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RESEARCH

# How information about effort and luck shapes altruism of social preferences: a survey experiment

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**Abstract**
This paper introduces a test to compare the levels of altruism of social preferences over the decision maker's own and another person's monetary pay-off. We propose a straightforward adaptive bisectional method for eliciting social preferences, applied in an online survey experiment with 573 decision makers. In the experiment, we provided randomized information about the other person's effort and luck to assess how this information influences the altruism of the social preferences. Our results reveal that decision makers exhibit greater altruism when informed of high effort and reduced altruism when the other person is perceived as lucky.

**Keywords** Altruism · Information · Social preferences · Survey experiment · Vignette

## 1 Introduction

There is a large body of evidence that refutes the idea that people care exclusively about their own outcomes. Weighing pure self-interest and concerns about other people is indeed central to many human decisions and actions, such as contributions to the public good, charitable donations, volunteering, or voting on redistribution and welfare policies. Social (or distributional) preferences capture the trade-off between self-interest and other-regarding concerns, and have been used in experimental studies to model and analyse phenomena such as reciprocity (Rabin 1993; Bolton and Ockenfels 2000), fairness considerations (Fehr and

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Schmidt 1999), positional concerns (Levine 1998; Charness and Rabin 2002) and altruism (Andreoni and Miller 2002), amongst others.[1]

We study social preferences and their level of altruism in a general two-person context that allows for non-Paretian positional concerns. In this context, we propose a non-parametric altruism test that compares social preferences according to the importance that is given to concerns about the other person.[2] The proposed altruism tests not only allow for interpersonal altruism comparisons, but also provide a framework for investigating how information about the other person shapes these preferences and levels of altruism. Indeed, many actions of politicians, fundraisers and other political players attempt to shape social preferences by providing information about others (e.g., by stressing the laziness of welfare claimants or, conversely, their adverse circumstances and bad luck). Little is known, however, about whether and to what extent social preferences in a two-person context can be reshaped by information about the other person. In this paper, we address this gap and investigate the extent to which the degree of altruism in social preferences can be influenced by (randomized) information about two characteristics of the other person: the level of effort and luck.

Beliefs about the levels of effort and luck play a central role in several branches of the literature. First, in the literature on preferences for redistribution it is found that the demand for redistribution decreases when people view effort as the main determinant of economic outcomes, but increases when they believe luck is more important (see, e.g., Piketty 1995; Fong 2001; Alesina and Angeletos 2005; Alesina and La Ferrara 2005; Bénabou and Tirole 2006)). Alesina et al. (2001) and Alesina and Glaeser (2004) document how beliefs about the role of effort differ between the US and Europe and relate this finding to observed differences in social spending of the welfare states. Second, some recent empirical studies of public attitudes on the "deservingness" of welfare state beneficiaries document how factors such as effort affect public attitudes about deservingness (see, e.g., Kootstra (2016) and van der Meer and Reeskens (2021)). Third, in normative theories about luck-egalitarianism (Arneson 1989; Cohen 1989) and liberal egalitarianism (Roemer 1998; Fleurbaey 2008), the distinction between inequalities due to differences in effort and luck also plays a central role. Luck is considered as an illegitimate source of inequality that justifies government intervention, whereas inequalities due to differences in effort are considered legitimate. We are therefore interested to test whether decision makers become less altruistic when they learn that the other person is of a low effort type and, conversely, more altruistic when they learn that the other person is a low luck type.[3]

Several methods have been used in the experimental literature to elicit social preferences. After its introduction by Kahneman et al. (1986) and Forsythe et al. (1994), the dictator game

[1] Kolm and Ythier (2006) and Fehr and Charness (2025) provide reviews of the literature on social preferences and altruism. Fisman et al. (2017); Kerschbamer and Müller (2020); Almås et al. (2020); Cabeza Martínez (2023); Fisman et al. (2023); Epper et al. (2024), and Fehr et al. (2024) study how social preferences relate to political attitudes and preferences for redistribution. See, however, Smith (2018) and Smith and Wilson (2019) for a critical discussion of the standard modelling of other-regarding behaviour using social preferences.

[2] See Cox et al. (2008) and Heufer et al. (2020) for related tests that compare the level of altruism of social preferences.

[3] This hypothesis is in line with finding from several studies. Krawczyk (2010) observes that, when participants are given the chance to redistribute towards other groups before knowing the outcome of a game, lower transfers are made when winning depends on performance rather than luck. Mollerstrom et al. (2015) present a series of experiments where respondents have the possibility to reallocate resources between two players and correct inequalities due to different types of luck. Bartling et al. (2018) finds that most respondents choose not to redistribute to correct extreme inequality as long as the income difference has been solely driven by performance. Cappelen et al. (2022) offer evidence that redistributive behaviour can be driven by uncertainty about the source of inequality.

has become the main workhorse to elicit social preferences.[4] In a dictator game, decision makers are requested to split a monetary endowment into a pay-off for themselves and a pay-off for another person who is unknown to them. Andreoni and Miller (2002) and Fisman et al. (2007, 2017) use a modified dictator game to elicit social preferences in which the relative price of both pay-offs is experimentally manipulated so that revealed preference techniques can be used to test the consistency of a parametric social utility function. Fehr et al. (2023) further generalize this approach by allowing for positively sloped budget lines.[5]

Kerschbamer (2015) developed a geometric non-parametric method to elicit and classify social preferences, the "equality equivalence test". In this method, decision makers are requested to compare an equal reference allocation with several comparison allocations that are presented in an ordered list. To incentivize truthful responses, decision makers are matched to another participant after the elicitation procedure and the preferred option of one randomly selected choice is paid to both.[6]

While the adaptive bisectional method that we use in this paper to elicit social preferences resembles the non-incentivized version of the equality equivalence test in many respects, the main difference is that we ask the decision makers to make a limited number of choices between a fixed equal reference allocation and a few comparison allocations. These comparison allocations are generated by the adaptative bisectional algorithm proposed by Decancq and Nys (2021) to elicit preferences in a non-parametric way. The adaptive bisectional algorithm proceeds iteratively and generates, in each iteration, a comparison allocation which is situated in the middle of the interval where the social indifference curve should be, based on the responses to previous choices. This algorithm considerably reduces the number of comparisons for each decision maker, reduces their fatigue, increases precision and, importantly, cuts down the required survey time and costs. These features permit the elicitation of social preferences almost routinely in (online) social surveys with a large representative sample of respondents.

We implemented the adaptive bisectional elicitation method in an online survey experiment with 573 decision makers from the UK in August 2019. The proposed altruism tests are used to compare the social preferences across decision makers and, importantly, to study how the level of altruism is affected by additional information about a hypothetical other person. We used vignettes to provide the decision makers with a structured description of the hypothetical other person along two dimensions: effort and luck.[7] Each vignette is randomly selected from a pool of four vignettes that indicate whether the other person was hard-working or idle (capturing two levels of effort) and whether they came from a privileged

[4] Before the introduction of the dictator game, however, some geometric methods had already been developed to chart and analyse individual social indifference curves. MacCrimmon and Siu (1974), for instance, modified the non-parametric method proposed by MacCrimmon and Toda (1969) to chart an indifference curve of a social preference ordering.

[5] In a series of experiments, Cappelen et al. (2007, 2013); Almås et al. (2010) and Almås et al. (2020) make use of a "real-effort" dictator game, in which the distribution of the monetary endowment is preceded by a production phase, in which decision makers choose an investment level (effort) which is rewarded at an exogenously given rate of return (luck). This permits the authors to distinguish between strict egalitarian, libertarian, and liberal egalitarian decision makers.

