related to markets and trade on trust.

Our research has implications for the design and evaluation of optimal compensation schemes and for related research attempting to explain why not all peers matter and some matter more than others. Our laboratory experiment mimicked work environments where co-workers are either encouraged to work together to produce the firm/institution's output or are stimulated to outperform each other for tangible (bonus, career advancement) or intangible (image, reputation) goals. Since co-workers repeatedly interact and social interaction is influenced by an individual's preferences, we have tested whether the effect of such cooperative/competitive co-workers' relationship, induced with the aim of raising productivity, spills over into decisions influenced by pro-social attitudes (e.g. knowledge sharing with the cooperative/competitive co-worker), with the potential to affect the firm/institution's future productivity. We show that the effect of the compensation schemes introduced is not limited to immediate productivity but, via change in social relationships, it spills over into pro-social attitudes. This may trigger a chain reaction affecting knowledge sharing, undermining behaviour and future productivity. Moreover, our findings are important for policy makers and private sector companies interested in fostering pro-social behaviour and suggest the potential of promoting a cooperative tie between donors and recipients.

The paper is structured into five parts. Section 2 describes our experimental design. In Section 3 we present our empirical analysis for altruism and cooperation separately. In Section 4 we offer insights into possible drivers of our results, investigating heterogeneity by relative rank in the effort task and impulsivity. Section 5 is the conclusion.

2 Experimental Design

We performed the experiment at the Behavioural Laboratory at the University of Edinburgh (BLUE), using z-Tree (Fischbacher 2007). We recruited 160 students using ORSEE software (Greiner 2015). Each student participated in a single session only and we organized a total of 9 sessions, each lasting about 45 min.

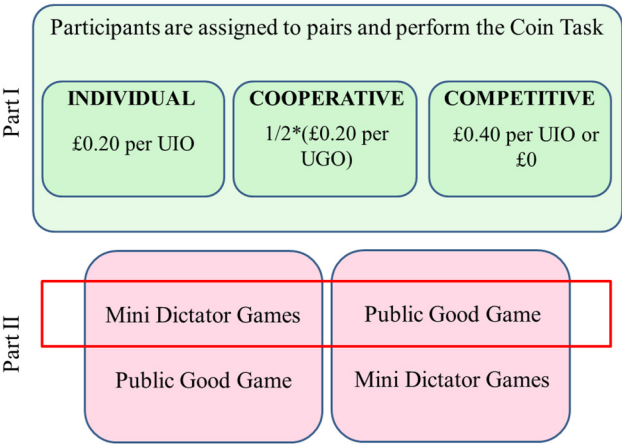


Figure 1: Structure of the experiment.

The experiment is part of a bigger experiment that also included a risk behaviour elicitation task (Gioia 2019). Here we describe only the tasks and the parts of the experiment relevant for the analysis that, for the sake of simplicity, we have called Part I and Part II, based on the order in which they appear in the experiment.²

The structure of the experiment is shown in Figure 1.

In Part I, we introduce our treatments by manipulating the compensation scheme associated with a real effort task, the *Coin Task* (Gioia 2019). Subjects are randomly paired up and peers are either random individuals (Individual incentive), teammates (Cooperative incentive) or opponents (Competitive incentive). They then performed the Euro coin recognition task with the assigned incentive scheme and, at the end, received feedback on their individual potential earnings and the score of both group members.³

In Part II, we elicited pro-social behaviour using MDGs and a PGG. The matched pairs used to define donor and recipient in MDGs and the reference group in PGG are the same as those created in part I. Participants were randomly divided into two groups and the order of the two tasks was reversed in the two groups. Even if

² In the entire experiment, these are actually Part II and Part III because there is a first part aimed at eliciting ex-ante risk preferences (Gioia 2019). See Appendix A for detailed instructions on the parts of the experiment relevant for the analysis.

³ In our setting, subjects have complete information on performance in the effort task because they can observe their own and their peer's output, even if it is irrelevant to their own payoff. As explained in Gioia (2019), in order to reduce the perceived artificiality of our individual scheme, where subjects see additional “useless” information, before reading detailed instructions for the Coin Task, all subjects are informed that, at the end of the task, they will see their earnings, their own score as well as the score of a randomly drawn participant in the session, although the score of the other person may or may not affect their earnings.

each participant performed both tasks,⁴ for each group, we used only the first type of game performed (as in the red frame in Figure 1) in order to acquire clean data and provide clean inference, avoiding any spillover of one task onto the other.

Upon entering the laboratory, participants were assigned randomly to a computer. Detailed instructions, for each part (and each relevant step) were read aloud and also displayed on the participants' computer screens and participants could ask clarifying questions. After answering the final questionnaire, participants saw on their computer screen the task selected for payment⁵ and their earnings which were paid in cash at the end of the experiment and included a £3 show-up fee.

2.1 Treatments and Effort Task

In order to induce incentive-related ties, we used a real effort task called the Coin Task (Gioia 2019), in which participants see, on their computer screens, a random sequence of both tables with Euro coins of different values from several countries showing their value and country (left-hand side) and Euro coins randomly drawn from the tables (right-hand side) and they have to recognize the value and country of origin of the randomly selected Euro coins. After confirming their choice, a new table and a new coin to identify appeared on the computer screen. Figure 2 shows participants' computer screens.

Participants had 5 min to recognize as many coins as they could and the number of coins successfully recognized within this time period represented their score. There was no penalty for wrong answers. Before they started, participants were allowed to practice the task for 1 min⁶

We decided to induce an individual/cooperative/competitive tie by means of this real effort tasks because it is simple; the outcome is easy to measure; it does not involve gender stereotypes; it does not require any preliminary knowledge or ability, as subjects may in principle get all of the answers correct, provided that they make sufficient effort; it does not involve learning and it can be performed with real

4 Having all participants perform the same number and type of tasks gave them the same earnings opportunities and the same workload and meant that the experimental session lasted the same time for all participants.

5 Since the experiment involved four tasks, we decided to pay only for one of them, randomly selected, in order to reduce possible hedging between tasks. If the Coin Task was selected for payment for one of the competitors/teammates, it was used to determine the payment of both of them. This with the aim of implementing the 'common fate' condition that is generally considered to be an important determinant of group identity (Brewer and Kramer 1986; Zizzo 2011), and, in the Cooperative treatment, also in order to foster coordination to achieve a common goal. Likewise, in all treatments, for the PGG and the MFG, where one out of the 44 decisions was randomly selected and one member of the pair was randomly chosen to play the role of the dictator.

6 Performance during this practice period does not affect subjects' earnings.

Please select the Country and the Value of the following Euro Coin

2
Kosovo

1
Netherlands

2
Italy

1
Luxembourg

2
Malta

2
Vatican City

1
Monaco

2
San Marino

1
Slovakia

2
Greece

1
Lithuania

1
Austria

2
France

2
Cyprus

2
Belgium

2
Portugal

1
Finland

1
Ireland

1
Andorra

2
Vatican City

1
Germany

2
Lithuania

2
Slovenia

1
Vatican City

2
Spain

2
Country:

☐ Andorra

☐ Austria

☐ Belgium

☐ Cyprus

☐ Estonia

☐ Finland

☐ France

☐ Germany

☐ Greece

☐ Ireland

☐ Italy

☐ Latvia

☐ Lithuania

☐ Luxembourg

☐ Malta

☐ Monaco

☐ Netherlands

☐ Portugal

☐ San Marino

☐ Slovakia

☐ Slovenia

☐ Spain

☐ Vatican City

Value:

☐ 0.01

☐ 0.02

☐ 0.05

☐ 0.1

☐ 0.2

☐ 0.5

☐ 1

☐ 2

CONFIRM

Figure 2: Effort task.

money and outside of the lab for field studies, as in the study of Belot and Schröder (2013, 2016).

Table 1 describes the compensation scheme used for each treatment. Fifty-four subjects, corresponding to 27 groups (i.e. pairs of subjects), participated in the Individual and Competitive treatments and 52 subjects, corresponding to 26 groups, in the Cooperative treatment. Subjects were randomly assigned to perform either the MDGs or the PGG first. In all treatments, 24 subjects' first game was the battery of MDGs while 30 subjects participating in the Individual and Competitive treatments and 28 subjects assigned to the Cooperative treatment started Part II by playing the PGG.

In the *Individual* treatment, participants received £0.20 per correctly identified coin.

In the *Cooperative* treatment, both members of the pair contributed to the subject's earnings determination. The two formed a team and shared the money earned equally between them. The team's output was the sum of the number of correct answers of the two members, and each teammate earned £0.10 for each correct team answer.

Table 1: Treatments of the experiment.

	Pay scheme	N. of sessions	N. of subjects	N. of groups	MDGs first (subjects)
Piece rate (individual)	£0.20 per UIO	3	54	27	24
Equal-split-sharing-rule (cooperative)	$1/2 \times (\text{£}0.20 \text{ per UGO})$	3	52	26	24
Tournament (competitive)	£0.40 per UIO or £0	3	54	27	24

Note: UIO denotes unit of individual output; UGO denotes unit of group output; output denotes the number of correctly identified coins.

In the *Competitive* treatment, participants in the pair were opponents so that, within each pair, the subject with the highest score earned £0.40 for each correct answer, while his/her competitor got £0. In the case of a tie between group members, winners were randomly selected and others earned nothing.⁷ As compared to the individual and cooperative incentive schemes, competitive incentives entail important differences in payoffs between competitors because the subject with the lowest performance obtains £0. To take into account this potential confounding factor, in Appendix B we show that our results are robust when the competitive incentive is compared with a control condition that produces similar payoff differentials but does not have a competition element to it.

To increase the saliency of the cooperative/competitive nature of peer interaction, both in the instructions and in the on screen information we referred to peers as “teammates” or “competitors” in the *Cooperative* and *Competitive* treatments, respectively, and used “other person” in the *Individual* treatment.

During the 5 min that the effort task lasts, participants try to identify on average about 28 coins; they correctly identify about 25 coins while the identification of about 2 coins is incorrect. As shown in Gioia (2019), none of the variables representing the outcomes of the effort task is significantly different across treatments.

2.2 Mini Dictator Games

In order to study how different social relationships induced by the incentive scheme in a preceding task affected other-regarding motives we elicited altruism using MDGs.

⁷ Pay in the *Competitive* treatment was designed in such a way that, for a given performance, a subject with a 50 % chance of winning the tournament earned the same expected payoff from the tournament as from the piece-rate scheme.

MDGs are a variant of the standard dictator game: the decision-maker is presented a finite set of self/other allocations of monetary payoffs and has to decide its preferred allocation.⁸

We chose to include MDGs because, by forcing subjects to choose between two options, they allow a better control over the opportunity set and help to extend the scope of the dictator game in both range of payoffs and cost of giving terms. Moreover, since the dictator has to decide between predetermined options, his choice is not framed as *giving* or *taking* and is thus less sensitive to demand effects than standard or modified dictator games.⁹ This is especially true when dictators play several MDGs presented in random order.

