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Do differences in brute luck influence preferences for redistribution in favour of the environment and health?

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Redistributive justice is based on the premise that it is unfair for people to be better or worse off relative to others simply because of their fortune or misfortune. It assumes equal opportunities arising from four factors: social circumstances, effort, option luck and brute luck. This paper seeks to investigate how differences in perceived brute luck influence individual preferences for redistribution in favour of two public policies: "health intervention" and "environmental actions". These policies are viewed somewhat differently: the environment is considered a pure "public good" and health, more as a "private good" with a strong public good element. Consequently, potential self-serving biases inherent in the preferences for redistributive policies are expected to differ, more likely favouring health than the environment. The perceived degree of brute luck may capture such a difference—those perceiving themselves as luckiest should be less amenable to redistribution in favour of health than the unluckiest. Data from the three waves (2000, 2006 and 2008) of ~~a~~ French population survey are used to examine this self-serving bias. A Generalised Ordered Logit (GOL) model is found to be statistically more relevant compared to other logistic regression models (multinomial and ordered). We find that a perceived low degree of brute luck is significantly associated with a decreased preference of redistributive environmental policies but the reverse is true for redistributive health policies, i.e., association with an increased preference. Assuming that all inequalities due to differing luck are unjust, this empirical validation gives redistributive justice grounds for equalisation policies regarding health.

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Introduction

How to achieve fairness in managing the consequences of people's fortune and misfortune has long been a subject of debate in political economy (Nyborg, 2014; Mouter, 2019). The concept of redistributive justice relies on a notion of equality of opportunities arising from four individual factors contributing to success in life: social circumstances, effort, option luck and brute luck (for an overview, see Roemer and Trannoy, 2016). Social circumstances are conferred at birth as well as inherited from parents. Effort is the result of individuals' perceived responsibility, and is determined by their characteristics (Cappelen et al., 2013), which include risk-taking behaviour (option luck). Finally, brute luck is independent of any direct human decision or behaviour and reflects random chance: "the occurrence of an event is due to brute luck for an agent if and only if the agent could not have (reasonably) avoided the possibility of its occurrence" (Vallentyne, 2002, p. 532).

The literature on redistribution within a society includes a strand on where to place the responsibility cut-off, as defined by fairness views. Libertarians consider that there should be no compensation, while egalitarians (Charness and Rabin, 2002) advocate compensating people for everything. Between these two extremes, different views have emerged and that includes compensating only for circumstances (Lefranc et al., 2009), for circumstances and brute luck (Dworkin, 1981), and for even every factor barring effort (Fleurbaey, 2001).

Keeping aside all considerations of fairness, individual preferences for redistribution are affected by selfish concern, which depends on individuals' endowments in terms of the four above factors. Revealed fairness views thus combine preferences for redistribution with a self-serving bias that can be adapted opportunistically according to personal (and financial) interest (Dana et al., 2007; Cappelen et al., 2007; Williams, 2021). Such preferences for redistribution have often been studied using an earned-money phase and a money-distribution phase in the laboratory (Frohlich et al., 2004; Cappelen et al., 2007; Durante et al., 2014) and rarely, in hybrid settings using a mixture of experiment and survey (Chanel et al., 2022). This paper attempts to investigate how differences in perceived brute luck influence individual preferences for a centralised government redistribution through public policies, using data generated from a hybrid approach. This study explores redistribution in favour of two policies—health and the environment—where the four factors affect differently for equality of opportunity along two broad dimensions.

First, we consider the public/private dimension. Health includes both dimensions—public components (the health system) and private/individual components (service consumption by choice)—which generally do not conflict with each other. The environment has more of a public dimension: individuals are exposed in a roughly similar way to the positive and the negative aspects of the environment. However, conflicts between immediate self-interest and longer-term collective interest arise (Biel and Thøgersen, 2007; Lorenzoni et al., 2007), for instance with policies aimed at sustainable transport (cf. the 2018 Yellow Vests protests in France; Stephens, 2019).

Second, we consider the responsibility dimension. The limit of solidarity through redistribution is reached when neediness is self-inflicted. Regarding health, neither their genetic endowment nor their brute luck (random diseases and life accidents) are within individuals' control, whereas their option luck through risky behaviours (alcohol and tobacco consumption, lifestyle, addiction, poor diet, etc.) and their efforts to improve health are clearly within self-control. Regarding the environment, none of these factors can be considered individuals' responsibility.