[6] Krawczyk and Le Lec (2021) stress-test and relax some of the underlying assumptions of the equality equivalence test (such as the equality of the reference allocation) and compare the results to a non-incentivized version of the elicitation procedure. The authors find decision makers to be slightly more altruistic according to the non-incentivized version compared to the incentivized one and observe a larger variance in the non-incentivized version of the elicitation procedure.

[7] On the advantages of using vignettes in survey experiments, see Auspurg and Hinz (2015) and Stantcheva (2023).

background or not (capturing two levels of luck). Vignettes create exogenous and orthogonal identifying variation in the characteristics of the other person in a way that is difficult to achieve in incentivized experiments with non-hypothetical other persons. However, like other self-reported survey questions, the external validity of vignettes may be criticized due to their hypothetical nature.[8]

The rest of the paper is organised as follows: Section 2 introduces the non-Paretian social preferences and discusses how they can be compared with respect to their altruism. The implementation is discussed in Section 3, which presents the elicitation procedure, the information treatment, and some details about the data from the survey experiment. Section 4 presents the results of the interpersonal altruism comparisons prior to the information treatment and the effect of the information treatment. Section 5 presents our conclusions.

## 2 Comparing the altruism of social preferences

### 2.1 Non-Paretian social preferences

A decision maker $i$ is assumed to have social preferences over allocations $\pi = (\pi_i, \pi_j)$, which consist of a non-negative pay-off for them, denoted $\pi_i$, and a non-negative pay-off for another person, $\pi_j$. The domain of these allocations is referred to as $D = \mathbb{R}^2_+$. For a given allocation $\pi$, the domain can be divided in an advantageous and disadvantageous subdomain. This division has been shown to be instrumental in the literature to describe social preferences, see Fehr and Charness (2025)). We define the advantageous subdomain of allocation $\pi$ as the set of all allocations in which the decision maker's pay-off weakly increases more (or weakly decreases less) than the other person's pay-off: $AD(\pi) = \left\{ \left(\pi_i', \pi_j'\right) \in D : \pi_i' - \pi_i \geq \pi_j' - \pi_j \right\}$. The disadvantageous subdomain of allocation $\pi$ is defined as the set of all allocations in which the decision maker's pay-off strictly increases less (or strictly decreases more) than the other person's pay-off, so that $DD(\pi) = \left\{ \left(\pi_i', \pi_j'\right) \in D : \pi_i' - \pi_i < \pi_j' - \pi_j \right\}$. Figure 1 illustrates the advantageous and disadvantageous subdomain of allocation $\pi$ graphically.

Each decision maker is assumed to have a (weak) social preference relation $R$ over allocations. The expression $\pi' \, R \, \pi$ means that the allocation $\pi'$ is at least as good as $\pi$ according to the decision maker. The social preference relations $P$ and $I$ refer to the corresponding strict social preference and indifference relations, respectively. For a given allocation $\pi$ and a social preference relation $R$, the upper contour set $UC_R(\pi) = \left\{ \pi' : \pi' \, R \, \pi \right\}$ is defined as the set of all allocations which are at least as good as $\pi$ according to the decision maker. Analogously, we define the lower contour set as $LC_R(\pi) = \left\{ \pi' : \pi \, R \, \pi' \right\}$. The indifference set (or curve) is the intersection between the upper and lower contour sets. The social preference relations are assumed to satisfy four general properties, of which the first three are standard.

**Completeness**. For all $\pi$ and $\pi'$ in $D$, we have $\pi \, R \, \pi'$ or $\pi' \, R \, \pi$ or both.

**Transitivity**. For all $\pi$, $\pi'$ and $\pi''$ in $D$, if $\pi \, R \, \pi'$ and $\pi' \, R \, \pi''$, then $\pi \, R \, \pi''$.
**Continuity**. For all $\pi$ in $D$, the contour sets $UC_R(\pi)$ and $LC_R(\pi)$ are closed.

The first property, completeness, ensures that a decision maker can rank any pair of allocations. The second property, transitivity, is a consistency requirement which rules out cycles.

[8] Reassuringly, Hainmueller et al. (2015) have compared the results of a vignette experiment with a referendum on naturalization of immigrants in Switzerland, and find that the effects estimated from the vignette-based survey match the effects observed in the referendum remarkably well. Moreover, they find that paired designs, such as the one used in this paper, perform better.

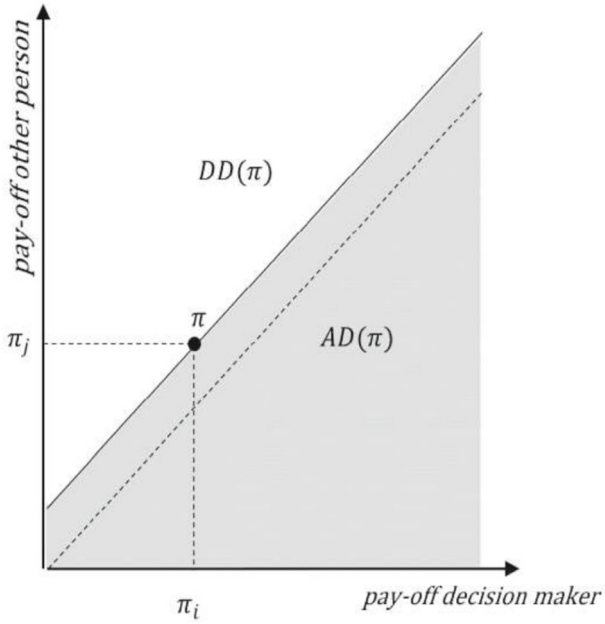



**Fig. 1** Advantageous and disadvantageous subdomains of allocation $\pi$

The third property, continuity, ensures that sudden preference reversals do no occur. Since the upper and lower contour sets are closed, their intersection, the indifference set, is also closed. While transitivity plays an important role in the elicitation procedure that we use, completeness and continuity do not (see, respectively, Decancq and Nys (2021) and Kerschbamer (2015) for discussions). Completeness and transitivity are standard requirements for preferences to be considered rational (see, e.g., (Mas-Colell et al. 1995, p.6)). The fourth property weakens standard monotonicity and is, to the best of our knowledge, novel.[9]

**AD-Monotonicity**. For all $\pi, \pi'$ in $D$ with $\pi'$ in $AD(\pi)$, if $\pi' \geq \pi$ then $\pi' \, R \, \pi$ and if $\pi' > \pi$ then $\pi' \, P \, \pi$.

The standard monotonicity property, which requires decision makers to be Paretian and to prefer any allocation in which both pay-offs have increased, is arguably too strong in the context of studying social preferences. Indeed, some decision makers have non-Paretian positional concerns, in the sense that they care about the size of their pay-off compared to the other person's pay-off.[10] Therefore, we weaken the standard monotonicity property and require that a decision maker prefers an allocation in which both pay-offs have increased only when that allocation belongs to his own advantageous subdomain, that is, when the pay-off of the decision maker increases more (decreases less) than the pay-off of the other person. This property is illustrated in Fig. 2. AD-Monotonicity requires that all allocations which are situated in the shaded area in the North-East of $\pi$ belong to the upper contour set

[9] Let $\geq$ and $>$ denote the standard vector inequalities. We write $\pi' \geq \pi$ if the weak inequality holds in all dimensions and $\pi' > \pi$ if at least one of the inequalities also holds strictly.