In our experiment, subjects played 44 MDGs. In each MDG, subjects were presented with two self/other money payoff allocations (in Euro), such as: Option A: (9,7) and Option B: (7,8) where, for each option, the first figure in brackets is the dictator's payoff, while the second figure corresponds to the recipient's payoff, i.e. the other member of the pair created in Part I. For example, if the dictator chose A he or she got a higher payoff while, if he or she chose B, he decided to benefit the recipient of €1 incurring a €2 cost. We informed participants that the chosen allocation could not be challenged by the recipient and that the choices made would not be disclosed to the recipient with anonymity being maintained both during and after the experiment. Figure 3 shows participants' computer screens.

To establish the 44 choices, we defined the opportunity cost and, hence, the type of MDGs, by following Guala and Filippin (2017).¹⁰ Unlike them, we balanced the number of games for each typology and varied the opportunity cost within spite games. Furthermore, we varied the magnitude of the difference in the dictator's (and in turn recipient's) payoff between allocations across games.

A full list of the games used in our experiment is shown in Table 5 in Appendix C. For the sake of simplicity the Table always shows the option which

⁸ In a standard dictator game two players share a sum of money (provided by the experimenter or earned in previous tasks). One player plays an entirely passive role while the other, the dictator, has to decide the size of the shares. According to standard economic theory, a perfectly rational dictator who only cares about his own payoff should keep 100 % of the cake, and give nothing to the other player since the latter can only accept the proposed division. Nevertheless, evidence from experimental studies demonstrates that many subjects give a strictly positive amount to the recipient and this is usually interpreted as proof that the decision-making process is not driven only by selfish motives but also by other-regarding motives, social preferences, or social norms (Camerer 2003). Another variant of the standard dictator game is the *modified* dictator game, where the cost of giving can be lowered or raised at will instead of being unitary.

⁹ A vast literature shows that observed allocations in the dictator game vary significantly depending on the 'giving' or 'taking' framing of the dictator's decision (Bardsley 2008; List 2007).

¹⁰ Chen and Li (2009) also use MDGs with two available allocations to choose from.

Figure 3 displays three screenshots of the MDG (Money Decision Game) interface, each showing a decision point for a subject. The interface is titled "Decision 1 out of 44" in the top right corner.

Top Screenshot (Other Person Treatment): The instruction is "Please choose one of the two allocations of money by clicking on the corresponding button". Option A shows "YOU = £9" and "OTHER PERSON = £8". Option B shows "YOU = £12" and "OTHER PERSON = £5".

Middle Screenshot (Teammate Treatment): The instruction is "Please choose one of the two allocations of money by clicking on the corresponding button". Option A shows "YOU = £9" and "YOUR TEAMMATE = £8". Option B shows "YOU = £12" and "YOUR TEAMMATE = £5".

Bottom Screenshot (Competitor Treatment): The instruction is "Please choose one of the two allocations of money by clicking on the corresponding button". Option A shows "YOU = £9" and "YOUR COMPETITOR = £8". Option B shows "YOU = £12" and "YOUR COMPETITOR = £5".

Figure 3: MDGs in each treatment.

maximizes the dictator's payoff under label *A* and orders the MDGs by type. However, the order in which the MDGs were displayed to all subjects is assigned randomly in the experiment, as reported by the variable *Round*.¹¹ Also, the labels of the options (*A* or *B*) are randomized between subjects. Table 2 summarises game

¹¹ The variable *Round* takes values from 1 to 44 and captures the evolution of the task (low values of the variable represent the first MDGs displayed to the subject while higher values indicate that the task is approaching the end).

Table 2: Mini dictator games.

Type	Number of games	Favourable	Unfavourable	Round	$\pi_d A$	$\pi_r A$	$\pi_d B$	$\pi_r B$	$\pi_d B - \pi_d A$	$\pi_r B - \pi_r A$	Opportunity cost
<i>Expensive Giving</i>	9	6	3	43	9	7	7	8	-2	1	-2
				20	9	9	8	9.5	-1	0.5	-2
				16	13	8.5	10	10	-3	1.5	-2
<i>Zero Sum Giving</i>	9	4	5	11	7.5	7	5.5	9	-2	2	-1
				23	9	8	8	9	-1	1	-1
				26	12	4.5	9	7.5	-3	3	-1
<i>Cheap Giving</i>	9	4	5	29	7	8	6	10	-1	2	-0.5
				31	8	8	6	12	-2	4	-0.5
				3	13	3.5	10	9.5	-3	6	-0.5
<i>Envy</i>	9	4	5	34	8	6	8	9	0	3	0
				32	9	5	9	7	0	2	0
				2	7	8	7	9	0	1	0
<i>Spite</i>	8	3	5	12	7	7.5	8	9	1	1.5	0.67
				7	6.5	7	8.5	11	2	4	0.5
				15	7	8	9	11	2	3	0.67
				5	7	7	8	9	1	2	0.5

characteristics and gives some examples of the self/other allocations participants were asked to choose between.

Like Guala and Filippin (2017), we have five types of MDGs.¹² In *giving* games, dictators face a trade-off between their own payoff and recipient's payoff. The relative price of giving is equal to one (every cent to the recipient costs one cent to the dictator) in *Zero-sum Giving* games; it is greater than one (2) in *Expensive Giving* games, and it is less than one (0.5) in *Cheap Giving* games. In *Envy* games, recipient's payoff can be increased or decreased at no cost to dictators; as dictator payoffs are the same in both allocations, choosing an allocation in which the recipient has a lower payoff (not giving) may be interpreted as envy. Finally, in *Spite* games giving is beneficial to both recipients and dictators; if they choose not to give dictators behave spitefully because they are reducing recipient payoffs of a given amount by reducing their earnings by half or two thirds of that amount. Research has shown that some people exhibit spiteful or envious behaviour (Falk, Fehr, and Fischbacher 2005). These people always value recipients' material payoffs negatively and are therefore willing to decrease recipient payoffs even at a personal cost to themselves (Kirchsteiger 1994; Mui 1995), irrespective of the payoff distribution and recipients' fair or unfair behaviour. We used 9 games for each type except for *Spite*, for which we have 8 games.

On the basis of inequalities in the payoffs, the games can be further categorised into *Favourable* games, when the dictator's payoff is larger than the recipient's payoff in both allocations, and games where altruism is *Unfavourable* to the dictator because giving implies a strictly larger payoff for the recipient.

By eliciting altruism with this set of games we can study how the incentive experienced in a preceding task affects choices, depending on the type of giving and on the relative rank in dictator's and recipient's payoffs.

2.3 Public Good Game

The PGG is a game used for describing situations that require people to cooperate to achieve a goal considered to be beneficial to all. Therefore, in addition to altruism, we also used the PGG as a distributive choice for cooperation measurement purposes. Since one of the incentives experienced in the preceding task was cooperative in nature, measuring cooperation in the PGG allowed us to study whether incentive

¹² See Guala and Filippin (2017) for an intuitive representation of the game types on a graph with the dictator's payoff on the vertical axis and the recipient's payoff on the horizontal axis.

effects are long lasting and whether this cooperative tie fosters more cooperation than an individual or competitive social relationship.¹³

In the PGG, participants were given an endowment of £10 and told to choose how to allocate this money between a private and a public account. The public good was the sum of the contributions of both group members to the public account. This amount of money was multiplied by 1.4 and divided equally between the 2 participants as returns from the public account. Thus, contributing £1 to the public good yielded a private marginal return of 0.7 and the social marginal benefit was 1.4.¹⁴ Individual returns from the private account were simply the amount of money invested in the account and individual earnings were computed as the sum of the amount of money invested in the private account plus the return from the public account. A subject's contribution to the public account represents their pro-social behaviour.

In this case, too, participants were informed that the chosen allocation would not be disclosed to the other group member, maintaining anonymity both during and after the experiment. Figure 4 shows participants' computer screens.

Your endowment is £10.00

Please write the amount of money that you want to allocate to each account and press the button OK to confirm your choice

Please round the amounts to the first decimal place and remember that they should add to 10.00

PRIVATE ACCOUNT

£

PUBLIC ACCOUNT

£

Figure 4: Public Good Game.

¹³ The cooperative behaviour observed in the PGG may be induced by several factors, such as altruism, warm-glow from giving to the public good, beliefs on contribution levels and reciprocity towards group members' expected contribution. The question why people cooperate in such social dilemma situations has been extensively investigated in the literature and is beyond the scope of this paper.

¹⁴ The prediction of standard assumptions is that both group members free ride completely, leading to a socially inefficient outcome.

3 Results

In this section, we will first look at the role of incentives-induced social tie on subjects' altruism by using choices made in the MDGs (Section 3.1). We will start by looking at aggregate data by treatment, then, to delve deeper into the motives driving dictators' behaviour, across treatments, we will examine the types of games offering similar opportunity costs and, finally, within each type of game, we will distinguish between favourable and unfavourable inequality. Graphic and non-parametric analysis will be followed by multivariate analysis to look at the main determinants of behaviour across treatments and by type of game.

We found that a cooperative social relationship, arising from a previously performed task whose earnings divide up the group payoff equally, significantly increased altruism compared with a control condition where there was no previous interaction between group members and a treatment inducing competitive ties. Results were robust across all types of game, above all when altruism was favourable to the dictator because his/her payoff was larger than the recipient's payoff also in the giving option. In this case, it is only in *Spite* games that no treatment effect is visible. By contrast, in cases of unfavourable inequality, incentive-induced social tie had no statistically significant differentiated effects in the case of *Expensive Giving* games.

In Section 3.2 we will shift our investigation in the direction of cooperation and present data from the PGG to look at the effect of incentive-induced social tie on the choice of how much to contribute to a common pool. Again, we found evidence of positive spillovers from Cooperative treatment: the distribution of the contribution to the public account in the Cooperative treatment is to the right of and statistically significantly different from the distributions of the other two treatments.

3.1 The Effect of the Incentive Scheme on Subsequent Altruism (MDGs)

In this section we will investigate whether cooperative and competitive social relationships induced by the incentive scheme experienced in a preceding effort task affect a subject's altruism towards teammates/competitors to a different extent than a control condition where altruism is random. In the graphic analysis, the horizontal line represents the level of aggregation of the data while the vertical line represents the frequency with which the most favourable option for the recipient is chosen. 95 % confidence intervals are reported. * = 0.1, ** = 0.05 and *** = 0.01 are (1-sided) significance thresholds obtained with Fisher's exact tests while the arrows point to the groups between which the test is conducted. We have 24 independent observations and 1056 decisions for each treatment.

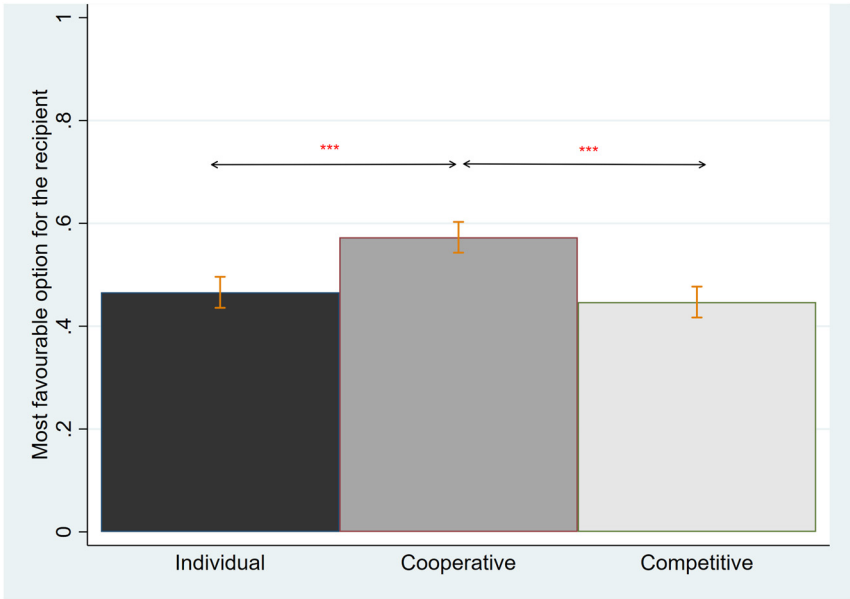


Figure 5: Mini Dictator Games: all.

