



# Preferences for redistribution are sensitive to perceived luck, social homogeneity, war and scarcity

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## ABSTRACT

Many human societies feature institutions for redistributing resources from some individuals to others, but preferred levels of redistribution vary greatly within and between populations. We postulate that support for redistribution is the output of a structured cognitive system that is sensitive to features of the social situation. We developed an experimental approach in which participants prescribe appropriate redistribution for hypothetical villages whose features vary. Over seven experiments involving 2400 adults from the UK, we show that participants shift their redistribution preferences systematically as situational features change. Higher levels of redistribution are favoured when luck is more important in the initial distribution of resources; when social groups are more homogeneous; when the group is at war; and when resources are abundant rather than scarce. Judgements about the right level of redistribution carry moderate or high levels of moral conviction. Participants have systematic intuitions about when the implementation of redistribution will prove problematic, distinct from their intuitions about when it is desirable. Individuals are only weakly consistent in the level of redistribution they prefer, and political orientation explains rather little variation in preferred redistribution for a given situation. We argue that people have divergent views on redistribution at least in part because they have different appraisals of the features of their societies. Understanding the operating principles of the psychology of redistribution may help explain variation and change in support for, and hence existence of, redistributive institutions across societies and over time.

## 1. Introduction

Developed economies typically have institutionalised arrangements for transferring resources from certain individuals, generally those who are better off, to others, usually those who are vulnerable or in need. These arrangements are not unique to developed economies: many subsistence-level societies featured systematic sharing or mutual aid practices (Jaeggi & Gurven, 2013). A stated desire for redistributive mechanisms is widespread amongst citizens, and governments presumably introduce or maintain such mechanisms in order to satisfy this desire. However, redistributive sentiment is always variable and contentious; support for redistribution varies substantially both within and between societies (Alesina & Giuliano, 2009; Alesina, Glaeser, & Sacerdote, 2001; Dallinger, 2010; Lübker, 2007; Rueda, 2018). The level of support is not simply explained by the level of economic inequality in a society; it appears to matter how that inequality, and the whole context of the society, is perceived and understood (Dallinger, 2010; Lübker, 2007). Support for redistribution can change markedly

within a society over time, and when this happens, the change is related to changes in perceptions and beliefs about how society works, rather than changes in the actual inequality of market outcomes (Georgiadis & Manning, 2012). Explaining the variability of support for redistribution is an important building block of understanding the origins of political disagreements, and of the different social policy courses that different countries follow over time.

Although variability in support for redistribution is glaringly obvious, its causal origins remain incompletely understood. There are several layers to a person's view on redistribution: it can be associated with the extent to which they personally stand to lose or gain (Alesina & Giuliano, 2009; Rueda, 2018); their experience of the particular institutions of their country; or their sense of affiliation to particular political parties that espouse positions on the issue (Cohen, 2003). Even stripping these layers away, though, variation in views on redistribution remains. Researchers have attributed components of this variation to a variety of individually-stable latent variables such as cultural norms (Alesina & Giuliano, 2009; Dallinger, 2010), dispositional

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compassion (Sznycer et al., 2017), social dominance orientation (Kteily, Sheehy-Skeffington, & Ho, 2017), or moral foundations (Graham, Haidt, & Nosek, 2009; Janoff-Bulman & Carnes, 2016). However, positions on policy issues are not, in general, completely stable within individuals: they are least partly recomputed 'online' as information is encountered (Berinsky, 2017; Lodge, McGraw, & Stroh, 1989; Tourangeau & Ransinski, 1988). Likewise, preferences for redistribution are not simply context-insensitive readouts of stable inner variables: they depend on details of the specific case, such as the apparent effort or deservingness of the recipient (Aaroe & Petersen, 2014; Almås, Cappelen, & Tungodden, 2019; Petersen, Sznycer, Cosmides, & Tooby, 2012).

We start from the basic principle that, for humans over the course of their history, there have been sets of circumstances where it was adaptively advantageous to share (i.e. redistribute) resources with others, and other sets of circumstances where it was advantageous to share less, or not at all (Aktipis et al., 2018; Hamilton, 1975; Nettle, Panchanathan, Rai, & Fiske, 2011; Roberts, 2005). Given the recurrence and importance of redistribution-related decisions, we hypothesize that humans possess a proximal *psychology of redistribution*. We conceive of this as a structured cognitive system that takes sets of *situational features*, encompassing key aspects of the ecological challenges in force as well as the nature of the relationships amongst the individuals included, combines them, and outputs judgements about appropriate redistribution for that social grouping. These judgements concern the right level of redistribution, and potentially other things too, such as how the redistribution process should be organized, and the problems that might befall it. We further hypothesize that the judgements outputted by the psychology of redistribution carry moral force. We do not directly test this until study 7, but there is some suggestive evidence that it may be correct. Almås et al. (2019) found that people's decisions about how much to redistribute were largely insensitive to the efficiency of the redistributive mechanism. This implies that, where people decide redistribution is called for, it is experienced as a moral obligation rather than merely pragmatic. If our assumption concerning moral force is correct, the psychology of redistribution is a part of moral psychology, and may share many features with other moral computations. For example, we expect that providing even impoverished or minimal cues of relevant situational features should be sufficient to evoke or suppress preferences for redistribution (as is true in general in moral cognition, Mikhail, 2007). These preferences may be largely intuitive, and indeed, people may not be able to provide explicit reasons for them.

To which situational features is the psychology of redistribution most likely to be sensitive? Correlational research suggests three candidates: the perceived role of luck in generating the initial inequality in resources, the homogeneity of group members, and the presence of active intergroup conflict. Individuals who believe that the initial distribution of resources is more a result of luck than of effort are more likely to support redistribution (Alesina & Giuliano, 2009). A recurrent problem that humans have faced in all kinds of societies is risk – the chance deviation of the return on an action from its expected return. People reduce their exposure to risk by risk-pooling, the sharing of returns across a number of independent actors (Dyble et al., 2016; Jaeggi & Gurven, 2013). Thus, we should expect cues that members of society can try hard but have bad luck to increase support for redistribution. Individuals also support redistribution more when the social group over which redistribution will occur is more socially homogeneous, for example in terms of ethnicity (Alesina et al., 2001; Rueda, 2018). There are a number of possible explanations for this: homogeneity may serve as a cue of kinship, triggering motivations for kin-directed altruism (Krupp, Debruine, & Barclay, 2008); social homogeneity may imply similarity of values or interests, which may make redistributive rules easier to coordinate on (Alesina, Baqir, & Easterly, 1999); or social homogeneity may imply embeddedness in the same social networks, which makes selfish exploitation of the redistributive system easier to detect and sanction (Habyarimana, Humphreys,

Posner, & Weinstein, 2007). Whichever of these is correct, we expect homogeneity to be another feature to which the psychology of redistribution is sensitive. There is also a long tradition of historical and political research arguing that war promotes the development of redistributive policies (see e.g. Kasza, 2006). Even in artificial interactions in a lab, between-group competition increases within-group cooperation (Burton-Chellew, Ross-Gillespie, & West, 2010). Since the effectiveness of a group in between-group competition depends on the aggregate state of all the group members, between-group competition provides a positive stake of all individuals in the welfare of their fellow group members. We therefore expect the psychology of redistribution to be sensitive to between-group competition, and support for redistribution to increase where this feature is cued.

Over a series of seven studies, we developed an experimental method for investigating the psychology of redistribution. This builds on the limited prior experimental research on the topic (Aaroe & Petersen, 2014; Almås et al., 2019) in a number of ways. Those studies were restricted to the role of luck in generating the initial distribution of resources, whereas we consider a broader range of situational features. The prior research either asked about support for welfare in participants' actual societies, and used vignettes to foreground the possibility of bad luck (Aaroe & Petersen, 2014); or else had participants decide whether to redistribute between the members of artificial work groups where payoffs were either determined by chance, or by performance (Almås et al., 2019). In place of either of these methods, we asked individuals to make judgements about hypothetical faraway societies in which they will never live (see Sprong & Jetten, 2019 for other uses of this approach). We then parametrically varied the situational features of the societies. Our descriptions of the hypothetical societies are deliberately minimal. Minimal, schematic stimuli of this kind are often used in research on moral psychology, where they are useful for laying bare basic cognitive operating principles through carefully chosen feature alterations (Conway, Goldstein-Greenwood, Polacek, & Greene, 2018; Mikhail, 2007). In our case, using hypothetical villages usefully strips away participants' habitual positions on, and personal interactions with, the political and welfare systems of their country. All but one of our experiments used within-subjects designs. The same participants were asked about their ideal level of redistribution repeatedly for a series of societies that differed on sets of situational features. This allows strong inference about causality, since any systematic differences in preferred redistribution can only reflect changes in the specified situational features, not the person. We also measured self-reported political orientation, so were able to test to what extent this correlates with the solutions participants suggest for the hypothetical societies, or moderates their response to particular situational features.

Surveys of support for redistribution typically use a single-item dependent measure, so that the only dimension measured is preference for 'less' versus 'more' redistribution (Alesina & Giuliano, 2009; Dallinger, 2010; Rueda, 2018). This is also our main dependent measure. However, people may also have intuitions about how the redistribution should be organized, what the benefits might be, and what obstacles may arise in implementation. On the question of how redistribution should be organized, there are two main alternatives: targeting need, which is the predominant organizing principle of existing welfare systems, or an unconditional and equal ration for all members of society. This is the Universal Basic Income principle, long discussed as philosophically attractive, but implemented only in restricted cases, such as old-age entitlements and Alaska's permanent fund dividend (Standing, 2017). In studies 1–4, we sought to determine whether the same features that affect preferences about the level of redistribution also affect which of these two approaches is deemed preferable. As for implementation, people may have intuitive theories about the kinds of problematic consequences (for example, evasion, cheating and disagreement) that will stem from imposing redistribution over social groups of different kinds. In studies 5 and 6, we therefore also

investigated how situational features affected judgements about the benefits and problems that would stem from implementing a redistributive system.

## 2. Studies 1–6

Studies 1–6 represent the main body of our experimental series. As they were all close variants of one another, we now present their methods and results concurrently rather than sequentially. Study 7 was a follow-up between-subjects study and is described after discussion of studies 1–6. All study protocols and predictions were pre-registered on Open Science Framework (see Supporting Information (SI), Section 1 for details). For each new study, we pre-registered predictions in the light of the results of the earlier studies. Thus, the findings reported below consist of a mixture of confirmatory tests of predictions that we made at the outset of the project; purely exploratory analyses; and findings that were exploratory the first time they were observed, and then incorporated as pre-registered predictions for later studies. We have briefly indicated which type of finding each one is below, and we encourage interested readers to consult the individual study protocols for full lists of predictions and plans for exploratory analysis.

### 2.1. Method

#### 2.1.1. General framework

Studies 1–6 were completed with adult UK-national volunteers recruited from an online research participant pool (mean ages per study 32.63–35.64 years, *s.d.s* 10.04–12.92 years, ranges 18–19 to 60–73). Each participant completed just one experiment and did so remotely, in return for a small financial incentive. All participants gave written informed consent and the studies were approved by the Faculty of Medical Sciences ethics committee at Newcastle University.