[10] Duesenberry (1949) calls such decision makers "status seeking" or "interested in relative income". MacCrimmon and Messick (1976) and Charness and Rabin (2002) refer to them as "competitive" and Levine (1998) and Kerschbamer (2015) as "spiteful".

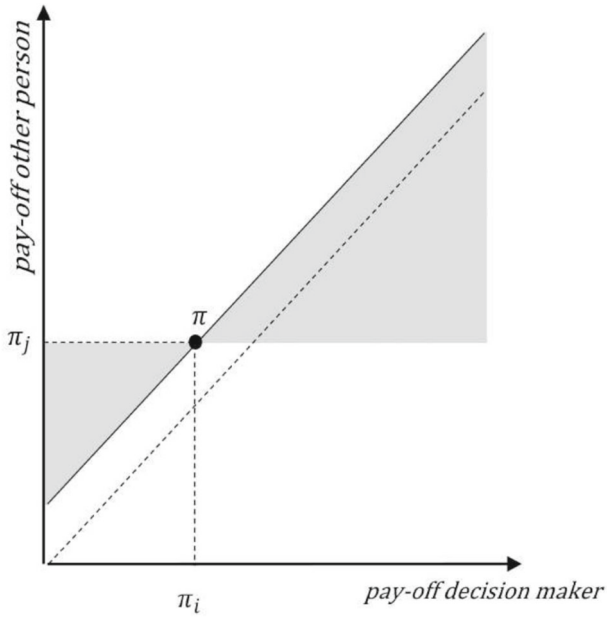



**Fig. 2** When social preferences satisfy AD-monotonicity, the indifference curve through $\pi$ must lie in the unshaded area

of allocation $\pi$. Conversely, all allocations in the shaded area in the South-West belong to the lower contour set. Consequently, the indifference set must be situated in the unshaded area.

AD-Monotonicity ensures that the indifference set is thin. For any given level of the other person's pay-off, there is at most one allocation that belongs to the indifference set of a given allocation $\pi$. The pay-off that is required by a decision maker with social preferences $R$ to be indifferent to $\pi$ when the other person receives pay-off $\pi'_j$, is called the equivalent pay-off at $\pi'_j$ and is denoted $\pi^*_R(\pi'_j)$. The equivalent pay-off can be implicitly defined as:

$$\left(\pi_i, \pi_j\right) I \left(\pi^*_R(\pi'_j), \pi'_j\right). \tag{1}$$

As can be seen in Fig. 3, AD-Monotonicity ensures, furthermore, that the equivalent pay-off at $\pi'_j$ is situated in the advantageous subdomain of $\pi$ when $\pi'_j \leq \pi_j$ and in the disadvantageous subdomain of $\pi$, otherwise.

### 2.2 Altruism comparisons

We define what it means for a social preference relation to be more altruistic at a given allocation $\pi$ than another social preference relation (see Cox et al. (2008) and Heufer et al. (2020) for similar definitions). It is useful to do this first for the advantageous subdomain and afterwards for the disadvantageous subdomain of $\pi$. For a given allocation $\pi$, we say that one social preference relation is more AD-altruistic at $\pi$ than another preference relation if all allocations in the advantageous subdomain of $\pi$ that are preferred by the more altruistic social preference relation are also preferred by the less altruistic preference relation. A decision maker with more AD-altruistic social preferences will therefore require a larger pay-off for themselves to compensate for the loss of the other person.

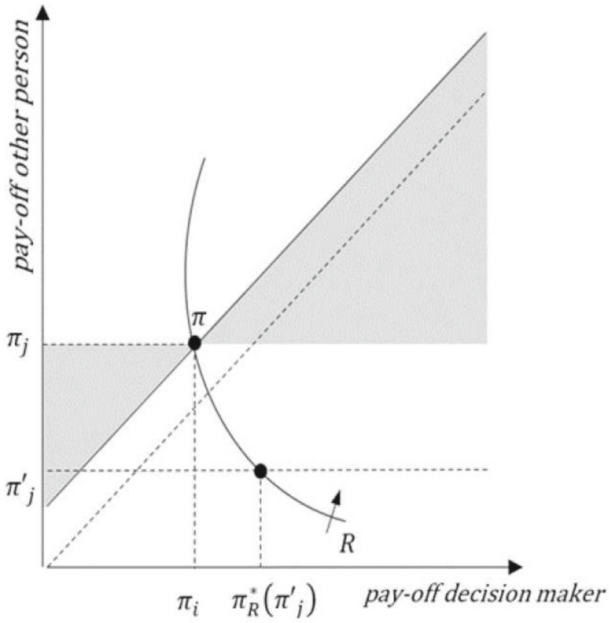



**Fig. 3** The equivalent pay-off at $\pi'_j$ for social preference relation R, $\pi^*_R(\pi'_j)$

**More AD-Altruistic at $\pi$.** Social preference $R'$ is more AD-altruistic than $R$ at $\pi$, if $R' \neq R$ and $\pi' \; R' \; \pi$ implies that $\pi' \; R \; \pi$ for all $\pi'$ in $AD(\pi)$.

We can define in analogous way what it means for a social preference relation to be locally more DD-altruistic at $\pi$. For a given allocation $\pi$, we say that one social preference relation is more DD-altruistic at $\pi$ than another preference relation, if all allocations in the disadvantageous subdomain of $\pi$ that are preferred by the less DD-altruistic social preference relation are also preferred by the more altruistic preference relation.

**More DD-Altruistic at $\pi$.** Social preference $R'$ is more DD-altruistic than $R$ at $\pi$, if $R' \neq R$ and $\pi' \; R' \; \pi$ implies that $\pi' \; R' \; \pi$ for all $\pi'$ in $DD(\pi)$.

The definitions on both subdomains of $\pi$ can be combined to define what it means for social preference $R'$ to be more altruistic than $R$ at $\pi$.

**More Altruistic at $\pi$.** Social preference $R'$ is more altruistic than $R$ at $\pi$, if $R'$ is more AD-altruistic and more DD-altruistic than $R$ at $\pi$.

This definition provides a partial ordering on the set of social preference relations. A pair of two different social preference relations can be ranked when the social indifference curves through $\pi$ cross only once. In other words, the "more altruistic at $\pi$ than" relation implies a single-crossing property on the social preference relations.