Figure 5 shows that having performed an effort task with cooperative incentives makes respondents significantly more likely to select the most favourable option for the *teammate* recipient. By contrast there is no statistically significant difference in subjects' altruism towards a competitor or a random person.

Aggregating all MDGs, however, may mask important heterogeneity if the induced social tie interacts with the motives that drive a dictator's behaviour. For example, a spiteful decision may be more likely to happen towards a competitor than a teammate. Thus, in Figures 6–8 our data is disaggregated by game and inequality type within each type of game. Starting from the left-hand side of each figure, games are shown in order of decreasing cost of altruism. In *Expensive Giving*, *Zero-sum Giving* and *Cheap Giving* games, benefitting recipients required dictators to pay costs which were, respectively, twice as big as the donated amount, of the same size of the donated amount and half its size. In *Envy* games, choosing the most favourable option for the recipient costs dictators whose payoff is the same in both allocations nothing, while in *Spite* games the most favourable option for the recipient is also the most favourable for the dictator, however, since the marginal increase in payoff between allocations is bigger for the recipient than for the dictator, the latter may choose not to give out of spite.

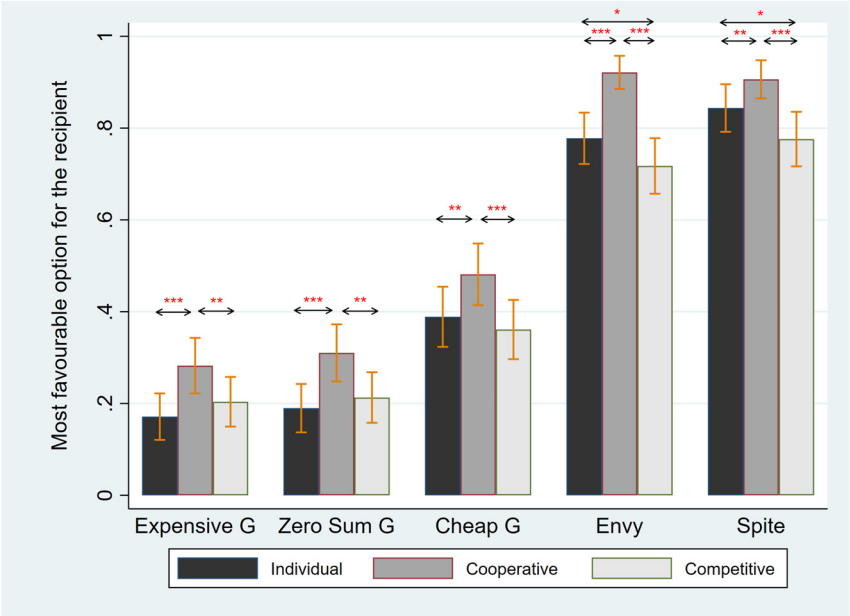


Figure 6: Mini Dictator Games: by type.

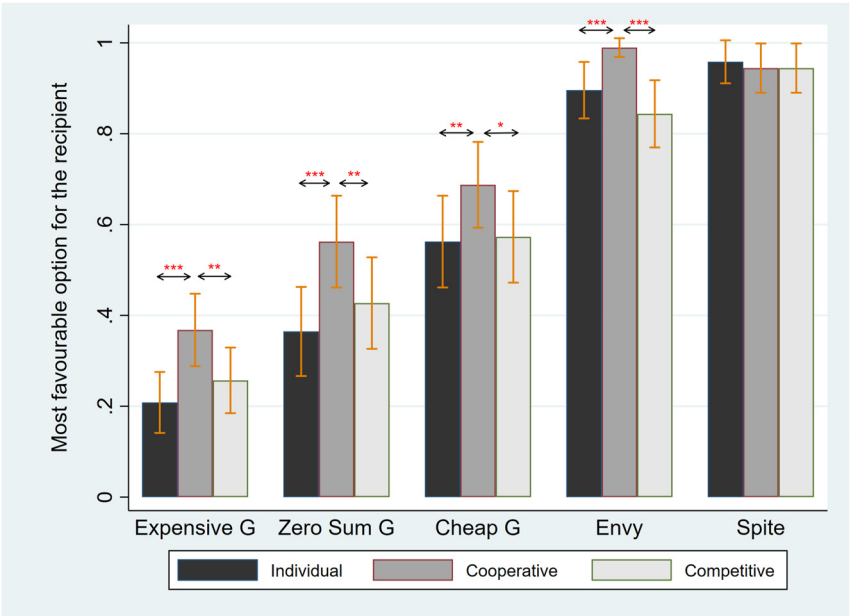


Figure 7: Mini Dictator Games: by type, only favourable.

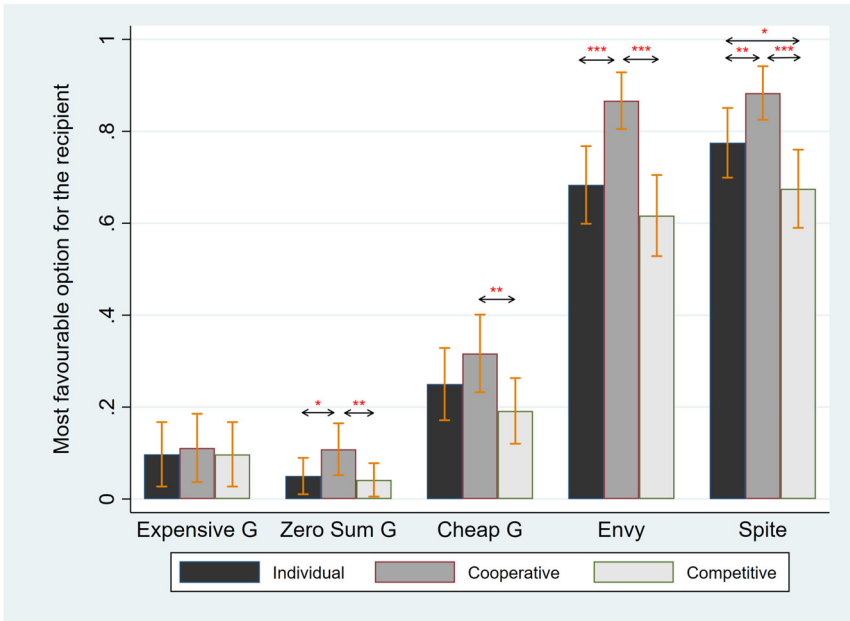


Figure 8: Mini Dictator Games: by type, only unfavourable.

Figure 6 shows that the fraction of dictators making altruistic choices regarding teammates is always significantly bigger than the fraction of dictators deciding to choose the most favourable option for randomly selected participants or competitors. Thus, compared with individualistic and competitive incentive schemes, cooperative incentives have positive externalities not only in terms of higher giving but also in terms of lower levels of envious and spiteful behaviour towards teammates. By contrast, competitive incentives have the lowest share of dictators selecting the most favourable option for the recipient in *Envy* and *Spite* games thus suggesting that competition increases envious and spiteful behaviour not only compared with a cooperative social tie but also compared to a condition in which the recipient is just a randomly selected person.¹⁵

To delve deeper into dictators' behaviour, we also divided up the games by relative dictator and recipient payoff rank. When inequality was favourable to the dictator, who obtained a payoff larger than the recipient's in both allocations (Figure 7), incentives-induced social tie had no effect on dictators' choice in *Spite*

¹⁵ This result is in line with some research showing that competitive pressure may adversely affect moral behaviour and create incentives for unethical practices such as child labour or corruption (Falk and Szech 2013; Huber et al. 2023; Shleifer 2004).

games while the Cooperative treatment had the highest share of dictators making altruistic choices in all other types of game. On the other hand, in unfavourable inequality games (Figure 8), dictators seemed overall less likely to choose the altruistic option. Moreover, participants in the Cooperative treatment were more likely than participants in the Competitive treatment to choose the giving option, where the payoff of the recipient was larger, in all but *Expensive Giving* games where there was no treatment effect. When compared with the Individual treatment, they were more likely to choose the most favourable option for the recipient in all but *Expensive Giving* and *Cheap Giving* games. Interestingly, when their payoffs were larger in both allocations dictators were almost never spiteful, but when inequality was unfavourable to dictators, they behaved spitefully, especially towards competitors.

Overall, our data suggests that dictators' choices are influenced both by the cost of giving and by relative payoff rank concerns. Thus, it is important and revealing to explore the set of possible dictator choices by using several MDGs. Importantly, incentive schemes have externalities on altruism: cooperative incentives entail higher levels of altruism, a result which is quite robust across game and inequality type; competitive incentives, on the other hand, tend to entail more envious and spiteful behaviour, the latter especially when the inequality in dictator-recipient payoff is unfavourable to the dictator.

We supplemented our graphic analysis with an econometric investigation. We followed the identification strategy proposed by (Guala and Filippin 2017) and regressed the probability of choosing the left option in each choice¹⁶ on three payoff features: variations in dictator payoff between options (*Self*); variations in recipient payoff (*Alt*)¹⁷ and the positive/negative/null inequality in the dictator-recipient payoff in (the arbitrarily chosen) Option A (*Posdiff*, *Negdiff*, *NodiffA*) as well as perfect equality of payoffs in Option B (*NodiffB*). As regards explanatory variables we also included interaction terms between the main features of the choices and a time trend (*Round*). This control is important because subjects' choices may differ conditioning on the round in which the choice takes place. In columns (1)–(3) we estimated a linear probability fixed effects model to control for any observable and unobservable individual characteristics and to enable us to interpret the coefficients in terms of percentage changes. Since ours was a binary dependent variable, we also estimated a fixed effects Logit model in column (4) and a random effects

¹⁶ Had we chosen the variable indicating the most favourable option for the recipient, most of the effect of the *Alt* coefficient would have been captured by the constant (see Guala and Filippin 2017). Importantly, the position of the options was randomized at the subject level therefore the left option does not always coincide with the A option in Tables 2 and 5 where, for the sake of simplicity, we always show the option which maximizes the dictator's payoff under label A.

¹⁷ *Self* and *Alt* are computed as payoff in Option A minus payoff in Option B.