There were 100 participants in each experiment (48–51 males, 49–52 females, 0–1 other). On average participants rated themselves somewhat to the left of centre politically, but with a good range of variation (on a 0–100 scale with left-wing as 0, means per experiment 34.69–40.22, *s.d.s* 19.06–23.99, ranges 0 to 85–100). We also completed two pilot experiments, again featuring 100 participants each. The results of the pilots were consistent with those of studies 1 and 2, but the dependent measures suffered comprehension and interpretative problems, and those pilots are not reported here.

Participants were told that they would receive information about a series of villages ‘in a faraway country that you are never likely to visit’, except for Study 3 where the instruction was ‘imagine you lived in each village’. They were told that in all villages, villagers live by growing food in their gardens, every villager has a garden, all gardens are equal in size, and the size of the harvest is affected by the amount of effort put in, but also by luck, because there can be floods, insects and plant diseases that strike at random. There then followed a series of villages (6 villages in studies 1 and 2; 8 villages in studies 3 and 4; 4 villages in studies 5 and 6) where key information about the village was varied independently on several dimensions (see Section 2.1.2). Participants set their preferred level of redistribution for each village (see Section 2.1.3). The information on each village was presented in the form of summary graphics in studies 1–4 and verbal descriptions in studies 5 and 6 (see SI Section 1 for links to materials). In studies 1–4, comprehension questions were used to establish that participants had understood what the summary graphics represented. Pass rates on comprehension questions were 93–98% in all cases. Villages were presented in random order and all possible combinations of different village features were presented (that is, all designs were fully factorial). On conclusion of the final village, participants were asked about their own political orientations (see Section 2.1.4).

#### 2.1.2. Independent variables

The key independent variables tested are summarised in Table 1. As

the experimental series progressed, independent variables were added or dropped, or other alterations made, in response to findings of the previous study. The rationale for each change is explained in Section 2.2.

In studies 1–4, we used a graphical method of manipulating appraisals of the society. This was motivated by a desire to strip complex representations down to the simplest possible perceptual cues, avoiding potentially leading phraseology. For studies 5–6, we used simple verbal statements instead, and results appear to be similar. In studies 1–4, we manipulated the importance of luck by showing a bar graph divided into a ‘luck’ part and an ‘effort’ part, with the relative sizes varied (Fig. 1A, C). Social heterogeneity was manipulated by stating that in each village, unrelated to gardening activity, individuals have beliefs, customs and ways of dressing. A tableau of coloured-in human silhouettes was then shown where ‘the more similar the colours, the more similar the people of that village are to one another in terms of beliefs, customs and appearance’ (Fig. 1B, D). All tableaux had the same mean RGB values, but the variation in R, G and B values between figures within a tableau was either high (producing figures of very different colours to one another) or low (producing near-uniform colours). In study 5, it was simply stated verbally that villagers are ‘very similar to one another’ or ‘rather different from one another’ ‘in terms of beliefs, customs and appearance’.

In study 4, the presence of war was indicated by a graphic with a red flash or yellow sun. The initial participant instructions specified that if there was a red flash the village ‘is often at war with neighbouring villages for land and resources’, whereas if a yellow sun was shown ‘there is no conflict over land and resources, and peace reigns’. In study 5, war was manipulated with the verbal statements ‘the village is a peace with all of its neighbouring villages’ or ‘the village is at war with a neighbouring village’ (see Section 2.2 for further explanation).

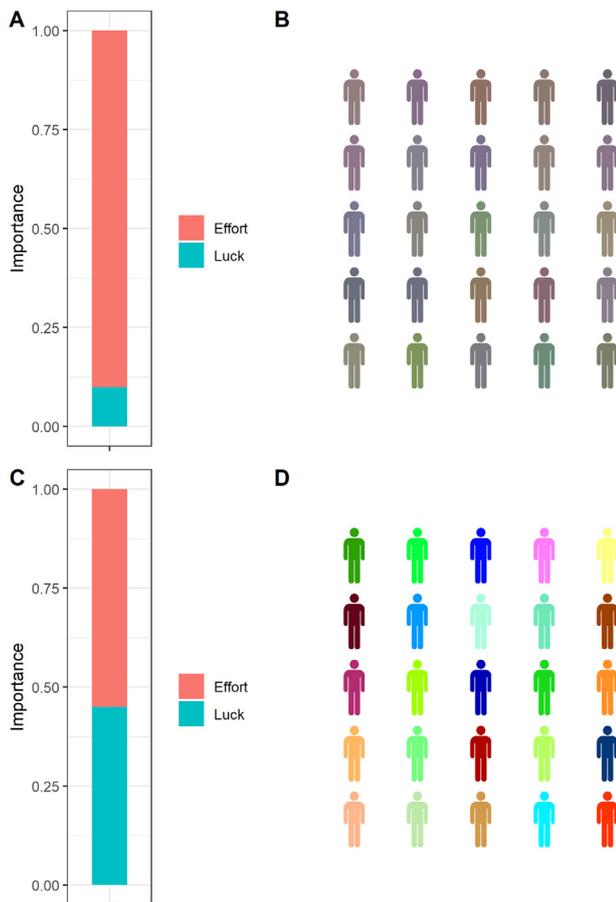
#### 2.1.3. Dependent variables

The main dependent variable, common to all studies, was the level of redistribution that the participant judged to be right for that village. Instructions explained that the villagers have a common store, and that each villager is obliged to place a certain proportion of their harvest into it. This proportion is the same for all villagers. The common store is then shared out. Participants were asked what would be ‘the ideal proportion’ (studies 1–4) or ‘the right proportion’ (studies 5 and 6) to be obligatorily put into the common store. Participants indicated their response by moving a slider along a scale 0% to 100% (initial slider position 50%). For studies 1–4, an additional dependent measure set out two ideas for how the common store could be distributed: an equal share for each villager, or giving the common store specifically to those with the smallest harvest. We refer to this as the mode of redistribution. Participants indicated their view on which idea was better using a slider from 0 (‘equal shares better’) to 100 (‘targeting smaller harvests better’) with initial slider position 50 (‘equally good’).

Studies 5 and 6 introduced additional questions to understand people’s reasons for their observed shifts in preferred level of redistribution. In study 5, participants rated, on a scale 0–100, how much of a problem eight potential issues would be for that particular village if the village set a redistribution rate of 90%. The issues were: decline in gardening effort by those with large harvests; decline in gardening effort by those with small harvests; non-payment in by those with large harvests; over-claiming from the common store; difficulty punishing and detecting cheating; arguments over redistribution causing conflict and division; undermining the motivation of those with large harvests to defend the village; and undermining the motivation of those with small harvests to defend the village. In study 6, participants rated the likelihood of six bad outcomes (decline in village’s ability to defend itself against other villages; death of individual villagers; decline in gardening effort; non-payment in; over-claiming; and increased social conflict and division) on a 0–100 scale, first if the village set the redistribution rate very high, and then again if the village set the

**Table 1**  
Summary of the variables manipulated in studies 1–6.

Study	Main independent variables			Additional independent variables
	Luck	Heterogeneity	War	
1	3 levels (low, medium, high)	2 levels (homogeneous, heterogeneous)	Not tested	None
2	3 levels (none, medium, high)	2 levels (homogeneous, heterogeneous)	Not tested	None
3	2 levels (low, high)	2 levels (homogeneous, heterogeneous)	Not tested	Viewpoint (rich, poor)
4	2 levels (low, high)	2 levels (homogeneous, heterogeneous)	2 levels (war, peace)	None
5	Not tested	2 levels (homogeneous, heterogeneous)	2 levels (war, peace)	None
6	Not tested	Not tested	2 levels (war, peace)	Scarcity (abundance, scarcity)



**Fig. 1.** Example stimuli, studies 1–4. Panels A and B represent a village where luck has a low importance and villagers are socially homogeneous; panels C and D a village with medium importance of luck and socially heterogeneous villagers.

redistribution rate very low.

**2.1.4. Individual differences variables**

In all six studies, we measured participants' self-placement on a single left-right political spectrum (slider 0–100). This is widely used as a cross-culturally applicable single-item summary of political orientation, for example in the World Values Survey (Alesina & Giuliano, 2009). The single left-right dimension has been argued to capture a substantial proportion of the variation in stated preferences for substantive policy options, in a way that is consistent across populations and time, and self-placement on it is strongly associated with redistribution preferences in real societies (Rockey, 2009). We added the reference instructions ‘in the UK, the Labour party is described as more to the left, and the Conservative party as more to the right’ to provide greater specificity for our UK samples. We also measured the short form

of the Social Dominance Orientation (SDO; Ho et al., 2015). This is a measure of support for the existence of inequality between social groups that correlates with opposition to redistributive policies (Kteily et al., 2017). Scale reliability for SDO was high in all six studies ( $\alpha$  values 0.82–0.86). Left-right self-placement and SDO were positively highly correlated in all studies, with more right-wing people having higher SDO scores ( $r$ s 0.46–0.71, all  $p$ s < 0.01). We also measured self-placement on the continuum ‘people should take care of themselves’ (0) to ‘the government should do everything to improve the standard of living for poor people’ (100); and whether, in the long run, hard work brings a better life (0) or it's more a matter of luck and connections (100). The former variable, or variants of it, is widely used as a measure of support for redistribution in the participant's actual society (Alesina & Giuliano, 2009; Kenworthy & Mccall, 2008). The latter variable is a measure of the perceived importance of luck in actual society (Alesina & Giuliano, 2009).

**2.1.5. Data analysis**

Data were analysed using linear mixed models to account for repeated measures from the same participants. Significance testing for mixed models used Satterthwaite's method (for full model tables, see SI, Section 2). The models reported below, unless otherwise stated, contained only the additive effects of the independent variables. In all cases, we experimented with models also including interaction terms; in no case were these significant or model fit improved. Hence, the main effects of each independent variable can be presented separately Section 2.2, collapsing over the levels of the others. The extent of individual consistency in preferred level of redistribution was evaluated by the intra-class correlation coefficient. Final data files for all studies and R scripts for analyses are available via the Open Science Framework [dataset] (Nettle & Saxe, 2019).

**2.2. Results**

**2.2.1. Luck**

In study 1, luck had three levels (low: harvest size 10% luck; medium: 45% luck; and high: 80% luck). A greater role of luck increased preferred redistribution (confirming pre-registered prediction; Fig. 2A;  $B_{\text{medium}} = 4.61$  (s.e. 2.21),  $B_{\text{high}} = 16.55$  (2.21);  $F_{2, 497} = 29.85$ ,  $p < .001$ ). We noted that even with low luck in study 1, a considerable level of redistribution was endorsed (estimated marginal mean 44.5 (s.e. 2.03)). For study 2, we therefore changed the levels of luck to zero role of luck, medium (45%) and high (80%). Again increasing role of luck strongly increased preferred redistribution (confirming pre-registered prediction; Fig. 2B;  $B_{\text{medium}} = 7.96$  (2.02),  $B_{\text{high}} = 16.21$  (2.02);  $F_{2, 497} = 32.33$ ,  $p < .001$ ). However, considerable redistribution was preferred even at the zero luck level (estimated marginal mean 41.1 (2.14)). Studies 3 and 4 used two levels of luck, low (10%) and high (80%), and both replicated the results of study 1 (confirming pre-registered predictions; study 3:  $B_{\text{high}} = 13.90$  (1.44),  $F_{1, 697} = 93.10$ ,  $p < .001$ ; study 4:  $B_{\text{high}} = 7.10$  (1.60),  $F_{1, 697} = 19.64$ ,  $p < .001$ ).