We focus on how individuals' willingness to redistribute is affected by their perceived brute luck in daily life relative to others. We expect luck's effect on preferences for redistribution to differ between health and the environment. Indeed, individuals with dispositional optimism anticipate good events (Scheier and Carver, 1985) and believe in their ability to exert control over life situations (Heckhausen et al., 2010). This would make them less likely to support redistribution in favour of health, but such a redistribution should be supported by pessimistic individuals. Thus, both optimists and pessimists would be acting in line with self-serving biases. Redistribution in favour of the environment, by eliminating the self-serving component, might show a redistribution pattern better aligned with individuals' views of fairness.

We exploit three surveys to compare the effects of brute luck on the preferences of a sample of the French population. We use an original hybrid survey of 40 to 140 individuals interviewed in person, reinforcing the survey's citizen-centric dimension. We find respondents more likely to support redistribution in favour of health in preference to the environment. Moreover, the influence of negative perceptions of luck on willingness to redistribute in favour of health is consistent with expectations, supporting the existence of a self-serving bias. Furthermore, we find an opposite preference for redistribution in favour of the environment that is aligned with fairness views.

The remainder of the paper is organised as follows: the next section describes the data and the study design, the subsequent section presents the methods and the results section reports the empirical findings. Finally, we conclude with a discussion highlighting policy implications and study limitations.

Data

Our data come from three surveys (2000, 2006 and 2008) conducted in the Bouches-du-Rhône (BDR) department of France. The BDR has a population of 2 million with main city, Marseille (0.86 million inhabitants) being the second largest in France. Each survey session lasted roughly 1 h and took place in the Provence-Alpes-Côte d'Azur (PACA) Regional Council assembly hall in Marseille. Respondents simultaneously, individually and anonymously answered a self-administered survey. Willingness-to-pay (WTP) revelation questions were administered interactively by computer, using the regional council's electronic voting machines. This unique survey design, used in all sessions of the three surveys, allowed the same survey protocol to be applied simultaneously to a large number of people and offered several advantages over standard telephone or individual face-to-face surveys (Ami et al., 2011). Such an approach made it easier to secure the respondents' attention and meant that the survey itself could take longer, since a large number of individuals were dealt with simultaneously. Moreover, visual aids were available; anonymity of the respondents increased the likelihood of truthful answers and interviewer bias was also minimal.

Although the three surveys were conducted without any intention of using them as three waves in this study, this reorganisation and use of the data acquired make a three-pronged contribution to the literature. First, redistributive justice (related here to perceived brute luck) and the possibility of a self-serving bias in fairness views that have been important issues in political economy for at least half a century. Second, the data collected are relevant, capturing perceived brute luck and ranking redistributional preferences, and were obtained over a similar geographic area using a consistent survey method. Third, by assembling the respondents in a micro society (the survey session's setting), this innovative approach addressed the redistributive justice issue from the citizen's perspective. Despite the age of the data, there being no more recent data from a similar geographic area and/or from any survey using a consistent method, we felt this empirical work might provide policy relevant insights by applying a robust methodological approach.

The first wave (2000) was a contingent valuation (CV) survey on the underlying risks associated with a change in air pollution exposure. Individual WTP responses for both health (morbidity and mortality) and non-health effects were elicited. A sample of 267 BDR inhabitants was interviewed in June 2000 in two sessions (140 and 124 people). Respondents were recruited through advertisements in local newspapers, where the survey was described as "about quality of life", and were remunerated through gift vouchers (€15).

The second wave (2006) used a CV survey to air pollution exposure. Individual WTP responses were first elicited for health and non-health effects as a whole, and then for mortality effects alone (with the aim of assessing a contextual value of a statistical life). The survey was conducted from 10th to 12th October, 2006 in nine sessions, each involving between 43 and 117 participants. All 615 participants were recruited through advertisements in the local media (written press, radio, television) and awarded a twenty-euro voucher in return for participating. To limit selection bias, the exact topic of the survey was not mentioned in the advertisement, which announced a more general theme "quality of life in the PACA region."

The final wave (2008) was an experimental survey on equality of opportunity, more specifically "how public preferences for redistribution relate to how money was earned". Participants were recruited through advertisements in local newspapers and regional television broadcasts. Flyers were handed out in the street and faxes sent to 6000 companies inviting people to participate in a study, "Succeeding in Marseille" as part of a Science Fair. Participants were told that they could earn up to €40 for one and a half hours. Four sessions organised on two successive days in October 2008 gathered 432 participants.