Probit model in column (5).¹⁸ For the sake of parsimony we did not include the interaction terms between the time trend and payoff inequality in our specifications because they are not statistically significant, and including them does not improve the explanatory power of our specification nor affect the other estimated coefficients.¹⁹

The estimation results are shown in Table 3, column (1). The results are very similar to the evidence presented by (Guala and Filippin 2017): both *Self* and *Alt* increase the probability of choosing a given option, however the effect of the variation in participants' own payoff is twice as big as the effect of the variation in the payoff of the other player (14.39 % vs. 6.95 % for every euro of difference in the payoff between Option A and Option B). Selfishness increases (and altruism decreases) as the task proceeds with further rounds. Finally, differences in the payoff reduce the probability of choosing a given option, especially unfavourable differences, and equality in the payoff of the other option increases the likelihood of preferring it.²⁰

In column (2), in order to delve deeper into treatment effects, we allowed the impact of our variables to vary with treatment status.²¹ Just as in the graphic analysis, the estimate shows that, while selfishness/altruism does not differ when the other person is a stranger or a competitor, the Cooperative treatment makes altruism more likely than the Individual treatment ($Alt \times Cooperative = 2.33\%$, $p\text{-value} = 0.109$) and the Competitive treatment ($2.33 + 1.55 = 3.88\%$, $p\text{-value} = 0.008$). The results are even more marked in column (3), where we allow the treatment effect to vary over time: the Cooperative treatment boosts altruism especially in the first rounds, while the effect weakens as the task approaches the end.

In columns (4) and (5) we estimated the complete specification reported in column (3) by using a fixed effects Logit model and a random effects Probit model, respectively. Our main results held.

To parallel our graphical analysis, Table 4 will study the effect of our treatments on selfishness/altruism separately by type of game. In the first three columns we consider *Giving* games. Within each type of giving game, we have introduced some variance in the – between options – change of dictator's payoff. This enables us to study the effect of the treatments on selfish/altruistic behaviour for each type of game. However, since there is a perfect negative correlation in all *Giving* games

¹⁸ In all our estimates standard errors are clustered at the subject level. The only exception is the estimate in column (4) because the estimation of the fixed effects Logit model does not allow clustered standard errors.

¹⁹ A similar approach is followed by (Guala and Filippin 2017).

²⁰ Figure 19 in Appendix C shows, for each treatment, the share of Option B depending on the inequality in the payoff of the dictator and the recipient in the chosen option.

²¹ We exclude the interaction variables with inequality from the model in one of the two options because they are not statistically significant.

Table 3: Mini dictator games: choice of the left option.

	Linear probability model			FE logit model	RE probit model
	(1)	(2)	(3)	(4)	(5)
<i>Self</i>	0.1439*** (0.0142)	0.1598*** (0.0204)	0.1548*** (0.0285)	0.6381*** (0.1121)	0.3943*** (0.1060)
<i>Alt</i>	0.0695*** (0.0092)	0.0670*** (0.0122)	0.0630*** (0.0144)	0.2207*** (0.0682)	0.1386*** (0.0447)
<i>Self</i> × <i>Round</i>	0.0010** (0.0004)	0.0010** (0.0004)	0.0012 (0.0008)	0.0224*** (0.0056)	0.0104** (0.0054)
<i>Alt</i> × <i>Round</i>	−0.0004* (0.0002)	−0.0004* (0.0002)	−0.0002 (0.0003)	0.0092*** (0.0035)	0.0041 (0.0027)
<i>Posdiff</i>	−0.0430*** (0.0063)	−0.0429*** (0.0062)	−0.0429*** (0.0062)	−0.2224*** (0.0298)	−0.1331*** (0.0204)
<i>Negdiff</i>	−0.0755*** (0.0079)	−0.0756*** (0.0079)	−0.0757*** (0.0079)	−0.4219*** (0.0484)	−0.2548*** (0.0298)
<i>NodiffA</i>	0.0193 (0.0213)	0.0189 (0.0215)	0.0192 (0.0214)	0.3438** (0.1498)	0.1791*** (0.0702)
<i>NodiffB</i>	−0.1171*** (0.0254)	−0.1176*** (0.0256)	−0.1172*** (0.0255)	−0.8742*** (0.1431)	−0.4529*** (0.0961)
<i>Self</i> × <i>Cooperative</i>		−0.0259 (0.0248)	0.0028 (0.0388)	0.2162 (0.1595)	0.1022 (0.1500)
<i>Self</i> × <i>Competitive</i>		−0.0218 (0.0262)	−0.0356 (0.0433)	−0.1676 (0.1456)	−0.1011 (0.1455)
<i>Alt</i> × <i>Cooperative</i>		0.0233 (0.0144)	0.0409** (0.0197)	0.3095*** (0.1047)	0.1692** (0.0776)
<i>Alt</i> × <i>Competitive</i>		−0.0155 (0.0149)	−0.0210 (0.0213)	−0.0902 (0.0905)	−0.0542 (0.0640)
<i>Self</i> × <i>Coop</i> × <i>Round</i>			−0.0013 (0.0009)	−0.0168** (0.0076)	−0.0074 (0.0062)
<i>Self</i> × <i>Comp</i> × <i>Round</i>			0.0006 (0.0011)	−0.0017 (0.0074)	0.0001 (0.0066)
<i>Alt</i> × <i>Coop</i> × <i>Round</i>			−0.0008** (0.0004)	−0.0082* (0.0050)	−0.0039 (0.0034)
<i>Alt</i> × <i>Comp</i> × <i>Round</i>			0.0002 (0.0005)	−0.0024 (0.0047)	−0.0009 (0.0038)
Observations	3168	3168	3168	3168	3168
Adjusted R-squared	0.292	0.302	0.302		

*, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

between the change in the payoffs of the two players, we have included only *Self* and the corresponding interactions in the specification and the specular estimates obtained when *Alt* and its interaction terms were included are shown in curly brackets.

Table 4: Mini dictator games by type: choice of the left option.

	Expensive giving (1)	Zero sum giving (2)	Cheap giving (3)	Envy (4)	Spite (5)
<i>Self</i>	0.1619*** (0.0225)	0.1260*** (0.0160)	0.0636** (0.0311)		{0.2719***} {(0.0238)}
<i>Self</i> × <i>Cooperative</i>	−0.0624* (0.0320)	−0.0532* (0.0271)	−0.0446 (0.0430)		{0.0057} {(0.0327)}
<i>Self</i> × <i>Competitive</i>	−0.0159 (0.0325)	−0.0076 (0.0270)	0.0084 (0.0410)		{−0.0027} {(0.0315)}
<i>Posdiff</i>	−0.0662*** (0.0148)	−0.0795*** (0.0100)	−0.0476*** (0.0085)	−0.0786*** (0.0192)	
<i>Negdiff</i>	−0.1978*** (0.0355)	−0.1396*** (0.0135)	−0.0920*** (0.0111)	−0.0452*** (0.0163)	
<i>Alt</i>	{−0.3239***} {(0.0450)}	{−0.1260***} {(0.0160)}	{−0.0318**} {(0.0156)}	0.1066*** (0.0210)	0.1480*** (0.0125)
<i>Alt</i> × <i>Cooperative</i>	{0.1247*} {(0.0640)}	{0.0532*} {(0.0271)}	{0.0223} {(0.0215)}	0.0483* (0.0246)	0.0007 (0.0181)
<i>Alt</i> × <i>Competitive</i>	{0.0317} {(0.0651)}	{0.0076} {(0.0270)}	{−0.0042} {(0.0205)}	−0.0322 (0.0332)	−0.0029 (0.0173)
<i>Alt</i> × <i>Unfavourable</i>					−0.0429** (0.0199)
<i>Alt</i> × <i>Cooperative</i> × <i>Unfavourable</i>					0.0453* (0.0240)
<i>Alt</i> × <i>Competitive</i> × <i>Unfavourable</i>					−0.0226 (0.0315)
<i>Self</i> × <i>Unfavourable</i>					{−0.0722**} {(0.0336)}
<i>Self</i> × <i>Cooperative</i> × <i>Unfavourable</i>					{0.0709} {(0.0405)}
<i>Self</i> × <i>Competitive</i> × <i>Unfavourable</i>					{−0.0487} {(0.0540)}
Observations	648	648	648	648	576
Adjusted R-squared	0.308	0.357	0.142	0.421	0.470

*, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively. Since there is a perfect negative correlation in all *Giving* games between the change in the payoffs of the two players, only *Self* and the corresponding interactions are included in the specification. The specular estimates obtained when *Alt* and its interaction terms are included are shown in italic in curly brackets. In column 5, for *Spite* games, we have estimated only the effect of the variation in the recipient's payoff in the main specification and the corresponding estimate obtained when considering the effect of the variation in the dictator's payoff are shown in italic in curly brackets.

The data shows that the positive effect of the change in a participant's own payoffs on the probability of choosing a given option is about 16 % for every euro of difference in the case of *Expensive Giving* games (column 1); it drops to about 13 % for *Zero Sum Giving* games (column 2) and shrinks to about 6 % in *Cheap Giving* games (column 3).²² Importantly, the positive spillover of having performed a task under a cooperative incentive is confirmed above all for *Expensive Giving* (−6.24 %) and *Zero Sum Giving* games (−5.3 %) while it is still meaningful in size (−4.5 %) but less precisely estimated for *Cheap Giving* games. As expected, the coefficients in curly brackets show that the estimated effects when considering the change in the other person's payoff are of the opposite sign and twice as big/of the same size/halved in *Expensive Giving/Zero Sum Giving/Cheap Giving* games, respectively.

In column (4) we will turn our attention to *Envy* games. In such games, dictators earn the same payoff in both options (thus, we do not control for *Self*) and can decide whether to increase the recipient's payoff at no cost. Decisions not to do this suggest envy of increased recipient payoff. We see that altruism exerts a significant positive effect which is significantly amplified when the subjects potentially benefiting (for free) are cooperators rather than random individuals or competitors. Dictators also react negatively to increases in the difference in payoffs, especially when they are positive.

Finally, in column (5) we will look at *Spite* games. As for the three types of giving games, there is a strong (positive) correlation between the change in the dictator's payoff and the corresponding change in the recipient's payoff in *Spite* games, too ($\rho = 0.9899$, p -value = 0.0000). Thus, we have estimated only the effect of the variation in the recipient's payoff in the main specification and the corresponding estimate obtained when considering the effect of the variation in the dictator's payoff are shown in curly brackets. In order to econometrically test the insights emerging from the graphic analysis, where treatment effects are null in the event of favourable inequality,²³ we compare treatment effects on altruism between choices involving favourable and unfavourable inequality (to the dictator). The data shows that, for favourable inequality games, where the dictator's payoff is larger than

²² When considering all giving games in the same estimate and including the interaction terms between *Self* and the type of game (*Expensive Giving* and *Zero Sum Giving*) we find that the interaction terms are positive and statistically significant.

