Fairness in times of crisis: Negative shocks, relative income, and preferences for redistribution

Anna Hochleitner*

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Abstract

This paper investigates whether and how negative economic shocks affect redistributive preferences. Informed by a theoretical framework, I design an experiment that exogenously varies an individual's experience of negative income shocks before they decide how to redistribute resources. Furthermore, the experiment introduces exogenous differences in relative income, distinguishing between poorer individuals who benefit from redistribution and richer individuals who benefit from the status quo. The results provide causal evidence that redistributive decisions depend on relative income, with poorer individuals favouring higher levels of redistribution. Moreover, the effect of negative shocks is conditional on relative income. While poorer individuals do not respond to shocks, richer individuals become more opposed to redistribution when they are hit by a shock, but more supportive of redistribution if poorer individuals are affected. A follow-up study extends these findings by bringing real world income shocks caused by the recent Covid-19 crisis into the experiment.

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*University of Nottingham, UK. Email: anna.hochleitner@nottingham.ac.uk.

1 Introduction

Economic crises give rise to public and political debates surrounding inequality and redistribution. Examples include concerns regarding aggravated inequalities caused by the Covid-19 pandemic (Adams-Prassl et al., 2020; Butler, 2021; The Economist, 2021; Ten et al., 2022), or the current cost-of-living crisis and its impact on the most vulnerable (Siemplenski, 2022; United Nations, 2022). While negative economic shocks caused by such crises increase the salience of redistributive issues, a key question is whether they also affect preferences for redistribution. If yes, this can have significant implications for the acceptance of inequality or support for social policies (see e.g. Alesina et al., 2012; Almås et al., 2020).

In this paper, I study how negative economic shocks affect redistributive decisions. Addressing this question, poses several empirical challenges. The degree to which an individual is affected by a shock could correlate with socioeconomic characteristics. Moreover, a crisis will not only impact individuals through economic channels but also lead to wider political and societal changes. To isolate the causal effect of economic shocks on redistributive preferences, I thus design an experiment that - informed by a theoretical framework - allows me to exogenously vary an individual's loss of income.

To understand the conditions under which economic shocks facilitate or hinder redistributive policies, it is important to consider heterogeneous responses within society. Previous research has argued that redistributive preferences are formed in a self-serving way, with support for redistribution being negatively correlated with an individual's position within the income distribution (Piketty, 1995; Alesina and La Ferrara, 2005; Alesina and Giuliano, 2011; Cappelen et al., 2013; Durante et al., 2014). For this reason, I randomly assign individuals to different income levels in the experiment, distinguishing between two types: poorer individuals who benefit from redistribution and richer individuals who benefit from the status quo. This does not only allow me to provide causal evidence for the relationship between relative income and redistributive preferences, but also to test whether different socioeconomic groups show distinct responses to shocks.

To conceptualise notions of distributive fairness I focus on two views that stand out from the literature: fairness as equality of outcomes, and fairness as proportionality to individual inputs (see e.g. Konow, 2003; Cappelen et al., 2007). In the following, I refer to those ideas as egalitarian and contribution-based fairness views. In the theoretical framework, I assume that individuals first form fairness views on which they base their redistributive decisions. If there are differences in relative income, it becomes optimal for different income types to form distinct fairness views;[1] richer individuals will favour contribution-based views,

[1] In line with this, people tend to judge beneficial outcomes as more fair (see e.g. Babcock and Loewenstein, 1997; Ubeda, 2014; Neuber, 2021) and engage in motivated reasoning to avoid redistribution (Jia, 2022).

while poorer individuals will favour egalitarian views. This will ultimately translate into differences in redistributive decisions.

These differences in fairness views have direct implications for reactions to negative economic shocks. If, in accordance with egalitarianism, final income is to be shared equally, it does not matter if one party suffers a negative shock. By contrast, under the contribution-based fairness view, shocks to earned income will be compensated, as the unexpectedness of a crisis leaves pre-shock earnings as a natural reference point that affects post-shock allocation decisions.[2] The model thus predicts that only richer individuals will respond to shocks. They will become more opposed to redistribution when they themselves are hit by economic shocks, but more supportive of redistribution if poorer individuals are affected.

The purpose of the theoretical framework is to provide a structure for the empirical analysis. In the experiment, participants work to earn an initial endowment and are later given the opportunity to redistribute total earnings between themselves and another player (following Cappelen et al., 2007, 2013). I introduce differences in relative income by randomly assigning participants to either a hard or an easy task for which they earn different initial endowments. A crucial and novel aspect of my study is that, after earning their endowments, but before the redistribution decision, participants may incur a shock that reduces their earned income.[3] Similarly, I vary the information individuals have about the experience of the other participant. They either know that the other suffered a shock, that the other did not suffer a shock, or are in a situation where the other's shock is unknown. This allows me to disentangle the effect of own shocks and shocks to others on redistributive decisions. Finally, by holding post-shock earnings constant across all conditions, I can exclude alternative explanations such as differences in inequality or total earnings.

The results indicate that both relative income and the experience of shocks matter for redistributive preferences. Consistent with the theoretical framework, participants with a higher initial endowment are more likely to distribute total post-shock income in line with contribution-based fairness views, while players with a lower initial endowment are more likely to distribute total post-shock income equally. Moreover, relative income moderates the reaction to shocks. As predicted by the theoretical framework only richer individuals respond to shocks. Finally, in line with the literature on moral wiggle room (see e.g. Dana et al., 2007), the absence of full information about the other's shock, provides an excuse for

[2] See e.g. Kahneman and Tversky (1979); Kőszegi and Rabin (2006) on the relevance of reference points for decision making. More recently, studies have shown that these concepts also matter for distributional preferences (Roth and Wohlfart, 2016; Charité et al., 2015).

[3] Income shocks within the lab have been previously used to study a wide range of topics such as solidarity and insurance agreements (Selten and Ockenfels, 1998), poverty and discount rates (Haushofer et al., 2019), the intra-personal consistency of fairness views (Ubeda, 2014), reciprocity between employers and employees in the presence of economic shocks (Gerhards and Heinz, 2017), or the effect of own failures on redistribution decisions as an unaffected observer (Cassar and Klein, 2019).

individuals who would otherwise compensate the shocks of others to ignore them.

To provide more context to the experiment, I run a follow-up study that incorporates shocks caused by a real world crisis into the lab. In particular, I run the same experiment with participants who did/ did not lose their employment due to Covid-19. The results confirm that participants who lost their employment allocate more resources to themselves, whereas learning that others lost their employment makes people redistribute more towards those in need. While the Covid-19 crisis is a highly relevant case study, my results are based on its economic component and can thus be translated to other large-scale crisis such as mass layoffs, recessions or natural disasters.

This paper contributes in several ways to the literature on redistribution and preference formation.[4] First, my research complements previous studies that investigate the effects of economic shocks on distributive behaviour, analysing both macro shocks such as a general economic crisis (Giuliano and Spilimbergo, 2014; Fisman et al., 2015; Cappelen et al., 2021; Lotti and Pethiyagoda, 2022), as well as individual level shocks such as becoming unemployed (Barr et al., 2016; Naumann et al., 2016; Martén, 2019), exposure to natural disasters (Stein and Weisser, 2022), or correcting beliefs about the income distribution (Cruces et al., 2013; Karadja et al., 2017; Hvidberg et al., 2020). While results on macro shocks are mixed, negative individual shocks seem to increase support for redistribution, which is also confirmed in a recent experiment by Gagnon et al. (2021).[5] An experimental study by Mérola and Helgason (2016) moreover shows that absolute and relative changes in income can have different effects on demand for redistribution. I extend these findings by showing that individuals do not only react to own income shocks, but also compensate the shocks of others. Moreover, distinguishing between different types of individuals allows a more nuanced analysis. Depending on which socioeconomic groups are affected by economic shocks, times of crises can both generate support for and resistance to redistributive policies.

Second, my study provides causal evidence for the notion that relative position within society matters for redistributive preferences (see e.g. Piketty, 1995; Alesina and La Ferrara, 2005; Alesina and Giuliano, 2011; Cappelen et al., 2013; Durante et al., 2014). This is in line with literature on the *veil of ignorance*, showing that individuals who take distributive decisions before their own position is revealed (behind the veil) take significantly different decisions from those who already know their position within society (see e.g. Sutter and Weck-Hannemann, 2003; Schildberg-Hörisch, 2010; Durante et al., 2014). My results also confirm recent theoretical and empirical work by Gallenstein (2021), who in a simultaneous paper studies exogenous variation in relative income. A key distinction is that in my paper

[4]For a recent survey on determinants of redistributive preferences see Mengel and Weidenholzer (2022).

[5]There is also research on positive shocks such as winning the lottery (Doherty et al., 2006; Powdthavee and Oswald, 2014), showing a reduction in the support for redistribution. See Margalit (2019) for an overview.

earned income differences interact with exogenous shocks, yielding a rich set of results that inform the formation of redistributive preferences under different environments.

Third, I show that the source of inequality matters for redistributive decisions (see also Preuss et al., 2022). While the initial income inequality in the experiment can be justified by different difficulty levels of the real effort task, the subsequent income shock is unambiguously random. The finding that participants with a contribution-based fairness view compensate shocks but not initial differences, supports previous research showing that inequalities based on merit are more accepted than those produced by luck (see e.g. Alesina and La Ferrara, 2005; Almås et al., 2020; Nettle and Saxe, 2020; Trump, 2020).

Finally, my paper has interesting implications for understanding the formation and limits of self-serving biases and motivated reasoning (see e.g. Bénabou, 2015; Bénabou and Tirole, 2016). The experiment indicates that participants behave in line with the fairness view that is most beneficial to them. However, once an individual commits to a fairness view, they appear to be bound by it and tend not to engage in further self-serving behaviour such as only reacting to own but not others' shocks.[6]

The remainder of this paper is structured as follows. Section 2 outlines the theoretical framework, conceptualising how income differences and shocks can affect fairness views. Section 3 describes the experimental design and hypotheses, while Section 4 reports results. Section 5 provides the design and results for the follow-up study using income shocks caused by the recent Covid-19 crisis, before Section 6 discusses the results and concludes.

2 Theoretical framework

2.1 Basic set-up

Let us consider two individuals i and j who at time t earn respective endowments x_{it} and x_{jt}. Individuals can then decide to offset potential income differences by redistributing total earnings X_t ($X_t = x_{it}+x_{jt}$) among each other. Previous research has shown that in addition to their own material benefit, most people seem to be guided by fairness considerations and social motives (Hoffman et al., 1994; Camerer, 2011; DellaVigna et al., 2020). Following the seminal work by Cappelen et al. (2007, 2013), an individual's allocation decision can then be modelled as a trade-off between own material benefit (y_{it}) and the amount they consider as a fair allocation to themselves (m_{it}), yielding the following utility function:

[6] Such a commitment may be explained by an individual's self-image, such as preferences for consistency (Cialdini et al., 1995; Falk and Zimmermann, 2011) or a desire to think of oneself as a moral person (Brekke et al., 2003; Bénabou and Tirole, 2011, 2016).

$$U_{it} = y_{it} - \beta_i \frac{(y_{it} - m_{it})^2}{2X_t}, \beta_i \geqslant 0, \quad (1)$$

where β_i is a sensitivity parameter that describes how much an individual values behaving in accordance with their own fairness judgement. When solving (1) for the optimal allocation this results in:

$$y^*_{it} = m_{it} + \frac{X_t}{\beta_i} \quad (2)$$

If individuals do not care about adhering to their own fairness judgement ($\beta_i = 0$), the solution is trivial and individuals will always allocate all earnings to themselves. In the following, I thus focus on the more interesting case of $\beta_i > 0$. The higher β_i, the closer the allocation will be to m_{it}.

While individuals' decisions depend on m_{it}, a key question is how they decide on what constitutes a fair allocation. In an early and influential contribution to this literature, Konow (2003) categorised fairness along the categories of *"equality and need"* and *"equity and desert"*. In the following, I focus on two fairness views that embody these respective categories: the egalitarian and the contribution-based view. The egalitarian view abstracts from individual contributions and always prescribes an equal split of the total pie X_t. According to the contribution-based view, by contrast, each individual should receive exactly what they contributed to the overall endowment (x_{it}, x_{jt}).[7] This is also in line with Konow's accountability principle, stating that a fair distribution should be proportionate to a person's discretionary inputs (Konow, 2000, 2003).[8] The two fairness views can be summarised as follows:

Egalitarian fairness view: *Fairness means equality of outcomes ($m_{it} = \frac{X_t}{2}$). It is fair to redistribute total earnings such that each individual receives the same amount independent of individual contributions.*

Contribution-based fairness view: *Fairness means that each individual receives an amount that is proportional to their individual contributions ($m_{it} = x_{it}$). This is independent of whether such an allocation causes inequalities between individuals.*

The two fairness views can be seen as endpoints of a continuum, with some individuals being closer to the egalitarian and others closer to the contribution-based view (see also Barr et al., 2015). Formally, the allocation an individual perceives as fair can then be represented as a weighted average between these two notions:

[7] Cappelen et al. (2007) refer to this as a *libertarian* fairness view in line with the libertarian principle of non-interference.

[8] While Konow (2000, 2003) argues that a fair allocation will be a function of inputs and endowments, he also states that subjects should not be held accountable for exogenous variables.

$$m_{it} = \alpha_i x_{it} + (1 - \alpha_i)\frac{X_t}{2}, \tag{3}$$

where α_i determines where on the continuum between the egalitarian and contribution-based fairness view an individual falls. If m_{it} is the fair allocation to self, the fair allocation to the other player from the point of view of individual i is consequently:

$$m_{jt} = X_t - m_{it} = X_t - (\alpha_i x_{it} + (1 - \alpha_i)\frac{X_t}{2}) \tag{4}$$

In the following I refer to the fair allocation to self and other as m_{kt} with $k \in \{i, j\}$.

While this conceptualisation represents a formal restriction on what can be considered as fair, it captures the most important ideas discussed in the literature and thus provides a useful way to think about the possible range of fairness judgements (see e.g. Cappelen et al., 2007, 2013; Barr et al., 2015; Almås et al., 2020).

2.2 The effect of relative income

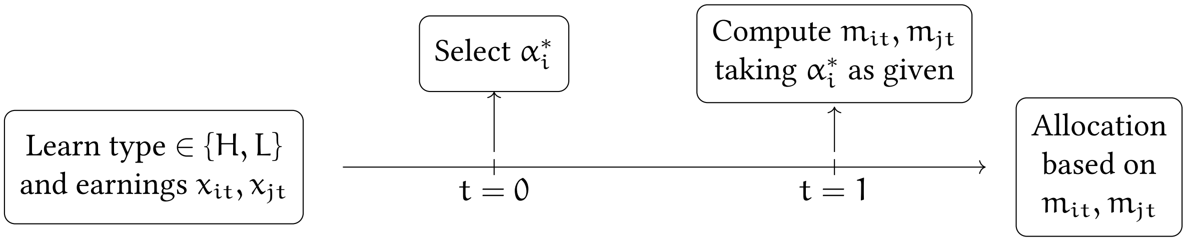
To explore how differences in relative income affect what an individual perceives as fair, I consider a situation where initial endowments differ between i and j. Some individuals earn a high and some a low endowment ($i, j \in \{H, L\}$), generating differences in relative income.

As mentioned in the introduction, individuals tend to follow the fairness view that is most beneficial to them (Konow, 2000; Cappelen et al., 2013; Ubeda, 2014; Barr et al., 2015; Gallenstein, 2021). Conceptually, this means that individuals choose α_i such that their utility is maximised. One can think of the allocation decision as a two-period process ($t \in \{0, 1\}$), similar to models of motivated beliefs and reasoning (see e.g. Bénabou, 2015; Bénabou and Tirole, 2016). At $t = 0$, an individual decides which fairness views (which α_i) they should apply given a specific situation. At $t = 1$ the selected α_i^* is then taken as given and i decides on what they consider as a fair allocation m_{kt} given the individual earnings, and ultimately how they want to distribute X_t (see Figure 1).[9]

To find the optimal weight between the two fairness views α_i^*, I substitute Equation 3 into the utility function. This yields a corner solution where $\alpha_i^* \in \{0, 1\}$, implying that individuals are either following the contribution-based ($m_{kt} = x_{kt}$) or the egalitarian fairness view ($m_{kt} = \frac{X_t}{2}$). If there are differences in relative income, it is always true that for richer individuals ($i = H$) own contributions are larger than average contributions ($x_{it} > \frac{X_t}{2}$), while the opposite is true for poorer individuals ($i = L$). To maximise their own material benefit, richer individuals should thus tend towards a contribution-based fairness view

[9] Note that fairness views do not translate one-to-one into allocation decisions. If β_i - the importance individuals assign to adhering to their own fairness views - is low, individuals will allocate amounts to themselves that exceed m_{it}.

Figure 1: Formation of fairness views and allocation decisions



and poorer individuals towards an egalitarian fairness view. Individuals may justify such self-serving judgements by interpreting the situation in question in a favourable way. For instance, one contextual factor that can justify different fairness views could be whether differences in earnings are deserved (see e.g. Barr et al., 2015; Jakiela, 2015). Intuitively, if individuals differ in the assessment of the situation - e.g. regarding the deservingness of income differences - they may also differ in their fairness judgement.[10] *Proposition 1* summarises the idea that differences in income can lead to differences in fairness views. All proofs can be found in Appendix A.1.

Proposition 1: *Fairness views depend on relative income. For richer individuals $\alpha_i^* = 1$, implying that they hold a contribution-based fairness view ($m_{kt} = x_{kt}$). Poorer individuals, with $\alpha_i^* = 0$ hold an egalitarian fairness view ($m_{kt} = \frac{X_t}{2}$).*

2.3 Experience of shocks

Finally, but most importantly, I consider the situation where endowments are not fixed but subject to negative shocks. Formally, this means that individuals suffer a reduction in earnings between $t = 1$ and $t = 2$ such that $x_{k2} < x_{k1}$.

While shocks change the allocation decision, the pre-shock situation can still affect fairness judgements by generating reference points for distributive decisions (Roth and Wohlfart, 2016; Charité et al., 2015). Conceptually, the allocation perceived as fair can thus be written as a weighted average of the initial and the post-shock situation:[11]

$$m_{i2}^* = (1 - \rho_i)m_{i2} + \rho_i m_{i1} \tag{5a}$$

$$m_{j2}^* = (1 - \rho_i)m_{j2} + \rho_i m_{j1} \tag{5b}$$

where $\rho_i \in [0, 1]$ is exogenously given and can be seen a measure for the stickiness or

[10] A crucial aspect of the experimental design is that income differences are generated in a way that allow different perceptions of deservingness. See Section 3 for more details.

[11] The specification in Equations 5a and 5b is consistent with the standard model for reference dependent preferences (see Kőszegi and Rabin, 2006).

saliency of the initial judgement (m_{k1}). m_{k2} describes what an individual would have considered as a fair allocation in the post-shock situation, had they been presented with it from the start. However, given the shock, the final fairness judgement (m^*_{k2}) may be different from the hypothetical judgement (m_{k2}). If $\rho_i > 0$ the pre-shock situation will influence which allocation individual consider as fair.