In total, 1311 respondents took part in the 15 sessions of the three survey waves. It should be noted that these respondents, although more diverse than in standard lab experiments, were not representative of the BDR population (more young people, less active workers—more students or unemployed—more urban residents and slightly more women). This was due to the absence of *ex-ante* participant selection to control for socio-demographic profiles.

Table 1 presents the descriptive statistics of the data from the three waves (2000, 2006 and 2008). The proportion of females and of 31–60-year-olds increased progressively over the 8 years. There were no respondents older than 74 in 2000 and in 2008. Respondents with higher levels of educational attainment were less frequent in 2000. The equivalent household income increased over the 8-year period, while the proportions of respondents owning their primary residence and those living in a couple relationship were lower in 2000.

The proportions of respondents whose perceived brute luck equalled the population average were comparable in 2000 and 2006 (51%), although lower in 2008 (43%). The proportion whose perception of their brute luck was lower than the population average increased progressively over the period, from 11% in 2000 to almost 19% in 2008, while the proportion whose perception of their brute luck was higher than the population average remained stable throughout the period.

Table 2 presents the two response variables: "Redistribution in favour of environmental issues" (Redis_Env) and "Redistribution in favour of health care" (Redis_Health), based on the respondents' ranking of environment and health for eight government redistribution policies by order of preference.[1] Both variables are categorical and ordered, from a "strong" (Rank #1) to a "minimal" (Rank #4 and higher) intensity of preference. The proportions of respondents ranking health first were marginally higher in 2006 and 2008 than in 2000, whereas there was no clear temporal trend towards prioritising the environment.

Table 1 Descriptive statistics for explanatory variables.

	2000	**2006**	**2008**
Age (in years) (%)			
18–30	68.56	34.31	43.52
31–44	14.77	34.15	29.63
45–60	14.40	21.95	21.53
61–74	2.27	8.78	5.32
75–84	0	0.65	0
85 and over	0	0.16	0
Mean (in years)	30.144 (12.047)	39.115 (13.977)	35.530 (13.449)
Gender—Male (%)	39.77 (0.490)	35.45 (0.479)	28.7 (0.453)
Employed (%)	24.24 (0.429)	58.28 (0.494)	51.76 (0.500)
Education attainment (%)			
No education	4.17	2.47	2.64
With elementary school certificate	8.33	7.07	5.53
Professional diploma	13.26	12.34	9.86
General and Technical Baccalaureate	25.38	21.38	27.88
University education and higher	48.86	56.74	54.09
Eq. Household Income—annual (10^3 €)[a]	11.547 (7.679)	14.433 (11.096)	21.114 (14.434)
Living in Couple relationship (%)	33.71 (0.474)	48.29 (0.500)	44.91 (0.498)
Minor in the household (%)	15.91 (0.366)	34.63 (0.476)	33.56 (0.473)
Residence ownership (%)	27.65 (0.448)	46.18 (0.499)	36.19 (0.481)
Perceived presence of luck in daily life (%)			
Lower than the population average	11.24	13.64	18.65
Equal to population average	51.00	50.75	43.12
Higher than the population average	37.75	35.61	38.23
N	**264**	**615**	**432**

[a]We used OECD equivalent income scale: dividing household income by the square root of household size (Atkinson et al., 1995). Standard deviations are in parentheses.

Finally, Table 3 presents the proportion of missing cases for all dependent and explanatory variables.

Methods

We modelled Redis_Env and Redis_Health as functions of perceived brute luck in daily life, and accounted for the potential confounding variables (age, gender, working status, educational attainment, household income, living in a couple relationship and ownership of primary residence).

Three types of model were used to examine and estimate.

First, a standard Multinomial Logit (ML) model, which estimated a vector of coefficients for each alternative (except the reference alternative, hence three vectors), but did not account for the underlying ordering of the dependent variable.

Second, a standard Ordered Logit (OL) model that accounted for the ordering but imposed identical slope coefficients across the alternatives by estimating one vector of coefficient for all alternatives (the parallel-lines assumption).