²³ Since the graphic analysis shows null treatment effects also for *Expensive Giving* games in the event of unfavourable inequality, we also tested heterogeneity by type of inequality for these game types by running the same regression presented in column (1) including the interaction terms between *Unfavourable* and *Self/Alt*, *Self* × *Cooperative/Alt* × *Cooperative* and *Self* × *Competitive/Alt* × *Competitive*. As figures show, in cases of favourable inequality altruism is significantly higher towards teammates while there are no treatment effects when the inequality is unfavourable to the dictator.

the recipient's payoff in both options, the probability of dictators choosing a given option A increases by 14.8 % for every Euro of difference in the recipients' payoff between option A and B and the magnitude of the effect does not vary across treatments. However, when considering games involving unfavourable inequality, that is games where giving implies a strictly larger payoff for recipients, altruism significantly decreases (hence spiteful behaviour significantly increases) by about 4.3 % in the Individual treatment and by about 6.6 % ($-0.0429 - 0.0226 = -0.0655$, p -value = 0.009) in the Competitive treatment while it does not vary in the Cooperative treatment.²⁴

3.2 The Effect of the Incentive Scheme on Cooperation (PGG)

In this section we will turn our attention to cooperation, as expressed by the willingness to contribute to a public good. This type of pro-social behaviour is of paramount importance in work environments. In fact, a less cooperative attitude may translate into lower willingness to share working time, knowledge or even tools and equipment with colleagues.

When average contribution to the public good is looked at, we find that overall participants decided to contribute about £4.30. This figure is significantly higher in the Cooperative treatment where participants decided to allocate on average about £5.25 to the public account as compared with the Competitive treatment (average allocation £4.42, p -value = 0.003) and the Individual treatment (average allocation £3.33, p -value = 0.030). By contrast, there is no statistically significant difference in social preferences between the Competitive and Individual treatments.

Figure 9 plots kernel density estimates separately by treatment and reports the significance level of the Epps–Singleton characteristic function test (ES) and of the two-sample Kolmogorov–Smirnov equality-of-distributions test (KS). The data shows that the null hypothesis that the distribution of the Cooperative treatment is equal both to the distribution of the Competitive treatment and to the distribution of the Individual treatment can be rejected.

All in all, we found that after experiencing cooperative incentives, individuals are significantly more willing to cooperate by contributing their own resources to a public good shared with the cooperator. Thus, cooperative incentives seem to trigger a virtuous circle by fostering a positive group belonging that enhances pro-social behaviour and, in turn, benefits not only the individuals but also the organization.

²⁴ All our results are robust if the interaction term between *Alt (Self)* and *Round* are included in the controls except that the magnitude of the *Alt (Self)* coefficient reduces as compared with the average effect and in columns (3) and (5) it is less precisely estimated. When included, the interaction term with the round has a positive and statistically significant effect.

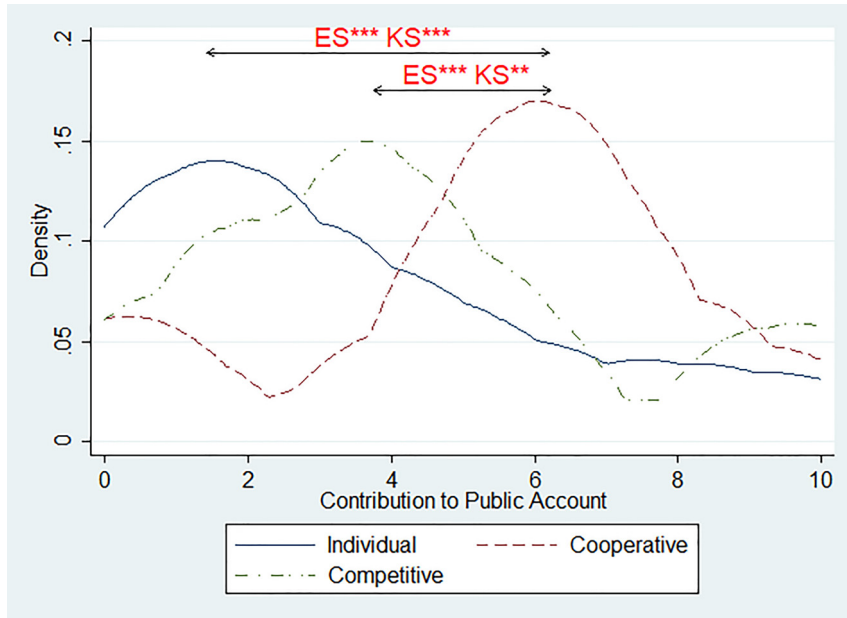


Figure 9: Public Good Game.

As far as competitive incentives are concerned, these do not seem to harm social attitudes as expressed by contribution to a public good because competitors are treated in the same way as randomly chosen individuals with whom no previous incentivized interaction has taken place.

4 Possible Drivers

In this section we will offer some insights into the possible drivers of our results. We have seen that inducing a cooperative social relationship enhances altruism and cooperation, while the effect of a competitive social tie is less clear-cut as it does not seem to significantly affect giving and cooperation as compared with the Individual treatment, but to some extent strengthens envious and spiteful behaviour.

Since the variation in the nature of the social relationship is induced by manipulating the compensation scheme of a real effort task and relative payoffs have been shown to be an important concern for people even when making decisions that only affect their personal sphere, one possible driver of treatment effects on pro-social behaviour may be relative rank in the effort task. Altruism towards relatively better/worse performing recipients may vary according to whether these are randomly chosen individuals, on whether their performance represented a

contribution to one's own team output or, rather, led to defeat/victory for the dictator. Thus, in Section 4.1 we will study heterogeneity by rank in the effort task.

Moreover, induced social ties may work as heuristics that individuals may follow to inform their decision-making process. This may be especially the case of more impulsive people as they act without thinking things over at length. Thus, in Section 4.2 we will take advantage of a question asked in the final questionnaire aimed at eliciting impulsivity to study heterogeneity concerning this behavioural trait.

4.1 Relative Performance in the Effort Task

At the end of the effort task, subjects were given feedback on their score and that of the other member of the assigned pair. Thus, they do not have to form – possibly incorrect – beliefs on relative performance because they play in a setting of complete information. This information can affect pro-social behaviour heterogeneously by outcome and across treatments: being the highest/lowest ranked in the pair may be different if the other participant is randomly chosen, if s/he is a teammate who has contributed to the group output or if s/he is a competitor who has won/lost the competition. Thus, treatment effects on altruism and cooperation may vary depending on rank in the effort task. Our hypotheses are, on one hand, that lowest rank participants will be more generous towards and less envious of highest rank teammates (i.e. Cooperative treatment) in an attempt to reciprocate their higher contribution to the group output in the effort task; on the other hand, in order to make up for the inequality created in the effort task, winners (namely, the highest rank participants in the Competitive treatment) are expected to be more altruistic towards losers (lowest rank participants in the Competitive treatment) both when compared with the Cooperative treatment, where the outcome of the effort task is a group output and therefore there is no inequality in final earnings, and, above all, when compared with the Individual treatment because, in this treatment, participants do not interact at all, possibly pay less attention to feedback on the other person's score, and, most importantly, even the lowest ranked subjects are compensated for their efforts while in the Competitive treatment the loser gets nothing at all.

Figure 10 shows that giving in the Cooperative treatment is actually driven by the reciprocation intentions of teammates who contributed less to the group output. Cooperative incentives also significantly reduced envious behaviour regardless of rank, and attenuate spiteful choices by the best performing subjects. As regards our second hypothesis, we found that winners do indeed tend to give more to losers, significantly so when compared with the Individual treatment.

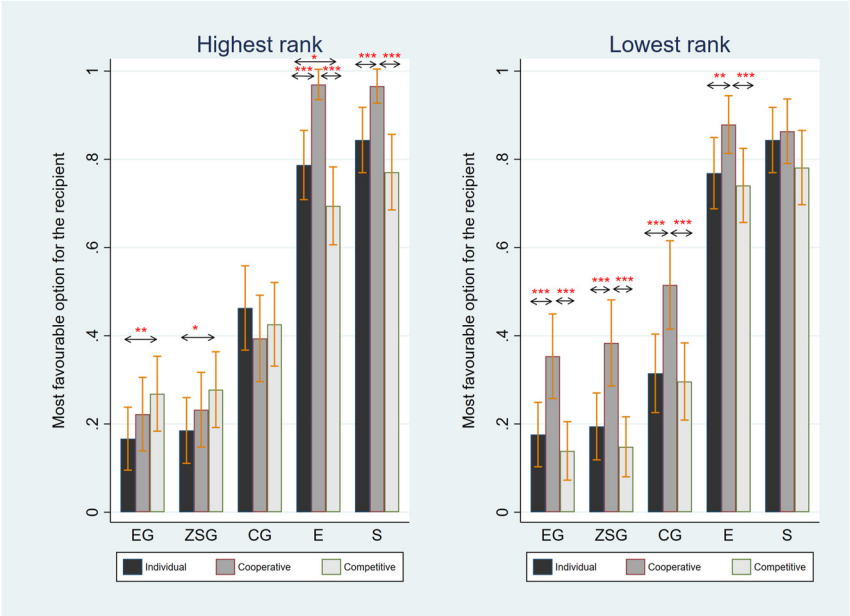


Figure 10: MDGs: relative performance in the effort task.

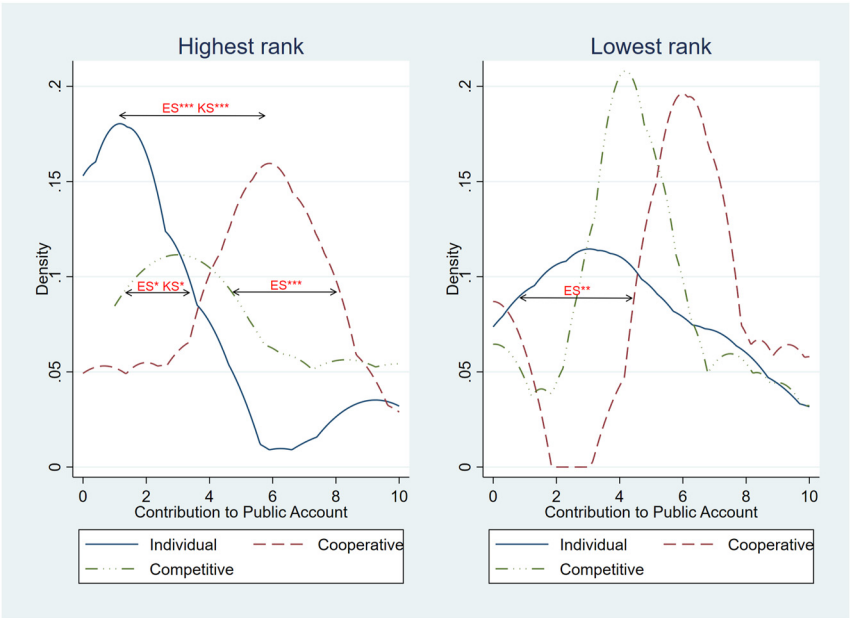


Figure 11: PGG: relative performance in the effort task.

When considering treatment effects in terms of contribution to the public good in the PGG (Figure 11), we found that cooperative incentives fostered higher cooperation regardless of rank; by contrast, competitive incentives exerted a significant positive effect on cooperation as compared with individual incentives only among winners.

4.2 Impulsivity

We elicited impulsivity using the same question present in the German Socio-Economic Panel, namely: “Do you generally think things over for a long time before acting – in other words, are you not impulsive at all? Or do you generally act without thinking things over for long time – in other words, are you very impulsive? Please choose the value on the scale, where the value 0 means: ‘Not at all Impulsive’, and the value 10 means: ‘Very impulsive’.” *Impulsivity* is on average 4.5 in the MDGs sample and 4.6 in the PGG sample. We defined *Impulsive* participants (49 % in the MDGs sample and 51 % in the PGG sample) with an higher than average value of the *Impulsivity* variable while the others were labeled *Non impulsive*.