As well as influencing preferred level of redistribution, luck

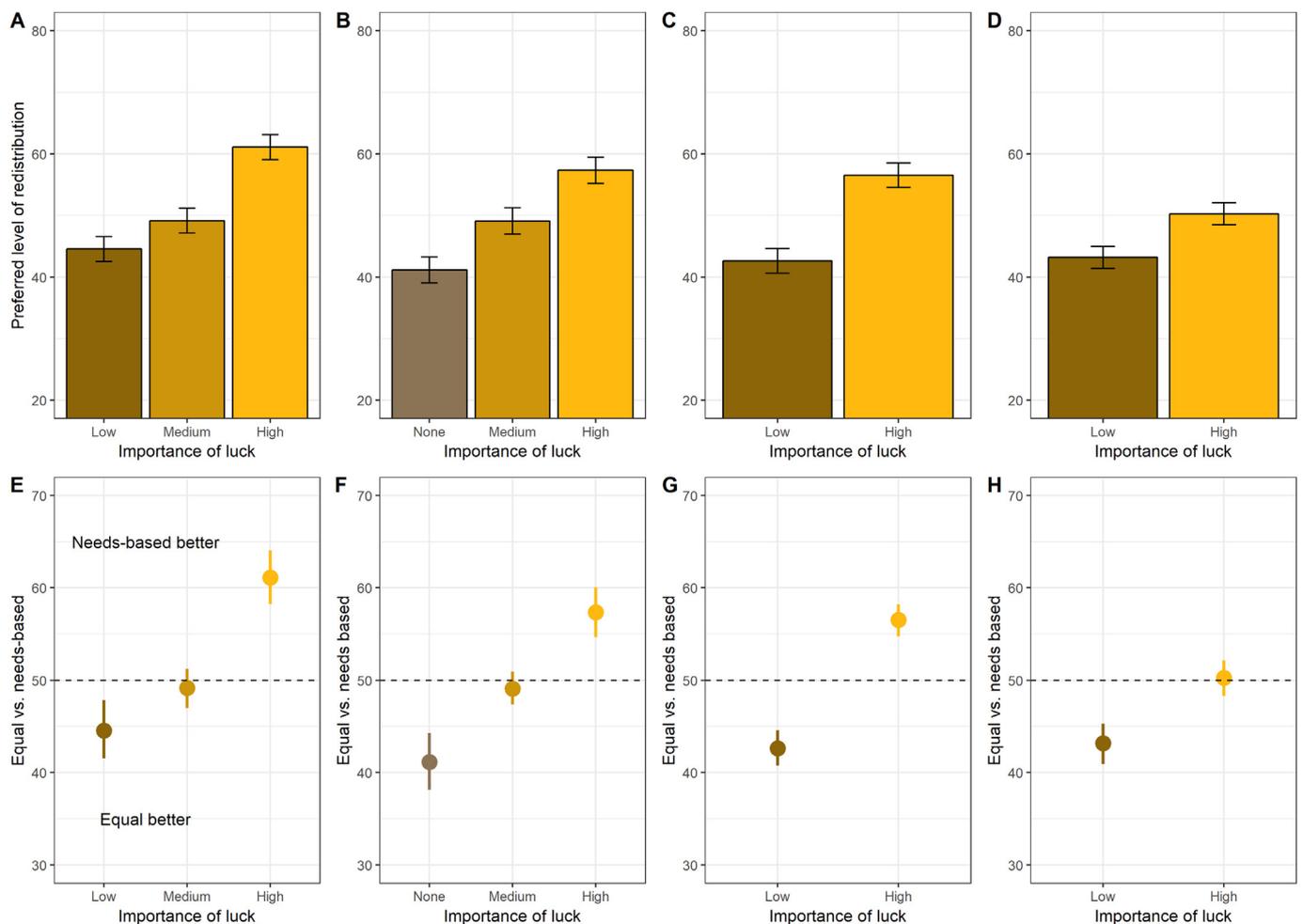


Fig. 2. Effects of the role in luck on redistribution preferences, studies 1–4. Shown are marginal means plus or minus one standard error. A–D: preferred level of redistribution (percentage of harvest to be transferred to common store) by role of luck. E–H: Preferred mode of redistribution. A value of < 50 indicates the participant thought equal shares to all villagers was better than targeting to need, and a value > 50 the opposite. Scale range was 0–100.

influenced the preferred mode of redistribution (study 1:  $B_{\text{medium}} = 4.89 (2.48)$ ,  $B_{\text{high}} = 7.36 (2.48)$ ;  $F_{2, 497} = 4.55$ ,  $p = .011$ ; study 2:  $B_{\text{medium}} = 14.55 (2.43)$ ,  $B_{\text{high}} = 17.56 (2.43)$ ;  $F_{2, 497} = 29.99$ ,  $p < .001$ ; study 3:  $B_{\text{high}} = 10.84 (1.76)$ ;  $F_{1, 697} = 38.12$ ,  $p < .001$ ; study 4:  $B_{\text{high}} = 11.16 (1.77)$ ;  $F_{1, 697} = 39.59$ ,  $p < .001$ ; this effect was observed in exploratory analysis of study 1, and became a pre-registered prediction for studies 2–4). The larger the role of luck, the more participants felt that the common store should be targeted at those with small harvests, such that at high luck, needs-based allocation was weakly favoured on average. Where the role of luck was small or zero, on average participants preferred the allocation of equal shares to every villager, in the manner of a universal basic income (Fig. 2E–H).

### 2.2.2. Heterogeneity

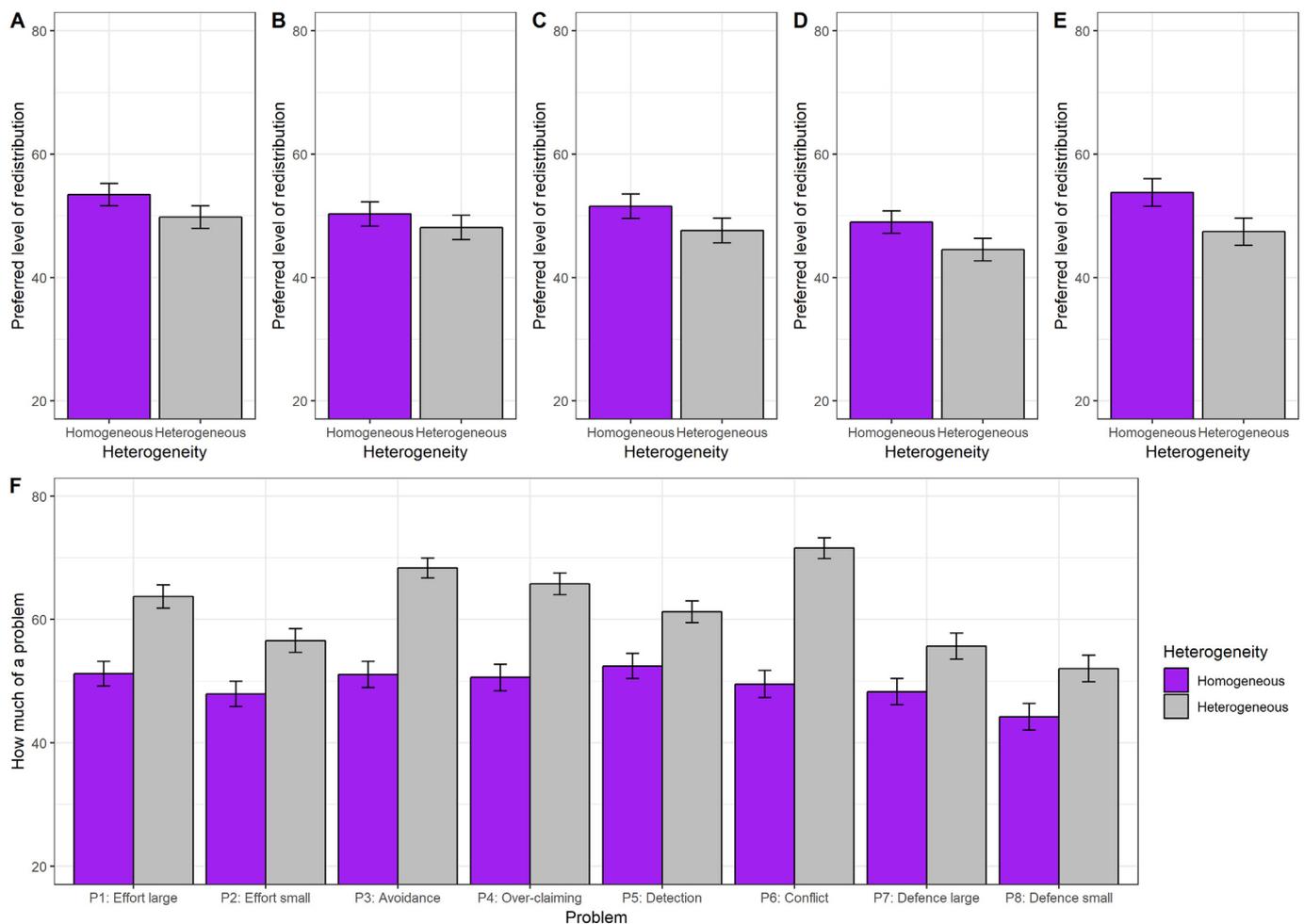
The impact of social heterogeneity was tested in studies 1–5. Participants preferred lower levels of redistribution for heterogeneous than homogeneous villages (confirming pre-registered prediction; Fig. 3A–E; study 1:  $B_{\text{het}} = -3.67 (1.81)$ ; study 2:  $B_{\text{het}} = -2.20 (1.64)$ ; study 3:  $B_{\text{het}} = -3.95 (1.44)$ ; study 4:  $B_{\text{het}} = -7.14 (1.60)$ ; study 5:  $B_{\text{het}} = -6.37 (1.64)$ ). The effect was smaller than that of luck, and was statistically significant in all but study 2 (study 1:  $F_{1, 497} = 4.13$ ,  $p = .043$ ; study 2:  $F_{1, 497} = 1.79$ ,  $p = .181$ ; study 3:  $F_{1, 697} = 7.52$ ,  $p = .006$ ; study 4:  $F_{1, 697} = 7.89$ ,  $p = .005$ ; study 5:  $F_{1, 297.19} = 15.16$ ,  $p < .001$ ). In study 3, we tested a pre-registered prediction derived from Rueda (2018) that it would be the rich in particular whose support for redistribution would be sensitive to the homogeneity of other

members of society, by asking participants to adopt the viewpoint of someone with a large harvest, or someone with a small harvest. Contrary to prediction, there was no interaction between viewpoint and heterogeneity ( $F_{1, 696} = 1.04$ ,  $p = .307$ ), nor main effect of viewpoint ( $F_{1, 696} = 0.16$ ,  $p = .691$ ). Heterogeneity had no effect on preferred mode of redistribution in any of studies 1–4 (contrary to a pre-registered prediction we made for study 1; study 1:  $F_{1, 497} = 0.14$ ,  $p = .708$ ; study 2:  $F_{1, 497} = 0.37$ ,  $p = .543$ ; study 3:  $F_{1, 697} = 0.89$ ,  $p = .347$ ; study 4:  $F_{1, 697} = 0.01$ ,  $p = .906$ ).