Third, a Generalised Ordered Logit (GOL)/Partial Proportional Odds (PPO) model (McCullagh and Nelder, 1989; Peterson and Harrell, 1990), which relaxed the parallel-lines assumption while accounting for the underlying ordering. It allowed the estimates in each of the cumulative logistic regressions to differ:

$$P(Y_i > j) = g(X_i\beta_j) = \frac{\exp(\alpha_j + X_i\beta_j)}{1 + \left\{\exp\left(\alpha_j + X_i\beta_j\right)\right\}}, j = 1, 2, \ldots, M-1, i = 1, \ldots, n$$

where $j = 1, \ldots, M$ are the categories of the ordinal-dependent variable Y (Redis_Env and Redis_Health), i indexes respondents, X_i are explanatory variables, α_j is an intercept term and β_j is a vector of coefficient to be estimated. So, the probabilities of Y taking each of the j values, $j = 1, 2, \ldots, M$ are:

$$P\left(Y_i = 1\right) = 1 - g\left(X_i\beta_1\right)$$

$$P(Y_i = j) = g(X_i\beta_{j-1}) - g(X_i\beta_j), j = 2, \ldots, M-1$$

$$P\left(Y_i = M\right) = g\left(X_i\beta_{M-1}\right).$$

The model can be written with a cumulative distribution function:

$$P(Y_i \leq j) = 1 - g(X_i\beta_j) = F(X_i\beta_j).$$

In our setting, since $M = 4$ each GOL model yielded three sets of coefficients, some of which can differ across alternatives when the parallel-lines assumption is relaxed. In the absence of any underlying theory for identification of variables violating this assumption, we used an iterative fitting procedure (Schneider et al., 2012) and selectively relaxed the proportionality constraints (Williams, 2006) based on the Brant test (1990). Consequently, some of the β coefficients were similar for all values of j, while others were allowed to differ (with a 5% level of significance). For each j, a positive β_j coefficient indicated that an increase in the values of the corresponding explanatory variable increased the likelihood of the respondent being in a higher category than jth. Conversely, a negative β_j coefficient indicated a greater likelihood of the respondent being in a lower category. All estimates were performed with Stata, using the gologit2 programme (Williams, 2006).

We started from full models with all explanatory variables, before removing explanatory variables step by step, decreasing p-values to obtain parsimonious models. Note that all significant variables in the full models remained significant in the parsimonious models (details upon request). For the sake of brevity, only the results from the best model, based on statistical tests, are presented here for each of the two dependent variables.

We also computed the marginal effects of a change in X_i on $P(Y_i = j)$. We first computed the predicted probability for each respondent on each category of j, based on the observed values of X_i and α_j and β_j estimates. We then replicated these with a marginal change in each of the explanatory variables *ceteris paribus*, and computed the change in predicted probabilities. We averaged these predicted marginal changes over the sample.

Finally, because our main focus was on the effect of perceived brute luck on support for redistribution, we computed the

Table 2 Descriptive statistics for dependent variables.

	2000	2006	2008
	Percentage	Percentage	Percentage
Redis_Env: Redistrib. in favour of the Environment			
Rank # 1 (strong)	13.13	15.15	11.01
Rank # 2 (moderate)	13.13	17.43	15.93
Rank # 3 (weak)	16.22	20.20	15.93
Rank # 4 and higher (minimal)	57.53	47.23	57.14
Redis_Health: Redistrib. in favour of Health			
Rank # 1 (strong)	15.83	20.49	24.12
Rank # 2 (moderate)	15.06	19.19	18.74
Rank # 3 (weak)	13.90	16.10	18.74
Rank # 4 and higher (minimal)	55.21	44.23	38.41
N	**264**	**615**	**432**

Table 3 Descriptive statistics for missing cases.

	2000		2006		2008	
	Observed	Miss.	Observed	Miss.	Observed	Miss.
Redis_Env	259	5	614	1	427	5
Redis_Health	259	5	615	0	427	5
Age (in years)	264	0	615	0	432	0
Gender—Male	264	0	615	0	432	0
Employed	264	0	592	23	425	7
Education attainment	264	0	608	7	416	16
Eq. Household Income	235	29	557	58	413	19
Living in Couple relationship	264	0	615	0	432	0
Minor in the household	264	0	615	0	432	0
Residence ownership	264	0	615	0	431	1
Perceived presence of luck in daily life	249	15	601	14	429	3

Miss. = number of missing observations.

Table 4 Model results (Generalised Ordered Logit Models).