Since our treatments induced a cooperative/competitive/neutral social tie, our hypothesis is that they may help simplify the decision-making process especially for *impulsive* respondents who generally make decisions without thinking them over for a long time. In fact, Figure 12 shows that treatment effects were especially relevant for *Impulsive* respondents who gave significantly more to cooperators regardless of its cost and were significantly less envious and spiteful when they had to make allocations to cooperators than competitors. The cooperative social tie was still a powerful tool among *Non impulsive* respondents, who can be assumed to have thought more deeply about their decisions, to attenuate envious and spiteful behaviour and increase zero-sum giving (only to randomly chosen individuals). Interestingly, when respondents habitually think things over for a long time, they are significantly more generous towards competitors when the cost of giving is high. Given the evidence above, this may be driven by winners who, when pondering their decisions, tend to be more benevolent towards losers to improve equality.

As regards cooperation in terms of contribution to a public good, Figure 13 shows that the Cooperative treatment significantly enhances cooperation for *Impulsive* respondents. For *Non Impulsive* respondents, on the other hand, distributions are much more similar and the null hypothesis that the Cooperative treatment is equal to the other two treatments can be rejected only when using the ES test.

Our evidence of a role of the cooperative social tie among both *Impulsive* and *Non impulsive* respondents adds to the literature studying whether altruistic behaviour can be explained with theories of dual-system decision-making. Fromell, Nosenzo, and Owens (2020) conduct both a meta-study of the literature and

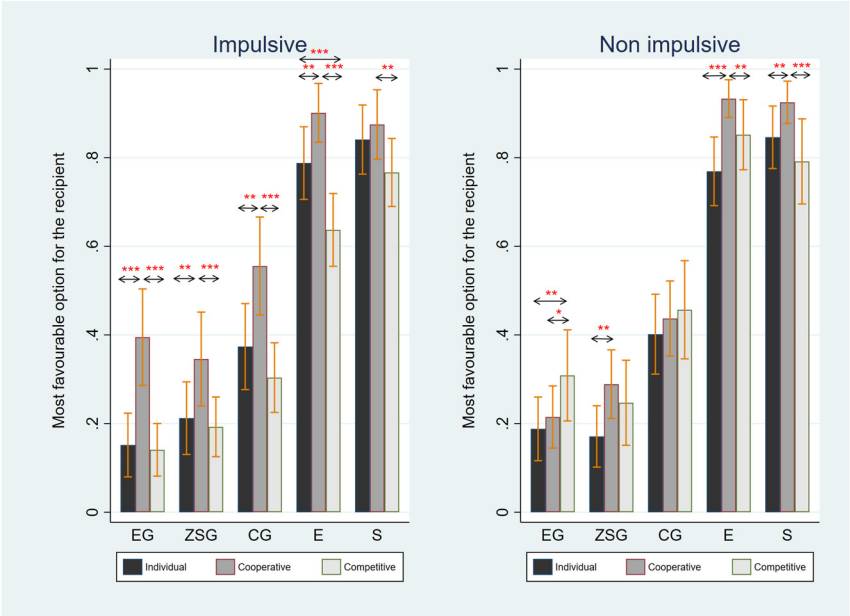


Figure 12: MDGs: impulsivity.

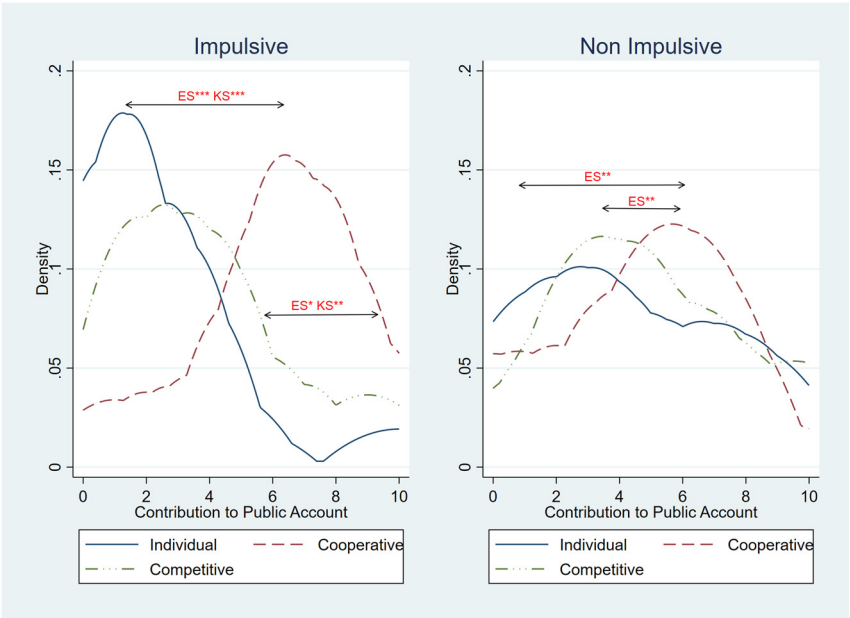


Figure 13: PGG: impulsivity.

a new experiment and show that there is no evidence of a conflict between intuition and deliberation in altruistic choices. Therefore, either both the intuitive and the deliberative systems lead to the same outcome for any given individual or, simply, dual-system theories do not extend to altruistic behaviour.

5 Concluding Remarks

Being altruistic or contributing to a public good means sacrificing one's own resources for the benefit of others. This entails a trade-off between self-interest and regard for others and this may differ depending on who the others are.

When recipients are unknown or not further identified, for example when donating to charity, donors conduct a sort of mental exercise involving imagining that "person", the attributes of the potential beneficiary of the altruistic act. By contrast, when pro-social behaviour targets a known – better identifiable – recipient, a shared sender-recipient identity may influence the decision.

In this paper we have studied whether the experience of cooperative or competitive incentive schemes affects people's altruism and cooperative attitudes towards cooperators or competitors by changing the nature of the social interaction and inducing a defined shared social tie. Our data is based on a laboratory experiment in which incentives were introduced via a real effort task and pro-social behaviour was measured with a PGG and a battery of MDGs that enabled expensive, zero-sum and cheap giving, spite and envy to be elicited.

We found that incentive schemes affected pro-social behaviour. In particular, a cooperative social tie exerted a positive effect on attitudes towards redistribution compared with both an individualistic and competitive social tie. This was robust across the different types of games: team identification increased altruism and limited envy, spite and individual shirking and free-riding in environments with a public good. By contrast, when recipients were competitors, dictators displayed more envious and spiteful behaviour, especially when giving implied a larger payoff for the recipient. This result was robust when comparing the competitive incentive with a control condition that produced similar payoff differentials without a competitive motive.

Since our subjects work in a setting of complete information, we also investigated whether attitudes towards redistribution depend on relative rank in an incentivized effort task. We found that, compared with no or competitive social tie, a cooperative social tie enhanced giving among teammates who contributed less to group output in the effort task, as a sort of reciprocating intention. When dictators were the highest ranked peer in the effort task, the cooperative tie tempered spiteful choices and the competitive tie increased giving and contribution to the public

good as compared to the Individual treatment, possibly in an attempt to make up for the inequality generated in the effort task with the losers. Moreover, since induced social relationships may be used as a heuristic that helps to provide guidance in unfamiliar situations allowing subjects to economise cognitive effort, we studied if its effects are stronger on more impulsive subjects, defined as those who generally act without thinking things over at length. We found that impulsivity strengthened the positive effect of cooperative incentives on the decision to give, regardless of its cost, and to cooperate.

Our evidence helps to explain why the same subject may treat distinct types of peers differently: even if a subject has overall pro-social preferences, actual attitudes towards redistribution may vary in accordance with the social tie shared with the recipient. Importantly, social ties often arise without targeted intervention, as is the case with incentives used in the work environment to enhance employee performance. Thus, designing and evaluating an optimal compensation scheme should take into account that the effects of the incentives implemented are not simply a matter of short term productivity but also spill over into pro-social attitudes via changes in social relationships which may, in turn, affect future productivity.

The fairly robust positive effect of the previously experienced cooperative incentive on subsequent altruism and cooperation suggests that fostering a cooperative social tie may be an important tool for organizations interested in enhancing pro-social behaviour.

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Conflict of interest: None.

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Data availability: Data available on request from the author.

Appendix A: Experimental Instructions

The experiment is part of a bigger experiment that also included a risk behaviour elicitation task (Gioia 2019). Here we report only the instructions of the parts of the experiment relevant for the analysis.

[Aloud and on the screen]

Welcome. Thank you very much for agreeing to participate in today's experiment.

From now on, we kindly ask you to remain silent and to turn off your mobile phones. You will have the opportunity to ask questions later. Participants intentionally violating the rules may be asked to leave the experiment and may not be paid.

The purpose of this experiment is the analysis of economic decision making.

The experiment will last for about 1 h. It consists of three parts. Your decisions in one part have no implications for your decisions in the other parts.

The instructions will appear on your screen, and we will read an introduction aloud at the beginning of each part. Please read the instructions carefully as your decisions in the tasks will affect your earnings. Press the button "OK" only when you have finished reading the instructions to go ahead with the experiment.

The experiment ends with a short questionnaire after which you will see your final earnings on your screen.

If you have any questions or problems at any point in today's experiment, please raise your hand and the experimenter will come to you and answer your questions in private.

We would be grateful if you will not discuss the experiment with other students after leaving the laboratory.

Payoff

The experiment is funded by the School of Economics of the University of Edinburgh.

Your earnings are directly calculated in British Pounds.

At the end of the experiment, the computer will randomly select one task (and where needed one decision) that will determine your earnings. You will be informed of which task (and which decision) was chosen and what your final earnings are.

For your punctual arrival, you receive an additional show up fee of £3.

Please note: As every task could determine your earnings, it is in your interest to take every decision carefully.

End of the experiment

We will wait for everybody to be finished and will need between 5 and 10 min to prepare the payments. You will be called individually, based on the number of your computer, will receive your earnings and will be asked to sign a receipt.

PART I

[...]

PART II**[Aloud and on the screen]**

Now we start Part II of the experiment. In this part, you have to perform again the task performed in Part I. Before you do that, you will do another task. You will find

the instructions of the new task on your computer screen. Please, read them carefully as your decisions may affect your earnings.

At the end of the new task, you will be informed on your earnings in that task, on your score as well as on the score of a randomly drawn participant in this room. The score of the other person may or may not affect your earnings. We will give you the information about this other person in any case. You will find details on how the earnings of this task are computed in the instructions of the task.

If you have any questions or problems, please raise your hand and the experimenter will come to you and answer your questions in private.

Please, press the button “OK” to go ahead with the experiment.

[On the screen only]

Task 2

This task consists in recognizing the value and the country of Euro coins.

On the left hand side of your computer screen you will see a table with different Euro coins and for each coin the indication of the value and of the country.