In study 5 we also asked participants to rate, for each village, how serious they thought each of eight social problems would be if the redistribution rate were set very high (90%). We pre-registered no predictions concerning these, and consider the following findings exploratory. All problems were rated as significantly more serious in heterogeneous than homogeneous villages (Fig. 3F; for statistics see figure caption). The largest differences between homogeneous and heterogeneous villages were for avoidance of paying in by those with large harvests (P3), over-claiming from the common store (P4), and arguments over redistribution causing conflict and division within the village (P6).

### 2.2.3. War

The impact of war was first tested in study 4. Against our pre-registered prediction, the war treatment significantly reduced the preferred level of redistribution (Fig. 4A;  $B_{\text{war}} = -7.14 (1.60)$ ,  $F_{1, 697} = 19.87$ ,  $p < .001$ ). On reflection, we realised our method of



**Fig. 3.** Effects of social homogeneity on preferences for redistribution, studies 1–5. Panels A–E: Preferred levels of redistribution (percentage of harvest to be transferred to common store) for homogeneous and heterogeneous villages, studies 1–5. Shown are estimated marginal means  $\pm 1$  s.e. Panel F: From study 5, participant ratings of how serious a set of social problems would be (0–100 scale) if the redistribution rate were set very high in homogeneous and heterogeneous villages. Shown are estimated marginal means  $\pm 1$  s.e. The problems are: P1: reduction in effort by those with large harvests ( $B_{\text{het}} = 12.53$  (1.84),  $t = 6.83$ ,  $p < .001$ ); P2: reduction in effort by those with small harvests ( $B_{\text{het}} = 8.66$  (1.92),  $t = 4.52$ ,  $p < .001$ ); P3: avoidance of payment in by those with large harvests ( $B_{\text{het}} = 17.28$  (1.99),  $t = 8.69$ ,  $p < .001$ ); P4: over-claiming from the common store ( $B_{\text{het}} = 15.27$  (1.92),  $t = 7.97$ ,  $p < .001$ ); P5: difficulty of effective detection and punishment of cheating ( $B_{\text{het}} = 8.81$  (1.84),  $t = 4.79$ ,  $p < .001$ ); P6: arguments causing conflict and division within the village ( $B_{\text{het}} = 22.04$  (2.20),  $t = 10.03$ ,  $p < .001$ ); P7: reduced motivation or ability of those with large harvests to fight for the village ( $B_{\text{het}} = 7.33$  (1.96),  $t = 3.74$ ,  $p < .001$ ); P8: reduced motivation or ability of those with small harvests to fight for the village ( $B_{\text{het}} = 7.78$  (1.92),  $t = 4.05$ ,  $p < .001$ ).

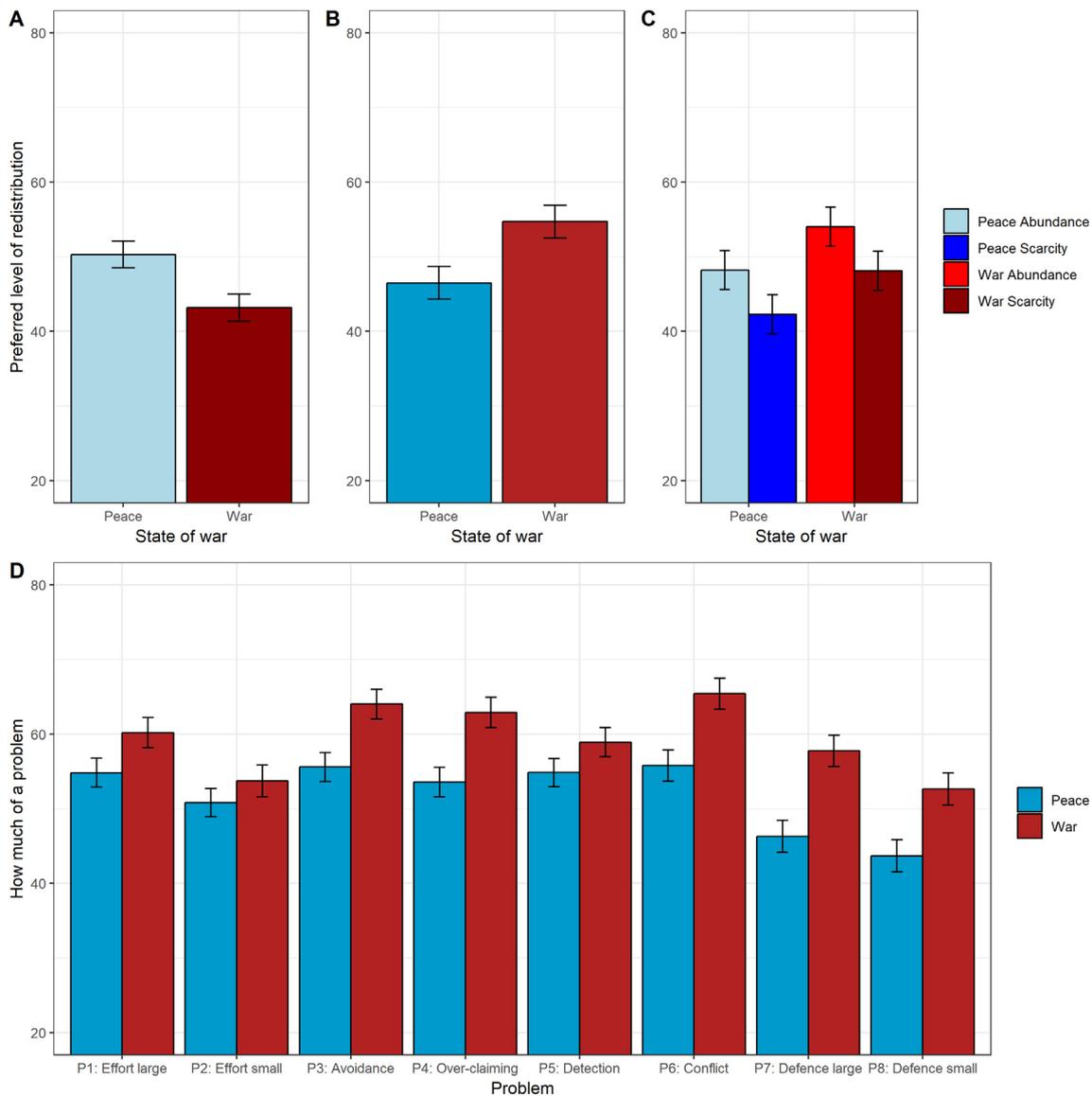
introducing the information that villages were at war ('the village is often at war with neighbouring villages for land and resources' versus 'there is no conflict over land and resources, and peace reigns') might have inadvertently provided information about scarcity of resources as well as about war per se. In study 5, we therefore used a simple verbal manipulation that described each village as either 'at war with a neighbouring village' or 'at peace with all of its neighbouring villages', with no other information. In this study, people preferred significantly higher redistribution in the war treatment, in line with our pre-registered prediction (Fig. 4B;  $B_{\text{war}} = 8.20$  (1.64),  $F_{1,297.19} = 25.13$ ,  $p < .001$ ). This suggests that any positive impact of war in study 4 might have been masked by a negative impact of resource scarcity. To test this directly, study 6 used a cross-factored design manipulating both war and scarcity. In study 6, as per our pre-registered prediction, there was a positive effect of war on preferred redistribution (Fig. 4C;  $B_{\text{war}} = 5.82$  (2.50),  $F_{1,298} = 5.39$ ,  $p = .021$ ), and a negative effect of scarcity (Fig. 4D;  $B_{\text{scarcity}} = -5.94$  (2.50),  $F_{1,298} = 5.62$ ,  $p = .018$ ).

War had no effect on the preferred mode of redistribution in study 4 (exploratory finding;  $F_{1,697} = 1.27$ ,  $p = .260$ ). Although participants preferred higher redistribution in time of war, they also felt that redistribution would be more problematic to achieve under these

circumstances. All of the problems of high redistribution in study 5 were rated as more serious under conditions of war than peace, seven of them significantly so (Fig. 4D; for statistics see figure caption; these analyses were exploratory). In study 6, we also asked whether six different social problems would be worse under high or low redistribution in all possible combinations of war and scarcity. We carried out exploratory analyses on these data (for full analysis, see SI, Section 3). Again, war was anticipated to make 5/6 of the social problems significantly worse, as was scarcity. The effects of war and scarcity were additive and held under both high- and low-redistribution regimes. As for high redistribution, it was anticipated to improve collective defence and ameliorate individual starvation, but lead to declines in productive effort, reluctance to pay in, and over-claiming. High redistribution had no overall effect on the anticipated level of conflict and division in the village.

#### 2.2.4. Individual consistency and political orientation

Individual consistency across villages in preference for redistribution was 0.25–0.57 (mean across studies 0.36). Thus, individuals were only weakly or moderately consistent in their preferences for a level of redistribution. We calculated the within-participant range of preferred



**Fig. 4.** Effects of war on preferences for redistribution, studies 4 and 5. Panels A, B: Preferred levels of redistribution (percentage of harvest to be transferred to common store; shown are estimated marginal means  $\pm$  1 s.e.) for villages at war and at peace, studies 4 and 5. The manipulation of war in study 4 may have inadvertently cued scarcity too (see text). Panel C: Preferred levels of redistribution (estimated marginal means  $\pm$  1 s.e.) for the combinations of scarcity and war, study 6. Panel D: From study 5, participant ratings of how serious a set of social problems would be (0–100 scale) if the redistribution rate were set very high, in villages at war or at peace (estimated marginal means  $\pm$  1 s.e.). The problems are: P1: reduction in effort by those with large harvests ( $B_{\text{war}} = 5.29$  (1.84),  $t = 2.88$ ,  $p = .004$ ); P2: reduction in effort by those with small harvests ( $B_{\text{war}} = 2.90$  (1.92),  $t = 1.52$ ,  $p = .130$ ); P3: avoidance of payment in by those with large harvests ( $B_{\text{war}} = 8.36$  (1.99),  $t = 4.20$ ,  $p < .001$ ); P4: over-claiming from the common store ( $B_{\text{war}} = 9.33$  (1.92),  $t = 4.87$ ,  $p < .001$ ); P5: difficulty of effective detection and punishment of cheating ( $B_{\text{war}} = 4.06$  (1.84),  $t = 2.21$ ,  $p = .028$ ); P6: arguments causing conflict and division within the village ( $B_{\text{war}} = 9.53$  (2.20),  $t = 4.34$ ,  $p < .001$ ); P7: reduced motivation or ability of those with large harvests to fight for the village ( $B_{\text{war}} = 11.47$  (1.96),  $t = 5.86$ ,  $p < .001$ ); P8: reduced motivation or ability of those with small harvests to fight for the village ( $B_{\text{war}} = 8.92$  (1.92),  $t = 4.64$ ,  $p < .001$ ).

redistribution for each participant (i.e. the difference between the highest level of redistribution they chose, and the lowest). On average, this was 45.96 points (s.d. 26.69). Only 6% of participants chose the same level of redistribution for every trial, and 79% shifted by 20 points or more over the course of the experiment.