Building on the definition of the equivalent pay-off, a test of whether $R'$ is more altruistic than $R$ at $\pi$ can be implemented by checking the following series of inequalities:

$$\begin{cases} \pi^*_{R'}(\pi'_j) - \pi^*_R(\pi'_j) \geq 0 & \text{for all } \pi'_j \leq \pi_j \\ \pi^*_{R'}(\pi'_j) - \pi^*_R(\pi'_j) \leq 0 & \text{for all } \pi'_j > \pi_j . \end{cases} \tag{2}$$

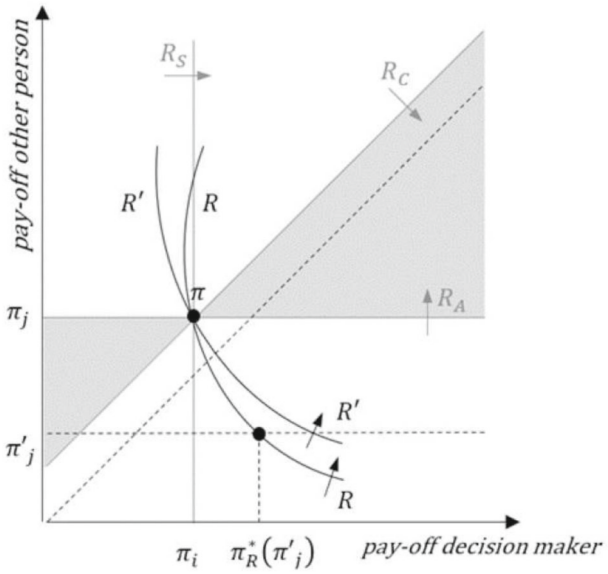



**Fig. 4** The social preference relation $R'$ is more altruistic than $R$ at $\pi$

The first series of inequalities test whether $R'$ is more AD-altruistic than $R$ at $\pi$, while the second series of inequalities test whether $R'$ is more DD-altruistic than $R$ at $\pi$. We say that a test fails when there is at least one level of the pay-off for the other person, $\pi'_j$, for which the inequality does not hold. When both tests are passed, $R'$ is more altruistic than $R$ at $\pi$. Moreover, the magnitude of the difference between both equivalent pay-offs, or its integral across all relevant $\pi'_j$ values, can provide a measure of how much more altruistic at $\pi$ the social preference relation $R'$ is compared to $R$.

Figure 4 graphically illustrates the altruism definitions and tests. The social preference relation $R'$ depicted in the figure is more AD-altruistic than $R$ at allocation $\pi$, since the upper contour set in the advantageous subdomain of $R'$ is nested in the upper contour set of $R$. The social preference relation $R'$ is also more DD-altruistic than $R$ at allocation $\pi$, since the upper contour set in the disadvantageous subdomain of $R$ is nested in the upper contour set of $R'$ and, consequently, $R'$ is more altruistic than $R$ at $\pi$.

The social preference relation with the highest level of altruism at $\pi$ is the social preference relation $R_A$ (the social preference relation with a horizontal indifference curve in Fig. 4). According to the altruism tests, the purely self-interested social preference relation $R_S$ (the vertical indifference curve in Fig. 4) is less altruistic, but it is not the social preference which shows the lowest level of altruism, once positional concerns are allowed for. The social preference with the lowest level of altruism at $\pi$ is $R_C$ (with an indifference curve with slope equal to one in Fig. 4). In line with the literature, we define a decision maker as altruistic if his social preferences exhibit more altruism than $R_S$.[11]

The proposed altruism tests can be used to make inter-personal comparisons of altruism, to compare a decision maker's altruism with respect to a self-interested decision maker, or to study how social preferences change (for instance by additional information).

[11] See, e.g., Andreoni and Miller (2002); Charness and Rabin (2002); Fisman et al. (2007), or Kerschbamer (2015) for related definitions of altruistic social preferences.

## 3 Implementation

In this section, we outline the implementation of the proposed altruism tests within an online survey experiment. First, we introduce a straightforward method for eliciting social preferences. Next, we discuss the information treatment that we implemented to study how social preferences are shaped by information about effort and luck of the other person. Lastly, we provide details about the respondents of the survey experiment.

### 3.1 Elicitation of social preferences

We propose a method to elicit social preferences that builds on the implicit definition of the equivalent pay-off in expression Eq. 1. In this method, decision makers are asked to make $T$ dichotomous choices between two allocations: the reference allocation $\pi$, which remains fixed across all choices, and a comparison allocation $(\pi_t^*, \pi_j')$, which is adjusted after each choice $t = 1, \ldots, T$, based on which allocation was chosen. In the empirical part of this paper, we consider $T = 3$ to avoid fatigue. Importantly, we select a reference allocation $\pi = (20, 20)$, in which both pay-offs are equal. Consequently, the advantageous subdomain of $\pi$ contains all allocations where the pay-off of the decision makers is larger than or equal to the pay-off of the other person, and while the disadvantageous subdomain contains all other allocations.

In the comparison allocation, $\pi_j'$ denotes the pay-off of the other person at which the equivalent pay-off is elicited. We consider two different values for $\pi_j'$, one which is smaller than the pay-off in the reference allocation, $\pi_j$, and one which is larger (Table 1 provides the precise parameter values). This choice permits the elicitation of an equivalent pay-off in the advantageous and disadvantageous subdomain, respectively.

The level of $\pi_t^*$, that is, the pay-off of the decision maker in the comparison allocation of each choice $t$, is obtained by means of the adaptive bisectional algorithm (Decancq and Nys 2021). This algorithm proceeds iteratively and generates in each iteration a value for the next iteration, which is situated precisely in the middle of the interval where the equivalent pay-off of the decision maker should lie based on the previous choices:

$$\pi_{t+1}^* := \left(\underline{\pi}_t^* + \overline{\pi}_t^*\right)/2, \tag{3}$$

where $\underline{\pi}_t^*$ is the lower bound on the equivalent pay-off $\pi^*$ in iteration $t$ and $\overline{\pi}_t^*$ the upper bound, such that $\pi_t^* \in \left[\underline{\pi}_t^*, \overline{\pi}_t^*\right]$ in each iteration $t$. Depending on the choice of the decision maker, the lower bound or upper bound of the interval is replaced by the midpoint of the interval in each iteration. Hence, the interval $\left[\underline{\pi}_t^*, \overline{\pi}_t^*\right]$ is halved in each iteration of the algorithm. In the end, the elicited interval $\left[\underline{\pi}_T^*, \overline{\pi}_T^*\right]$ contains all values of the equivalent pay-off which are consistent with the $T$ dichotomous choices of a decision maker. Appendix 1 provides more details on the bisectional algorithm.

This non-parametric elicitation method resembles the "equality equivalence test" proposed by Kerschbamer (2015) and shares many of its advantages and disadvantages. Like the equal-

**Table 1** Parameter values of the adaptive bisectional algorithm

| | $\pi_j'$ | $\underline{\pi}_0^*$ | $\overline{\pi}_0^*$ | $\pi_1^*$ |
|---|---|---|---|---|
| Advantageous subdomain | 10 | 10 | 40 | 20 |
| Disadvantageous subdomain | 30 | 0 | 30 | 20 |

**Table 2** Information treatments in the vignettes

| Vignette | Luck | Effort | Wording: *"The other person comes from ...* |
|---|---|---|---|
| 1 (LL/LE) | low | low | *an underprivileged background and is idle."* |
| 2 (HL/LE) | high | low | *a privileged background and is idle."* |
| 3 (HL/HE) | high | high | *a privileged background and is hard-working."* |
| 4 (LL/HE) | low | high | *an underprivileged background and is hard-working."* |

ity equivalence test, it is a non-parametric method which imposes only mild requirements on social preferences, as discussed in Section 2. The most important difference is that the equality equivalence test presents the comparison allocations as an ordered list of several pay-offs, rather than as a sequence of dichotomous choices that are generated by the adaptive bisectional algorithm. In an ordered list, decision makers have to make more comparisons to reach the same level of precision.[12] The adaptative bisectional algorithm involves some tedious, but standard, routing, which can be implemented easily in a Computer-Assisted Personal Interview (CAPI) or Computer-Assisted Web Interview (CAWI) survey mode. Nevertheless, the ordered list approach can arguably be even more easily implemented in a Pen-and-Paper Personal Interview (PAPI) survey mode.