Note that equations 5a and 5b are subject to a feasibility constraint $m_{i1} + m_{j1} = X_2$, as a negative shock implies that the total distributable amount (X_t) is shrinking. It may thus become impossible to stick to the allocation that was originally considered as fair. Individuals need to weigh off the fair reference allocation for themselves against the one for the other player. I thus introduce an additional parameter, γ_i, that measures how much i cares for the fair reference allocation to self relative to the fair reference allocation to the other player.[12] The feasible m_{i1} can then be written as $\gamma_i m_{i1} + (1-\gamma_i)(X_2 - m_{j1})$ (and analogously for m_{j1}).

By substituting the feasibility constraint into Equation 5a, I derive the following expression for the allocation perceived as fair by individual i. The allocation perceived as fair for individual j is derived analogously.

$$m^*_{i2} = m_{i2} + \rho_i\gamma_i(m_{i1} - m_{i2}) - \rho_i(1-\gamma_i)(m_{j1} - m_{j2}) \tag{6}$$

How does relative income affect reactions to shocks? Let us first consider how richer individuals will respond to shocks. As argued in Section 2.2, richer individuals will adhere to a contribution-based fairness view with $m_{kt} = x_{kt}$. The change in m^*_{i2} caused by an own shock is thus given by $\frac{\partial m^*_{i2}}{\partial(x_{i1}-x_{i2})} = \rho_i\gamma_i \geqslant 0$, while the response to a shock to others is given by $\frac{\partial m^*_{i2}}{\partial(x_{j1}-x_{j2})} = -\rho_i(1-\gamma_i) \leqslant 0$.[13]

Corollary: *The effect of an own negative shock on m^*_{i2} is strictly positive if $\rho_i, \gamma_i > 0$. The effect of a shock to other is strictly negative if $\rho_i > 0$ and $\gamma_i < 1$.*

The framework thus predicts that - given certain parameter restrictions - richer individuals ultimately allocate more to themselves after an own shock and less to themselves after the other suffered a shock. In other words, they become less supportive of distributing income to the poor if they receive a shock themselves, but more supportive if poorer individuals are hit by a shock. As Equation 6 shows, the framework assumes that the effects of an own shock and a shock to the other are additive, i.e. independent from each other. If both players

[12] In Appendix A.2, I discuss an alternative version of the model where reference points are not expressed in absolute terms but by the share of the total endowment that each individual should receive. This makes γ_i redundant. I show that the predicted effect of shocks is robust to this alternative specification.

[13] Note that in the experiment x_{k2} is held constant across treatments. Negative shocks are thus driven by changes in x_{k1}.

suffer a shock, the weight individuals give to their own versus the other's reference point (γ_i) determines which of the two effects prevails.[14] The predictions for richer individuals are summarised in *Proposition 2*.

Proposition 2: *Richer individuals react to negative income shocks. For own shocks* $\frac{\partial m^*_{i2}}{\partial(x_{i1}-x_{i2})} = \rho_i \gamma_i \geqslant 0$, *while for shocks to others* $\frac{\partial m^*_{i2}}{\partial(x_{j1}-x_{j2})} = -\rho_i(1-\gamma_i) \leqslant 0$.

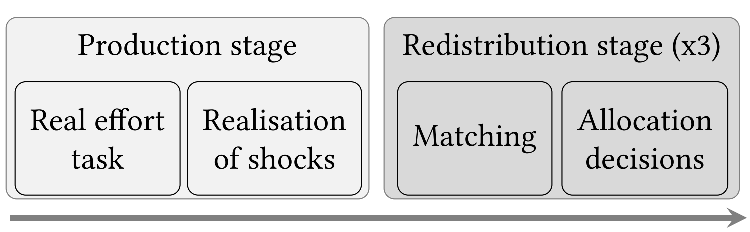
For poorer individuals, by contrast, the egalitarian view implies that $m_{kt} = \frac{X_t}{2}$. This means that independent of who suffers a shock, the effect on m^*_{i2} will be identical. The response to a shock is given by $\frac{\partial m^*_{i2}}{\partial(x_{k1}-x_{k2})} = \rho_i\gamma_i - \rho_i(1-\gamma_i)$. If $\gamma_i = 0.5$, the effect is equal to zero. Intuitively, if poorer individuals believe that a fair distribution is an equal split, it does not matter whether individual earnings change due to a negative shock. As stated in *Proposition 3*, the framework thus predicts that if $\gamma_i = 0.5$ fairness judgements and ultimately allocation decisions will not be affected by income shocks.

Proposition 3: *Poorer individuals take the same allocation decision independent of who suffers a shock. If* $\gamma_i = 0.5$, *the effect of a negative shock is equal to zero.*

3 Experimental Design

The following section describes the experimental design and the hypotheses derived from the theoretical framework. The experiment was pre-registered and builds on the structure of previous allocation experiments (see e.g. Cappelen et al., 2007, 2013). It consists of two stages: A *production* and a *redistribution* stage (see Figure 2). In the production stage, participants individually generate earnings that depend on i) the difficulty level of a real effort task and ii) whether a negative income shock occurs. In the redistribution stage participants are then matched in pairs and are given the opportunity to freely redistribute the total earnings both players brought into this stage between each other. Each player is thereby matched with three different players who differ in their experience of shocks.

Figure 2: Session structure



[14] Section A.4 extends the model to situations with incomplete information about the other's shock.

3.1 Player types and realisation of shocks

At the outset of the experiment, participants have to perform a real effort task and receive a flat fee upon completion. They are either completing a *more difficult* task with higher earnings (x_{H1}) or an *easier* task with lower earnings (x_{L1}), introducing differences in relative income.[15] In the following, I refer to participants who receive the high initial earnings as H and to those who receive the low initial earnings as L players. Note that the difference in earnings can be seen as deserved or a consequence of luck. On the one hand, who is assigned to which version of the task is random. On the other hand, knowing that one did a more difficult task could generate a sense of entitlement.

After participants have completed the real-effort task, a negative income shock may occur. Participants know from the beginning that their earnings depend on external factors that will be revealed to them later on (see Appendix D.1 for experimental instructions). Half of the participants randomly suffer a shock, while the other half do not. The realisation of a shock is thereby independent of player type and performance in the real effort task. Moreover, shocks do not change the relative income position. Players are immediately informed whether they have been hit by a shock as well as about their new post-shock earnings (x_{H2}, x_{L2}).

A key feature of the design is that post-shock earnings are always identical, independent of own and other's shocks ($x_{H2} = 300, x_{L2} = 100$). In other words, the final allocation decision is fixed, but the pathway of how participants got there varies (see Table 1). Any differences in allocation decisions can thus be attributed to those pathways. If H players have been assigned to the shock condition they start with pre-shock earnings of 400. They then learn that they suffered a negative shock of -100 and are left with post-shock earnings of 300. If, by contrast, they are assigned to the no shock condition they directly start with 300. The same is true for L players. In the shock condition they start with 200 tokens and are left with 100 after the shock, while they already start with 100 tokens in the no shock condition. Differences in pre-shock earnings can be justified, as individuals are informed

Table 1: Pre- and post-shock earnings

	H players		*L players*	
	No shock	**Shock**	**No shock**	**Shock**
Pre-shock	300	400	100	200
	↓	↓	↓	↓
Post-shock	300	300	100	100

[15] In the task, participants have to correctly reverse 10 strings consisting of 6 letters each (see e.g. Zhu et al., 2018). In the easy version of the task, typed letters are visible, in the difficult version they are replaced by asterisks.

that participants are assigned to "different difficulty levels" in the experiment and will earn more for higher difficulty levels.

Note that in case of a shock, both H and L players receive the same *absolute* reduction in earnings (-100). This implies, however, that L players are affected more by shocks in relative terms. While the instructions make absolute losses salient, this does not rule out the possibility that people think in relative terms. If I find that - as predicted by the theoretical framework - H players redistribute more towards L players after the latter suffer a shock, a potential criticism is that they only become more generous because L players suffer a relatively larger shock. To exclude this possibility, I run an additional treatment variation in which relative and not absolute shocks are held constant across player types. The only difference in this variation is that H players start with pre-shock earnings of 600 instead of 400. While absolute shocks are now larger for H players (-300), this implies that H and L players suffer identical shocks in relative terms (-50%). The results of this variation are discussed in Section 4.3.1. In addition, I include questions about the perception of absolute and relative differences in a post-experimental survey that I use as controls in the analysis.

3.2 Matching and allocation decisions

In order to investigate how people react to different shocks, I employ a 2x3 design and vary both *own* experience of shocks (shock/no shock) and what is known about the *other's* shock (shock/no shock/no information). In the redistribution stage, H players are always matched with L players. In a random order, each participant makes decides how to distribute total post-shock earnings between themselves and i) a player who has suffered a shock, ii) a player who has not suffered a shock and iii) a player for whom they have no information (while knowing that half of all participants suffered a shock). What is known about the other's shock thus varies within subjects, while the own experience of shocks varies between subjects. As it is possible that earlier allocation decisions have an impact on later ones, the decision order is randomised. For the incomplete information condition, I also elicit incentivised beliefs about the shock to the other player.[16]

After being matched with another player, participants can freely redistribute the total post-shock earnings between themselves and the other person in an unbounded dictator game. At the end of the experiment, first one of the three situations is selected at random, then the allocation of one of the two players is chosen randomly to be relevant for the bonus.

[16] Participants receive 50 tokens if their guess about the other's shock is correct and 0 otherwise. To control for order effects, I randomise whether a participant first takes the allocation decision in iii) or is first asked to state their beliefs about the other player.

3.3 Hypotheses

The theoretical framework allows me to derive precise hypotheses about how pre-shock earnings and shock experiences affect distribution decisions within the experiment. See Appendix A.3 for a detailed application of the framework to this setting. *Proposition 1* states that fairness views depend on relative income. I can thus formulate the following hypothesis for the experimental setting:

Hypothesis 1: *Poorer (L) players allocate less to themselves than richer (H) players. In line with an egalitarian view, L players' allocations will be closer to an egalitarian split (200-200), while H players' allocations will be closer to individual contributions (300-100).*

From *Proposition 2* and *3*, I can then derive corresponding hypotheses for the expected reaction to shocks for each player type:

Hypothesis 2: *Richer players react to income shocks. They i) allocate more to themselves after suffering a negative shock and ii) less to themselves after the other suffered a shock.*

Hypothesis 3: *For poorer players, allocations are not affected by the experience of shocks.*

Finally, under incomplete information individuals may choose to believe that they are the only ones who suffered a shock. Such biased beliefs would be in line with own material interests for H players, as a shock to the other person implies higher allocations to the other and lower allocations to self (see Appendix 4.4). Pretending that the other did not suffer a shock, would thus justify a similar allocation as in the situation where it is known that the other did *not* suffer a shock. This leads to the following hypothesis:

Hypothesis 4: *If information is incomplete, richer players form beliefs in a self-serving way. Allocations under incomplete information will then be similar to a situation where it is known that the other did not suffer a shock.*

4 Results

4.1 Sample and procedures

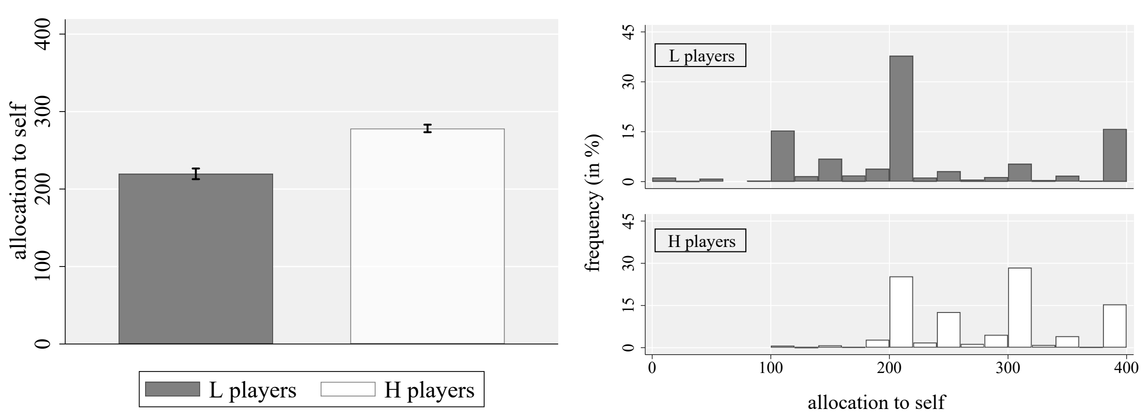
The experiment was programmed using LIONESS Lab (Giamattei et al., 2020) and participants were recruited online via Prolific in July 2021. The median completion time was 15.5 minutes and participants earned on average £7.35/h. Based on a power analysis, I recruited 536 participants that were equally distributed across player type (H, L) and shock experience (yes, no), resulting in 134 participants in each cell. This allows me to detect an effect size of 0.36 standard deviations at a significance level of 5% with 90% power.[17] Participants were stratified with respect to real world shocks to ensure balance across treatment cells (see Table B.2 in Appendix B for balance checks). Using data provided by Prolific, I distinguished between three different sub-samples: 1) participants who became unemployed due to Covid-19 (large shock), 2) participants who were full-time employed and now work part-time (medium shock) and 3) participants who still work full-time (no shock).

After participants completed the experiment, they were asked to fill out a short questionnaire that collected demographic information, perceived closeness between participants (Aron et al., 1992), affective reactions to shocks (see Appendix B.5), attitudes towards redistribution and solidarity during a crisis, as well as perceptions of inequality and shocks within the experiment.

4.2 Relative income and fairness views

The data confirms that different player types take significantly different allocation decisions. The graph on the LHS in Figure 3 shows the average allocation to self by player type, with H players allocating significantly more to themselves than L players (t-test, $p < 0.001$). This is in line with previous research showing that initial earnings generate a feeling of entitlement (see e.g. Barr et al., 2015; Jakiela, 2015). Moreover, the graph shows that L players allocate on average 220 tokens to themselves. This exceeds their contribution to total resources (100 tokens), revealing a significant degree of redistribution (t-test, $p < 0.001$). H players, by contrast, allocate on average 278 tokens to themselves, which is only slightly less than

Figure 3: Average allocation to self (LHS) and distribution (RHS) by player type.



Note: Whiskers represent 95% confidence intervals.

[17] The power analysis was based on comparisons of means. The effect size was informed by previous research on redistributive preferences (Fisman et al., 2015; Barr et al., 2015; Cassar and Klein, 2019).

their contribution of 300 (t-test, $p < 0.001$). H players thus support a much lower level of redistribution than L players.

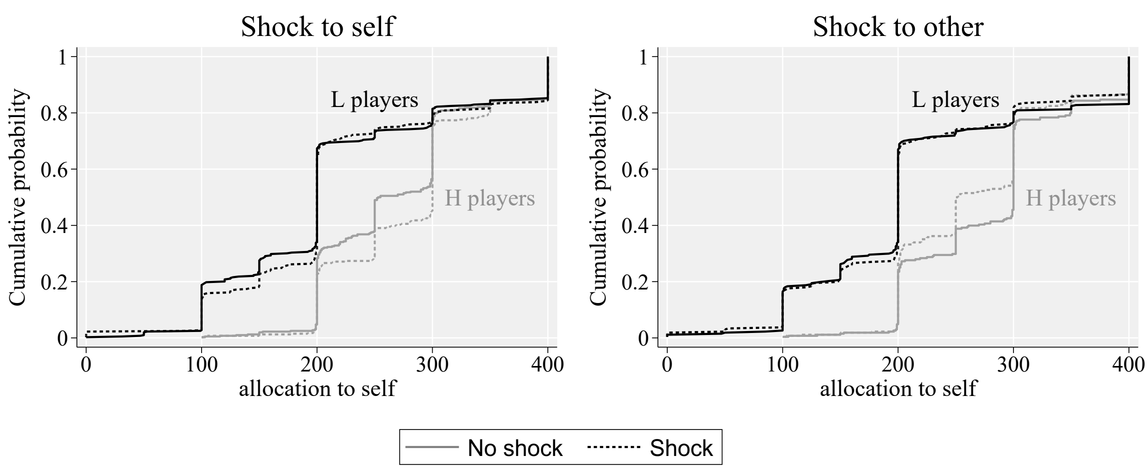
The graph on the RHS in Figure 3 depicts the distribution of allocations for both H and L players. The distribution for H players is not only further to the right, but also differs with respect to modal allocations.[18] While the most common allocation to self for H players is 300 in line with a contribution-based fairness view, the modal choice for L players is the egalitarian 200-200 split. While there is a second mode for H players at 200, indicating some heterogeneity in fairness views, the results confirm that there are substantial differences in both mean and modal allocations between player types. The results thus support Hypothesis 1 and can be summarised as follows:

Result 1: *Relative income differences matter for redistribution decisions. L players are more likely to choose an egalitarian allocation, while H players are more likely to allocate earnings in line with individual contributions.*

4.3 Effect of negative income shocks

Figure 4 provides graphical evidence on how allocations to self change after players themselves (left graph) or others (right graph) suffered a shock.[19] As illustrated by the light dotted lines, for H players there is a clear reaction to shocks with the cumulative distribution of allocations shifting to the right after a shock to self and to the left after a shock to the other. H players thus allocate on average more to themselves after an own shock (t-test, $p = 0.02$),

Figure 4: Players' reaction to own shock (left) and shock to other (right)



[18] Distributions are statistically different from each other (Kolmogorov-Smirnov test, $p < 0.001$).

[19] The affect measure used in the ex-post survey shows that participants perceive shocks as a negative event. They report significantly more negative feelings after having suffered a shock (see Appendix B, Figure B.1).

but redistribute more towards L players if the latter suffer a shock (t-test, $p = 0.05$). L players, by contrast, neither react to own nor other's shocks. The cumulative distributions after a shock (dark dotted lines) are indistinguishable from the ones without a shock (dark solid lines).[20]

These findings are also confirmed in a regression analysis. Table 2 reports results from regressing the number of tokens individuals allocate to themselves on own and other's shock.[21] In line with the graphical evidence, the regression results show that H players allocate more to themselves after experiencing a negative shock and less to themselves if the other player suffered a negative shock (model 1). These effects are robust to the inclusion of controls (model 2). To test whether reactions to the shock of others depend on own experience of shocks, model 3 includes an interaction term. As the latter is insignificant ($p = 0.35$), being affected by a shock does not seem to cause participants to become more or less responsive to the shock of their co-player.[22]

While both own and other's shocks have a significant effect on allocation decisions for H

Table 2: OLS models for the effect of shocks on allocation to self y_i

	H players			L players		
	(1)	(2)	(3)	(4)	(5)	(6)
Shock self	13.10*	14.99*	11.87	4.00	3.03	6.68
	(7.87)	(7.77)	(8.57)	(11.63)	(11.86)	(12.35)
Shock other	-12.06***	-11.71***	-14.82***	-2.67	-2.20	1.40
	(3.29)	(3.39)	(4.33)	(3.65)	(3.61)	(5.50)
Shock self x Shock other			6.24			-7.30
			(6.78)			(7.20)
Constant	277.61***	305.43***	306.99***	211.43***	291.91***	290.11***
	(6.74)	(35.65)	(35.83)	(10.03)	(43.38)	(43.61)
Additional controls	No	Yes	Yes	No	Yes	Yes
N observations	536	518	518	534	508	508
N clusters	268	259	259	267	254	254
R-squared	0.016	0.117	0.118	0.004	0.133	0.134

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the individual level.