Left-right political self-placement and SDO significantly predicted preferred redistribution for the hypothetical villages, with those classifying themselves as more right wing or scoring higher on SDO preferring lower levels of redistribution (confirming pre-registered predictions; meta-analysis across studies: left-right,  $B = -0.14$  (0.03),  $z = -4.13$ ,  $p < .001$ ; SDO,  $B = -0.27$ , (0.06),  $z = -4.92$ ,  $p < .001$ ). However, these relationships were weak: pooling all 600 participants, they amounted to a correlation between mean preferred redistribution and left-right self-placement of  $r = -0.17$ ; and between

redistribution and SDO of  $r = -0.13$ . There were no significant interactions, in any study, between the independent variables and political self-placement or SDO (contrary to the pre-registered predictions of the early studies, which included the prediction that individuals with high SDO would be more sensitive to social heterogeneity).

We also analysed whether left-right self-placement and SDO predicted ratings of the likelihood of bad outcomes for the villages in study 6. Results for the bad outcomes were in stark contrast to those for the preferred level of redistribution. Neither political self-placement nor SDO significantly predicted preferred level of redistribution in the study 6 data. By contrast, left-right self-placement significantly predicted rated likelihood of 5/6 bad outcomes, and SDO 4/6, either as a main effect or in interaction with level of redistribution. On average, those who were right-wing/high in SDO thought high redistribution would

impair the village's ability to defend itself; that high redistribution would not prevent villagers dying; that a decline in gardening effort was more likely, regardless of the level of redistribution; that high redistribution would make those with large harvests more reluctant to pay in (not significant for SDO); and that high redistribution would lead to more conflict and division in the village (these are exploratory findings; see SI Section 4 for full results).

### 2.2.5. Beliefs about actual society

Mean preferred redistribution across the hypothetical villages was positively but weakly correlated with support for welfare in actual society (exploratory analysis; all 600 participants:  $r = 0.20$ ,  $p < .001$ ). Left-right self-placement and SDO predicted preferences for redistribution actual society (confirming pre-registered prediction; left-right:  $B = -0.50$  (0.04),  $t = -13.15$ ,  $p < .001$ ; SDO:  $B = -1.37$  (0.09),  $t = -15.10$ ,  $p < .001$ ). These relationships were partially mediated by a lesser belief in the importance of luck in actual society amongst those who placed themselves as more right wing (exploratory analyses; mediation pathway:  $B = -0.03$  (0.01),  $z = -2.64$ ,  $p = .008$ ; mediation pathway accounted for 6.6% of total association), or scored higher on SDO ( $B = -0.08$  (0.03),  $z = -2.87$ ,  $p = .004$ ; mediation pathway accounted for 5.6% of total association).

### 2.3. Discussion

The results of studies 1–6 were consistent across experiments. Individual participants prescribed different levels of redistribution for different villages, depending on situational features of the village, namely the role of luck, the heterogeneity of the villagers, the threat of war and the scarcity of resources. The observation of systematic within-participant shifts in response to changed situational features is consistent with our conceptualisation of the psychology of redistribution. However, two important questions were not directly tested by studies 1–6. First, we were not able to directly estimate how important the shifts in response to the experimental situational features were, as compared for example to the influence of background variability in political orientation. Second, we did not directly test our assumption that the outputs of the psychology of redistribution carry moral force.

### 3. Study 7

Studies 1–6 were not well designed to reveal how large (and potentially socially relevant) the effects were, compared for example to differences related to political orientation. The effects of experimental condition were robust, and effects of individual differences in political orientation were small. However, given the within-subjects design, each participant saw villages from all conditions; the pragmatics of the experiment may have suggested to participants that they ought to change their prescriptions on each trial, potentially exaggerating the effect of the experimental treatment and masking genuine individual-differences patterns. To render the effects of the experimental treatment and of pre-existing individual differences more directly comparable, study 7 used a between-subjects design, in which each participant prescribed redistribution levels for just one village. We chose to vary just one situational feature, the role of luck in generating inequality. Participants therefore read about one just hypothetical village, where inequality in resources was described as “mainly determined by luck” (high luck condition) or “mainly determined by the amount of effort the gardener puts in” (low luck condition).

Study 7 also gave us an opportunity to replicate, in a large independent sample, our finding that support for redistribution in actual society is correlated with appraisals of the role of luck in life, and that these appraisals mediate the effects of political orientation. In addition, we sought to test a possible interpretation of these relations: do people's political orientations influence the formation of their appraisals of the role of luck in generating inequality? To address this question, we

included a third experimental condition (the unspecified condition): a hypothetical village in which we did not provide any information about the role of luck. We expected people with different political orientations to have different priors about the importance of luck, leading them to ‘fill in’ the missing information differentially.

The other motivation for study 7 was to investigate directly the extent to which judgments about redistribution are held with moral force. Participants in studies 1–6 may have viewed the appropriate common-store contribution as a moral matter; or on the other hand, they may have seen it as a simple matter of pragmatic convenience or efficiency. Moral conviction about an issue is independent and distinguishable from strength or direction of opinion on that issue (Skitka, Washburn, & Carsel, 2015). So, in study 7, in addition to asking for a preferred level of redistribution, we measured moral conviction about this preference. To benchmark their responses, we also asked for participants' degrees of moral conviction about two other issues affecting the hypothetical village. One of these, whether the village should have a death penalty, was presumptively highly moral, since this issue carries high levels of moral conviction, for participants of all opinions, in other research (Skitka, Hanson, Washburn, & Mueller, 2018). The other issue (the appropriate construction of houses) we designed to be a largely pragmatic one. Thus, a degree of moral conviction for preferred redistribution close to that of house-building would indicate that redistribution is largely seen as a pragmatic issue; whilst a degree of moral conviction close to that of the death penalty would indicate that it is seen as a moral one.

### 3.1. Method

#### 3.1.1. Participants

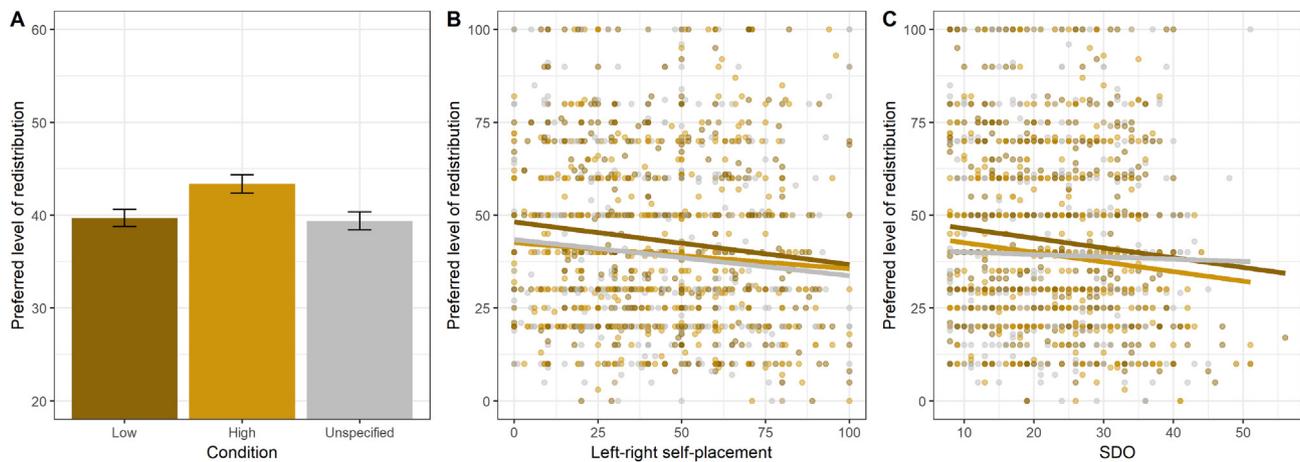
Participants in study 7 were 1795 UK adult volunteers from the same online research participant pool as studies 1–6 (898 male, 894 female, 3 other; mean age 37.38, s.d. 12–62, range 18–81). None had participated in earlier studies. As before, participants received a small financial incentive to participate. All participants gave written informed consent. The study was approved by the Faculty of Medical Sciences ethics committee at Newcastle University.

#### 3.1.2. Design and measures

Each participant read a verbal vignette describing one hypothetical village (see SI Section 1 for link to materials) using similar text to the introductory material of studies 1–6. In the high luck condition, the vignette stated: ‘each year, some harvests are bigger than others. The size of the harvest is mainly determined by luck. This is because there are things like plant diseases that strike at random’. The low luck condition vignette instead stated: ‘each year, some harvests are bigger than others. The size of the harvest is mainly determined by the amount of effort that the gardener puts in.’ The unspecified condition vignette merely stated: ‘each year, some harvests are bigger than others.’

Our main dependent variable, preferred level of redistribution, was implemented exactly as in studies 1–6. In addition, we asked for participants' appraisals of the relative importance of luck vs. effort in determining harvest size (0–100 scale). This was a variable of interest in the unspecified condition, where we expected it to be associated with political orientation and SDO. For the high and low conditions, it was included as a manipulation check.

We measured the degree of moral conviction that attended judgments of preferred level of redistribution, using a four-item scale based on the items used in Skitka et al. (2018). These were: to what extent is your view: ‘a reflection of your core moral beliefs and convictions’; ‘connected to your beliefs about fundamental right and wrong’; ‘based on moral principle’; and ‘a moral stance.’ Each statement was rated on a scale from 0, ‘not at all’ to 100, ‘very much’. We took the mean of the four responses to give a moral conviction score with a possible range of 0–100. We obtained comparison moral-conviction information from other domains, using two additional mini-vignettes that were the same



**Fig. 5.** Study 7 results for preferred level of redistribution. A. Mean preferred level of redistribution (percentage of harvest to be transferred to common store, mean  $\pm$  1 s.e.) by experimental condition. B. Preferred level of redistribution against left-right self-placement. Colour coding distinguishes experimental conditions using the same colour scheme as panel A. Lines represent linear fits. C. As for panel B, but for SDO in place of left-right self-placement.

in all three experimental conditions. For house building, we described villagers as having two options about the kinds of house to build: round houses, which were more durable and cooler in the summer, and square houses, which were easier to build. We asked whether villagers should try to build round or square houses, and then the same four moral conviction items about this view. For capital punishment, the vignette described a potential new law in the village introducing the death penalty for serious crimes. Participants were asked whether the new law would be a bad or good idea, along with the same four moral conviction items. Scale reliabilities were high for all three moral conviction scales (redistribution:  $\alpha = 0.91$ ; house building:  $\alpha = 0.94$ ; death penalty:  $\alpha = 0.94$ ).