Dependent variables	Desired redistribution in favour of the Environment (Redis_Env)			Desired redistribution in favour of Health (Redis_Health)		
	Other responses vs. strong	**Other responses vs. strong and moderate**	**Minimal vs. strong, moderate and weak**	**Other responses vs. strong**	**Other responses vs. strong and moderate**	**Minimal vs. strong, moderate and weak**
Perceived presence of luck in daily life [ref.: lower than the population average]						
Equal to population average	0.270 (0.123)	0.270 (0.123)	0.270 (0.123)	**0.223 (0.200)**	−**0.159 (0.314)**	−**0.193 (0.225)**
Higher than the population average	**0.261 (0.268)**	**0.625*** (0.001)**	**0.650*** (0.001)**	−0.370* (0.019)	−0.370* (0.019)	−0.370* (0.019)
Household income (in €)	−0.016*** (0.007)	−0.016*** (0.007)	−0.016*** (0.007)	-	-	-
Gender (male = 1)	**0.417* (0.020)**	**0.189 (0.165)**	**0.001 (.999)**	-	-	-
Female and Employed (=1)	-	-	-	0.227* (0.044)	0.227* (0.044)	0.227* (0.044)
Living in couple relationship (=1)	0.350*** (0.003)	0.350*** (0.003)	0.350*** (0.003)	-	-	-
Minor at home (=1)	−0.326*** (0.009)	−0.326*** (0.009)	−0.326*** (0.009)	-	-	-
Residence ownership (=1)	0.275* (0.034)	0.275* (0.034)	0.275* (0.034)	-	-	-
Survey wave [ref.: 2000]						
2006	0.354* (0.024)	0.354* (0.024)	0.354* (0.024)	0.333* (0.026)	0.333* (0.026)	0.333* (0.026)
2008	0.150 (0.397)	0.150 (0.397)	0.150 (0.397)	0.575*** (<0.0001)	0.575*** (<0.0001)	0.575*** (<0.0001)
Constant	−**2.435*** (<0.0001)**	−**1.446*** (<0.0001)**	−**0.606*** (0.004)**	−**1.772*** (<0.0001)**	−**0.678*** (<0.0001)**	**0.028 (0.872)**
Null Log pseudolikelihood		−1415.810			−1611.635	
Log pseudolikelihood for GOL model		−1387.572			−1591.091	
AIC for GOL model		2807.1444			3202.182	
LR test for joint nullity for GOL model (*p*-value)		$Chi^2(13) = 56.48$ (<0.0001)			$Chi^2(7) = 41.09$ (<0.0001)	
Fraction of correct predictions		52.43%			44.50%	
Log pseudolikelihood for ML model		−1379.014			−1588.373	
AIC for ML model		2818.027			3212.75	
LR test of GOL model (H_0) vs. ML model (*p*-value)		$Chi^2(14) = 17.12$ (0.250)			$Chi^2(8) = 5.44$ (0.710)	
Log pseudolikelihood for OL model		−1393.919			−1597.196	
AIC for OL model		2811.837			3210.393	
LR test of OL model (H_0) vs. GOL model (*p*-value)		$Chi^2(4) = 12.69$ (0.013)			$Chi^2(2) = 12.21$ (0.002)	
N		1171			1245	

GOL Generalised Ordered Logit, *LR* likelihood ratio, *ML* Multinomial Logit, *OL* Ordered Logit, *p*-values computations are in parentheses, and based on robust standard error estimates. Bold is for variables for which parallel assumption is relaxed.
**p*-value ≤ 0.05; ***p*-value ≤ 0.01; ****p*-value ≤ 0.001.

marginal effects of each degree of brute luck on the probability of choosing each of the four categories, and tested their equality based on the standard errors computed using the delta method.

Results

Table 4 presents the estimates for the GOL models, found here to be more relevant than standard ML and OL models, based on likelihood ratio (LR) tests and the akaike information criterion (AIC). For both dependent variables, the null assumption that GOL was better than the ML model was not rejected (p-values > 0.318), whereas the null assumption that the standard OL model was better than the GOL model was rejected (p-values < 0.0128). Overall, the parallel-lines assumption was rejected for two out of nine explanatory variables in the redistribution in favour of the environment (Redis_Env) model and for one out of five in the redistribution in favour of health (Redis_Health) model.[2]

For redistribution in favour of the environment (columns 2–4, Table 4), the coefficients of the variables "perceived brute luck in daily life (higher than the population average)", "Living in a couple relationship", "Owning his/her primary residence" and "Being a male" were positive, and statistically significant (p-values ≤ 0.05, although not at every level for the latter variable). Respondents with these characteristics therefore supported higher levels of redistribution in favour of the environment. Those with at least one minor child and with a high household income were significantly more inclined to support lower levels of redistribution in favour of the environment (p-values < 0.01).