Note: Regressions control for order effects. *Shock self* is a binary variable that takes the value of 1 if an individual i suffered a shock themselves and 0 otherwise. *Shock other* is a binary variable that takes the value of 1 if the player i has been matched with suffered a shock and 0 otherwise. Additional controls include employment shock due to Covid-19, age, gender, income, household size, education, region, subjective social status, and fairness of task.

[20] For H players, distributions are statistically different from each other (Kolmogorov-Smirnov tests, $p = 0.01$ for own shocks and $p = 0.03$ for shocks to other). For L players, they are statistically not distinguishable.

[21] The order in which participants faced the distribution situations had no effect on their decisions (see Table B.3 in Appendix B for more details).

[22] While this is in line with the theoretical framework where shocks are additive, it contrasts previous research by Cassar and Klein (2019). They find that own prior experiences moderate how people respond to the experience of others. A key difference is that in my experiment shocks happen simultaneously. It would be interesting to test the effect of own shocks on future interactions.

players, Table 2 shows that there is no effect for L players. The coefficients on *shock self* and *shock other* are small and insignificant for all specifications (models 4-6). Different player types thus show very different reactions to shocks (they are also different in a statistical sense, see Appendix B, Table B.4). The results thus confirm *Hypothesis 2* and *3* and can be summarised as follows:

Result 2: *H players react to negative income shocks. They allocate i) more to themselves after experiencing an own shock and ii) less to themselves if the other suffered a negative shock.*

Result 3: *For L players, allocation decisions are independent of income shocks.*

When it comes to the strength of reactions to own and other's shocks for H players, one can see from Table 2 that the coefficient on own shock is slightly larger than the one on shock to other in the models without interactions. However, for every specification, a Wald test fails to reject the null hypothesis of no difference in the reaction to own and other's shocks. One caveat is that while H and L players suffer the same shock in absolute terms, L players are affected more in relative terms (although the reaction to the other's shock is robust to controlling for relative perception of shocks, see Appendix B, Table B.5). Moreover, own shocks are measured between subjects, while the reaction to the other's shock is measured within subjects, complicating a direct comparison. A more careful interpretation of the results is thus that H players put at least as much weight on their own shocks as on the shocks to others.

4.3.1 Constant relative shocks

As discussed above, relative shocks are not identical for H and L players in the main experiment. One concern is thus that H players only react to the other's shock because it is relatively larger. To address this issue, I run an additional treatment variation where both H and L players suffer an identical shock in relative terms (-50% of their initial earnings). Data was collected with a sample of N=536 Prolific workers in July 2022 using the same procedures as for the main study. The additional data collection was pre-registered.[23]

Table 3 shows how allocation decisions are affected by shocks for different player types, using the same specifications as in Section 4.3. Models 1-3 confirm that H players still show a significant reaction to the other's shock, replicating *Result 2ii*. The effect found in the main experiment is thus not an artefact of the relatively larger shock to other. Moreover, models 4-6 support *Result 3* that L players allocation decisions are independent of the experience of shocks.

[23] AEA RCT Registry. July 11, 2022. https://doi.org/10.1257/rct.7913.

Table 3: OLS models for the effect of constant relative shocks on allocation to self y_i

	H players			L players		
	(1)	(2)	(3)	(4)	(5)	(6)
Shock self	-6.69 (8.60)	-5.88 (9.01)	-7.98 (9.48)	-6.24 (12.73)	-16.82 (12.92)	-16.55 (13.26)
Shock other	-10.82*** (2.96)	-9.67*** (3.13)	-11.80** (4.64)	-2.66 (2.98)	-2.30 (3.27)	-2.03 (5.29)
Shock self x Shock other			4.20 (6.27)			-0.54 (6.56)
Constant	290.03*** (7.29)	311.81*** (35.85)	312.88*** (35.78)	257.89*** (11.82)	310.65*** (45.49)	310.51*** (45.46)
Additional controls	No	Yes	Yes	No	Yes	Yes
N observations	536	502	502	536	494	494
N clusters	268	251	251	268	247	247
R-squared	0.010	0.081	0.081	0.028	0.200	0.200

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the individual level.

Note: Regressions control for order effects. *Shock self* is a binary variable that takes the value of 1 if an individual i suffered a shock themselves and 0 otherwise. *Shock other* is a binary variable that takes the value of 1 if the player i has been matched with suffered a shock and 0 otherwise. Additional controls include employment shock due to Covid-19, age, gender, income, household size, education, region, subjective social status, and fairness of task.

Interestingly, the second data collection does not confirm that H players allocate more to themselves after an own shock (see *Result 2i)*). This is surprising as the shock for H players in this version of the experiment is both larger in absolute and relative terms. In the main data collection H players lost 100 tokens (25% of their initial income), while they lose 300 tokens (50% of their initial income) in the constant relative shocks treatment. One explanation for this findings is that the initial income difference between L and H players if the latter suffer a shock may be too large to be justifiable (600 vs 200/100), leading H players to judge the advantageous inequality more negatively (see e.g. Fehr and Schmidt, 1999). In the post-experimental survey I ask participants how fair they perceive the initial difference in earnings between H and L players. H players with initial earnings of 600 judge the fairness of income differences to be significantly lower than H players with initial earnings of 300 (t-test, $p = 0.09$), providing some support for this explanation.

The additional data collection also allows me to test whether the effect of relative income on allocation decisions can be replicated in a new sample. In line with *Result 1*, I find that L players are most likely to choose an allocation based on egalitarian fairness views, while H players are most likely to allocate resources proportional to individual contributions (see Figure B.2, Appendix B).

Finally, using the post-experimental survey, I find that 60% of participants perceive shocks in relative terms, while 30% view them in an absolute way (see Appendix B, Figure B.3). The share of individuals thinking in absolute terms is moreover significantly higher in the main experiment where individuals suffer the same absolute shock than in the variation where they suffer the same relative shock (t-test, $p < 0.001$). This opens interesting questions for future research on the perception of income shocks.

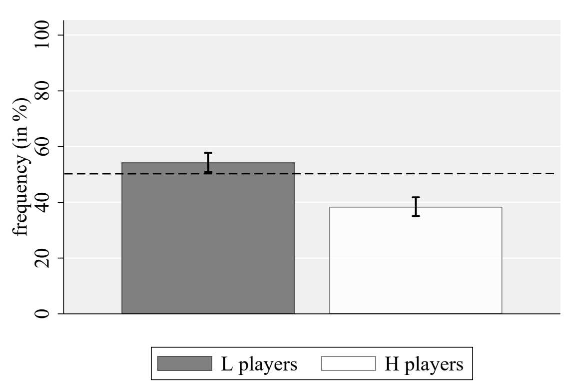
4.4 The role of incomplete information

In one of the three scenarios, participants are faced with a situation in which they do not know what happened to the player they have been matched with. They only know that the other might have suffered a shock and that overall half of the participants in the experiment suffer a shock and half of them do not. When asked about their beliefs, on average, 50% of participants should thus state that the other did suffer a shock and 50% that the other did not suffer a shock.

Figure 5 shows that while L players do not deviate from this prediction ($p = 0.16$), the beliefs of H players are significantly downward biased with less than 50% stating that the other suffered a shock ($p < 0.001$). This bias is in line with *Hypothesis 4*. As H players are the ones who react to shocks, acknowledging that the other player might have suffered a shock implies that they should redistribute more towards the other. If, by contrast, they downplay the probability that the other suffered a shock, H players can justify higher allocations to self without deviating from the contribution-based fairness view. For L players, on the other hand, there is no incentive to distort beliefs, as the egalitarian fairness view translates into an equal split independent of the experience of shocks.[24]

In addition, a regression analysis shows that incomplete information has a significant effect on allocation decisions for H, but not for L players (see Appendix B, Table B.6). Under no information, H players behave as if the other player did not suffer a shock. For L players,

Figure 5: Share of players believing that the other suffered a shock by type



Note: The dashed line represents the actual share of players suffering a shock (50%). Whiskers represent 95% confidence intervals.

[24]These findings are also replicated in the variation with constant relative shocks (see B, Figure B.4).

by contrast, allocation decisions are independent of the available information, leading to the following result:

Result 4: *Under incomplete information H players' beliefs are systematically biased towards the other not suffering a shock. This is also reflected in allocations. L players do not show biased beliefs and allocate earnings in the same way across conditions.*

5 Study 2: Income shocks caused by Covid-19

The experiment described above isolates the effect of income differences and negative shocks through a controlled lab environment. As a next step, I draw real world shocks into the experiment. In a follow-up study, I use information on how people's economic situation has been affected by the Covid-19 pandemic and test how the latter affects allocation decisions in an experiment. This provides additional insights into how people react to shocks in a less abstract environment.

5.1 Design

The design of Study 2 closely follows the design of the previous study. As before, half of the participants engage in an easier task earning a lower flat fee x_L, the other half in a more difficult task earning a higher flat fee x_H, before deciding on how to redistribute total earnings between themselves and another player. However, this time there is no negative shock that reduces earnings from the production stage. Instead, after being matched with another player, participants learn about the *real world shock* of the other player. They either learn that the other player i) did suffer a significant loss in livelihood due to Covid-19, ii) did not suffer a significant loss in livelihood due to Covid-19 or iii) are not provided with information about the other player. Appendix E provides instructions for Study 2.

To define whether participants suffered a *significant loss in livelihood*, I use information about changes in their employment status that is accessible via Prolific. Participants who experienced a change from full-time employment to unemployment due to Covid-19 are classified as having suffered a significant shock, while participants who remained in full-time employment are classified as not having suffered a shock. For the instructions in the experiment, I use the formulation a *significant loss in livelihood* to avoid any connotations with being unemployed. While this information is used to inform participants about the shocks of the other player, I directly ask participants whether they suffered a significant loss in livelihood in the ex-post questionnaire and use this question as a proxy for own shock.[25]

[25]The question uses a likert scale from 1-7. I distinguish between people who rather disagree with having suffered a shock (1-4) and those who rather agree with having suffered a shock (5-7).

Even if somebody lost their job due to Covid-19, whether this constitutes a significant loss in livelihood will depend on many other factors such as assets, savings or income provided by other family members. I thus use the survey question to make shocks to self and other more comparable. This results in 62% of participants being categorised as having experienced no negative shock, while 38% are categorised as having suffered a shock.[26]

Study 2 allows me to test the same hypotheses as developed for the pure online experiment (see Section 3.3). There are however two key differences to the previous design. First, while the shock to the other player remains exogenous in Study 2, the own experience of shocks becomes endogenous. Second, the environment in which I study negative shocks is very different. While exploring income shocks within the experiment provides an abstract and highly controlled environment, Study 2 moves closer to people's real world experiences and explores shocks in a specific economic context. Study 2 thus complements and extends the findings from the main study and shows how the combination of different degrees of control and realism can contribute to a broader understanding of behavioural mechanisms.

5.2 Results

5.2.1 Sample and data collection

The experiment was programmed with LIONESS Lab (Giamattei et al., 2020) and run online via Prolific in July 2021. The median completion time was 14.7 minutes and participants earned on average £7.76/h. In line with the power calculations and sample size for the previous study, a total of 536 participants was equally split by player type and experienced loss in livelihood due to Covid-19.

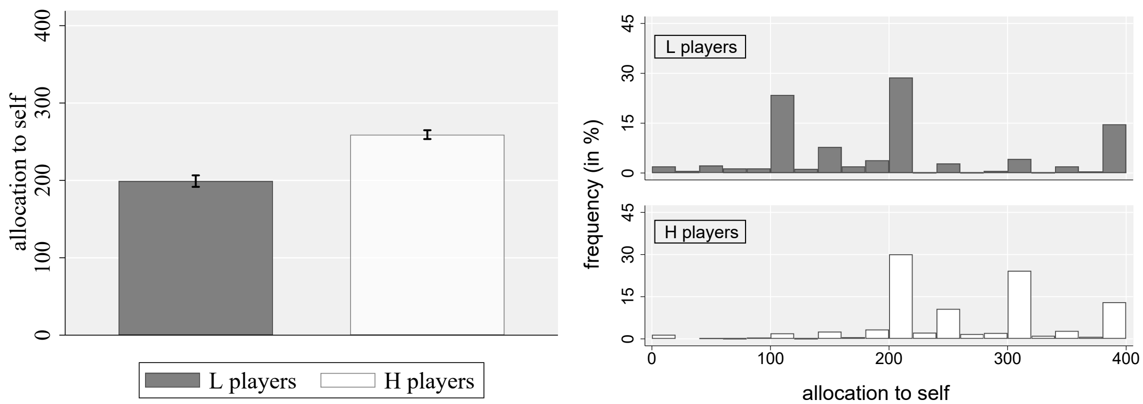
A balance test shows that own shocks are no longer orthogonal to individual socio-economic characteristics (see Appendix C, Table C.1). However, generalising from a lab experiment will always be accompanied by a loss of control, while offering a deeper understanding of the problem in a specific context (see Falk and Heckman, 2009, for a methodological discussion on laboratory experiments and causal inference). In the analysis, I control for these characteristics when analysing own shocks.

5.2.2 Relative income and fairness views

The results confirm that differences in relative income translate into different allocation decisions. In line with *Result 1*, H players allocate significantly more to themselves than L players ($p < 0.001$) and favour lower levels of redistribution (see Figure 6, LHS). However,

[26] The correlation between stating to have suffered a significant loss in livelihood and losing employment due to Covid-19 is 0.44 ($p < 0.001$).

Figure 6: Average allocation to self (LHS) and distribution (RHS) by player type



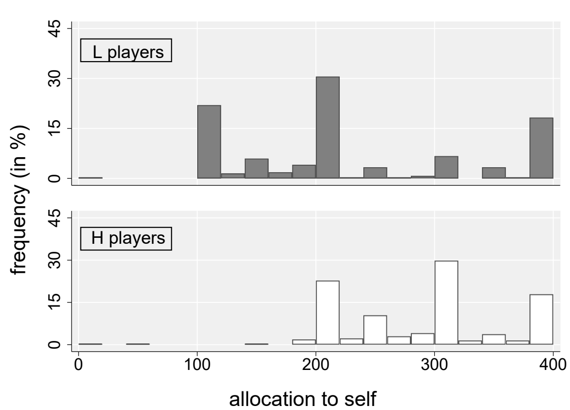
Note: Whiskers represent 95% confidence intervals.

when looking at the distribution of allocations (Figure 6, RHS), the most common allocation for both H and L players is now 200-200, suggesting an egalitarian fairness view. Also the share of participants who follow a contribution-based fairness view (300-100) is comparable across player types.

When analysing the results for Study 2, it is important to note that the difference between H and L players is generated within the lab, while the information about the other's shock is based on recent and severe real world experiences. It is thus conceivable that the information about real world shocks has such a strong impact that differences between experimental player types become less important when deciding on what is fair. In fact, when restricting the sample to cases where it is known that the other did not suffer a shock, the finding that different player types choose allocations in line with different fairness views re-appears. As Figure 7 shows, H players are again most likely to allocate 300 to themselves, while the modal allocation for L players remains an equal split.

Relative income differences in the lab thus matter for allocation decisions in the absence

Figure 7: Distribution of allocations to self in the absence of shocks to others



of real world shocks. When introducing large real world shocks this difference becomes less pronounced and an egalitarian split becomes the most common allocation for all players.

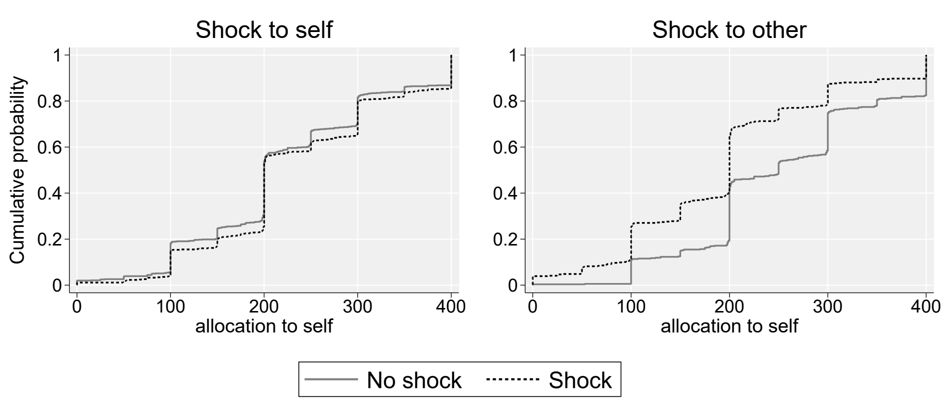
5.2.3 Effect of negative income shocks

As stated above, I find that player types induced in the lab lose their importance in the face of a large real world shock. Not surprisingly, participants show a more negative affect reaction when they learn that others suffered a significant loss in livelihood than if shocks happen within the experiment (t-test, $p < 0.001$.)[27] When exploring the effect of negative shocks, a Chow test confirms that the reaction to both own and other's shock is statistically indistinguishable between types (see Appendix C, Table C.2). For the rest of the analysis, I thus pool H and L players and only control for level differences.

The left graph in Figure 8 shows how own real world shocks affect allocation decisions. In the case of a shock to self, as represented by the dashed line, the cumulative distribution is shifted to the right. This means that own real world shocks are associated with higher allocations to self ($p = 0.04$). By contrast, the right graph in Figure 8 shows that when learning someone else suffered a significant loss in livelihood due to Covid-19, participants distribute significantly more to that player and less to themselves ($p < 0.001$).[28] All participants thus respond to shocks in the same way as H players in the previous study (see *Result 2*).

These results are confirmed by a regression analysis, controlling for differences between H and L players (see Table 4).[29] and are robust to the inclusion of demographic controls (models 1 and 2). As in the previous study, the interaction between own and other's shock

Figure 8: Reactions to own (left) and other's (right) loss in livelihood



[27] For an analysis of affect reactions and closeness in Study 2 see Appendix C.4.

[28] A Kolmogorov-Smirnov test shows no difference in the overall distributions for shock to self, but a significant difference for shock to other ($p < 0.001$).

[29] See Appendix C Tables C.3 and C.4 for an analysis of order effects.