The study finished with the same individual-differences measures as studies 1–6. Scale reliability for SDO was similar to earlier studies ( $\alpha = 0.86$ ).

### 3.1.3. Data analysis

Our protocol and predictions were pre-registered via the Open Science framework (see SI, Section 1). With no repeated measures, data other than the moral conviction variable were analysed using simple general linear models. For moral conviction, we used linear mixed models as in studies 1–6.

We fitted series of confirmatory models corresponding to our pre-registered predictions, as outlined in SI, section 5. Our analyses of the moral conviction data were exploratory, and included how moral conviction about redistribution is associated with political orientation, SDO and preferred redistribution level, as well as how the level of moral conviction about redistribution compared to the levels of moral conviction about housebuilding and capital punishment. Data and R code are available via the Open Science Framework [dataset] (Nettle & Saxe, 2019).

### 3.1.4. Sample size and data peeking

To set our target sample size, we used the within-subjects shift between low and high luck conditions, and the between-subjects variation in preferred redistribution, from studies 1 and 2. This allowed us to generate an ‘as if’ anticipated between-subjects effect size of  $d = 0.39$ . The minimum sample size required to detect this with 90% power at  $p < .05$  was 138. We therefore set the group sizes for the high and low luck conditions to 150 each. We decided to oversample the unspecified condition, as our predictions concerned correlations between variables within this group considered alone. We thus targeted 300 participants in the unspecified condition, producing a target sample size of 600 participants overall.

After running the planned number of participants, the mean

difference in preferred redistribution between the high and low luck conditions was 4.10 points in the predicted direction, but this difference was not significant ( $t = 1.44, p = .15$ ). The smaller than expected effect (anticipated difference 10.45 points) may have been explained by the mean perceived importance of luck in the high luck condition being only 48.18 (SD 26.37) and 29.62 (SD 20.65) in the low luck condition. Thus, our experimental manipulation only succeeded in moving the perceived importance of luck from a low to medium level, not low to high as planned. The magnitude of the observed difference in preferred redistribution level is commensurate with this (for example, in study 1, the difference in mean preferred redistribution between the low- and medium-luck villages was 4.61 points). We recalculated required power based on the emerging small effect, and ran additional participants, with a target total of 600 per condition (evenly across all conditions, thus 1800 participants in all).

Post-hoc increases in sample size inflate type-I error rates (Sagarin, Ambler, & Lee, 2014). We therefore recalculated the critical  $p$ -values required in the final sample to keep overall type-I error rates at 0.05, using the  $p_{crit}$  formula (Sagarin et al., 2014), for one additional round of data collection, and assuming that any  $p$ -value  $< .2$  would have led us to collect more data. This corrected  $p$ -value was 0.04, which we therefore set as the  $\alpha$  value for the analysis of final sample. All subsequent analyses reported are on the final sample.

## 3.2. Results

### 3.2.1. Experimental effects

The perceived importance of luck was higher in the high condition (mean 51.69, s.d. 25.38) than the low luck condition (mean 29.15, s.d. 20.86; confirmatory analysis;  $t = 16.74, p < .001, d = 0.97$ ). Thus, our manipulation was effective, but only moved the perceived importance of luck from a low to a medium level on average. The mean perceived importance of luck for the unspecified condition was intermediate between the other two conditions (36.14, s.d. 20.30).

Participants preferred higher levels of redistribution in the high (mean 43.38, s.d. 24.10) than the low luck condition (mean 39.70, s.d. 22.24;  $t = 2.74, p = .006, d = 0.16$ ; confirmatory analysis; Fig. 5A). Preferred redistribution for the unspecified condition was similar to the low luck condition (mean 39.38, s.d. 23.46; Fig. 5A).

### 3.2.2. Role of political orientation

We predicted that left-right self-placement or SDO would affect perceived importance of luck most strongly in the unspecified condition. To test this, we fitted interactive models with perceived importance of luck as the outcome, and condition and either left-right self-

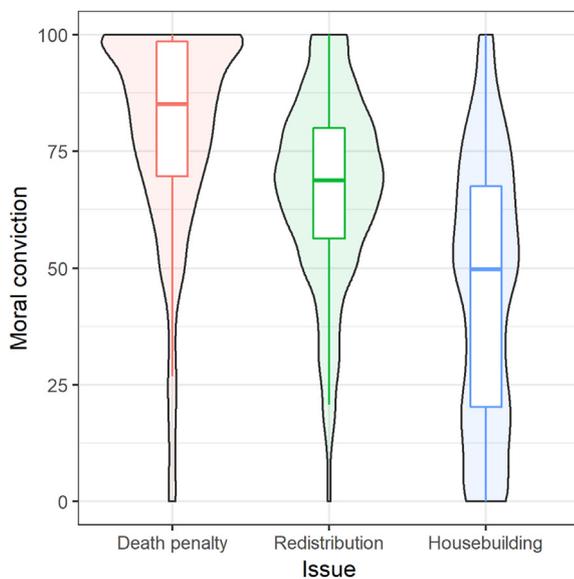


Fig. 6. Distribution of moral conviction by issue, study 7. Scale range is 0–100. Coloured envelopes show the density of the response data. Embedded boxes show the median and inter-quartile range.

placement orientation or SDO as predictors. Contrary to our pre-registered prediction, there were no significant interactions between condition being unspecified and left-right self-placement ( $B = -0.02$  (0.06),  $t = -0.42$ ,  $p = .676$ ) or SDO ( $B = 0.22$  (0.14),  $t = 1.59$ ,  $p = .113$ ). However, when we removed the non-significant interaction terms, there were significant main effects of both left-right self-placement ( $B = -0.05$  (0.02),  $t = -2.08$ ,  $p = .038$ ) and SDO ( $B = -0.14$  (0.06),  $t = -2.50$ ,  $p = .013$ ) on perceived importance of luck. That is, people who described themselves as more right wing, or scored higher in SDO, thought luck was a less important determinant of harvest size in the village, whether we specified the role of luck as high or low, or left it unspecified.

We repeated the above analyses but with preferred level of redistribution as the outcome variable. We had predicted stronger effects of left-right self-placement and SDO on preferred redistribution in the unspecified condition. Again contrary to our prediction, the effect of left-right self-placement on preferred redistribution level was no stronger in the unspecified condition (interaction  $B = 0.02$  (0.06),  $t = 0.30$ ,  $p = .767$ ). The same was true for SDO (interaction  $B = 0.20$  (0.15),  $t = 1.37$ ,  $p = .170$ ). However, for both left-right self-placement and SDO, there were significant main effects on preferred level of redistribution, additive to those of condition (left-right self-placement:  $B = -0.09$  (0.02),  $t = -4.00$ ,  $p < .001$ ; SDO:  $B = -0.19$  (0.06),  $t = -3.24$ ,  $p = .001$ ). Thus, regardless of condition, people who saw themselves as more right-wing or scored higher in SDO preferred slightly lower levels of redistribution (Fig. 5B, C).

In models including both a political orientation variable and experimental treatment, they each explained a similar, small amount of variation (model with left-right self-placement:  $\eta^2 = 0.0064$  for condition and  $\eta^2 = 0.0086$  for left-right self-placement; model with SDO:  $\eta^2 = 0.0068$  for condition and  $\eta^2 = 0.011$  for SDO). Another way of expressing their relative predictive power is to compare the respective partial coefficients from the general linear models. On this basis, the effect of experimentally specifying a high role of luck was equivalent to moving a participant 39.62 points (1.71 standard deviations) to the left on the 0–100 left-right self-placement scale. The equivalent calculation for SDO was 19.44 points (2.12 standard deviations) on the SDO total score.

### 3.2.3. Mediation by perceived importance of luck

Our pre-registered plan was to test for the mediation of the

relationships between the individual differences variables and preferred redistribution by perceived importance of luck, using the data from the unspecified condition alone. However, since left-right self-placement and SDO predicted perceived importance of luck in much the same way across all our conditions, not just the unspecified one, we present these analyses instead for the whole dataset controlling for condition (results for the unspecified condition alone are similar).

The mediation pathway from left-right self-placement to preferred redistribution via perceived importance of luck was marginally non-significant ( $B = -0.007$  (0.004),  $z = -0.196$ ,  $p = .0501$ ), and accounted for 7.6% of the total association between left-right self-placement and preferred redistribution. For SDO, the mediation pathway via perceived importance of luck was significant ( $B = -0.02$  (0.01),  $z = -2.31$ ,  $p = .021$ ), accounting for 10.7% of the total SDO-redistribution association.

### 3.2.4. Moral conviction

The three issues (redistribution, housebuilding and death penalty) were rated with different levels of moral conviction (exploratory analysis;  $F_{2, 3586.9} = 1084.70$ ,  $p < .001$ ). Moral conviction for redistribution (estimated marginal mean 66.81, s.e. 0.55) was substantially higher than for housebuilding (estimated marginal mean 45.50, s.e. 0.55,  $B_{\text{house}} = -21.31$  (0.73),  $t = -29.18$ ,  $p < .001$ ), but lower than for the death penalty (estimated marginal mean 79.12, s.e. 0.55,  $B_{\text{death}} = 12.31$  (0.73),  $t = 16.85$ ,  $p < .001$ ). The mean moral conviction for redistribution was around two thirds of the way from that of housebuilding to that of the death penalty (Fig. 6). Moral conviction about redistribution was positively correlated with preferred redistribution level ( $r = 0.21$ ,  $p < .001$ ). It was weakly negatively correlated with left-right self-placement ( $r = -0.05$ ,  $p = .02$ ) and SDO ( $r = -0.11$ ,  $p < .001$ ): that is, people who placed themselves more to the right or scored higher on SDO tended to have slightly lower levels of moral conviction about redistribution.

### 3.2.5. Beliefs about actual society

As in the study 1–6 data, preferred redistribution for the hypothetical village was positively but weakly correlated with support for welfare in actual society ( $r = 0.11$ ,  $p < .001$ ). Left-right self-placement and SDO predicted preferences for redistribution in actual society (confirmatory analyses; left-right:  $B = -0.46$  (0.02),  $t = -21.27$ ,  $p < .001$ ; SDO:  $B = -1.39$  (0.05),  $t = -27.20$ ,  $p < .001$ ). Just as in studies 1–6, and as per pre-registered prediction, these relationships were partially mediated by varying belief in the importance of luck in actual society (mediation pathway: right-left  $B = -0.06$  (0.01),  $z = -7.20$ ,  $p < .001$ ; mediation pathway accounted for 12.3% of total association; SDO  $B = -0.10$  (0.02),  $z = -6.54$ ,  $p < .001$ ; mediation pathway accounted for 7.4% of total association).