For redistribution in favour of health (columns 5–7, Table 4), the coefficients of the variable "perceived brute luck in daily life (higher than the population average)" were negative and statistically significant (p-value = 0.019). These respondents were therefore less inclined towards redistribution in favour of health: the stronger the perception of brute luck in daily life, the lower the likelihood of supporting major redistribution in favour of health. However, employed females were significantly more inclined to support major redistribution in favour of health (p-value = 0.044).

Finally, positive and statistically significant (p-values < 0.026) survey wave effects were found for every level of willingness to redistribute in favour of health (in 2006 and 2008) and in favour of the environment (in 2006).

Table 5 presents the marginal effects of a change in each explanatory variable on the predicted probabilities of the respective dependent variable, *ceteris paribus*. Compared to respondents with a perceived degree of brute luck in daily life lower than the population average, those with perceived brute luck higher than the population average were more likely to support a moderate level of redistribution in favour of the environment (9.7%), and less likely to support a minimal level (−15.6%). They were also more likely to support a minimal level of redistribution in favour of health (8.9%), and less likely to support a strong (−5.4%) or moderate (−3.3%) level.

Households with at least one minor child showed increased support for a minimal level of redistribution in favour of the environment (7.9%) but decreased support for a strong level (−3.7%). Employed females were more likely not to support a minimal level of redistribution in favour of health (−5.5%) but to support a strong level (3.7%). Respondents living in a couple relationship were less likely to support minimal redistribution in favour of the environment (−8.4%) and more likely to support strong redistribution (3.9%). Property owners showed a similar marginal effect.

Figure 1 illustrates how the predicted probabilities regarding redistribution in favour of the environment changed with perceived brute luck. The average marginal effects of a high degree of perceived brute luck were monotonically increasing on the

Table 5 Marginal effects from predicted probabilities (Generalised Ordered Logit Models).

	Desired redistribution in favour of the Environment (Redis_Env)				Desired redistribution in favour of Health (Redis_Health)			
	Strong	Moderate	Weak	Minimal	Strong	Moderate	Weak	Minimal
Perceived presence of luck in daily life [Ref: lower than the population average]								
Equal to population average	0.028 (0.101)	0.021 (0.126)	0.014 (0.153)	−0.064 (0.117)	**0.039 (0.190)**	**−0.077*** (0.002)**	**−0.008 (0.714)**	**0.046 (0.221)**
Higher than the population average	**0.027 (0.259)**	**0.097*** (<0.0001)**	**0.032 (0.184)**	**−0.156*** (<0.0001)**	−0.054* (0.024)	−0.033* (0.018)	−0.003 (0.258)	0.089* (0.017)
Household Income (in Euro)	−0.002*** (0.007)	−0.001*** (0.007)	−0.001*** (0.008)	0.004*** (0.006)	-	-	-	-
Gender (male = 1)	**0.047* (0.020)**	**−0.009 (0.687)**	**−0.038 (0.092)**	**−0.0001 (0.999)**	-	-	-	-
Female and Employed (=1)	-	-	-	-	0.037* (0.044)	0.016* (0.045)	0.002 (0.133)	−0.055* (0.043)
Living in couple relationship (=1)	0.039*** (0.003)	0.031*** (0.003)	0.014*** (0.005)	−0.084*** (0.003)	-	-	-	-
Minor at home (=1)	−0.037** (0.010)	−0.029** (0.010)	−0.013* (0.011)	0.079*** (0.009)	-	-	-	-
Residence ownership (=1)	0.031* (0.034)	0.025* (0.034)	0.011* (0.037)	−0.066* (0.032)	-	-	-	-
Survey wave [Ref: 2000]								
2006	0.039* (0.017)	0.032* (0.024)	0.015* (0.049)	−0.085* (0.022)	0.048* (0.020)	0.026* (0.030)	0.008 (0.090)	−0.082* (0.026)
2008	0.015 (0.392)	0.014 (0.396)	0.007 (0.406)	−0.036 (0.395)	0.089*** (<0.001)	0.043*** (<0.001)	0.008 (0.072)	−0.141*** (<0.001)

p-values computations are in parentheses, based on robust standard error estimates and computed using delta method. Bold is for variables for which parallel assumption is relaxed.
*p-value ≤ 0.05; **p-value ≤ 0.01; ***p-value ≤ 0.001.