A Euro coin randomly drawn from the table will appear on the right hand side of your screen. You have to look for the corresponding coin in the table and then choose the value and the country.

You have to validate your answer by pressing the button “CONFIRM”. Then, a new table and a new coin to identify will appear on your computer screen.

You have 5 min to recognize as many coins as you like.

Your score will correspond to the number of coins that you successfully recognize within this five-minute time period. There is no penalty for wrong answers.

INDIVIDUAL

You will receive £0.20 per coin you identify correctly. Your earnings will depend only on your own score.

COOPERATIVE

Your payment in this task depends both on your performance and on the performance of a randomly drawn participant in this room who will be your teammate. Both your and your teammate’s earnings are determined as follows:

Individual Earnings = (Your score + Teammate’s score) $\times$ £0.20 $\times$ (1/2) that is we will compute the group earnings by summing the number of coins identified correctly by both of you and paying £0.20 per coin correctly identified. Then, we will divide the group earnings in two equal amounts, one for each person in the group.

Thus, you will receive half of the total earnings of your group.

If this task is selected for payment for any of you, it will be selected for both of you.

COMPETITIVE

Your payment in this task depends both on your performance and on the performance of a randomly drawn participant in this room who will be your competitor.

You will receive £0.40 per coin you identify correctly only if you identify correctly more coins than your competitor does.

If your competitor identifies correctly more coins than you do, your earnings will be £0.00.

Therefore, only one person will receive a positive payment, the other will receive zero. In case of ties, the winner is randomly selected.

If this task is selected for payment for any of you, it will be selected for both of you.

Before we start, you are given a chance to PRACTICE this task during a minute to familiarize yourself with the task. The number of coins correctly identified during this practice period will not affect your earnings. Then, the five-minute period of the REAL experimental task will start.

Please, press the button “OK” to go ahead with the experiment.

[After Task 2. On the screen only]

Now you have to perform again the task performed in Part I [...]

PART III

[Aloud and on the screen]

Now we start Part III of the experiment and you have to perform two new tasks. You will find the instructions that will explain these tasks on your computer screen. Please, read them carefully as your decisions in the tasks may affect your earnings.

In this part of the experiment, you will have the opportunity to make choices that will affect the earnings of – the other person randomly selected in part II (INDIVIDUAL)/your teammate (COOPERATIVE)/your competitor (COMPETITIVE) – and he/she will have the opportunity to make choices that will affect your earnings.

If one of these tasks is selected for payment for any of you, it will be selected for both of you. In case both tasks will be selected (one for you and the other for – the other person randomly selected in part II [INDIVIDUAL]/your teammate [COOPERATIVE]/your competitor [COMPETITIVE]) another random draw will select which of the two tasks will determine the earnings of both of you. - In case one of the two tasks randomly selected for you and – your teammate (COOPERATIVE)/your competitor (COMPETITIVE) – is the Euro coins task, as stated in the instructions of that task, it will be selected for both of you. (COOPERATIVE and COMPETITIVE).

If you have any questions or problems, please raise your hand and the experimenter will come to you and answer your questions in private.

Please, press the button “OK” to go ahead with the experiment.

[On the screen only]

Task 3

Overall, in this task you have to make 44 choices. Every choice is a decision between two allocations of money, named A and B, representing a profile of sums that you decide to assign to yourself and to – the other person (INDIVIDUAL)/your teammate (COOPERATIVE)/your competitor (COMPETITIVE).

In order to choose between the two allocations of money, you have to click on the corresponding button.

The allocation that you choose cannot be challenged by the other person (INDIVIDUAL)/your teammate (COOPERATIVE)/your competitor (COMPETITIVE). The choices made by each subject will not be disclosed to the other person. The anonymity will be maintained both during the task and after the experiment.

If this task is selected for payment, one of the 44 decisions and one of you two will be randomly selected by the computer.

Your earnings will correspond to the amount that the selected individual (who can be yourself or – the other person [INDIVIDUAL]/your teammate [COOPERATIVE]/your competitor [COMPETITIVE] – with the same probability) decided to assign to yourself in the selected decision.

The earnings of – the other person (INDIVIDUAL)/your teammate (COOPERATIVE)/your competitor (COMPETITIVE) – will correspond to the amount that the selected individual decided to assign to – the other person (INDIVIDUAL)/your teammate (COOPERATIVE)/your competitor (COMPETITIVE) in the selected decision.

Please, press the button “OK” to go ahead with the experiment.

[On the screen only]

Task 4

Both of you will have an endowment of £10.00 each. Your task is to choose how much money to allocate to a private account and how much money to allocate to a public account.

You have to write both values rounded to the first decimal place. These two numbers should add to £10.00, the total amount you have for this task. You are free to put money in both accounts or only in one of them.

The choices made by each subject will not be disclosed to the other person. The anonymity will be maintained both during the task and after the experiment.

Your personal earnings will equal the sum of the return from your private account plus the individual return from the public account.

– *Return from the Private Account:*

It is equal to the amount of money you invest in your private account.

- Individual return from the Public Account:
What you earn from the public account will depend on the total amount of money that you and – the other person (INDIVIDUAL)/your teammate (COOPERATIVE)/your competitor (COMPETITIVE) – invest in the public account. The computer will determine the total contribution to the public account. It will be multiplied by 1.4 and divided equally among the 2 participants. Thus, it does not matter who invests in the public account. Each of you will get as return:

$$\text{Individual Return from the Public Account} = \text{total contribution to the public account} \times 0.7$$
- Personal Earnings:

$$\text{Return from the Private Account} + \text{Individual Return from the Public Account}$$

Please, press the button “OK” to go ahead with the experiment.

At the end of the experiment, experimenter says aloud: Now you have to complete a short questionnaire and at the end you will see your earnings displayed on your screen.

Appendix B: Role of Payoff Differences

The aim of the paper is to study the effect of incentive schemes on subsequent pro-social behaviour. However, as compared to the individual and cooperative incentive schemes, competitive incentives entail important differences in payoffs between competitors because the lowest ranked subject obtains zero, regardless of his/her performance.

Therefore, in order to be sure that the observed effects reflect how incentive schemes *per se* affect subsequent pro-social behaviour, a control condition that produces similar payoff differentials without a competitive motive is needed in the design.²⁵ This is especially important given the evidence of a role played by relative rank in the effort task.

With this aim, we have introduced a new control treatment (Random treatment) in which subjects were randomly paired up and peers were random individuals. They then performed the Coin Task and, at the end, one randomly selected participant in the pair earned £0.40 for each correct answer, while his/her peer got £0. Since this control treatment produces similar levels of payoff and payoff differences between the subjects to the competition scheme, but does not have a competition element to it, the subsequent pro-social behaviour of subjects in the Random treatment can be compared to the pro-social behaviour in the Competitive

²⁵ We thank the anonymous referee for this suggestion.

treatment, and any difference in pro-social behaviour between the two treatments can be attributable more conclusively to the competition scheme per se, rather than to payoff differences.

We have collected the new data by running an online experiment.²⁶ Since the methodology, the population and the time period of the additional control treatment are different from those of the original data, to be sure to make a proper comparison and produce reliable results, instead of using the original data from the Competitive treatment, we have also collected new data using the same competitive incentive scheme associated with the Coin task. Eighty subjects participated in either the Random or the Competitive2 treatment, 48 used to study choices in the MDGs (24 for each treatment) and 32 used to study choices in the PGG (16 for each treatment).

Firstly, we look at subjects' choices in the MDGs. Overall the fraction of dictators making altruistic choices is smaller than in the main sample (about 27.6 %), however, the evidence from the aggregate data is similar to that emerging from the main experiment when comparing the Competitive and the Individual treatment: there is no statistically significant difference in subjects' altruism towards a competitor or a random person.

In Figures 14 and 15 we disaggregate our data by game and inequality type within each type of game and we find that, even when the control condition takes into account payoff differentials, competition increases envious and spiteful behaviour compared to a condition in which the recipient is just a randomly

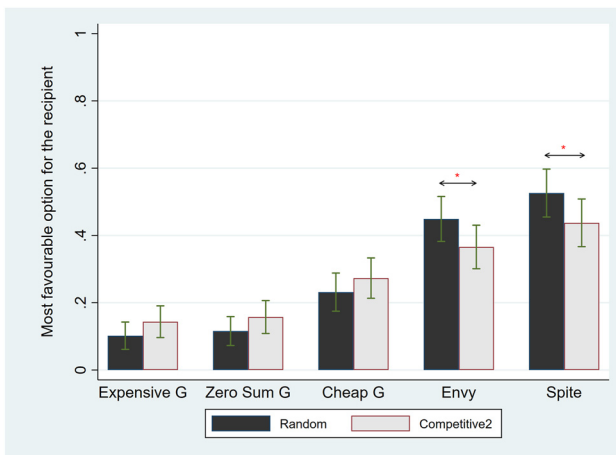


Figure 14: Mini Dictator Games: by type.

²⁶ We have used participants recruited by the online platform Prolific.

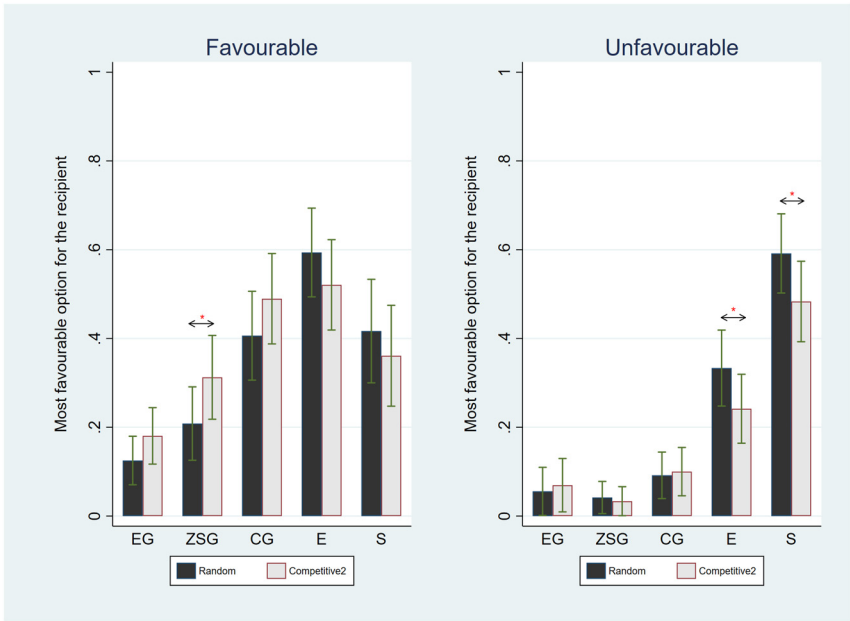


Figure 15: Mini Dictator Games: favourable versus unfavourable inequality.

selected person and this is especially true when inequality is unfavourable to dictators. It also emerges a significantly higher share of dictators choosing the most favourable option for the recipient when playing *Zero Sum* giving games in the Competitive2 treatment. A closer look at the role of the payoff potentially earned with the Coin Task (Figure 16) confirms results from the main experiment revealing that higher altruism in *Zero Sum* games in the Competitive2 treatment comes from subjects who have received a positive payoff who are significantly more likely to make up for payoff differentials after experiencing competitive incentives (i.e. winning the competition) than when having being randomly selected to receive the payoff of the Coin Task.