Table 4: OLS models for the effect of shocks on allocation to self y_i

	(1)	(2)	(3)
Shock self	16.47**	16.85*	14.96
	(7.70)	(9.00)	(9.49)
Shock other	-56.88***	-57.00***	-58.42***
	(3.25)	(3.33)	(4.32)
Shock self x Shock other			3.78
			(6.75)
H Player	61.38***	64.00***	64.00***
	(7.46)	(7.77)	(7.77)
Constant	212.25***	223.80***	224.51***
	(7.70)	(31.03)	(30.94)
Additional controls	No	Yes	Yes
N observations	1072	1026	1026
N clusters	536	513	513
R-squared	0.17	0.21	0.21

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the individual level.

Note: Regressions control for order effects. *Shock self* is a binary variable that takes the value of 1 if an individual i suffered a shock themselves and 0 otherwise. *Shock other* is a binary variable that takes the value of 1 if the player i has been matched with suffered a shock and 0 otherwise. H Player is a binary variable that takes the value of 1 for H players and 0 for L players. Additional controls include employment shock due to Covid-19, age, gender, household size, education, region, subjective social status, and fairness of task.

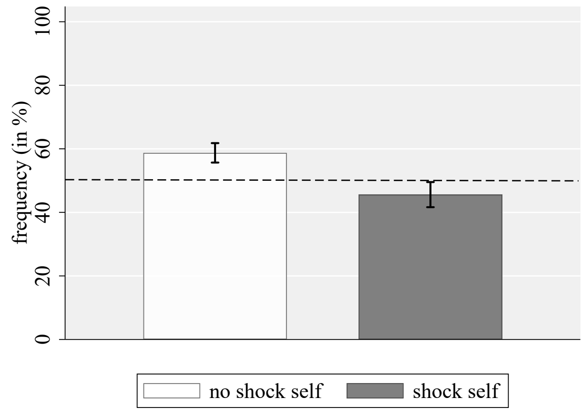
is insignificant (model 3). Individuals thus react to the other's shocks in the same way independent of their own experience. Finally, while player types do not matter for the reaction to shocks, they do for absolute allocations to self. Across all specifications, H players allocate on average more to themselves than L players.

When it comes to the weight placed on own and other's shocks, Figure 8 already indicates that the reaction to other's shock is much more pronounced. This is confirmed by a Wald test ($p < 0.001$ in models 1 and 2, $p = 0.01$ in model 3). However, a direct comparison between own and other's shocks might be misleading. First, the information about the other's shock is varied exogenously, while the own Covid-19 experience is endogenous. Second, participants are only asked about own experience of real world shocks in the ex-post survey, making it less salient during the experiment. Finally, the majority of participants (66%) state in the questionnaire that the other person was affected more than they were by Covid-19. Even among participants who state they suffered a significant loss in livelihood, 35% believe that the other player was affected more. The data thus suggests that if people perceive that others are affected more than themselves, they take this into account and put a higher weight on the other's shock.

5.2.4 The role of incomplete information

Finally, I explore what happens if there is uncertainty about the other's real world shock. Under incomplete information, participants are told that the other *"might or might not have suffered a significant loss in livelihood due to Covid-19"*. They do know, however, that the

Figure 9: Share of players believing that the other suffered a shock



Note: The dashed line represents the actual share of players suffering a shock (50%). Whiskers represent 95% confidence intervals.

probability for a shock is 50%. When asked to guess the other's shock, half of the participants should thus guess that the other did suffer a shock and half that they did not.

On aggregate, the share of participants who believes that the other did suffer a shock is very close to 50% and if anything slightly above (t-test, $p = 0.08$). The data thus provides no evidence for a self-serving bias in beliefs. Figure 9 shows that this result is mainly driven by participants who did not suffer a shock themselves (t-test, $p = 0.001$). Among participants who did suffer a shock, the proportion lies slightly, but insignificantly below 50%.[30] While convincing themselves that the other did not suffer a shock would allow participants to allocate more to themselves, there is no evidence for such self-serving beliefs in the data. In line with that, allocation decisions under incomplete information lie exactly between the decisions when it is known that the other did or did not suffer a shock (see Appendix C C.5).

These findings contrast with *Result 4* in the previous study. As the real word shock is so large, it might be psychologically too costly to assume that the other did not suffer a shock and be too selfish towards someone who really suffered a significant loss in livelihood.

6 Discussion and conclusion

In this paper, I study how redistributive preferences are affected by negative economic shocks and differences in relative income. This allows a better understanding of how redistributive preferences are formed and interact with socioeconomic variables. To structure my empirical analysis, I first develop a theoretical framework that is based on reference dependence and a self-serving bias in fairness perceptions. I then use an experiment that

[30] The same pattern holds true when examining H and L players separately. See Appendix C, Figure C.1.

exogenously varies individuals' experience of shocks as well as their relative position to isolate their effect on redistributive decisions.

The results provide further evidence for the notion that support for redistribution depends on an individual's position within the income position. Poorer individuals who benefit from redistribution tend to distribute resources in an egalitarian way, while richer individuals who benefit from the status quo distribute resources proportionate to individual inputs. Moreover, relative income moderate reactions to shocks. Only richer participants react to shocks. They become less supportive of redistribution after the experience of own shocks, but more supportive when learning that another person was hit by a shock. This shows that depending on which socioeconomic groups are affected by economic shocks, times of crises can both generate support for and resistance to redistributive policies. Lastly, I find that if there is uncertainty about the experience of others, participants underestimate the possibility of a shock to avoid having to distribute more towards others. It thus matters how aware individuals are of the consequences of a crisis for different groups. This may be particularly important if groups are affected differently by economic shocks.

An interesting implication of the interaction between responses to shocks and relative income is that there are limits to self-serving interpretations of fairness. While in the experiment, individuals behave in line with the fairness view that is most beneficial to them, they do not seem to re-evaluate this view in the presence of shocks. Individuals either compensate both own and others shocks or no shocks at all. Under full information, I do not find that participants self-servingly only react to own shocks. My research thus suggests interesting directions for further research on the limits of self-serving or motivated beliefs.

The paper also highlights that the context and scale of economic shocks matters. In a follow-up study, I incorporate real world shocks into the experiment, using data on whether people suffered a *significant loss in livelihood* due to Covid-19. An interesting characteristic of the Covid-19 shocks is that like income shocks in the experiment they may be interpreted as random, with individuals being not accountable for their situation. The results confirm that own real world shocks lead to larger allocations to self while shocks to others lead to higher redistribution towards those who suffered a shock. However, income differences induced in the lab become less important in the face of information about shocks caused by Covid-19. Similarly, participants do not downplay the possibility that the other might have suffered a shock under incomplete information. Intuitively, the follow-up study does not only add real world elements to the study, but also increases the scale of shocks, making them harder to ignore.

Ultimately, this paper presents compelling evidence that economic shocks have a significant effect on peoples' support for redistribution. Taking changes of socio-economic contexts into account can thus provide a better understanding of the heterogeneity in redistributive preferences.

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A Theoretical framework

A.1 Proofs

Proof of Proposition 1 Substituting $m_{it} = \alpha_i x_{it} + (1-\alpha_i)\frac{X_t}{2}$ into the expression for an individual's optimal allocation and maximising the expression with respect to α_i yields:

$$\max y^*_{it} = \underbrace{\alpha_i x_{it} + (1-\alpha_i)\frac{X_t}{2}}_{m_{it}} + \frac{X_t}{\beta_i} \text{ w.r.t } \alpha_i \tag{A.1}$$

Solving (A.1) results in $\frac{\partial y^*_{it}}{\partial \alpha_i} = x_{it} - \frac{X_t}{2}$, implying the following corner solutions:

$$\alpha^*_i = \begin{cases} 1, & \text{if } x_{it} > \frac{X_t}{2}. \\ 0, & \text{if } x_{it} < \frac{X_t}{2}. \end{cases} \tag{A.2}$$

Given differences in relative income, where H refers to a relatively higher income and L to a relatively lower income, $\frac{X_t}{2}$ can be written as $\frac{X_t}{2} = \frac{x_{Ht}+x_{Lt}}{2}$. By definition $x_{Ht} > x_{Lt}$. Consequently, for richer individuals we have $x_{it} > \frac{X_t}{2}$ resulting in $\alpha^*_i = 1$. For poorer individuals we have $x_{it} < \frac{X_t}{2}$ resulting in $\alpha^*_i = 0$. ■

Proof of Proposition 2 Using the result from *Proposition 1* that implies $m_{kt} = x_{kt}$ for richer individuals and substituting it into the function for what i perceives as a fair allocation for self results in:

$$m^*_{i2} = (1-\rho_i)x_{i2} + \rho_i \underbrace{[\gamma_i x_{i1} + (1-\gamma_i)(X_2 - x_{j1})]}_{\text{feasible } m_{i1} \text{ satisfying } X_2 = x_{i1} + x_{j1}} \tag{A.3}$$

m^*_{j2} can be derived analogously and is therefore omitted from the rest of the proof. Note that X_2 can be written as $x_{i2} + x_{j2}$. Equation A.3 can then be simplified as follows:

$$m^*_{i2} = x_{i2} + \rho_i\gamma_i(x_{i1} - x_{i2}) - \rho_i(1-\gamma_i)(x_{j1} - x_{j2}) \tag{A.4}$$

Reactions to own shocks $(x_{i1} - x_{i2})$ and the shocks of others $(x_{j1} - x_{j2})$ can then be analysed by evaluating the following FOC:

$$\frac{\partial m^*_{i2}}{\partial(x_{i1} - x_{i2})} = \rho_i\gamma_i \geqslant 0 \text{ and } \frac{\partial m^*_{i2}}{\partial(x_{j1} - x_{j2})} = -\rho_i(1-\gamma_i) \leqslant 0 \tag{A.5}$$

This is true as $\rho_i, \gamma_i \in [0, 1]$. If $\rho_i > 0$ and $0 < \gamma_i < 1$ these inequalities become strict. ■

Proof of Proposition 3 Substituting $m_{kt} = \frac{X_t}{2}$ into the expression for what an individual perceives as a fair allocation to self yields:

$$m^*_{i2} = (1-\rho_i)\frac{X_2}{2} + \rho_i \underbrace{[\gamma_i \frac{X_1}{2} + (1-\gamma_i)(X_2 - \frac{X_1}{2})]}_{\text{feasible } m_{i1} \text{ satisfying } X_2 = 2\frac{X_1}{2}} \tag{A.6}$$

The fair allocation for the other person m^*_{j2} is again omitted as it is derived analogously. Simplifying Equation A.6 then leads to:

$$m^*_{i2} = \frac{X_2}{2} + \rho_i\gamma_i\frac{(X_1 - X_2)}{2} - \rho_i(1-\gamma_i)\frac{(X_1 - X_2)}{2} \tag{A.7}$$

Both a shock to self and a shock to other ultimately lead to a reduction in $\frac{(X_t)}{2}$. The FOC is then $\frac{\partial m^*_{i2}}{\partial(X_1/2 - X_2/2)} = \rho_i\gamma_i - \rho_i(1-\gamma_i)$. m^*_{i2} is thus independent of whether there is an own shock, a shock to other or a shock to both. If $\gamma_i = 0.5$, FOC=0. ■

A.2 Model variation: Shares as reference points

In the main text, I conceptualise what is perceived as a fair allocation in terms of absolute values. An alternative is to use shares of the total endowment. In this section, I show that the key predictions of the framework are robust to this modification.

In line with Barr et al. (2015), the utility function used in Cappelen et al. (2007) can be slightly adjusted such that it does not depend on absolute income but the share of income that individuals allocate to themselves ($\tilde{y}_{it}$):

$$\tilde{U}_{it} = \tilde{y}_{it} - \beta_i\frac{(\tilde{y}_{it} - m_{it})^2}{2}, \beta_i \geqslant 0 \tag{A.8}$$

The optimal share allocated to self is then: $\tilde{y}^*_{it} = m_{it} + \frac{1}{\beta_i}$. Similarly,it is possible to express the allocation that is perceived as fair in terms of shares: $m_{it} = \alpha_i\tilde{x}_{it} + (1-\alpha_i)1/2$, where $\tilde{x}_{it}$ is the share that individual i contributed to total earnings.

Proposition 1a *Fairness views depend on relative income. For richer individuals $\alpha^*_i = 1$, implying that they hold a contribution-based fairness view ($m_{kt} = \tilde{x}_{kt}$). Poorer individuals, with $\alpha^*_i = 0$ hold an egalitarian fairness view ($m_{kt} = \frac{1}{2}$).*

Proof of Proposition 1a The proof is analogously to the one in A.1. Maximising the expression for an individual's optimal allocation with respect to α_i

$$\max \tilde{y}^*_{it} = \underbrace{\alpha_i\tilde{x}_{it} + (1-\alpha_i)1/2}_{m_{it}} + \frac{1}{\beta_i} \text{ w.r.t } \alpha_i \tag{A.9}$$

results in the following corner solutions:

$$\alpha_i^* = \begin{cases} 1, & \text{if } \tilde{x}_{it} > 1/2. \\ 0, & \text{if } \tilde{x}_{it} < 1/2. \end{cases} \tag{A.10}$$

If there exist differences in earnings with $\tilde{x}_{Ht} > \tilde{x}_{Lt}$, then for individuals with higher earnings (H) by definition $\tilde{x}_{it} > 1/2$ and vice versa for individuals with lower earnings (L). Richer individuals are thus predicted to hold contribution-based views ($\alpha_i^* = 1$) and poorer individuals to hold egalitarian views ($\alpha_i^* = 0$). ■

Proposition 2a: *Richer individuals react to negative income shocks. For own shocks* $\frac{\partial m_{i2}^*}{\partial(\tilde{x}_{i1}-\tilde{x}_{i2})} = \rho_i \geqslant 0$*, while for shocks to others* $\frac{\partial m_{i2}^*}{\partial(\tilde{x}_{j1}-\tilde{x}_{j2})} = -\rho_i \leqslant 0$*.*

Proof of Proposition 2a Analogously to Equations 5a and 5b in Section 2 the allocation perceived as fair after a shock can be modelled as a weighted average between the pre-shock fairness judgement that serves as a reference point and the hypothetical judgement of the post-shock situation:

$$m_{i2}^* = (1-\rho_i)m_{i2} + \rho_i m_{i1} \text{ and } m_{j2}^* = 1 - m_{i2}^* \tag{A.11}$$

Note that when focusing on shares, a shock that reduces the own share of earnings automatically increase the other's share and vice versa. This has two implications. First, it is theoretically not possible to isolate a negative own shock from a positive shock to the other. Second, m_{i1} will always be feasible, as shares can be calculated independently of a reduction in total resources. It is thus not necessary to introduce weights for own and other's reference points (γ_i). As the fair allocation to the other individual is automatically given by $m_{j2}^* = 1 - m_{i2}^*$ it is omitted in the rest of this section.

For richer individuals, where $m_{it} = \tilde{x}_{it}$ Equation A.11 can then be simplified to:

$$m_{i2}^* = \tilde{x}_{i2} + \rho_i(\tilde{x}_{i1} - \tilde{x}_{i2}), \tag{A.12}$$

Given that individuals care about pre-shock reference points ($\rho_i > 0$), the response to an own negative income shock, $\frac{\partial m_{i2}^*}{\partial(\tilde{x}_{i1}-\tilde{x}_{i2})} = \rho_i$ will be positive, implying an increase in what share individuals view as fair for themselves. By contrast, if there is a negative shock to the other person, $\frac{\partial m_{i2}^*}{\partial(\tilde{x}_{j1}-\tilde{x}_{j2})} = -\rho_i$ will be negative, and the share an individual views as fair for themselves decreases. *Proposition 2* thus also holds when using shares as reference points.■

Proposition 3a: *Poorer individuals take the same allocation decision independent of who suffers a shock. The effect of a negative shock is equal to zero.*

Proof of Proposition 3a Using Equation A.11 and the result from *Proposition 1a* that for poorer individuals $m_{it} = 1/2$, the allocation perceived as fair can be written as:

$$m^*_{i2} = (1 - \rho_i)1/2 + \rho_i 1/2 = 1/2 \tag{A.13}$$

Consequently, $\frac{\partial m^*_{i2}}{\partial(\tilde{x}_{k1} - \tilde{x}_{k2})} = 0$. For poorer individuals following an egalitarian fairness view, the allocation that is perceived as fair is thus independent of shocks. ■

A.3 Application to experimental setting

In the following, I apply the theoretical framework to the experimental design. An individual is predicted to hold contribution-based fairness views ($\alpha_i = 1$) if $x_{it} > \frac{X_t}{2}$ and egalitarian views ($\alpha_i = 0$) otherwise. As $\frac{X_t}{2} = x_{Ht} + x_{Lt}$ and by definition $x_{Ht} > x_{Lt}$ this implies that for H players $\alpha^*_i = 1$, while for L players $\alpha^*_i = 0$.

For H players, the final allocation considered as fair in then given by $m^*_{i2} = x_{i2} + \rho_i \gamma_i (x_{i1} - x_{i2}) - \rho_i (1 - \gamma_i)(x_{j1} - x_{j2})$ (see Equation A.4). For L players it is given by $m^*_{i2} = \frac{X_2}{2} + \rho_i \gamma_i \frac{(X_1 - X_2)}{2} - \rho_i (1 - \gamma_i) \frac{(X_1 - X_2)}{2}$ (see Equation A.7). Depending on the matching between participants, we have situations in which there is a) no shock, b) only a shock to self, c) only a shock to the other, d) a shock to both. In the main experiment, absolute shocks are identical for H and L players with $x_{H1} - x_{H2} = x_{L1} - x_{L2} = 100$ in the case of shocks. For the variation, where shocks are identical in relative terms we have $x_{H1} - x_{H2} = 300$ and $x_{L1} - x_{L2} = 100$ in the case of shocks. Table A.1 presents the predicted fair allocations to self (m^*_{i2}), applying these numbers. The changes resulting from the variation with $x_{H1} - x_{H2} = 300$ are provided in brackets. Fair allocations to the other player (m^*_{j2}) can simply be calculated by using $X_2 - m^*_{i2}$ and are thus omitted from the table.

Table A.1: Final evaluation of fair allocations to self (m^*_{i2})

	H players	L players
No shock	300	200
Shock to H	$300 + \rho_i\gamma_i 100(300)$	$200 + \rho_i\gamma_i 50(150) - \rho_i(1-\gamma_i)50(150)$
Shock to L	$300 - \rho_i(1-\gamma_i)100$	$200 + \rho_i\gamma_i 50 - \rho_i(1-\gamma_i)50$
Shock to both	$300 + \rho_i\gamma_i 100(300) - \rho_i(1-\gamma_i)100$	$200 + \rho_i\gamma_i 100(200) - \rho_i(1-\gamma_i)100(200)$

Table A.1 illustrates that for H players conditional on $\gamma_i, \rho_i > 0$ a shock to self increases what is perceived as a fair allocation to self, while a shock to the other player reduces this amount. As the effects are additive, if both players are hit by a shock the final evaluation depends on γ_i. Moreover, in the constant relative shocks variation the absolute shock is larger for H players. If participants think in absolute terms it is thus likely that they show a larger reaction to own shocks.