In total, each decision maker makes 12 binary choices, divided into two rounds. Round 1 presents three choices in the disadvantageous subdomain and three in the advantageous subdomain. Then, in Round 2, after receiving the information treatment, three more choices are presented in the disadvantageous and advantageous subdomains. This sequence is identical for all decision makers.[13]

### 3.2 Information treatment

To study how the characteristics of the other person affect the level of altruism of the social preferences of the decision maker in $\pi$, we provide randomized information about the level of effort and luck of the other person using a hypothetical vignette between Round 1 and 2. The vignette is randomly selected from a pool of four vignettes. This vignette describes in a stylized way two characteristics of the other person (see Table 2).

The first characteristic is whether the other person comes from a privileged or underprivileged background. As shown in the table, we consider coming from a privileged background a sign of high luck and coming from an underprivileged background a sign of low luck.[14] The second characteristic indicates whether the other person is hard-working or idle. We interpret being hard-working as a sign of high effort and being idle as a sign of low effort.

After the decision makers are shown a vignette about the level of effort and luck of the other person, we elicit the equivalent pay-off again in the advantageous and disadvantageous subdomains using the same elicitation procedure. Once this information is obtained, we investigate whether and how much the elicited equivalent pay-off has changed in the advan-

[12] After $T$ choices in the bisectional algorithm, the size of the interval to which the equivalent pay-off of the decision maker belongs, is narrowed to $(\overline{\pi}_0^* - \underline{\pi}_0^*)/2^T$. Hence, the size of the interval shrinks exponentially.

[13] We follow Kerschbamer (2015) in eliciting the equivalent pay-off first in the disadvantageous and then in the advantageous subdomain for all decision makers (note, however, that Krawczyk and Le Lec (2021) reverse the order). It is an open question whether and to what extent this order affects the findings.

[14] Although we only referenced the background of the other person when describing luck in the vignette, decision makers may have inferred the current socio-economic status of the other person from this background information. In our analysis, we abstract from these potential inferences.

tageous and disadvantageous subdomain. In some cases, this allows us to reject hypotheses about the effect of information on the level of altruism as defined in Section 2. For instance, if we observe that the equivalent pay-off of a decision maker elicited in the advantageous subdomain is lower after receiving the information that the other person comes from a privileged background and is idle (Vignette 2), we can reject the hypothesis that the decision maker became more altruistic after receiving this information.

As discussed in the previous section, the elicitation method only provides us with intervals to which the equivalent pay-offs belong. Hence, for the difference between the equivalent pay-offs before and after the information treatment, we also obtain an interval which contains all possible values that are consistent with the observed dichotomous choices.

### 3.3 Survey experiment

We carried out an online survey experiment in the UK in August 2019. The survey experiment was implemented by the survey agency Qualtrics, which uses a non-probability based sampling strategy. Cross-quotas were set on age and gender in order to ensure that the sample bears resemblance to the composition of the overall UK population.[15] A total of 573 decision makers participated in the survey.[16] The decision makers are rewarded around 5 euros for taking part in the online survey. This amount is conditional on fulfilling certain time and attention requirements, but not on the choices made in the elicitation procedure. Details on the required response time are provided in Appendix 2.

In the survey we gather demographic, socio-economic and ideological information. The first column of Table 3 presents summary statistics based on the total sample. The sample is balanced (by design) in terms of gender. Also, roughly half the decision makers are married and about 55% have children. About 42% of the sample declares they live either in a big city or on its outskirts. In terms of socio-economic characteristics, almost 40% of the decision makers had a basic level of education, while 43% had received higher education.[17] One fifth of the sample declares they earn less than £19,000 per year and about 41% of the sample states they make more than £35,000. Concerning ideology, almost 43% position themselves as right-wing.

Based on the vignette received in the information treatment, we group the decision makers into four treatment groups. Since the vignettes are randomly assigned to the decision makers, the demographic, socio-economic, and ideology characteristics are expected to be balanced across the four treatment groups. The right-most column of Table 3 provides $p$-values of an $F$-test of the joint significance of the difference, which confirms this expectation.

## 4 Results

We present two sets of results using the altruism tests of Section 2. First, we analyze altruism and its correlates before the information treatment by comparing the altruism of decision-

[15] The quota's require 25% of the sample to be younger than 35 years old, and 25% to be older than 66, with equal shares of female and male decision makers in each age group. While the main other demographic and socio-economic variables turn out to be in line with population figures for the UK, the sample may not be representative for the UK.

[16] The gross sample consisted of 585 decision makers. The responses of 12 decision makers were removed because of a routing error.

[17] Basic education is defined as having completed secondary education or lower. Higher education consists of having attended university to do a Bachelor's, Master's or PhD degree.

**Table 3** Summary statistics for sample and treatment groups

| Characteristics | Total Sample | Treatment groups 1 (LL/LE) | 2 (HL/LE) | 3 (HL/HE) | 4 (LL/HE) | Pr>F |
|---|---|---|---|---|---|---|
| Female | 49.7% | 48.2% | 46.8% | 48.9% | 54.8% | 0.54 |
| Married | 49.4% | 49.6% | 48.9% | 51.7% | 47.2% | 0.90 |
| Children | 54.6% | 55.2% | 57.3% | 48.2% | 57.6% | 0.35 |
| Urban | 42.2% | 41.3% | 44.0% | 44.8% | 38.9% | 0.73 |
| Age | | | | | | |
| - between 18 and 35 | 27.9% | 26.6% | 23.1% | 31.5% | 30.6% | 0.36 |
| - between 36 and 50 | 19.7% | 19.6% | 21.7% | 19.6% | 18.0% | 0.90 |
| - between 51 and 65 | 27.7% | 30.1% | 28.0% | 23.8% | 29.2% | 0.65 |
| - over 66 | 24.6% | 23.8% | 27.3% | 25.2% | 22.2% | 0.79 |
| Education | | | | | | |
| - Primary/secondary | 38.2% | 37.4% | 38.6% | 36.2% | 42.0% | 0.68 |
| - Professional training | 18.5% | 20.1% | 20.7% | 18.1% | 13.3% | 0.39 |
| - Bachelor's or above | 43.3% | 42.4% | 40.7% | 45.6% | 44.8% | 0.84 |
| Annual income | | | | | | |
| - Under £19,000 | 25.7% | 24.2% | 26.2% | 23.4% | 28.8% | 0.52 |
| - £19,000 - 34,999 | 33.6% | 29.7% | 42.1% | 31.2% | 31.6% | 0.22 |
| - Above £35,000 | 40.7% | 46.1% | 31.7% | 45.3% | 39.6% | 0.08 |
| Right-oriented | 42.7% | 39.9% | 46.1% | 37.8% | 47.2% | 0.29 |
| *N* | 573 | 143 | 143 | 143 | 144 | |

makers' social preferences with purely self-interested social preferences. Next, we evaluate the impact of the information treatment by comparing the altruism of the social preferences before and after the treatment.

### 4.1 Altruism before the information treatment

**Distribution** Table 4 presents the distribution of the elicited equivalent pay-offs in the disadvantageous and advantageous subdomains before the information treatment. The upper part of the table shows the equivalent payoffs elicited in the disadvantageous subdomain (when $\pi'_j > \pi_j$), while the lower part of the table shows the elicited equivalent pay-offs in the advantageous subdomain (when $\pi'_j \leq \pi_j$). A large proportion of the sample chooses the equal reference allocation in all dichotomous choices, which leads to maximal equivalent pay-offs. More specifically, around 35% of decision makers prefer the equal reference allocation in all choices on either the advantageous or disadvantageous subdomains, while 21% did this in both subdomains.