When we turn our attention to the PGG, again we find that on average the contribution to the public good is lower in the new data (£3.95) and, as in the main experiment, there is no statistically significant difference in social preferences between the Competitive2 and Random treatments.

Figures 17 and 18 plot kernel density estimates separately by treatment and by treatment and outcome of the Coin task (i.e. receiving either a positive payoff or £0), respectively. The Epps–Singleton characteristic function test (ES) and the two-sample Kolmogorov–Smirnov equality-of-distributions test (KS) are never statistically significant except in the subsample of participants receiving a positive

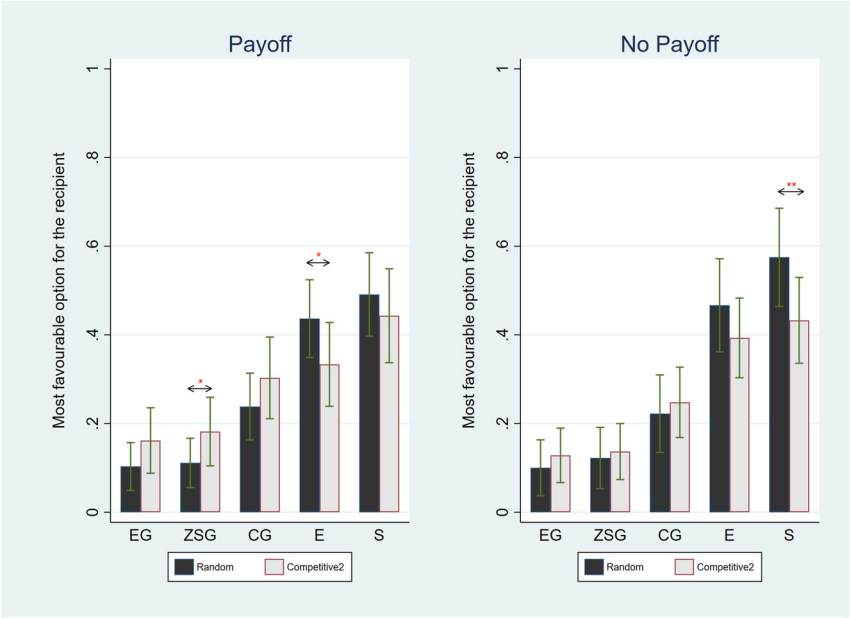


Figure 16: Mini Dictator Games: with and without potential earnings in the effort task.

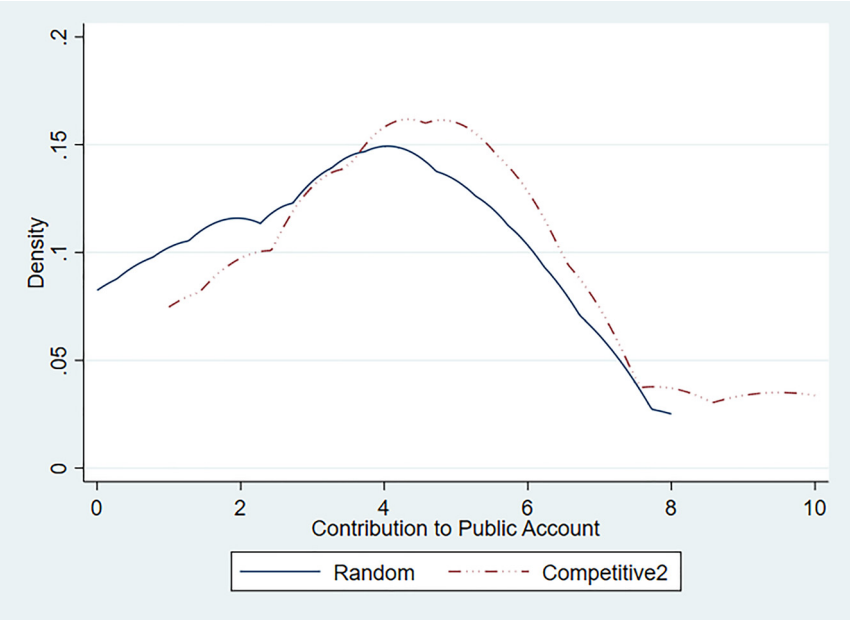


Figure 17: Public Good Game.

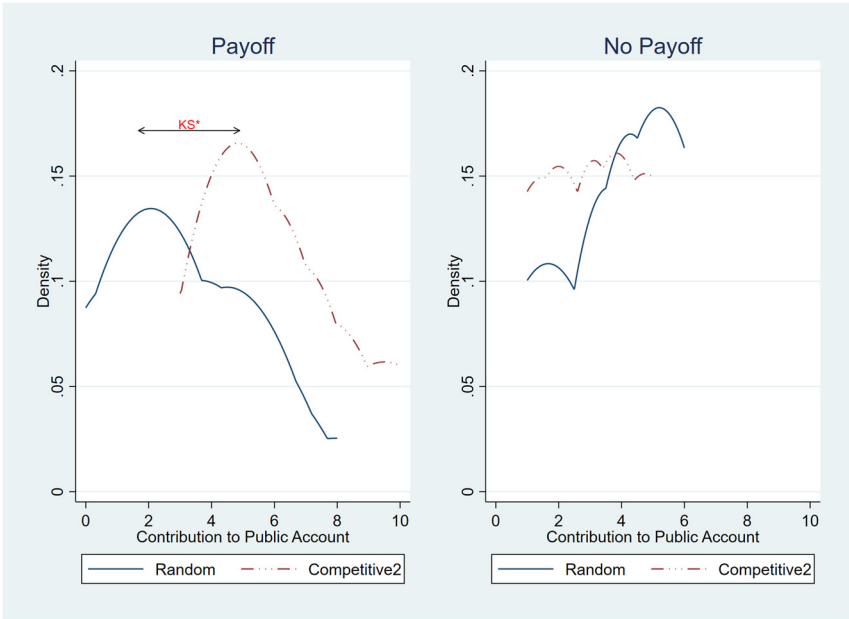


Figure 18: Public Good Game: with and without potential earnings in the effort task.

payoff for their performance in the Coin Task (where only the KS test is significant at the 10 % level). Results are similar to those emerging in the main experiment when comparing the Competitive and the Individual treatment: winning a competition tends to exert a positive effect on cooperation as compared to being randomly selected to receive a positive payment.

Appendix C: Mini Dictator Games

Table 5: All mini dictator games.

Type	Round	$\pi_d A$	$\pi_r A$	$\pi_d B$	$\pi_r B$	$\pi_d B - \pi_d A$	$\pi_r B - \pi_r A$	Opportunity cost	Favourable
Expensive G	43	9	7	7	8	-2	1	-2	0
	20	9	9	8	9.5	-1	0.5	-2	0
	22	8	6.5	7	7	-1	0.5	-2	1
	8	9	5	7	6	-2	1	-2	1
	40	10	6	9	6.5	-1	0.5	-2	1
	36	8	4	6	5	-2	1	-2	1
	17	11	8	8	9.5	-3	1.5	-2	0
	19	11.5	7	8.5	8.5	-3	1.5	-2	1
	16	13	8.5	10	10	-3	1.5	-2	1

Table 5: (continued)

Type	Round	$\pi_d A$	$\pi_r A$	$\pi_d B$	$\pi_r B$	$\pi_d B - \pi_d A$	$\pi_r B - \pi_r A$	Opportunity cost	Favourable
Zero Sum G	11	7.5	7	5.5	9	-2	2	-1	0
	23	9	8	8	9	-1	1	-1	0
	39	12	8	10	10	-2	2	-1	1
	14	8	9	6	11	-2	2	-1	0
	26	12	4.5	9	7.5	-3	3	-1	1
	42	10	7	7	10	-3	3	-1	0
	1	12	5	9	8	-3	3	-1	1
	38	8	9.5	7	10.5	-1	1	-1	0
	21	10	6	9	7	-1	1	-1	1
	29	7	8	6	10	-1	2	-0.5	0
Cheap G	31	8	8	6	12	-2	4	-0.5	0
	3	13	3.5	10	9.5	-3	6	-0.5	1
	9	12	6	10	10	-2	4	-0.5	1
	33	9	4.5	6	10.5	-3	6	-0.5	0
	24	12	4	9	10	-3	6	-0.5	0
	6	11	4	9	8	-2	4	-0.5	1
	30	10	8	9	10	-1	2	-0.5	0
	25	10.5	6	9.5	8	-1	2	-0.5	1
	34	8	6	8	9	0	3	0	0
	28	8	4.5	8	7.5	0	3	0	1
Envy	4	8.5	6.5	8.5	9.5	0	3	0	0
	32	9	5	9	7	0	2	0	1
	18	9	8	9	10	0	2	0	0
	13	6	8	6	10	0	2	0	0
	41	10	8	10	10	0	2	0	1
	2	7	8	7	9	0	1	0	0
	35	10	7	10	8	0	1	0	1
	12	7	7.5	8	9	1	1.5	0.67	0
	7	6.5	7	8.5	11	2	4	0.5	0
	37	8	6	10	10	2	4	0.5	1
Spite	15	7	8	9	11	2	3	0.67	0
	5	7	7	8	9	1	2	0.5	0
	27	9	6	10	8	1	2	0.5	1
	10	8.5	8.5	9.5	10	1	1.5	0.67	0
	44	8	7	10	10	2	3	0.67	1

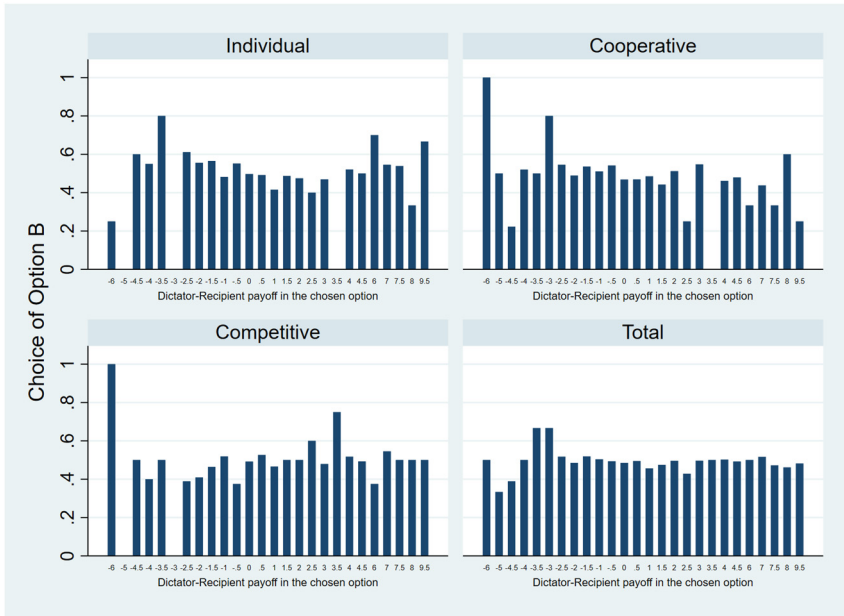


Figure 19: Dictator-recipient payoff in the chosen option.

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