By contrast, independent of the shock, L players, perceive similar amounts as fair (200).[31] As final allocation decisions depend on fairness judgements, the framework thus predicts that H players, but not L players, will react to negative income shocks.

As Section A.2 shows, these predictions also hold when using shares and not absolute values in the individuals' utility function. Applied to the experimental design, this means that L players will always perceive an allocation of 1/2 as fair. For H players, an own shock increases the allocation perceived as fair ($\frac{\partial m^*_{i2}}{\partial(\tilde{x}_{i1}-\tilde{x}_{i2})} = \rho_i \geqslant 0$), while a shock to the other player decreases it ($\frac{\partial m^*_{i2}}{\partial(\tilde{x}_{j1}-\tilde{x}_{j2})} = -\rho_i \leqslant 0$).

A.4 Extension: self-serving belief formation

So far I have assumed that individuals have perfect knowledge about shocks. While this is a reasonable assumption for own shocks, there might be uncertainty about the shocks of others. In this section, I outline an extension of the theoretical framework that incorporates incomplete information about the other's shock.

As before, individuals learn about their own position at $t = 0$ and form α^*_i. Before deciding on the allocation they perceive as fair at $t = 1$, under incomplete information they first need to form expectations about the other's shock (at $t = 0.5$). I assume that while individuals do not know whether the other suffered a shock, they do know the share of individuals that have been hit by a shock within the population (σ). When forming beliefs about the likelihood that another individual that is drawn from this population suffers a shock (p_s), a rational and unbiased expectation is thus to guess $p_s = \sigma$.[32]

However, individuals might benefit from distorting their beliefs about the other's shock. They trade off the costs of deviating from an honest assessment against the benefits of deviating from σ. This is similar to standard models of lying aversion (see e.g. Fischbacher and Föllmi-Heusi, 2013; Gneezy et al., 2018). The benefit of deviating is to avoid allocating less to themselves as a fair response to the other's shock (b_i). The cost is a psychological cost of not being honest (c_i). An individual would thus deviate from guessing $p_s = \sigma$ if:

$$(\sigma - p_s)b_i > c_i, \text{ with } c_i \geqslant 0 \quad \text{(A.14)}$$

Corollary *It is never optimal for individuals to deviate from* $p_s = \sigma$*, unless* $b_i > c_i$.

Intuitively, individuals would never guess $p_s > \sigma$, as this involves costs of not being honest but no benefits. The question is thus, when would they downplay their beliefs that the other

[31] As ρ_i and γ_i are exogenous, any deviation from 200 will be identical in the shock to H, shock to L, and shock to both condition.

[32] In the experiment, I set $\sigma = 0.5$.

suffered a shock? To inform the subsequent predictions, I use the experimental results from Section 4.3, showing that richer individuals allocate less to themselves after they suffer a shock (Result 2ii), while poorer individuals do not respond to shocks (Result 3). This is in line with the theoretical framework for $\rho_i > 0$ and $\gamma_i = 0.5$.

Formally, after a shock to the other, for richer individuals the fair amount that individuals can allocate to themselves decreases by $\rho_i(1-\gamma_i)(x_{1j}-x_{2j})$. This corresponds to the amount that can be gained if they believe the other did not suffer a shock (b_i). As long as i is not indifferent about a shock to the other ($\gamma_i < 1, \rho_i > 0$) and $b_i > c_i$, i should choose $p_s < \sigma$. From $U(p_s) = (\sigma - p_s)b_i - c_i$, it can be seen that an individual's utility is maximised at $p_s^* = 0$.

For poorer individuals, the experiment shows that $b_i = 0$, as they do not change their allocations after shocks, implying $b_i \leqslant c_i$. Equation A.14 can thus never hold for poorer individuals and it is optimal for them to guess $p_s = \sigma$.

Proposition: *Richer individuals can benefit from deviating from* σ *with* $p_s^* = 0$ *if* $b_i > c_i$. *For poorer individuals* $b_i \leqslant c_i$, *implying that they will never find it optimal to deviate from* $p_s = \sigma$.

B Additional figures and analysis

B.1 Sample and procedures

Balance checks

Table B.1: Sample characteristics and balance test across shocks

	Total	No shock to self	Shock to self	Difference
Age	31.82	31.62	32.02	-0.40
Gender (Female=1)	0.44	0.43	0.45	-0.02
Education level				
No formal education	0.01	0.01	0.01	0.00
Secondary school/GCSE	0.11	0.13	0.08	0.05*
College/A levels	0.17	0.17	0.17	0.00
Undergraduate degree	0.34	0.34	0.34	0.00
Graduate degree	0.34	0.30	0.39	-0.09**
PhD	0.03	0.05	0.02	0.03*
Employment status				
Full-time	0.50	0.50	0.50	0.00
Unemployed	0.19	0.19	0.19	0.00
Part-time	0.31	0.31	0.31	0.00
Income bin (1-8)	3.62	3.79	3.45	0.34**
Household size	2.79	2.80	2.79	0.01
Social ladder (1-10)	5.45	5.50	5.40	0.11
Loss in livelihood (1-7)	3.55	3.52	3.59	-0.07
Financial struggles (1-7)	3.59	3.59	3.60	-0.01
Fairness task (1-7)	4.08	4.07	4.09	-0.02
Region				
Europe	0.80	0.78	0.81	-0.03
North America	0.09	0.09	0.09	0.00
Other	0.11	0.12	0.10	0.02
N	536	268	268	536

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table B.1 shows the sample characteristics regarding demographics and survey answers. As can be seen, participants who suffer or do not suffer a shock within the experiment are balanced across most variables. The only small differences are with respect to education, where participants without a shock are slightly more likely to have a secondary school degree or a PhD and less likely to have a graduate degree. Moreover, participants who do not suffer a shock are in a slightly higher income bin. All differences are however very small.

Similarly, table B.2 shows that the sample is balanced across all observable demographics with respect to H and L players. The only significant difference lies in the fairness perception of the task. This, however, is an intuitive result as L players are assigned lower initial earnings and might thus feel disadvantaged compared to H players.

Table B.2: Sample characteristics and balance test across player types

	Total	H players	L players	Difference
Age	31.82	31.94	31.70	0.24
Gender (Female=1)	0.44	0.47	0.41	0.07
Education level				
No formal education	0.01	0.01	0.00	0.01
Secondary school/GCSE	0.11	0.12	0.09	0.04
College/A levels	0.17	0.17	0.16	0.01
Undergraduate degree	0.34	0.32	0.36	-0.04
Graduate degree	0.34	0.34	0.35	-0.01
PhD	0.03	0.03	0.04	-0.02
Employment status				
Full-time	0.50	0.50	0.50	0.00
Unemployed	0.19	0.19	0.19	0.00
Part-time	0.31	0.31	0.31	0.00
Income bin (1-8)	3.62	3.61	3.63	-0.02
Household size	2.79	2.74	2.85	-0.11
Social ladder (1-10)	5.45	5.54	5.35	0.19
Loss in livelihood (1-7)	3.55	3.55	3.56	0.00
Financial struggles (1-7)	3.59	3.58	3.60	-0.02
Fairness task (1-7)	4.08	4.27	3.88	0.39***
Region				
Europe	0.80	0.80	0.79	0.01
North America	0.09	0.09	0.09	0.00
Other	0.11	0.11	0.12	-0.01
N	536	268	268	536

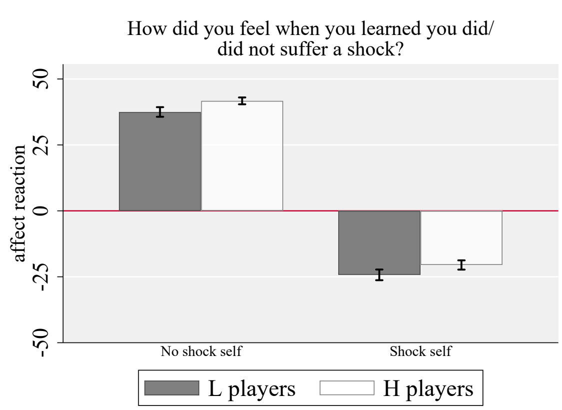
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

B.2 Effect of negative income shocks

Affect reaction to own shock

Figure B.1 shows how people feel after learning they did/ did not experience a negative shock within the experiment. Affect is measured on a scale from -50 to +50, where higher values are associated with more positive reactions. For both player types learning about a negative shock leads to significantly more negative affect reactions ($p < 0.001$). This provides evidence that the shock matters to participants and is perceived as a negative event.

Figure B.1: Affect reactions to finding out about a shock/ no shock to self



Note: Whiskers represent 95% confidence intervals.

Testing for order effects

For the regression analysis in section 4.3, order effects might be a concern as participants take repeated allocation decisions in different scenarios. Table B.3 shows the results of a regression that interacts an order dummy with the treatment indicators for both H and L players. Individually, the order effect is statistically insignificant. I then perform a test for the joint significance of the order dummy and the interaction with treatment indicators. Again, there are no significant results.

Table B.3: Testing for order effects. Dependent variable = allocation to self y_i

	H players		L players	
	(1)	(2)	(3)	(4)
Shock self	13.10*	5.13	4.00	-9.34
	(7.87)	(10.76)	(11.64)	(16.81)
Shock other	-13.99***	-14.56**	2.79	6.00
	(4.70)	(5.82)	(5.37)	(7.47)
Decision order				
Shock other first	-5.69	-11.68	17.26	0.50
	(8.83)	(12.64)	(12.29)	(17.61)
Shock other x Shock other first	4.68	-1.43	-10.20	-7.56
	(6.40)	(8.15)	(7.31)	(10.43)
Shock self x Shock other		1.16		-6.03
		(9.51)		(10.72)
Shock self x Shock other x Shock other first		23.64		27.37
		(17.77)		(23.79)
Constant	278.58***	282.43***	208.69***	215.79***
	(6.93)	(7.74)	(10.33)	(12.12)
Observations	536	536	534	534
Additional controls	No	No	No	No
N clusters	268	268	267	267
R-squared	0.02	0.02	0.00	0.01

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the individual level.

Note: *Shock self* is a binary variable that takes the value of 1 if an individual i suffered a shock themselves and 0 otherwise. *Shock other* is a binary variable that takes the value of 1 if the player i has been matched with suffered a shock and 0 otherwise. *Shock other first* is a binary variable that takes the value of 1 if an individual was first faced with the decision situation where the other player had suffered a shock and 0 otherwise.

Differences between player types in their reaction to shocks

Table B.4 pools all decisions for H and L players and interacts the treatment indicators (*shock self* and *shock other*) with player types. There is a significant difference in both the intercept as well as the slope for *shock other* between H and L players. This is also confirmed by a Chow test ($p < 0.01$ respectively). Although the difference in the slope of *shock to self* is of similar size than the one of *shock to other* it is not statistically significant due to larger standard errors. Nevertheless, overall the results confirm that H and L players show significantly different reactions to shocks in the experiment.

Table B.4: OLS model for the difference between player types in allocation to self y_i

	(1) H players	(2) L players	(3) Difference
Shock self	13.10*	3.10	-10.00
	(7.86)	(11.62)	(14.03)
Shock other	-12.06***	-2.29	9.76**
	(3.29)	(3.66)	(4.92)
Constant	277.61***	211.72***	-65.89***
	(6.73)	(10.02)	(12.07)
Additional controls		No	
N observations		1072	
N clusters		536	
R-squared		0.11	

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the individual level.

Note: Regression controls for order effects. *Shock self* is a binary variable that takes the value of 1 if an individual i suffered a shock themselves and 0 otherwise. *Shock other* is a binary variable that takes the value of 1 if the player i has been matched with suffered a shock and 0 otherwise.

Controlling for the perception of shocks

Table B.5 explores how the perception of shocks matters for allocation decisions. In the post-experimental survey, participants are asked to judge their own shock relative to the shock to the other person. They can either say that they were more, less, or equally affected by the shock compared to their co-player. This analysis can only be done for the sub-sample of participants who suffered a shock themselves, which is why *shock self* is not included in the regression. As can be seen from the results, H players show a negative reaction to the shock to others independent of their relative perception of shocks. All interaction terms are insignificant. Moreover, the relative perception of shocks does not matter for allocation decisions. The same holds true for L players who unlike H players show no reaction to shocks.[33]

[33] While Table B.5 shows that L players allocate significantly less to themselves if they feel the other has been affected more by the shock, there are only 3 participants who expressed this feeling.

Table B.5: OLS models for the effect of shocks on allocation to self y_i after controlling for relative perception of shocks

	H players		L players	
	(1)	(2)	(3)	(4)
Shock other	-15.91**	-14.09**	1.57	-2.47
	(6.70)	(6.86)	(6.38)	(5.61)
Perception of shock (ref.: same)				
Self more affected	5.64	10.04	10.82	12.36
	(27.12)	(27.08)	(17.99)	(19.35)
Other more affected	-0.89	-5.68	-30.18*	25.53
	(12.50)	(13.03)	(16.73)	(44.24)
Interactions				
Shock other x self more affected	37.34	35.52	-14.02	-5.56
	(29.66)	(30.91)	(9.70)	(8.94)
Shock other x other more affected	8.33	6.07	-5.57	-1.53
	(9.78)	(10.21)	(6.38)	(5.61)
Constant	285.37***	321.37***	203.17***	263.29***
	(9.10)	(46.83)	(16.23)	(58.64)
Additional controls	No	Yes	No	Yes
N observations	268	258	268	250
N clusters	134	129	134	125
R-squared	0.01	0.16	0.02	0.17

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the individual level.

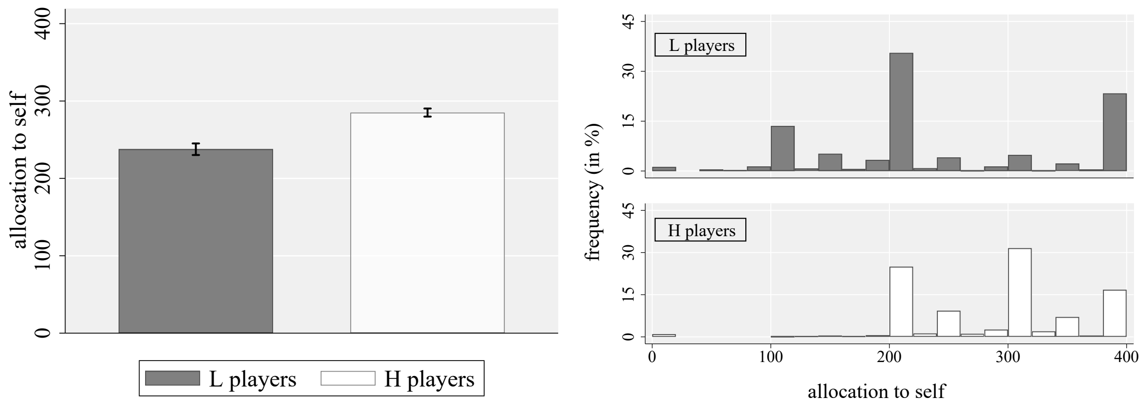
Note: Regressions control for order effects. *Shock other* is a binary variable that takes the value of 1 if the player i has been matched with suffered a shock and 0 otherwise. *Perception of shock* is a categorical variable that takes the value of 0 if shock to self and shock to other are perceived to be identical, 1 if shock to self is perceived as larger and 2 if shock to other is perceived as larger. Additional controls include age, gender, income, household size, education, region, subjective social status, and fairness of task.

B.3 Constant relative shocks

Relative income and fairness views

Figure B.2 shows that the relationship between allocations and relative income can be replicated when using constant relative shocks. The most common allocation for L players is 200, in line with the egalitarian fairness view. H players, by contrast, are most likely to choose allocations in line with individual contributions, resulting in 300 for themselves. The distribution of allocations differs significantly between types (Kolmogorov-Smirnov test, $p < 0.001$). This difference also translates into significantly lower allocations to self for L players (t-test, $p < 0.001$).

Figure B.2: Average allocation to self (LHS) and distribution (RHS) by player type

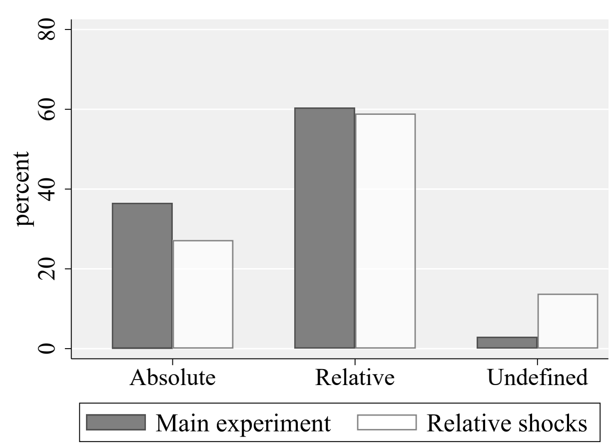


Note: Whiskers represent 95% confidence intervals.

Relative vs absolute perception of shocks

Figure B.3 visualises how participants perceive shocks in the post-experimental survey. Participants could state in the post-experimental survey whether they were more, less or identically affected by shocks compared to their co-player. This allows to assess whether participants view shocks in relative or absolute terms. For instance, in the main experiment, where absolute shocks are held constant participants are classified as viewing shocks in absolute terms if they say both players are affected in the same way. If they state that L players are affected more, they are classified as viewing shocks in relative terms. An analogous classification can be done for the variation where shocks are identical in relative terms.

Figure B.3: Perception of shocks within the experiment



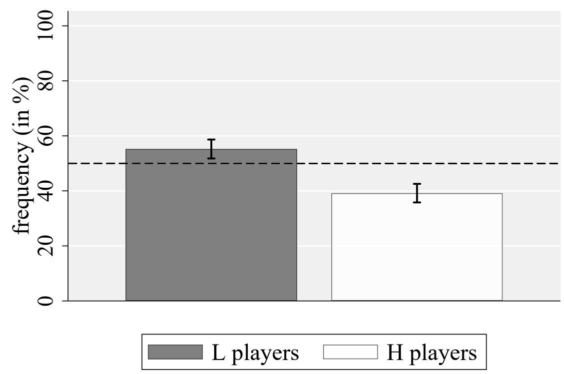
As Figure B.3 shows, both absolute and relative perceptions of shocks are present in the study. However, the majority seems to perceive shocks in relative terms. Interestingly, participants are significantly more likely to perceive shocks in absolute terms in the main study (t-test, $p < 0.001$). This suggests that it matters how information about shocks is presented.

B.4 The role of incomplete information

Replication of biased beliefs with constant relative shocks

Figure B.4 shows that the bias in beliefs for H players can be replicated in the data collection with constant relative shocks. Significantly less than 50% of H players believe that the other suffered a shock (t-test, $p < 0.001$). L players do not show this bias. If anything slightly more than 50% state that the other suffered a shock (t-test, $p < 0.09$).