These results are broadly consistent with existing evidence. For instance, in a similar elicitation exercise, (Kerschbamer 2015, p.100) finds that approximately one-fourth of decision makers have social preferences that are inequality averse (i.e. who exhibit a positive willingness-to-pay to increase the payoff of others when they are in the advantageous subdomain, while they display a willingness-to-pay to decrease the payoff of others in the disadvantageous subdomain). Additionally, Kerschbamer and Müller (2020, p.25) report

**Table 4** Distribution of equivalent pay-offs (before treatment)

| | Interval | Total sample |
|---|---|---|
| Disadvantageous subdomain | (0-5) | 3.14% |
| | (5-10) | 3.49% |
| | (10-15) | 3.84% |
| | (15-20) | 18.85% |
| | (20-22.5) | 10.12% |
| | (22.5-25) | 7.85% |
| | (25-27.5) | 14.83% |
| | (27.5-30) | 37.87% |
| Advantageous subdomain | (10-12.5) | 7.68% |
| | (12.5-15) | 5.41% |
| | (15-17.5) | 4.01% |
| | (17.5-20) | 21.82% |
| | (20-25) | 16.93% |
| | (25-30) | 5.41% |
| | (30-35) | 4.54% |
| | (35-$\infty$) | 34.21% |

that as many as 64% of participants consistently select the reference equal allocation across all allocation tasks in both advantageous and disadvantageous domains. Relatedly, Krawczyk and Le Lec (2021, p.22) classify between 12% and 19% of respondents as inequality averse, a figure that rises to approximately one-third when using incentivized choice tasks.

**Non-parametric altruism test** The tests proposed in Section 2 can be used to test whether a decision maker is DD-altruistic, i.e., if she is more DD-altruistic than a self-interested decision maker. This DD-altruism test requires that all equivalent pay-offs in the disadvantageous subdomain be smaller than 20. Consequently, a decision maker fails the DD-altruism test if the elicited equivalent pay-off in the disadvantageous subdomain is strictly larger than 20. From Table 4, it can be seen that for almost 61% of all decision makers, the elicited equivalent pay-off was indeed strictly larger than 20, so that they fail the DD-altruism test.[18] These individuals exhibit non-Paretian positional concerns in the disadvantageous subdomain, meaning that they care about the relative size of their pay-off compared to the other person's if the other person gets more. This finding underscores the empirical relevance of the weakening of the monotonicity axiom proposed in Section 2. Similarly, a decision maker can be said to fail the AD-altruism test if the elicited equivalent pay-off in the advantageous subdomain is strictly smaller than 20. Table 4 shows that this occurs for approximately 17% of decision makers. Combining both tests, we find that 66% of decision makers fail an overall altruism test of being more altruistic than a self-interested decision maker (i.e., their equivalent pay-off in the disadvantageous subdomain is strictly larger than 20 or their equivalent pay-off in the advantageous subdomain is strictly smaller than 20).[19] This finding is in line with the recent findings of Fehr et al. (2023), who cluster social preferences across various samples and classify about a third of the respondents as altruistic.

[18] This is a conservative estimate of the fail rate of the test as some individuals in the interval (20-22.5) may also have an equivalent pay-off that is strictly larger than 20.

[19] Given the non-incentivized design of this experiment, there is no real-world monetary cost for decision makers to act altruistically, which may lead to an overestimation of the proportion of altruistic decision makers.

**Table 5** Results of interval regression in the disadvantageous and advantageous subdomains, first round of the experiment (before information treatment)

| | (1) Disadvantageous | | (2) Advantageous | |
|---|---|---|---|---|
| Female | 1.259** | (0.544) | 1.363* | (0.811) |
| Married | 0.070 | (0.929) | 1.981 | (1.439) |
| Children | -1.266 | (0.818) | -2.732** | (1.174) |
| Married w/ children | 0.029 | (1.212) | 1.221 | (1.786) |
| Urban | -1.455** | (0.637) | -0.370 | (0.879) |
| Aged 36-50 | 1.565* | (0.823) | -0.489 | (1.169) |
| Aged 51-65 | 1.995** | (0.823) | 0.328 | (1.150) |
| Aged over 66 | 2.629*** | (0.876) | -0.190 | (1.231) |
| Professional training | -0.181 | (0.732) | 0.992 | (1.156) |
| Bachelor's or above | -0.367 | (0.628) | -0.451 | (0.881) |
| Income 19,000 - 34,999 | 0.503 | (0.685) | -0.138 | (1.033) |
| Income above 35,000 | 0.291 | (0.709) | -0.930 | (1.022) |
| Right-oriented | -2.006*** | (0.582) | -2.366*** | (0.801) |
| Constant | 24.185*** | (1.150) | 28.943*** | (1.944) |
| Logarithm $\sigma$ | 1.836*** | (0.038) | 2.204*** | (0.018) |
| Logarithm likelihood | -1234.18 | | -1313.05 | |
| Observations | 573 | | 573 | |

Robust standard errors in parentheses. Regional controls included
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

**Interval regression** In Table 5 we look at the socio-demographic correlates of the elicited equivalent pay-offs in the advantageous and disadvantageous subdomain. We do this by using a separate interval regression model for each subdomain.[20] These models take a series of socio-demographic characteristics (listed in Table 3) and regional control dummies as explanatory variables and the elicited intervals as explained variable. The coefficients are estimated using a maximum likelihood estimator with robust standard errors. The $\chi^2$ test (with 23 degrees of freedom) equals 0.0001 in the first specification, regarding the disadvantageous subdomain. It confirms that at least one of the coefficients in the regression is different from zero. The logarithm of the $\sigma$ statistic equals 1.84 (standard error of 0.04), and reflects the estimated standard error of the regression.[21] In the specification for the advantageous subdomain, the $\chi^2$ test equals 0.0024, while the logarithm of the $\sigma$ statistic amounts to 2.20 (standard error of 0.02).

Column 1 of Table 5 shows the coefficients of the socio-demographic variables in the interval regression in the disadvantageous subdomain. The constant in this model is 24.2. This constant captures the (latent) equivalent pay-off of a reference decision maker who is male, unmarried, has no children, is living in a rural area in the UK, is younger than 36 years-of-age, obtained only secondary education, has a yearly income below £19,000 and

[20] On interval regressions, see Wooldridge (2002, pp.508-509). An alternative, arguably simpler, approach is to take the midpoint of the interval as explained variable.

[21] The smaller the elicited intervals, the more $\sigma$ approaches the root mean squared error of an OLS regression taking the actual equivalent payoff values as explained variable.

is left-wing oriented. This reference decision maker is indifferent between the reference allocation (20,20) and the allocation (24.2,30). This finding indicates the importance of non-Paretian positional concerns in the disadvantageous subdomain. The reference decision maker did not consider an increase in his own pay-off by a positive amount smaller than £4.2 to be an improvement if the other persons pay-off increased by £10, that is, when the other person receives considerably more. Using the DD-altruism test proposed in Section 2, we can reject that the reference decision maker is more DD-altruistic than a self-interested decision maker, who would only consider his own pay-off. Female decision makers and those older than 36 years-of-age are found, on average, to have higher equivalent pay-offs, while decision makers who live in an urban area report lower equivalent pay-offs, as well as decision makers who identify themselves as right-oriented.