## 3.3. Discussion

Study 7 added some key information to the findings emerging from studies 1–6. For one situational feature, luck, we were able to detect an effect on preferred redistribution in a between-subjects design. We have not extended this demonstration to the other situational features, but study 7 is a demonstration in principle that the earlier findings are not purely consequences of changing stimulus features within subjects. The effect size for luck in study 7 was small ( $d = 0.16$ ), and hence a large sample size was required to detect it. However, the actual shift in means (about 4 percentage points) was comparable to the shift from the low to medium luck conditions in study 1. The small effect size merely reflects the very large variability that our village task elicits (this variability was similar in study 7 to any one of the villages in studies 1–6).

Experimental treatment and political orientation explained similar amounts of variation in preferred redistribution. To put this another way, moving from the low luck to the high luck condition whilst holding political orientation constant was equivalent to a roughly two

s.d. shift in political orientation whilst keeping condition constant. This reflects the fact that although the experimental effect was small, political orientation was also a weak predictor of preferred redistribution. We feel this is unlikely to be due to a restriction of range of political orientations in our participant pool. Our sample had a mean of 41.89 on the left-right self-placement scale, with a standard deviation of 23.21. A nationally-representative 2004 survey of the UK asked the same question on a 10-point scale, obtaining a mean equivalent to 50.50 and a standard deviation equivalent to 19.50 (European Commission, 2004). Thus, although the central tendency of our sample was slightly further to the left than would be true of a representative sample, our sample contained at least as much variability as the national population.

We predicted that where we left the role of luck in generating inequality unspecified, political orientation would supply appraisals. In fact, the findings were stronger than the prediction: even where we attempted to fix the importance of luck through the stimuli (i.e. the high- and low-luck conditions), more right-wing people or people higher in SDO appraised luck as less important. We discuss this finding more fully in the general discussion. Finally, study 7 demonstrated that for most participants, redistribution was a matter of moderate to high moral conviction; not as high as the death penalty, but substantially higher than a purely pragmatic choice. This validates our assumption that the psychology of redistribution whose workings we are uncovering is part of, or at least draws on, moral psychology.

#### 4. General discussion

Over seven studies, we found that people's prescribed level of redistribution for hypothetical societies was affected by luck, with higher redistribution where luck plays a greater role in the initial distribution of resources; by social heterogeneity, with lower redistribution in socially heterogeneous than homogeneous groups; and by the presence of inter-group conflict, with higher redistribution in times of inter-group warfare than in peace. In the course of the experiments, we also came to investigate the effect of resource scarcity, finding that most people favour a higher level of redistribution when resources are abundant than when they are scarce. Redistribution judgements were systematically related to situational features, even though people were not making them for themselves and did not stand to benefit. The judgements carried, for most people, moderate or high levels of moral conviction; we thus consider that the psychology of redistribution is a structured cognitive system that forms part of moral psychology.

Across real societies, simple aggregate economic measures, such as the inequality of the initial income distribution, do not successfully predict the variation in redistribution preferences (Dallinger, 2010; Georgiadis & Manning, 2012; Lübkner, 2007). Our experiments support, and provide an individual-level mechanism for, the contention that appraisals of society also matter: how did the resources end up unequally distributed initially; who is the set of people involved in the relationship; what are the common external projects of the social group; and how much surplus is there to go round? As the available information about these features changes, so will the distribution of views on redistribution.

Although a greater role of luck in generating the initial distribution of resources increased the preferred level of redistribution, our findings suggest compensation for bad luck (i.e. risk pooling) is not the only function served by the human motivation to share out. The heterogeneity and war effects have nothing to do with smoothing out individual production risk, and in study 2, a substantial amount of redistribution was favoured even where we specified that luck plays no role. Thus, people intuitively understand that there are multiple types of benefit to sharing out resources, and hence multiple constellations of circumstances that favour it.

Situational features affected more than just the preferred level of redistribution. They also affected inferences about how the redistribution should best be done; and about the implementation problems that

might befall it. Prescription and perceived implementation problems were sometimes aligned and sometimes not. For heterogeneous villages, participants both favoured lower redistribution, and predicted that implementing redistribution would go worse in all the possible ways we asked about. In times of war, by contrast, participants prescribed higher redistribution, but at the same time felt that implementation problems, including evasion, cheating, disincentive effects and arguments would be worse (studies 5 and 6). They anticipated a 'fog of war' in which evasion and cheating would be rife, akin to the 'anomie' discussed by Teymooori, Bastian, and Jetten (2017). This suggests that variation in support for redistribution should in future be parsed into separate components of different moral ideals, versus different inferences about what is likely to be possible to achieve in practice given the anticipated behaviour of others. Societal circumstances can evidently affect these two facets independently of one another.

Perhaps the most striking aspect of our findings is that in studies 1–6, most participants did not have a consistent preference for a level of redistribution in the villages. Moreover, political orientation variables were only weak predictors of preferred redistribution, and in no study were there any significant interactions between experimental variables and political orientation. Thus, people of different political starting points responded to the situational features in like manner. These findings strike against certain accounts of variation in support for redistribution. First, they call into question the idea that support for a certain level of redistribution is a stably transmitted cultural value. If this were the case, it would be hard to see how so many of our participants could switch from advocating almost zero redistribution to almost complete communism in the within-subjects studies. In one previous study, the cultural difference in support for welfare between Americans and Scandinavians was abolished merely by standardizing the information the different groups had about recipient deservingness (Aaroe & Petersen, 2014; though see below for discussion of the contrasting findings of Almås et al., 2019). Our experimental manipulations achieved similar shifts within the same individuals: within our hypothetical world, we turned attitudinal Americans into attitudinal Scandinavians and back again from one trial to the next. Second, our findings do not support the idea people disagree over the right level of redistribution largely because different dispositions (Rockey, 2009), basic moral values (Graham et al., 2009) or social dominance orientations (Kteily et al., 2017) necessarily entail particular preferred levels of redistribution. Whether someone self-identified as left- or right-wing, or low versus high in SDO, carried rather little information about the redistribution level they would set, and no information at all about how they would respond to any of the experimental cues.

Whilst people of different self-declared political orientations apparently differ rather little in terms of an ideal level of redistribution for a given set of hypothetical social facts, they do clearly come to different conclusions about what should be done about redistribution in their own societies. We consider several ways of reconciling this with our findings. In reality, voters have to pay through their taxes for the policies they endorse, or may stand to benefit from welfare arrangements, whereas our method of hypothetical rating is consequence-free. People with different political orientations might weigh their own financial incentives differently (Zettler & Hilbig, 2010). Further, people may feel affiliation to political parties or movements, and endorse pro- or anti-redistribution arguments because those arguments are advocated by those parties or movements (Cohen, 2003). In short, actual political preferences in real societies involve more than just the computational principles we have studied here, since these are overlaid with party loyalties, prudential considerations and other factors. Of note, though, left-right self-placement and SDO also explained a fairly small proportion of the variation in support for welfare in the participants' actual society (20% and 29% respectively, study 7 data), where all the layers of party affiliation and self-interest considerations are present.

People of different political orientations may share the same mapping from situational features to preferred levels of redistribution, but

differ in their perceptions of what the situational features in their society are. We provide two sources of evidence for this view. When it came to judgements about actual society, participants who self-identified as right wing supported welfare less, and this was partially mediated by their appraisal that luck was not so important for success in life (we observed this in studies 1–6 and replicated it in study 7). The extent of the mediation was modest; but by measuring a broader range of beliefs about society, such as the perception that its members are fundamentally alike, that there is a threat of inter-group conflict, that society's resources are scarce, and so on, it might be possible to more fully account for the association. More strongly, in study 7, we found that people of different political orientations formed different appraisals of how important luck was likely to be in a hypothetical village, even when we attempted to control their appraisals by telling them the answer in the experimental materials. These different appraisals partially mediated the political-orientation differences in the level of redistribution they preferred for that village. These results may be relevant to interpreting the findings of Almås et al. (2019). Those researchers found that, even when the role of luck in generating income inequality in an artificial workgroup was specified explicitly in the experimental setup, conservatives relative to progressives (and Americans relative to Norwegians) chose to redistribute less. This may have been because, despite the attempts by the researchers to control the perceived role of luck through the materials, different people nonetheless appraised its importance differently. This was not however directly tested by Almås et al. (2019), since they did not measure appraisals.

A final possibility is that people of different political persuasions agree fairly well on the ideal level of redistribution, but have different beliefs about the possibility of actually achieving the ideal. Though not pessimistic in a general way (Schlenker, Chambers, & Le, 2012), right-wing people are more focussed on threats as compared to opportunities (Janoff-Bulman, 2009). In our study 6, people who self-identified as right-wing thought that implementing high redistribution would be less effective at improving individual welfare and collective efficacy; and would be attended by greater disincentive effects, greater reluctance to pay in, and an increase in conflict and division. This suggests that more right-wing (or high-SDO) positions on redistribution are at least partly driven by a greater gap between the morally ideal situation and the inferred likely outcome if implementation is attempted. This must in turn reflect different underlying priors or implicit theories about how other people behave.

Leaving individual differences aside, our experiments demonstrate that influencing people's views about what the situation in society is like will have systematic consequences for their support for redistribution. This has major implications for political persuasion. Effective strategies to alter support for redistribution would not need to explicitly discuss what level of redistribution is right. Instead, they would more effectively concentrate on influencing appraisals of what the facts about society are. If communicators can effectively disseminate narratives of the large (or small) role of luck in initial resource distributions, (dis-)similarity of fellow citizens, serious external threat, or overall scarcity, then shifts in support for redistribution will follow, without redistribution needing to be explicitly reasoned about, or even mentioned. This is what happened in our study 7: a small difference in the framing of the discourse about the society led to a systematic difference in the experimental population's distribution of support for redistribution. The effect size, from that one-off verbal intervention, was admittedly small, but it would not be negligible when applied at the population scale. Moreover, real-world politicised discourses are prevalent, pervasive, and repetitive.

Given the psychology of redistribution we have begun to map out, political persuasion strategies that appear sensible could backfire. For example, stressing the poverty and hunger that exists within affluent societies seems an appropriate strategy to use in arguing for greater redistribution. However if such a strategy promotes the perception of general resource scarcity, our findings suggest it could be

counterproductive. Advocates of redistribution could instead be stressing that resources are, by historical standards, remarkably abundant. Likewise, in advocating a Universal Basic Income, proponents often draw attention to the role of luck in the current state of society (Nettle, 2018; Standing, 2017). However, our data suggest this strategy will fail: cues of luck instead trigger a preference for targeting benefits at those most in need. The clearest preference for a Universal Basic Income-like equal share per villager was found in Study 2 exactly when luck played no role at all in the initial distribution of resources. This suggests that the Universal Basic Income proposal might be more attractive if presented as solving different problems than the need to pool risk. The fact that most participants wanted all villagers to interact with the common store even where risk-pooling was superfluous (i.e. the low- or no-luck treatments) suggests that, in intuitive thought about society, redistributive mechanisms have other functions, possibly including the creation and mutual recognition of social relationships.