Figure B.4: Share of players believing that the other suffered a shock under constant relative shocks



Note: Whiskers represent 95% confidence intervals.

Effect of incomplete information on allocation decisions

Table B.6 shows the results of regressing allocations to self on shock to self and the available information about the other player. The table shows that under no information, H players behave as if the other player did not suffer a shock. Similarly, a Wald test shows that allocations to self are significantly higher under incomplete information than if it is known that the other suffered a shock ($p < 0.001$). For L players, by contrast, allocation decisions are indistinguishable across all three scenarios.

Note that in the data collection with constant relative shocks, this result is less robust. H players allocate significantly more to the other after incomplete information compared to knowing that the other did not suffer a shock. The difference becomes insignificant after controlling for an interaction with perceived fairness in initial income differences.

Table B.6: OLS models for the effect of shocks and information on allocation to self y_i

	H players		L players	
	(1)	(2)	(3)	(4)
Shock self	11.74	13.14*	5.62	4.90
	(7.81)	(7.60)	(11.80)	(11.61)
Information (ref.: Info = no shock other)				
Info = Shock other	-12.06***	-11.71***	-2.67	-2.20
	(3.30)	(3.37)	(3.66)	(3.60)
Info = No information	-1.53	-0.52	1.79	1.06
	(3.26)	(3.30)	(3.56)	(3.71)
Constant	272.74***	301.58***	216.60***	260.46***
	(11.98)	(35.57)	(15.38)	(41.79)
Additional controls	No	Yes	No	Yes
N observations	804	777	801	762
N clusters	268	259	267	254
R-squared	0.02	0.12	0.02	0.14

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the individual level.

Note: Regressions control for order effects. *Shock self* is a binary variable that takes the value of 1 if an individual i suffered a shock themselves and 0 otherwise. *Information* is a categorical variable that takes the value of 0 if player i is informed that the other did not suffer a shock, 1 if player i is informed that the other did suffer a shock and 2 if the other's shock is unknown. Additional controls include employment shock due to Covid-19, age, gender, income, household size, education, region, subjective social status, and fairness of task.

B.5 Relationship closeness and affect

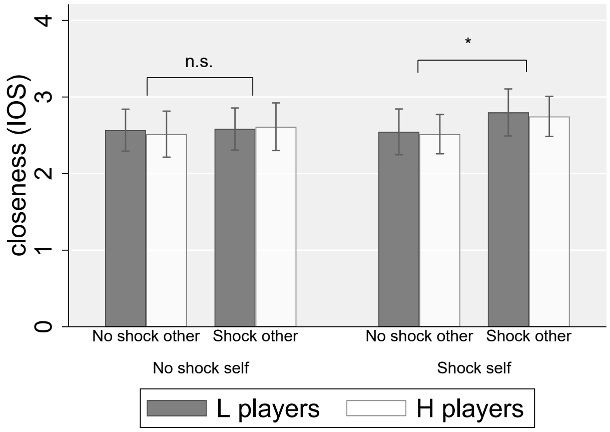
While the main focus of the experiment is understanding the effect of negative shocks and relative income on redistributive preferences, I also explore whether shocks change the perception individuals have of the other player.[34] In particular, I investigate perceptions of closeness between participants and positive/ negative affect. I elicit closeness between participants using the IOS scale (Aron et al., 1992) after each allocation decision.[35] For the affect questions, I ask participants how they felt when they learned that they/ the other player did or did not suffer a shock. Affect was measured on a scale from -50 to 50, corresponding to very negative or very positive affect reactions. I thereby use a variation of the pictorial assessment scale developed by Desmet et al. (2001).

When it comes to relationship closeness, I find that overall the experience of shocks does not have large effects (see Figure B.5). While a shock to the other player slightly increases closeness, this effect is only marginally significant if players suffer a shock themselves (t-test, $p = 0.09$). In addition, closeness is very similar for both player types. While

[34] The analysis of closeness and affect under constant relative shocks yields qualitatively similar results.

[35] The IOS scale measures closeness on a scale form 1 to 7, represented by pairs of circles with different degrees of overlap. A larger value thereby represents a higher degree of closeness.

Figure B.5: Reported closeness between players conditional on shocks



Note: Whiskers represent 95% confidence intervals.

participants' reported closeness to each other did not vary systematically across experience of shocks, I do find that there is a significant correlation between allocation decisions and closeness. Both H and L players who report a higher level of closeness to their co-player allocate significantly less to themselves. As Table B.7 shows the effect of shocks on allocation decisions is robust to the inclusion of IOS scores as an additional control variable. H players allocate more to themselves after experiencing a shock and less to themselves after the other does so. L players, by contrast, still show no reaction to any shocks.

Table B.7: OLS models for the effect of shocks on allocation to self y_i after controlling for perceived closeness

	H players		L players	
	(1)	(2)	(3)	(4)
Shock self	14.15*	15.38**	4.64	3.10
	(7.22)	(7.28)	(11.49)	(11.77)
Shock other	-9.25***	-8.87***	-1.38	-0.94
	(2.99)	(3.09)	(3.65)	(3.66)
Closeness (IOS)	-17.09***	-16.36***	-9.34***	-9.35**
	(1.98)	(2.03)	(3.50)	(3.72)
Constant	318.95***	324.61***	237.49***	309.03***
	(8.56)	(33.41)	(15.62)	(42.05)
Additional controls	No	Yes	No	Yes
N observations	536	518	534	508
N clusters	268	259	267	254
R-squared	0.18	0.26	0.03	0.16

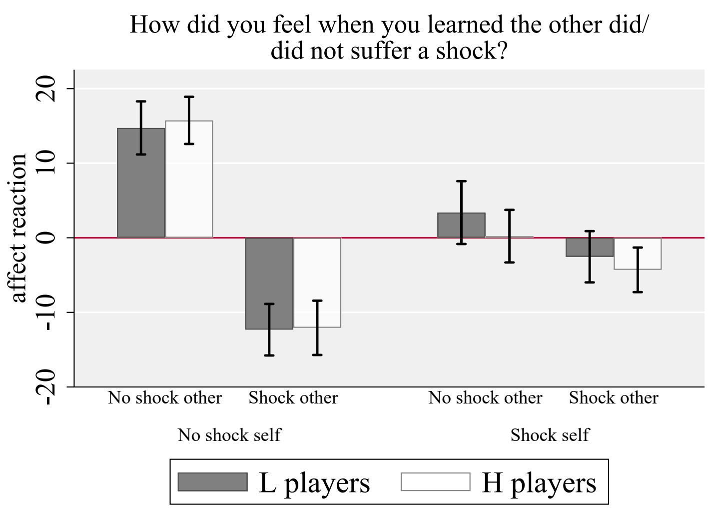
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the individual level.

Note: Regressions control for order effects. *Shock self* is a binary variable that takes the value of 1 if an individual i suffered a shock themselves and 0 otherwise. *Shock other* is a binary variable that takes the value of 1 if the player i has been matched with suffered a shock and 0 otherwise. *Closeness* is measured via the IOS scale, where a value of 1 indicates the lowest and a level of 7 the highest degree of perceived closeness between players. Additional controls include employment shock due to Covid-19, age, gender, income, household size, education, region, subjective social status, and fairness of task.

In addition to oneness, there are also other significant correlates of allocation decisions. Attitudes towards solidarity and behaviour during a crisis affect allocations in the experiment. People who state that compassion is a crucial virtue ($p = 0.01$), that in a crisis people become more compassionate ($p = 0.07$) and that one should give priority to society's instead of individual problems allocate significantly less to themselves ($p = 0.06$). In terms of demographics, women and older participants allocate significantly less to themselves ($p = 0.08$ and $p = 0.03$ respectively).

Finally, Figure B.6 shows affect reactions to the information that the other person did/ did not suffer a shock. A shock to the other leads to a significantly more negative reaction than learning that the other did not suffer a shock (t-test, $p < 0.001$). However, the difference is much larger if players themselves did not suffer a shock. They are significantly less happy (sad) for the other player avoiding (suffering) the shock if they were hit by a shock themselves (t-tests, $p < 0.001$ respectively).

Figure B.6: Affect responses to other's shock



Note: Whiskers represent 95% confidence intervals.

C Additional figures and analysis for Study 2

C.1 Sample and data collection

Balance check

Table C.1 shows the sample characteristics for Study 2. As expected, suffering a significant loss in livelihood is not orthogonal to demographic characteristics. In particular, participants who state they suffered a significant loss in livelihood are more likely to be female, to have lost their employment, to be from a lower income category, to have a lower perceived social status, to have recently faced financial struggles and to be from the US. Moreover, they are less likely to have a graduate degree, be full-time employed or to come from a European country.

Table C.1: Sample characteristics and balance test across real world shocks

	Total	No Covid shock	Covid shock	Difference
Age	31.21	31.08	31.42	-0.34
Gender (Female=1)	0.43	0.39	0.49	-0.10**
Education level				
No formal education	0.01	0.00	0.01	-0.01
Secondary school/GCSE	0.15	0.13	0.18	-0.05
College/A levels	0.16	0.16	0.17	-0.01
Undergraduate degree	0.34	0.33	0.35	-0.02
Graduate degree	0.31	0.34	0.26	0.08*
PhD	0.04	0.04	0.03	-0.01
Employment status (prolific)				
Full-time	0.50	0.67	0.22	0.45***
Unemployed	0.50	0.33	0.78	-0.45***
Employment status (survey)				
Full-time	0.42	0.57	0.19	0.38***
Unemployed	0.25	0.11	0.46	-0.35***
Other	0.33	0.32	0.35	-0.04
Income bin (1-8)	3.47	3.65	3.18	0.47***
Household size	2.87	2.83	2.94	-0.11
Social ladder (1-10)	5.26	5.58	4.75	0.83***
Financial struggles (1-7)	3.94	2.96	5.55	2.59***
Fairness task (1-7)	4.09	4.13	4.03	-0.10
Region				
Europe	0.77	0.81	0.71	0.11***
North America	0.10	0.05	0.19	-0.14***
Other	0.12	0.14	0.10	0.03
N	536	332	204	536

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

C.2 Effect of negative income shocks

Can player types be pooled?

To test whether H and L players can be pooled, I run a regression of allocations to self on shock experiences, player types and their interactions. As table C.2 shows, the only significant difference between H and L players is with respect to levels. Their reactions to shocks, by contrast, are statistically indistinguishable. I thus pool player types for the rest of the analysis, while controlling for level differences in allocations to self.

Table C.2: OLS model for the difference between player types in allocations to self y_i

	(1) H players	(2) L players	(3) Difference
Shock self	9.10 (9.38)	23.77* (12.19)	-14.68 (15.37)
Shock other	-57.56*** (4.26)	-56.21*** (4.91)	-1.34 (6.50)
Constant	276.78*** (6.71)	209.14*** (8.60)	67.64*** (9.54)
Additional controls		No	
N observations		1072	
N clusters		536	
R-squared		0.17	

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the individual level.

Note: Regression controls for order effects. *Shock self* is a binary variable that takes the value of 1 if an individual i suffered a shock themselves and 0 otherwise. *Shock other* is a binary variable that takes the value of 1 if the player i has been matched with suffered a shock and 0 otherwise.

Order effects

Table C.3: Testing for order effects. Dependent variable = allocation to self y_i

	(1)	(2)
Shock self	16.47** (7.71)	28.41** (11.39)
Shock other	-67.59*** (4.65)	-66.09*** (6.29)
Shock self x Shock other		-3.71 (9.28)
Decision order		
Shock other first	1.31 (7.81)	11.55 (9.63)
Shock other x Shock other first	21.26*** (6.44)	16.41* (8.48)
Shock self x Shock other x Shock other first		-14.00 (17.13)
H Player	61.38*** (7.46)	61.28*** (7.46)
Constant	217.60*** (7.85)	212.80*** (8.33)
Observations	1072	1072
Additional controls	No	No
N clusters	536	536
R-squared	0.18	0.18

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the individual level.

Note: *Shock self* is a binary variable that takes the value of 1 if an individual i suffered a shock themselves and 0 otherwise. *Shock other* is a binary variable that takes the value of 1 if the player i has been matched with suffered a shock and 0 otherwise. *Shock other first* is a binary variable controlling for order effects that takes the value 1 if a participant was first matched with another player who did suffer a shock and 0 if they were first matched with another player who did not suffer a shock. textitH Player is a binary variable that takes the value of 1 for H players and 0 for L players.

As participants are taking several allocation decisions for different participants I control for order effects. Table C.3 shows the results of regressing allocations to self on treatment indicators and their interaction with decision order. For the effect of a shock to other, decision order plays a significant role. More precisely, participants allocate more to themselves in the scenario where the other suffered a shock if they see that scenario first. Moreover, when testing for the joint effect of order effects, a Wald test confirms that they are significant ($p = 0.05$ for model 1, $p = 0.002$ for model 2).

As order effects are jointly significant, I test whether the results in Section 5.2.3 hold when including the interaction between decision order and shocks. As Table C.4 shows the effect of a shock to other is smaller when participants first face the situation where the other suffered a shock and then the situation where the other did not suffer a shock. Nevertheless, independent of the decision order, a shock to the other player always leads to a significant reduction in allocations to self.

Table C.4: OLS models for the effect of shocks on allocation to self y_i

	(1)	(2)	(3)
Shock self	16.47**	16.85*	28.52**
	(7.71)	(9.01)	(12.54)
Shock other			
Decision order: no shock other first	-67.59***	-67.58***	-66.35***
	(4.65)	(4.82)	(6.52)
Decision order: shock other first	-46.33***	-46.38***	-51.16*
	(4.46)	(4.49)	(5.68)
Shock self x Shock other			
Decision order: no shock other first			-3.05
			(9.62)
Decision order: shock other first			13.75
			(9.21)
Decision order	1.31	0.46	11.44
	(7.81)	(8.15)	(10.09)
H Player	61.38***	64.00***	63.98***
	(7.46)	(7.77)	(7.78)
Constant	217.60***	229.09***	221.80***
	(7.85)	(31.03)	(31.21)
Additional controls	No	Yes	Yes
N observations	1072	1026	1026
N clusters	536	513	513
R-squared	0.18	0.21	0.21

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the individual level.

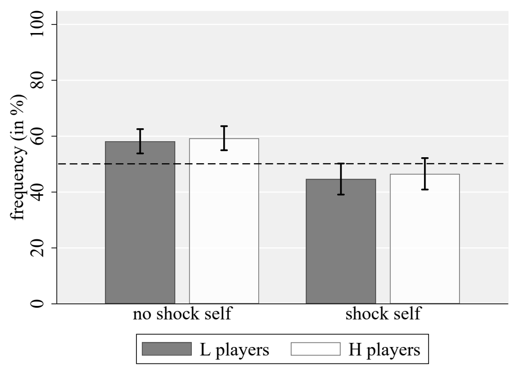
Note: Shock self is a binary variable that takes the value of 1 if an individual i suffered a shock themselves and 0 otherwise. *Shock other* is a binary variable that takes the value of 1 if the player i has been matched with suffered a shock and 0 otherwise. *H Player* is a binary variable that takes the value of 1 for H players and 0 for L players. *Decision order* is a binary variable controlling for order effects that takes the value 1 if a participant was first matched with another player who did suffer a shock and 0 if they were first matched with another player who did not suffer a shock. Additional controls include employment shock due to Covid-19, age, gender, household size, education, region, subjective social status, and fairness of task.

C.3 The role of incomplete information

Beliefs by player type

The belief pattern about the other player holds when looking separately at H and L players. If players suffer a shock themselves, their aggregate beliefs of whether the other did suffer a real world shock are not statistically different from 50% (see Figure C.1). If they did not suffer a shock themselves, by contrast, players are significantly more likely to believe that the other did suffer a shock ($p < 0.05$ respectively).

Figure C.1: Share of players believing that the other suffered a shock by player type



Note: Whiskers represent 95% confidence intervals.

Effect of incomplete information on allocation decisions

In addition to beliefs, I test the effect of incomplete information on distributive preferences by regressing allocations to self on shock to self and the available information about the other player. As Table C.5 shows, if there is no information about what happened to the other, participants allocate significantly less to themselves than if they know the other did not suffer a significant loss in livelihood. However, the reaction is not as strong as if they know for sure the other suffered a shock. A Wald test confirms that the coefficients are statistically different ($p < 0.001$). Allocation decisions under incomplete information thus lie between the decisions when it is known that the other did or did not suffer a shock. This stresses again that there is no self-serving bias among participants.

Table C.5: OLS models for the effect of shocks and information on allocation to self y_i

	(1)	(2)
Shock self	10.90	12.37
	(7.56)	(8.70)
Type of information (ref.: Info = No shock other)		
Info = Shock other	-56.88***	-57.00***
	(3.25)	(3.32)
Info = No information	-21.38***	-21.78***
	(2.27)	(2.34)
H Player	59.20***	61.51***
	(7.38)	(7.63)
Constant	228.94***	241.72***
	(11.92)	(31.30)
Additional controls	No	Yes
N observations	1608	1539
N clusters	536	513
R-squared	0.15	0.20

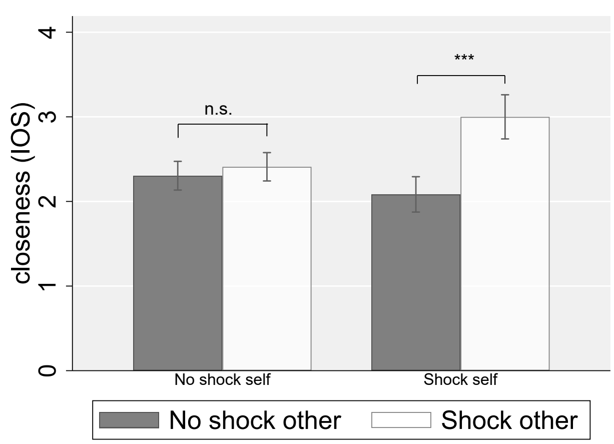
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the individual level.

Note: Regressions control for order effects. *Shock self* is a binary variable that takes the value of 1 if an individual i suffered a shock themselves and 0 otherwise. *Information* is a categorical variable that takes the value of 0 if player i is informed that the other did not suffer a shock, 1 if player i is informed that the other did suffer a shock and 2 if the other's shock is unknown. *H Player* is a binary variable that takes the value of 1 for H players and 0 for L players. Additional controls include employment shock due to Covid-19, age, gender, income, household size, education, region, subjective social status, and fairness of task.

C.4 Relationship closeness and affect

I find that the experience of shocks does not only affect redistributive preferences, but also closeness between players and affect reactions. Figure C.2 shows how reported closeness as measured by the IOS scale (1-7) changes with the experience of real world shocks. While a shock to the other player has no effect on perceived closeness if players did not suffered a shock themselves, it increases closeness if players suffer a shock themselves ($p < 0.001$). As

Figure C.2: Reported closeness between players conditional on shocks



in the previous study, participants who report a higher level of closeness to their co-player allocate significantly less to themselves. The effect of shocks on behaviour is robust to the inclusion of IOS scores as an additional control (see Table C.6).