The constant in the interval regression model in the advantageous subdomain (Column 2 of Table 5) is 28.9. Hence, the reference decision maker is found to be indifferent between the reference allocation (20,20) and the allocation (28.9,10). In other words, he would be willing to sacrifice up to £8.9 of his own pay-off to increase the pay-off of the other person with £10. Using the AD-altruism test, we find that the reference decision maker is more AD-altruistic than a self-interested decision maker. When inspecting the other coefficients in Column 2, it can be seen that female decision makers are found, on average, to have higher equivalent pay-offs. The opposite is true for those decision makers who have children and identify as right-oriented.

### 4.2 Effect of information treatment on altruism

To assess whether the information treatment altered the altruism of the social preferences, we first compare the elicited equivalent pay-off's before and after the information treatment for each decision-maker. Then, we use the non-parametric altruism tests to examine the effect of the information treatment on the difference in elicited equivalent pay-offs. Finally, we use interval regression to study the correlates of the change in equivalent pay-offs.

**Distribution** Figure 5 shows the distribution of changes in elicited equivalent pay-offs before and after the information treatment, disaggregated by treatment group. While differences are small for most respondents[22], notable patterns emerge across treatments, suggesting that the vignettes influenced social preferences. Compared to the first (LL/LE) and third (HL/HE) vignettes, which yield similar results, the second vignette (HL/LE) more frequently leads to higher equivalent pay-offs in the disadvantageous subdomain and lower ones in the advantageous subdomain, indicating a shift toward less altruistic preferences at $\pi$. In contrast, the fourth vignette (LL/HE) induces the opposite shift, suggesting increased altruism at $\pi$.

[22] Several factors may explain why the differences between the equivalent pay-offs before and after the information treatment are small. First, decision makers may have ignored the vignette or found it unrealistic. Second, their social preferences might not be sensitive to the effort or luck levels of the other person. Third, the information in the vignette may align with their prior beliefs, such as assuming the other person is from an underprivileged background and hardworking, thus not prompting any change in the equivalent pay-off. Finally, the interval-based elicitation method may not be sufficiently fine-grained to capture small changes in the equivalent pay-offs.

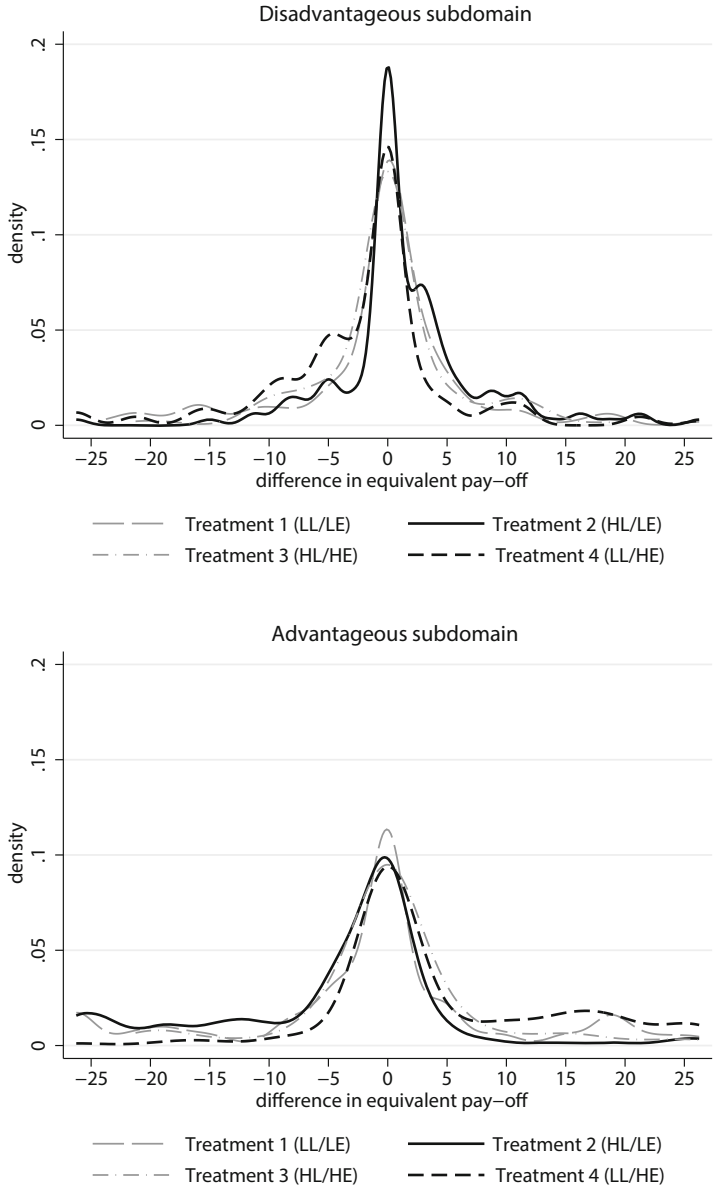



**Fig. 5** Difference in equivalent pay-offs before and after treatment

**Non-parametric altruism test** Table 6 reports the fail rates of the three proposed altruism tests by treatment group. We say that a decision maker fails the test of becoming more AD-altruistic, for instance, when at least one equivalent pay-off in the advantageous subdomain becomes strictly smaller after the information treatment. From the first column, it can be seen that for 17.8% of all decision makers the elicited equivalent pay-off after the information

**Table 6** Non-parametric altruism tests after information treatment (fail rates)

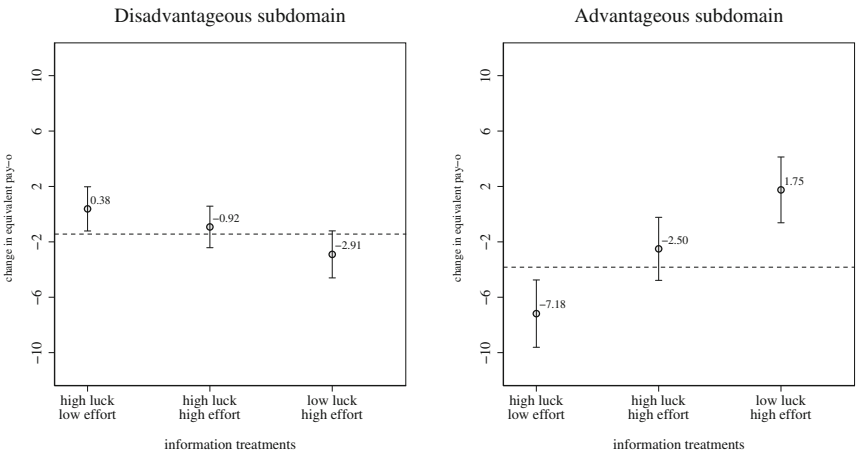
| fails test of becoming ... | total sample | treatment groups 1 (LL/LE) | 2 (HL/LE) | 3 (HL/HE) | 4 (LL/HE) |
|---|---|---|---|---|---|
| more AD-altruistic at $\pi$ | 17.8% | 23.1% | 30.7% | 11.9% | 5.5% |
| less AD-altruistic at $\pi$ | 15.9% | 16.7% | 5.5% | 11.1% | 29.8% |
| more DD-altruistic at $\pi$ | 13.6% | 13.2% | 18.1% | 13.9% | 9.0% |
| less DD-altruistic at $\pi$ | 17.1% | 16.0% | 11.9% | 15.3% | 25.0% |
| more altruistic at $\pi$ | 4.3% | 6.9% | 7.7% | 2.1% | 0.7% |
| less altruistic at $\pi$ | 4.1% | 4.5% | 2.1% | 1.4% | 8.3% |

treatment was strictly smaller, so that they fail the test of becoming more AD-altruistic. The second row shows that for a comparable share (15.9%) of all decision makers the equivalent pay-off was strictly larger, so that they fail the test of becoming less AD-altruistic. For the remaining 66.3% of decision makers the equivalent pay-off before and after the information treatment is situated in the same interval.