We have here laid out an experimental methodology for systematically studying the situational features that affect support for redistribution. Importantly, the methodology allows those features to be varied parametrically within subjects, laying bare the logic of what makes greater redistribution feel right and what makes it feel wrong. The method would readily extend to further features, and other participant pools. We hope that understanding the operating principles of the psychology of redistribution will contribute to explaining change within, and variation between, societies in how social and economic inequality is addressed.

#### CrediT author statement

**Daniel Nettle:** Conceptualization, Methodology, Formal analysis, Investigation, Resources, Data Curation, Writing – Original Draft, Project administration, Visualization, Supervision, Funding Acquisition.

**Rebecca Saxe:** Conceptualization, Methodology, Investigation, Resources, Writing – Review & Editing, Project administration, Visualization, Supervision.

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#### Declaration of competing interest

The authors declare that they have no competing interests.

#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.cognition.2020.104234>.

#### References

- Aaroe, L., & Petersen, M. B. (2014). Crowding out culture: Scandinavians and Americans agree on social welfare in the face of deservingness cues. *Journal of Politics*, 76(3), 684–697. <https://doi.org/10.1017/S002238161400019X>.
- Aktipis, A., Cronk, L., Alcock, J., Ayers, J. D., Baciu, C., Balliet, D., ... Winfrey, P. (2018). Understanding cooperation through fitness interdependence. *Nature Human Behaviour*, 2(7), 429–431. <https://doi.org/10.1038/s41562-018-0378-4>.
- Alesina, A., Baqir, R., & Easterly, W. (1999). Public goods provision and ethnic divisions. *The Quarterly Journal of Economics*, 114, 1243–1284.
- Alesina, A., & Giuliano, P. (2009). Preferences for redistribution. *NBER working papers*, 14825.
- Alesina, A., Glaeser, E., & Sacerdote, B. (2001). Why doesn't the US have a European-style welfare system? *NBER working papers*, 8524.
- Almås, I., Cappelen, A., & Tungodden, B. (2019). Cutthroat capitalism versus cuddly socialism: Are Americans more meritocratic and efficiency-seeking than

- Scandinavians? *Journal of Political Economy*. <https://doi.org/10.2139/ssrn.3343315>.
- Berinsky, A. J. (2017). Measuring public opinion with surveys. *Annual Review of Political Science*, 20, 309–329. <https://doi.org/10.1146/annurev-polisci-101513-113724>.
- Burton-Chellew, M. N., Ross-Gillespie, A., & West, S. A. (2010). Cooperation in humans: Competition between groups and proximate emotions. *Evolution and Human Behavior*, 31(2), 104–108. <https://doi.org/10.1016/j.evolhumbehav.2009.07.005>.
- Cohen, G. L. (2003). Party over policy: The dominating impact of group influence on political beliefs. *Journal of Personality and Social Psychology*, 85(5), 808–822. <https://doi.org/10.1037/0022-3514.85.5.808>.
- Conway, P., Goldstein-Greenwood, J., Polacek, D., & Greene, J. D. (2018). Sacrificial utilitarian judgments do reflect concern for the greater good: Clarification via process dissociation and the judgments of philosophers. *Cognition*, 179, 241–265. <https://doi.org/10.1016/j.cognition.2018.04.018>.
- Dallinger, U. (2010). Public support for redistribution: What explains cross-national differences? *Journal of European Social Policy*, 20(4), 333–349. <https://doi.org/10.1177/0958928710374373>.
- Dyble, M., Thompson, J., Smith, D., Salali, G. D., Chaudhary, N., Page, A. E., ... Migliano, A. B. (2016). Networks of food sharing reveal the functional significance of multilevel sociality in two hunter-gatherer groups. *Current Biology*, 26(15), 2017–2021. <https://doi.org/10.1016/j.cub.2016.05.064>.
- European Commission (2004). *Eurobarometer. vol. 61* <https://doi.org/10.4232/1.10961>.
- Georgiadis, A., & Manning, A. (2012). Spend it like Beckham? Inequality and redistribution in the UK, 1983–2004. *Public Choice*, 151(3–4), 537–563. <https://doi.org/10.1007/s11127-010-9758-7>.
- Graham, J., Haidt, J., & Nosek, B. A. (2009). Liberals and conservatives rely on different sets of moral foundations. *Journal of Personality and Social Psychology*, 96, 1029–1046.
- Habyarimana, J., Humphreys, M., Posner, D. N., & Weinstein, J. M. (2007). Why does ethnic diversity undermine public goods provision? *American Political Science Review*, 101, 709–725. <https://doi.org/10.1017/S0003055407070499>.
- Hamilton, W. D. (1975). Innate social aptitudes of man: An approach from evolutionary genetics. In R. Fox (Ed.), *Biosocial anthropology* (pp. 133–153). London: Malaby Press.
- Ho, A. K., Sidanius, J., Kteily, N., Sheehy-Skeffington, J., Pratto, F., Henkel, K. E., ... Stewart, A. L. (2015). The nature of social dominance orientation: Theorizing and measuring preferences for intergroup inequality using the new SDO7 scale. *Journal of Personality and Social Psychology*, 109, 1003–1028. <https://doi.org/10.1037/pspi0000033>.
- Jaeggi, A. V., & Gurven, M. (2013). Natural cooperators: Food sharing in humans and other primates. *Evolutionary Anthropology*, 22(4), 186–195. <https://doi.org/10.1002/evan.21364>.
- Janoff-Bulman, R. (2009). To provide or protect: Motivational bases of political liberalism and conservatism. *Psychological Inquiry*, 20(2–3), 120–128. <https://doi.org/10.1080/10478400903028581>.
- Janoff-Bulman, R., & Carnes, N. C. (2016). Social justice and social order: Binding moralities across the political spectrum. *PLoS One*, 11(3), 1–18. <https://doi.org/10.1371/journal.pone.0152479>.
- Kasza, G. J. (2006). War and welfare policy in Japan. *The Journal of Asian Studies*, 61, 417–435. <https://doi.org/10.2307/2700296>.
- Kenworthy, L., & McCall, L. (2008). Inequality, public opinion and redistribution. *Socio-Economic Review*, 6(1), 35–68. <https://doi.org/10.1093/ser/mwm006>.
- Krupp, D. B., DeBruine, L. M., & Barclay, P. (2008). A cue of kinship promotes cooperation for the public good. *Evolution and Human Behavior*, 29(1), 49–55. <https://doi.org/10.1016/j.evolhumbehav.2007.08.002>.
- Kteily, N. S., Sheehy-Skeffington, J., & Ho, A. K. (2017). Hierarchy in the eye of the beholder: (Anti-)egalitarianism shapes perceived levels of social inequality. *Journal of Personality and Social Psychology*, 112(1), 136–159. <https://doi.org/10.1037/pspp0000097>.
- Lodge, M., McGraw, K. M., & Strohm, P. (1989). An impression-driven model of candidate evaluation. *The American Political Science Review*, 83, 399–419. <https://doi.org/10.2307/1962397>.
- Lübker, M. (2007). Inequality and the demand for redistribution: Are the assumptions of the new growth theory valid? *Socio-Economic Review*, 5(1), 117–148. <https://doi.org/10.1093/ser/mwl002>.
- Mikhail, J. (2007). Universal moral grammar: Theory, evidence and the future. *Trends in Cognitive Sciences*, 11(4), 143–152. <https://doi.org/10.1016/j.tics.2006.12.007>.
- Nettle, D. (2018). Getting your head around the universal basic income. *Hanging on to the edges: Essays on science, society and the academic life* (pp. 111–128). Cambridge, UK: OpenBook Publishers.
- Nettle, D., Panchanathan, K., Rai, T. S., & Fiske, A. P. (2011). The evolution of giving, sharing, and lotteries. *Current Anthropology*, 52(5), 747–756. <https://doi.org/10.1086/661521>.
- Nettle, D., & Saxe, R. (2019). *Data and R code for analysis, support for social transfers project*. <https://doi.org/10.17605/OSF.IO/XRQAE>.
- Petersen, M. B., Sznycer, D., Cosmides, L., & Tooby, J. (2012). Who deserves help? Evolutionary psychology, social emotions, and public opinion about welfare. *Political Psychology*, 33(3), 395–418. <https://doi.org/10.1111/j.1467-9221.2012.00883.x>.
- Roberts, G. (2005). Cooperation through interdependence. *Animal Behaviour*, 70(4), 901–908. <https://doi.org/10.1016/j.anbehav.2005.02.006>.
- Rockey, J. (2009). Who is left-wing, and who just thinks they are? *University of Leicester working paper*, 09/23.
- Rueda, D. (2018). Food comes first, then morals: Redistribution preferences, parochial altruism, and immigration in Western Europe. *The Journal of Politics*, 80(1), 225–239. <https://doi.org/10.1086/694201>.
- Sagarin, B. J., Ambler, J. K., & Lee, E. M. (2014). An ethical approach to peeking at data. *Perspectives on Psychological Science*, 9(3), 293–304. <https://doi.org/10.1177/1745691614528214>.
- Schlenker, B. R., Chambers, J. R., & Le, B. M. (2012). Conservatives are happier than liberals, but why? Political ideology, personality, and life satisfaction. *Journal of Research in Personality*, 46(2), 127–146. <https://doi.org/10.1016/j.jrp.2011.12.009>.
- Skitka, L. J., Hanson, B. E., Washburn, A. N., & Mueller, A. B. (2018). Moral and religious convictions: Are they the same or different things? *PLoS One*, 13(6), <https://doi.org/10.1371/journal.pone.0199311>.
- Skitka, L. J., Washburn, A. N., & Carsel, T. S. (2015). The psychological foundations and consequences of moral conviction. *Current Opinion in Psychology*, 6, 41–44.
- Sprong, S., & Jetten, J. (2019). “Our country needs a strong leader right now”: Economic inequality enhances the wish for a strong leader. In Press1–29. <https://doi.org/10.1177/0956797619875472>.
- Standing, G. (2017). *Basic income: And how we can make it happen*. London: Pelican.
- Sznycer, D., Lopez Seal, M. F., Sell, A., Lim, J., Porat, R., Shalvi, S., & Tooby, J. (2017). Support for redistribution is shaped by compassion, envy, and self-interest, but not a taste for fairness. *Proceedings of the National Academy of Sciences*, 114(31), 8420–8425. <https://doi.org/10.1073/pnas.1703801114>.
- Teymoori, A., Bastian, B., & Jetten, J. (2017). Towards a psychological analysis of anomie. *Political Psychology*, 38, 1009–1023. <https://doi.org/10.1111/pops.12377>.
- Tourangeau, R., & Ransinski, K. A. (1988). Cognitive processes underlying context effects in attitude measurement. *Psychological Bulletin*, 103, 299–314.
- Zettler, I., & Hilbig, B. E. (2010). Attitudes of the selfless: Explaining political orientation with altruism. *Personality and Individual Differences*, 48(3), 338–342. <https://doi.org/10.1016/j.paid.2009.11.002>.