Table C.6: OLS model for the effect of shocks on allocations to self y_i when controlling for perceived closeness

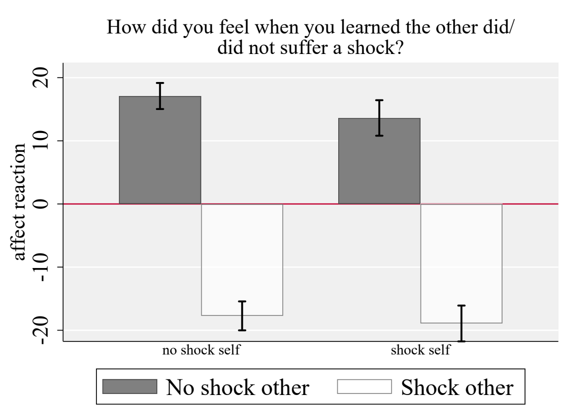
	(1)	(2)
Shock self	19.13***	18.39**
	(7.36)	(8.60)
Shock other	-50.44***	-50.60***
	(3.45)	(3.53)
Closeness (IOS)	-15.55***	-15.77***
	(2.04)	(2.15)
H Player	59.86***	63.29***
	(7.19)	(7.47)
Constant	248.35***	256.36***
	(9.71)	(29.95)
Additional controls	No	Yes
N observations	1072	1026
N clusters	536	513
R-squared	0.23	0.26

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the individual level.

Note: Regressions control for order effects. *Shock self* is a binary variable that takes the value of 1 if an individual i suffered a shock themselves and 0 otherwise. *Shock other* is a binary variable that takes the value of 1 if the player i has been matched with suffered a shock and 0 otherwise. *Closeness* is measured via the IOS scale, where a value of 1 indicates the lowest and a level of 7 the highest degree of perceived closeness between players. *H Player* is a binary variable that takes the value of 1 for H players and 0 for L players. Additional controls include employment shock due to Covid-19, age, gender, income, household size, education, region, subjective social status, and fairness of task.

Figure C.3 shows participants' reactions to the information that the other person did/ did not suffer a shock. A shock to other always leads to a significantly more negative reaction than learning that the other did not suffer a shock (t-tests, $p < 0.001$).

Figure C.3: Affect responses to other's shock



D Supplementary materials for Study 1

D.1 Instructions

In the following I provide instructions and screenshots for Study 1. As instructions only differ slightly for H and L players, I provide one set of instructions from the perspective of H players and add the corresponding text for L players in brackets when required.

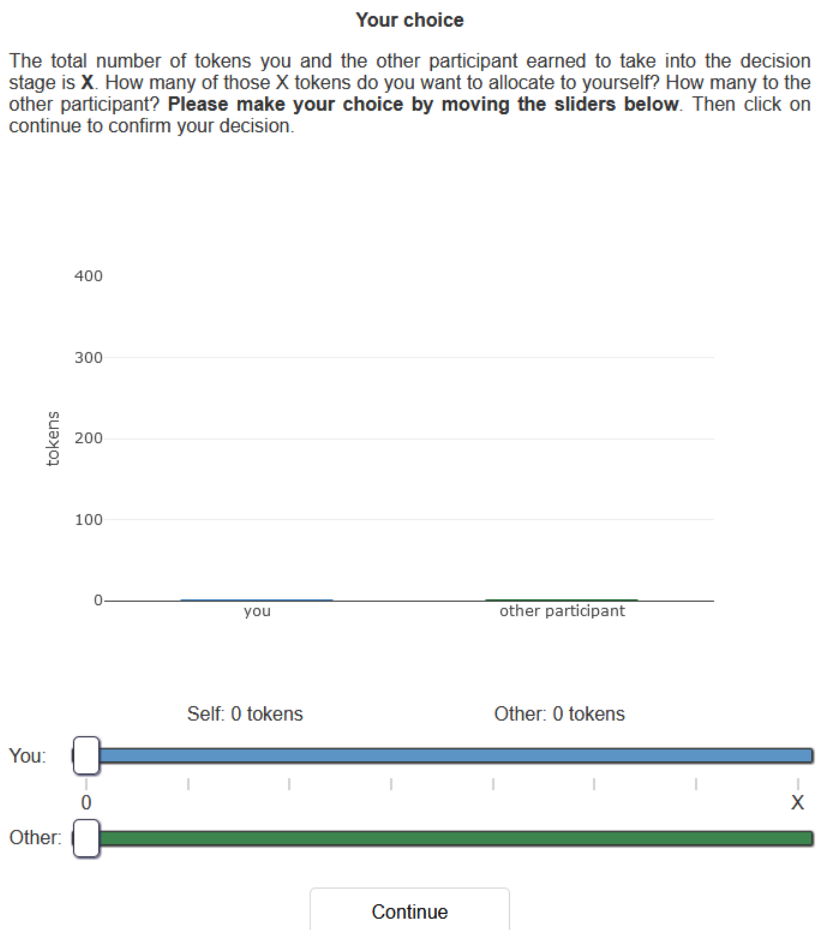
Instructions

Please read the instructions carefully.

This study consists of three stages: an earning stage, a decision stage, and a short questionnaire. You will be given details about the different stages below. Throughout the study you can earn Experimental Tokens, which are later converted into a bonus (£) at a pre-defined exchange rate (100 tokens = £0.40). Your final bonus will depend partly on your own decision, partly on the decision of another Prolific participant and partly on external factors. How your bonus is determined will be outlined below in greater detail.

Earning stage: In this stage, you have to work in order to earn tokens that are then used in the second stage of the study. As a task, you will be given randomly generated strings of letters that you need to type in reverse order. As an example: If you see the string "rlgowsahc", the correct answer will be "chaswoglr". In order to earn your tokens, you need to correctly solve 10 strings. All participants are randomly assigned to different difficulty levels and earn a different number of tokens. For a higher difficulty level you will earn more tokens. This will help us to correctly calibrate different difficulty levels for another study. **You have been assigned to a more difficult (easier) level for which you will earn 400 (200) tokens**. After finishing the string reversal task, you will be given more information about external factors that could affect the number of tokens you take into the second stage.

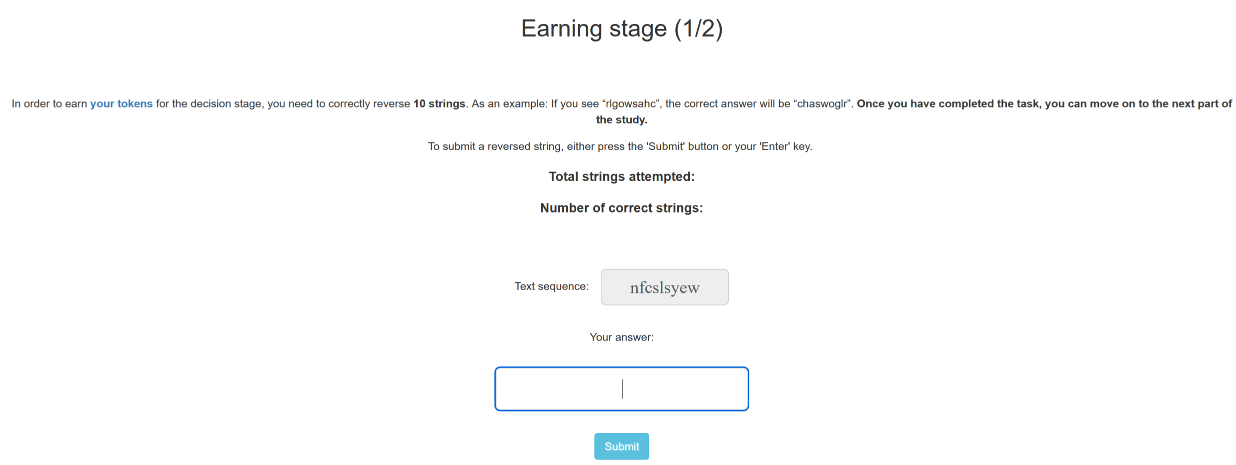
Decision stage: The second stage of the study consists of **three separate decision rounds**. In each round, you will be matched with a different Prolific participant who is participating in the same study but has been assigned to an **easier (more difficult) level**. In each round, you have to decide how you want to divide the total number of tokens that you and the other participant took into the second stage between **yourself**and the **other participant**. The other participant will do the same. The screenshot below shows what the decision screen will look like:



At the end of the experiment, there will be a lottery that selects one of the three decision rounds to count towards your bonus. In other words, each of the three decision rounds can be relevant for your final payment. Once a round has been selected, another lottery will decide whether **your choice**or the **other participant's choice**will determine your final bonuses. With a 50% chance, your choice will determine your and the other participant's final bonuses, with a 50% chance, the other participant's choice will determine your and their final bonuses. All interactions in this study are completely anonymous. You will never know the identity of the other participants, and they will never know yours.

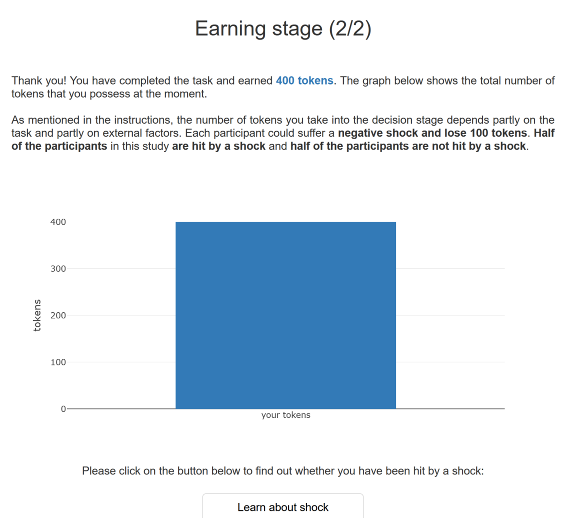
D.2 Screenshots experiment

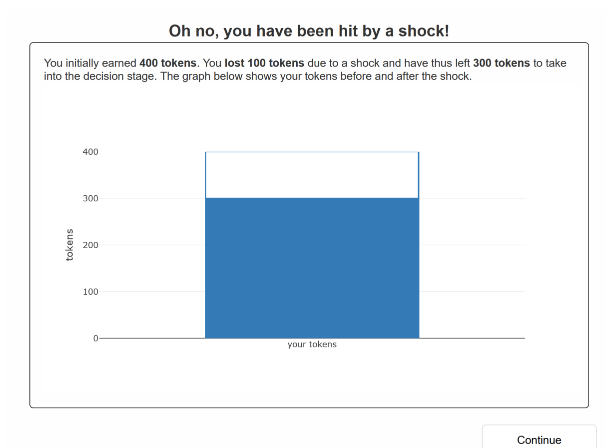
Real effort task



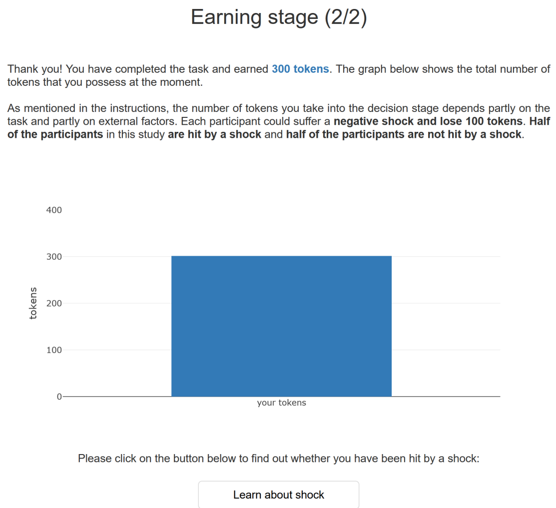
Learning about shocks

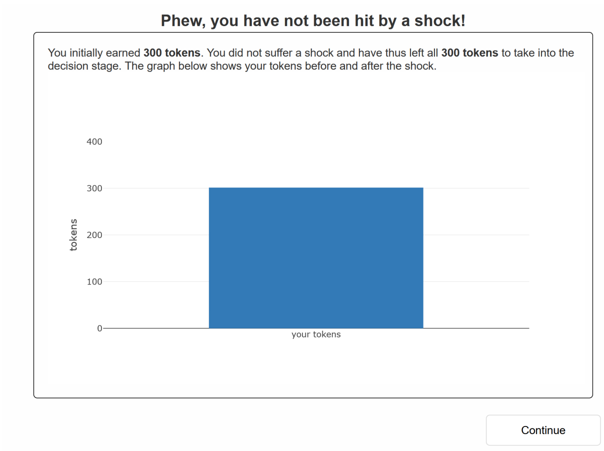
a) H players with a shock



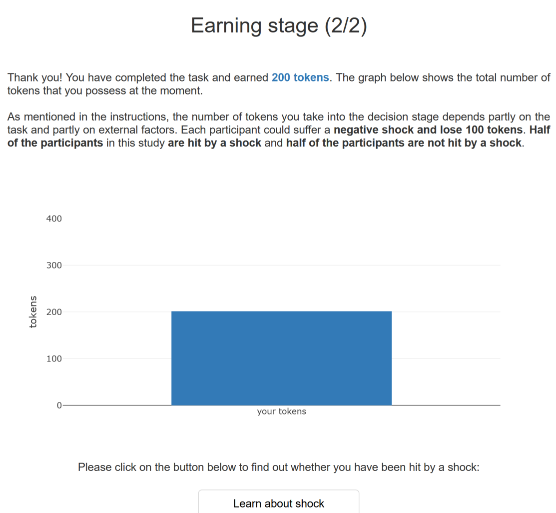


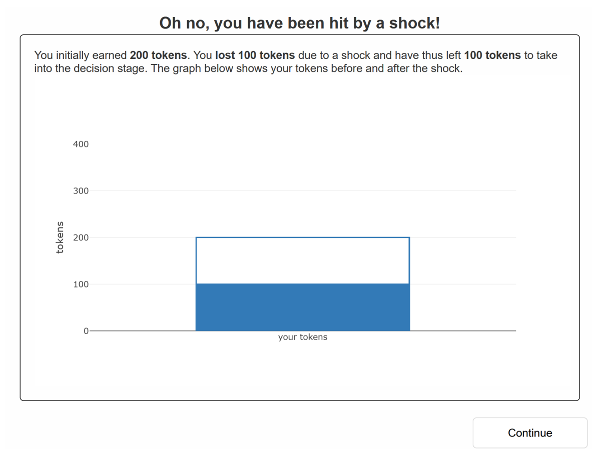
b) H players without a shock



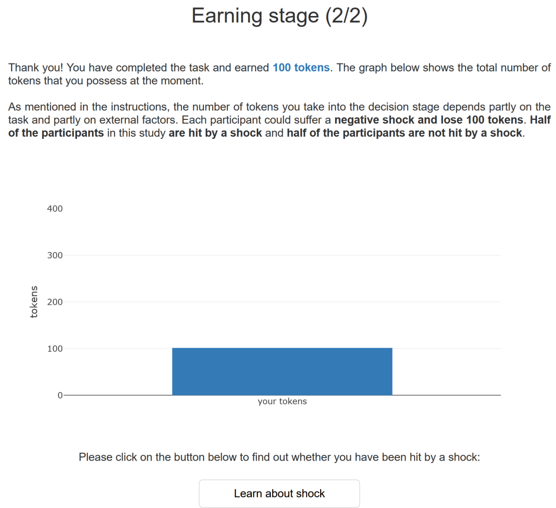


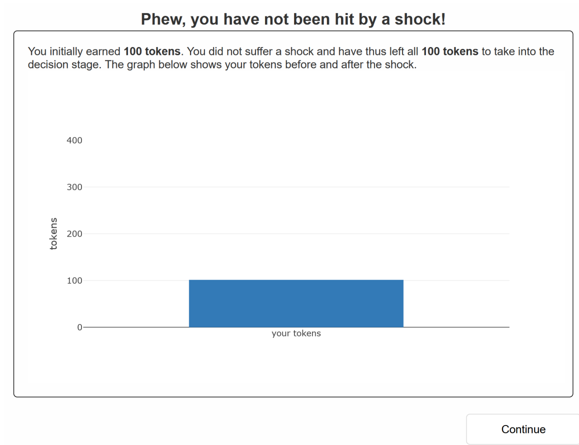
c) L players with a shock





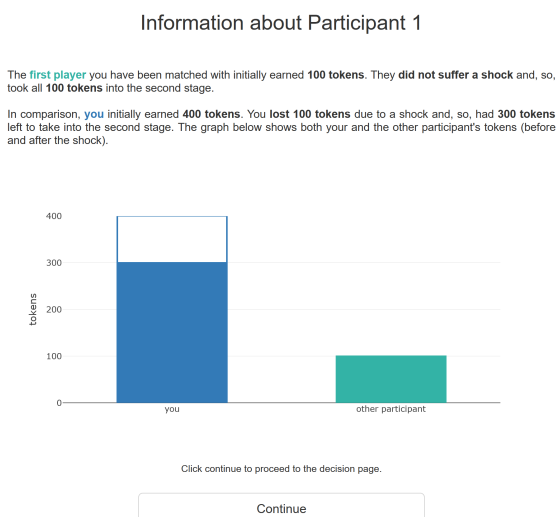
d) L players without a shock

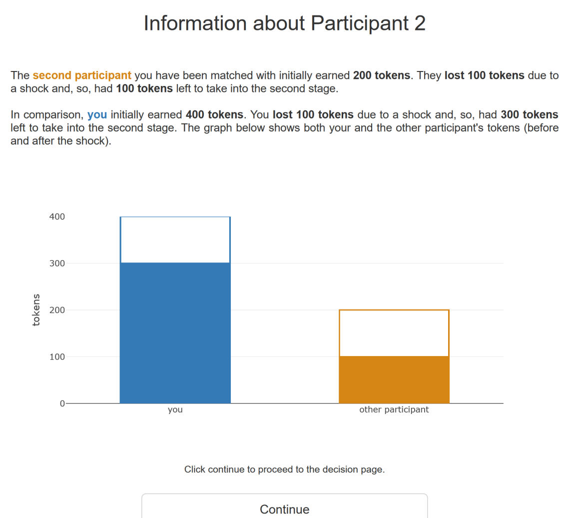


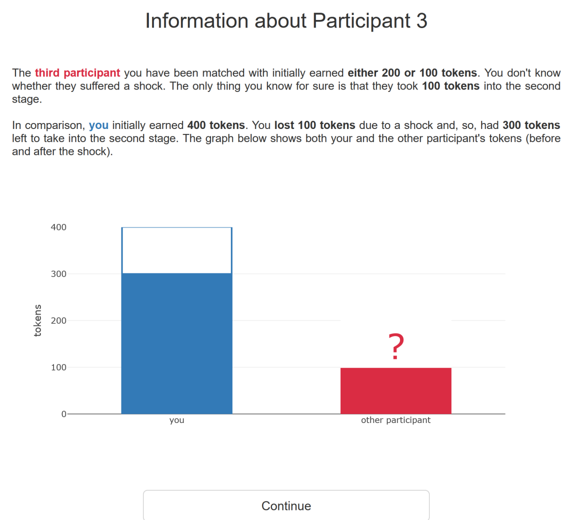


Decision screen

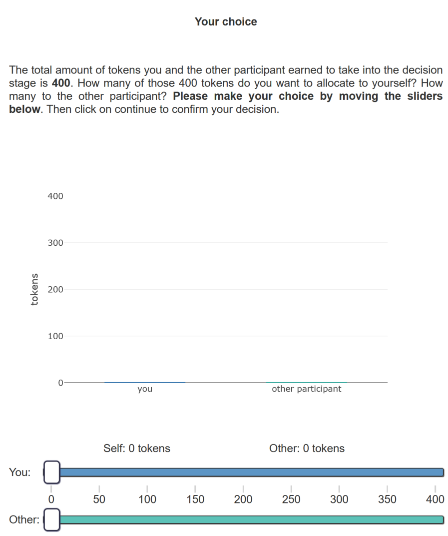
The decision screen is shown from the perspective of an H player who did suffer a shock. The screen is adjusted accordingly for different scenarios (order and colour of scenarios is randomised). In each of the 3 rounds, participants receive information about the participant they are being matched with.