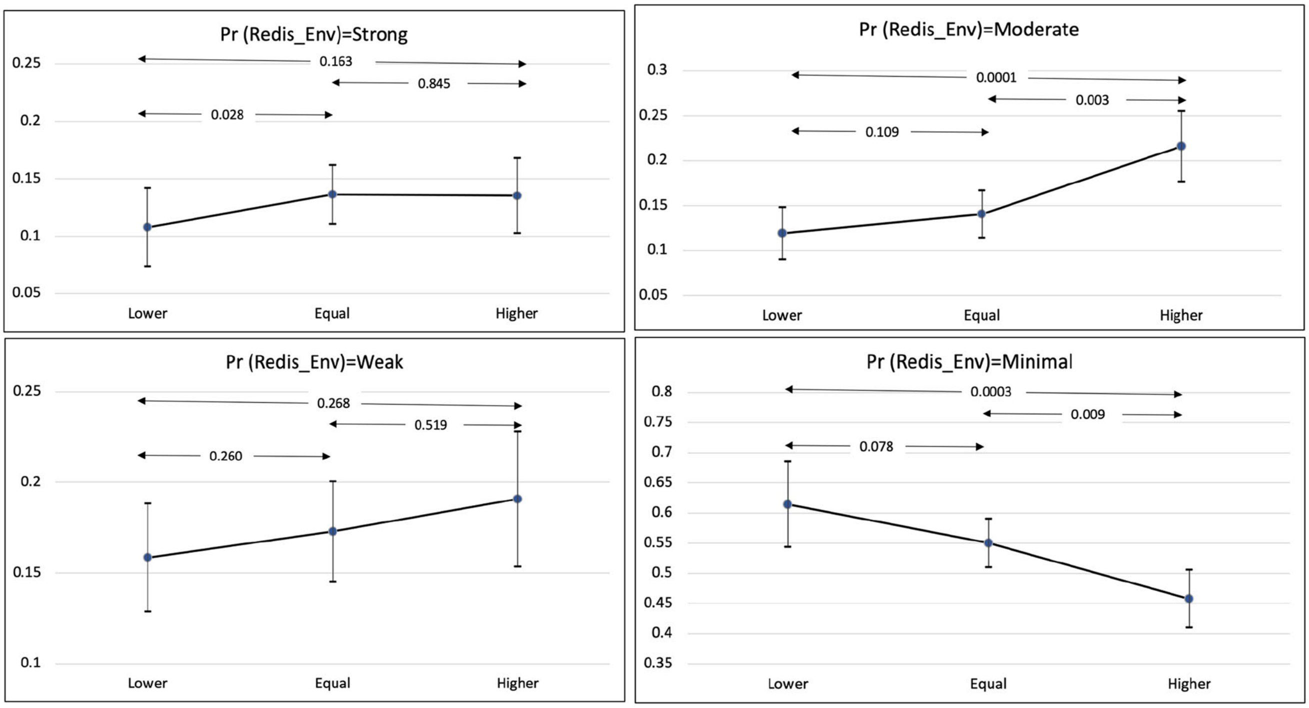

Fig. 1 Effect of inequalities in perceived brute luck on willingness to redistribute in favour of the environment. Each panel represents a level of redistribution (Strong, Moderate, Weak and Minimal). For each luck level (Lower, Equal, Higher), the predictive margin with 95% CIs is presented. For each pair of luck levels, the number corresponds to the *p*-value of a bilateral equality test computed using delta method.