As can be seen from Table 6, the fail rates vary substantially across the treatment groups. While the fail rate of the test of becoming more AD-altruistic increases to 30.7% after learning that the other person experienced high luck and exerted low effort in the second vignette, the fail rate decreases to 5.5% after learning that the other person experienced low luck and exerted high effort in the fourth vignette. In general, the fail rates of the test of becoming more AD-altruistic are found to be larger after a treatment with a vignette indicating high luck than after a vignette indicating low luck, while the fail rates of a treatment with vignettes indicating high effort are found to be smaller than vignettes indicating low luck. This evidence is consistent with the hypothesis that learning that the other person experienced high luck makes decision makers less AD-altruistic, while learning that the other person exerted high effort makes decision makers more AD-altruistic. Moreover, the latter effect turns out to be larger than the former, suggesting that more decision makers are sensitive to information about effort than about luck in the advantageous subdomain. The effects of the information treatments on the fail rates in the disadvantageous subdomain are found to be consistent, but less pronounced than the effects on the advantageous subdomain. In general, more decision makers are found to be reactive to the information in vignettes in the advantageous subdomain than in the disadvantageous subdomain. Finally, when turning to the concatenated altruism tests in the bottom row, we notice that the fail rates are generally low, but consistently larger than the product of the fail rates of the underlying tests of AD-altruism and DD-altruism, which suggests that there is some consistency between the responses in both subdomains at the level of the individual decision makers.

**Interval regression** Next, we turn to the question of how large the effect of the information treatment is in an interval regression model with the change in equivalent pay-off as explained variable. Figure 6 presents the coefficients and 95% confidence interval of the treatment dummies (for the second, third and fourth vignette). The interval regression model includes the same set of socio-demographic explanatory variables as the earlier models reported in Table 4.[23] The results obtained in the advantageous subdomain (shown in the right-hand panel of Figure 8) show that the treatment with the second vignette (HL/LE) decreases the equivalent

[23] The full regression results are available upon request.




Note: reference treatment is low luck/low effort. Constant: disadvantageous = −1.44, advantageous domain = −3.83.

**Fig. 6** Effects of information treatments

pay-off by about £3.4 compared to the first vignette (LL/LE) when the reference decision maker reports an average reduction of £3.8 in his equivalent pay-off after the information treatment. The treatment with the fourth vignette (LL/HE), on the other hand, increases the equivalent pay-off by about £5.6. Compared to the coefficients of the socio-demographic variables in Table 4, the effects of the information treatments are sizeable. We find that learning that the other person is of the high effort type (Vignette 4 compared to Vignette 1) has a larger effect on the equivalent pay-off than learning that the other person is of the high luck type (Vignette 2 compared to Vignette 1). The importance of effort is consistent with the "sympathy for the diligent" that is observed by Drenik and Perez-Truglia (2018) when considering the demand for redistribution through workfare. We could not find a significant difference between the third vignette (HL/HE) and the first vignette (LL/LE) which suggests that the effects of being simultaneously of the high luck and high effort type largely offset each other. The results on the disadvantageous subdomain (shown in the left-hand panel) are found to be consistent with the results on the advantageous subdomain, but they are found to be smaller in size. Receiving the second vignette (HL/LE) increases the equivalent pay-off by about £1.8, while receiving the fourth vignette (LL/HE) decreases it with about £1.5, compared to the first vignette (LL/LE).

In sum, we find that decision makers show greater altruism when informed of high effort and less altruism when the other person is perceived as lucky. This effect is particularly evident in the advantageous subdomain. In contrast, in the disadvantageous subdomain, non-Paretian positional concerns play a significant role and may partly override concerns about the source of inequality.

## 5 Conclusion

In this paper, we have studied social preferences in a framework that allowed for non-Paretian positional concerns. We discussed several altruism tests that provide a partial ordering of

social preferences, by checking inclusion of the upper contour sets of the social preferences in the advantageous subdomain, in the disadvantageous subdomain or in both subdomains. We used an easily implemented elicitation procedure for social preferences that requires decision makers to make only a small number of binary comparisons that are determined by the "adaptive bisectional discrete choice" algorithm. We have studied the level of altruism of 573 decision makers in an online survey experiment in the UK and investigated how a randomly selected vignette with information about the level of effort and luck of the hypothetical other person affects the level of altruism of the decision makers.

In line with the existing literature, we have found that most decision makers are not exclusively motivated by purely self-interested social motives. In the disadvantageous subdomain we have found that non-Paretian positional concerns play an important role, especially for female or older decision makers. In the advantageous subdomain we have found many decision makers to be willing to redistribute to the poorer other person, although decision makers who are right-oriented and have children are less willing.

We have found that the level of altruism of the decision makers is affected by the exogenous information that we provide about the other person. Our results are consistent with other findings that indicate decision makers who learn that the other person exerted high effort become more altruistic and, on the contrary, decision makers who learn that the other person experienced a high level of luck, become less altruistic. Decision makers are found to be more sensitive to this information in the advantageous subdomain than the disadvantageous subdomain. Moreover, we have found some evidence that decision makers who are female, older than 65 or who identify as right-oriented are more sensitive to information about effort than to information about luck. Our findings suggest that positional concerns can partly suppress concerns about the source of inequality when decision makers experience disadvantageous inequality.

Our study faces a number of design-related limitations. First, we cannot answer the question of what precisely motivates the decision makers to share their (hypothetical) endowment. While our preferred interpretation is that the level of altruism of social preferences depends on the characteristics of the other person and, in particular, about the source of the inequality between them, we cannot exclude the possibility that decision makers are subject to social pressure when allocating a pay-off to the other person (DellaVigna et al. 2012) or that their responses are driven by experimenter demand effects (Levitt and List 2007; List 2007). However, Kerschbamer (2015) argues that the neutral framing of the elicitation procedure reduces experimenter demand effects. We believe that demand effects constitute an interesting avenue for future work. Second, and related, while the vignettes are a powerful way to create exogenous and orthogonal variation in the characteristics of the other person, the external validity of the results may be questioned because of their hypothetical nature. Further investigations, along the lines of the work by Krawczyk and Le Lec (2021), are important to address such questions.

While the vignettes in this study contained only two dimensions and were randomly provided, more sophisticated (efficient) designs (such as discussed by Auspurg and Hinz (2015)) could be used to make the description of the other person richer. This would allow the study of whether and to what extent social preferences are shaped by information about demographic characteristics such as gender, citizenship and migration status and other characteristics capturing the closeness of the connection with the other person.

**Supplementary Information** The online version contains supplementary material available at https://doi.org/10.1007/s10888-025-09699-0.

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**Data Availability** Data are available from the authors upon reasonable request.

## Declarations

**Competing interests** The authors declare no competing interests.



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