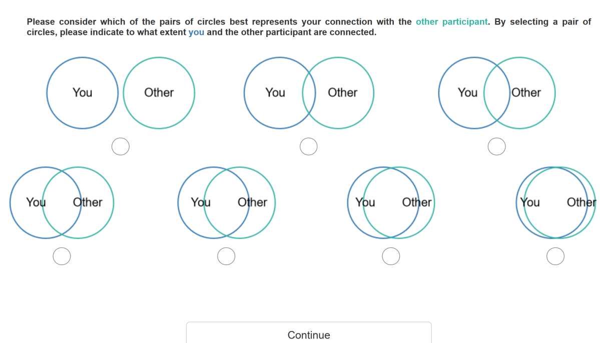




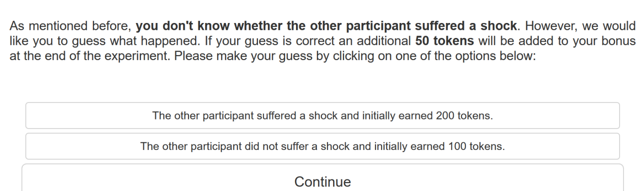


Next, they take a decision about how they want to allocate the total earnings between themselves and the other player (left graph below) and are then asked about how close they feel to the other player.





Under incomplete information (here participant 3), participants answer either first the allocation decision or the question about their beliefs about the shock of the other player.



Questionnaire

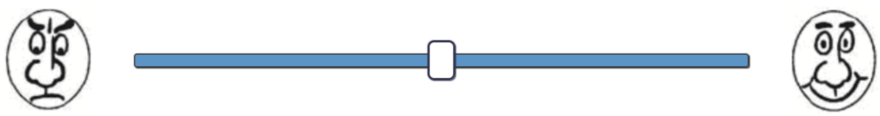
Again some of the questions vary with roles and experience of shocks. Here I provide the example of an H player who suffered a shock. Questions are adjusted accordingly for other players.

Questionnaire (1/3)

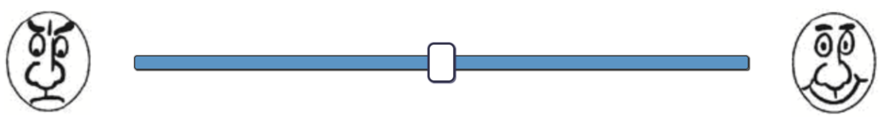
1) In the first stage of the study, participants were randomly assigned to different difficulty levels and **earned different amounts of tokens.** You were assigned to a more difficult level, for which **you initially earned 400 tokens. The other participants** you have been matched with **initially earned 200 or 100 tokens for an easier level.** What do you think about these differences?

very unfair ○ ○ ○ ○ ○ ○ ○ very fair

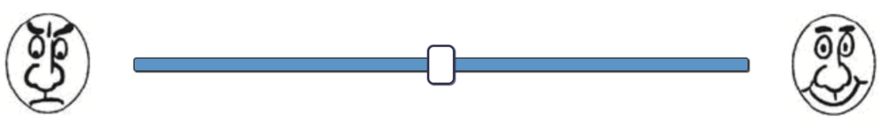
2) At the end of the earning stage, you learned that **you were hit by a shock and lost 100 tokens**. Please rate how this news made you feel by moving the slider below.



3) In one round of the decision stage you learned that **the participant you have been matched with was hit by a shock**. Please rate how this news made you feel by moving the slider below.



4) In another round of the decision stage you learned that **the participant you have been matched with was not hit by a shock**. Please rate how this news made you feel by moving the slider below.



5) **You** initially earned **400 tokens and lost 100 tokens** due to a shock. The **other participant** who suffered a shock, initially earned **200 tokens and lost 100 tokens** due to a shock. How do you judge both shocks?

- We were affected in the same way.
- The other participant was affected more.
- I was affected more.

Continue

Questionnaire (2/3)

1) What is your age?

2) What is your gender? (male/female/prefer not to say)

3) What is the highest degree or level of schooling you have completed? (No formal qualification/ Secondary school or GCSE/ College or A levels/ Undergraduate degree/ Graduate degree/ PhD/ Prefer not to say)

4) Some people describe political affiliation on a left to right spectrum. Please indicate where you believe your political ideology lies on this spectrum.

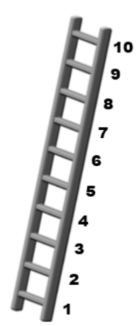
5) What was your household pre-tax income last year?

6) Including yourself, how many people currently live in your household?

7) Think of the ladder below as representing where people stand in your country.

At the top of the ladder are the people who are the best off - those who have the most income, the most education, and the most respected jobs. At the bottom are the people who are worst off - who have the least money, the least education, and the least respected jobs or no jobs. The higher up you are on this ladder, the closer you are to the people at the very top; the lower you are, the closer you are to the people at the very bottom.

Where would you place yourself on this ladder?[36]



[36] This question was developed by Adler et al. (2000) as a measure for perceived social status.

Questionnaire (3/3)

1) How has your employment status been affected by the COVID-19 (coronavirus) pandemic?

1.1) Before the pandemic I was:

- Working full-time
- Working part-time
- Unemployed or out of work
- Self-employed
- A student and not employed
- Prefer not to say

1.2) My current situation is:

- Working full-time
- Working part-time
- Working fewer part-time hours
- My job has been suspended (unpaid leave or furloughed)
- Unemployed or out of work
- Self-employed
- A student and not employed
- Prefer not to say

2) To what extent do you agree with the following statements:

I suffered a significant loss in livelihood due to the Covid-19 crisis.

Strongly disagree ○ ○ ○ ○ ○ ○ ○ Strongly agree

The pandemic made me struggle financially.

Strongly disagree ○ ○ ○ ○ ○ ○ ○ Strongly agree

The government should aim to reduce economic differences.

Strongly disagree ○ ○ ○ ○ ○ ○ ○ Strongly agree

Compassion for those who are suffering is the most crucial virtue.

Strongly disagree ○ ○ ○ ○ ○ ○ ○ Strongly agree

I think during a crisis people tend to become more

Selfish ○ ○ ○ ○ ○ ○ ○ Compassionate

Should you give priority to solving your own problems or should you give priority to solving your society's problems?

Own problems ○ ○ ○ ○ ○ ○ ○ Society's problems

E Supplementary materials for Study 2

E.1 Instructions

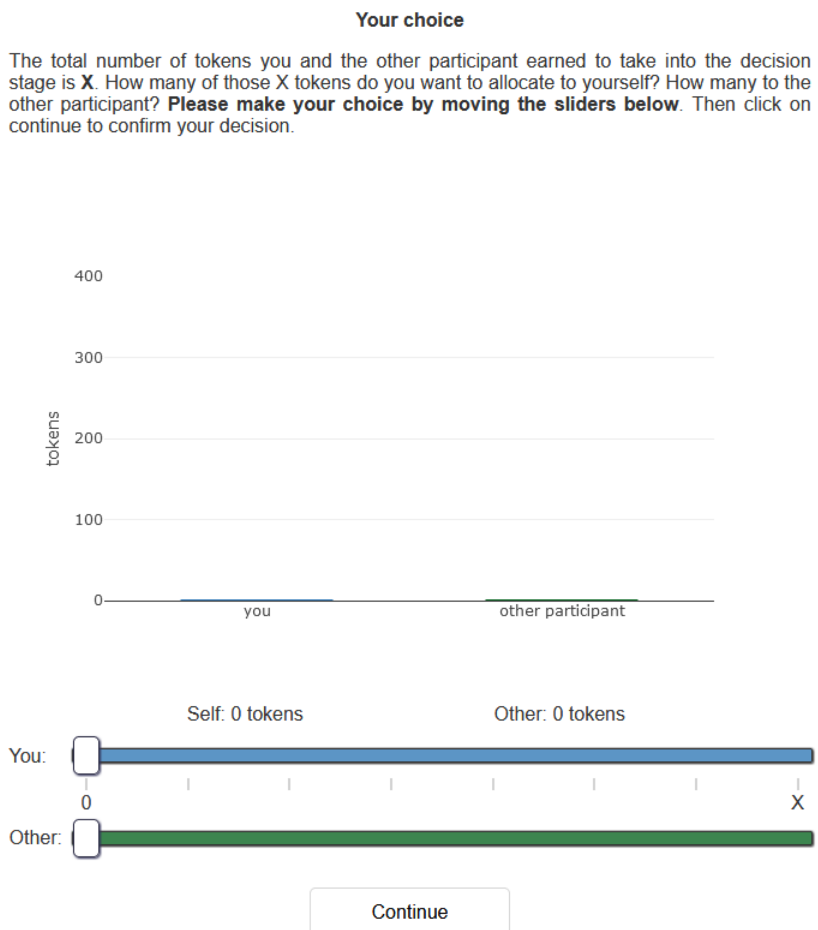
Instructions

Please read the instructions carefully.

This study consists of three stages: an earning stage, a decision stage, and a short questionnaire. You will be given details about the different stages below. Throughout the study you can earn Experimental Tokens, which are later converted into a bonus (£) at a pre-defined exchange rate (100 tokens = £0.40). Your final bonus will depend partly on your own decision, partly on the decision of another Prolific participant and partly on external factors. How your bonus is determined will be outlined in greater detail below.

Earning stage: In this stage, you have to work in order to earn tokens that are then used in the second stage of the study. As a task, you will be given randomly generated strings of letters that you need to type in reverse order. As an example: If you see the string "rlgowsahc", the correct answer will be "chaswoglr". In order to earn your tokens, you need to correctly solve 10 strings. All participants are randomly assigned to different difficulty levels and earn a different number of tokens. For a higher difficulty level you will earn more tokens. This will help us to correctly calibrate different difficulty levels for another study. **You have been assigned to a more difficult (easier) level for which you will earn 300 (100) tokens.**

Decision stage: The second stage of the study consists of **three separate decision rounds**. In each round, you will be matched with a different Prolific participant who is participating in the same study but has been assigned to **an easier (more difficult) level**. In each round, you have to decide how you want to divide the total number of tokens that you and the other participant earned between **yourself** and **the other participant**. The other participant will do the same. The screenshot below shows what the decision screen will look like:



In each round, before making your decision, we may show you some **background information about the other participant**. Concretely, we may tell you whether they suffered a **significant loss in livelihood** due to the Covid-19 crisis. This information comes from self-reports on Prolific. Similarly, we may inform your matched participants whether you reported a significant loss in livelihood on Prolific before they make their decisions. All interactions in this study are **completely anonymous**. You will never know the identity of the other participants, and they will never know yours.

At the end of the experiment, there will be a lottery that selects one of the three decision rounds to count towards your bonus. In other words, each of the three decision rounds can be relevant for your final payment. Once a round has been selected, another lottery will decide whether **your choice** or the **other participant's choice** will determine your final bonuses. With a 50% chance, your choice will determine your and the other participant's final bonuses, with a 50% chance, the other participant's choice will determine your and their final bonuses.

E.2 Screenshots experiment

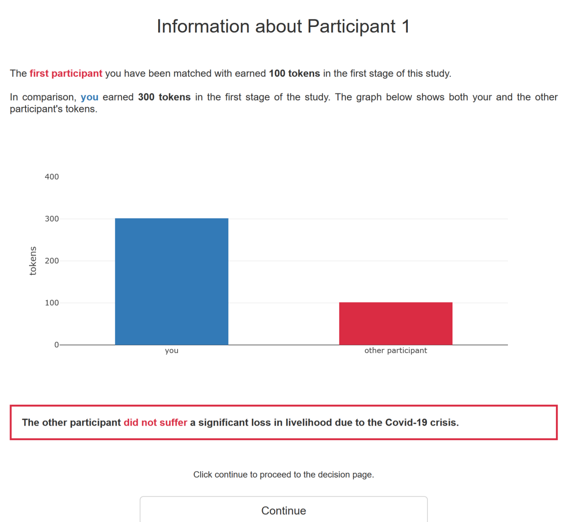
As Study 2 shares the same structure as Study 1, quite a few screens are identical across studies. For reasons of conciseness, I only show screens that differ and refer to Study 1 otherwise.

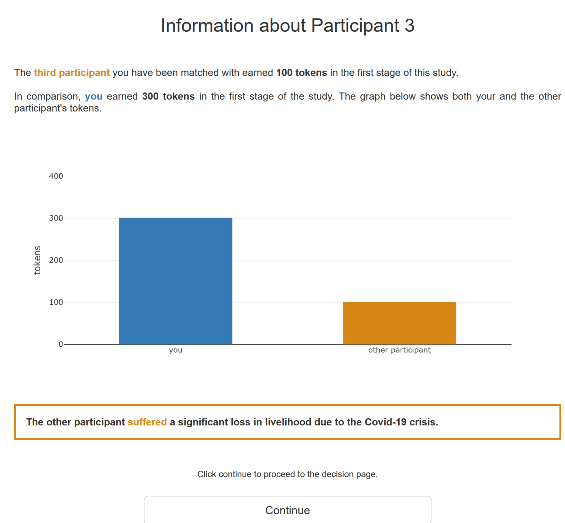
Real effort task

See Study 1.

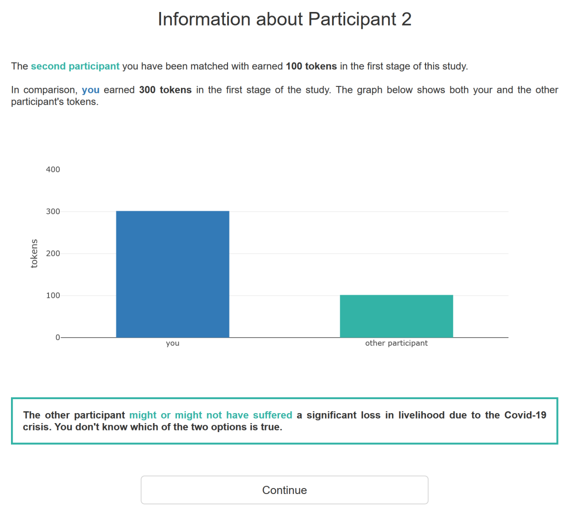
Information about the other player and beliefs

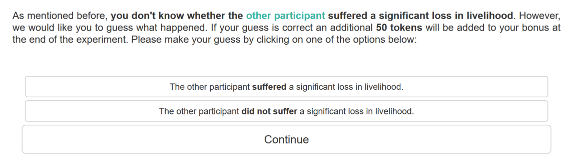
In each of the 3 rounds, participants receive information about the participant they are being matched with. The order and colour of scenarios is randomised. The decision screen where participants can allocate earnings between themselves and the other player is identical to Study 1.





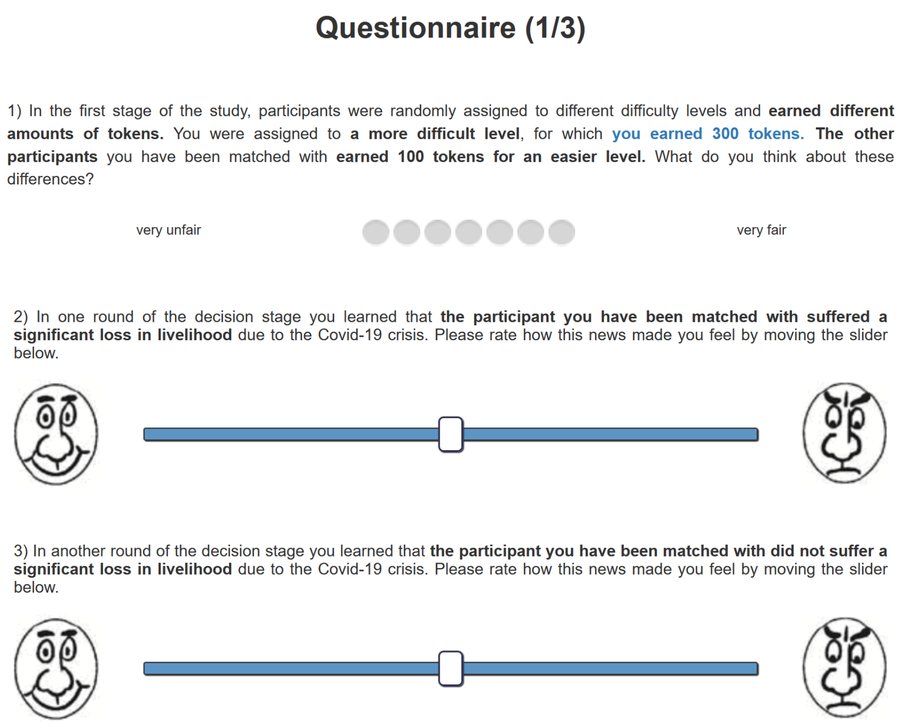
Under incomplete information (here participant 2), participants answer either first the allocation decision or the question about their beliefs about the real world shock of the other player (see Figure RHS below). Screenshots are made from the perspective of an H player. For L players the text and graphs are adjusted accordingly.





Questionnaire

Again the questions are phrased from the perspective of an H player. For L players, the text is adjusted accordingly. Questionnaire 2/3 and 3/3 are identical to Study 1.



4) **One of the participants** you have been matched with suffered a **significant loss in livelihood due to the Covid-19 crisis**. How do you judge both you and that other participant have been affected by Covid?

- The other participant was affected more.
- We were affected in the same way.
- I was affected more.

5) As mentioned in the instructions, the information about whether other participants suffered from a significant loss in livelihood due to the Covid-19 crisis comes from **self-reports on Prolific.** How truthfully do you believe the other participants reported their situation?

very untruthfully ○ ○ ○ ○ ○ ○ ○ very truthfully

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