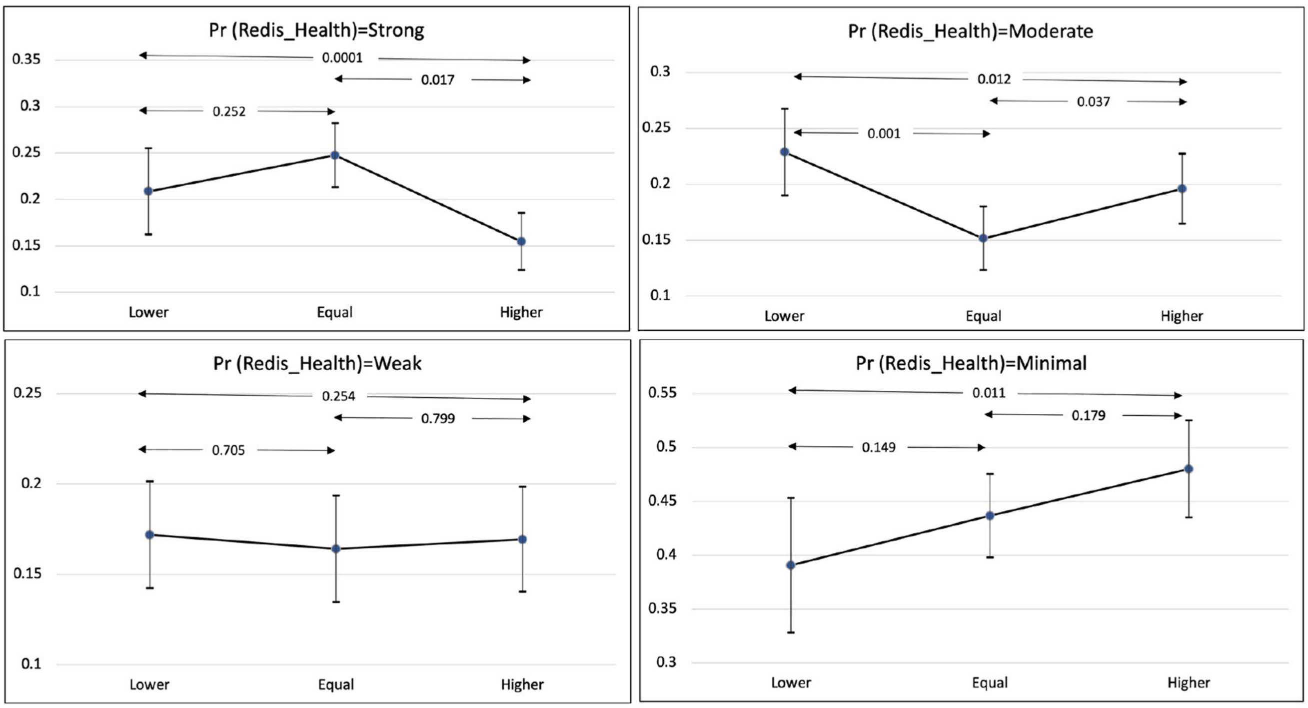

Fig. 2 Effect of inequalities in perceived brute luck on willingness to redistribute in favour of health. Each panel represents a level of redistribution (Strong, Moderate, Weak and Minimal). For each luck level (Lower, Equal, Higher), the predictive margin with 95% CI is presented. For each pair of luck levels, the number corresponds to the *p*-value of a bilateral equality test computed using delta method.

predicted probability of support for a moderate level of redistribution in favour of the environment, and decreasing on the predicted probability of support for a minimal level. No significant pattern was found for the other two degrees of perceived brute luck (moderate and weak).

Figure 2 illustrates how the predicted probabilities for willingness to redistribute in favour of health changed with perceived brute luck. The average marginal effects of higher perceived brute luck were monotonically increasing on the predicted probability of support for a minimal level of redistribution in favour of health. The changes in average marginal effects from "lower than" to "higher than" the population average perceived brute luck were decreasing for a strong (−5.4%) and for a moderate (−3.4%) willingness to redistribute in favour of health.

Discussion

This exploration of how differences in perceived brute luck in daily life influence support for redistribution in favour of the environment and of health yielded three important insights.

First, from a methodological standpoint, the best models were the GOL, selectively relaxing the assumptions of the OL models while being almost as easy to interpret. This allowed us to address differing effects of characteristics on the responses while accounting for their ordinal dimensions (Williams, 2006).

Second, we found that the perceived degree of brute luck in daily life had influences in opposite direction on redistribution in favour of the environment and redistribution in favour of health. Moving from "lower than" to "higher than" the population average significantly increased the likelihoods of support for strong and moderate redistribution in favour of the environment, but significantly decreased the likelihood of support for minimal redistribution, but the opposite was true for redistribution in favour of health.

Third, we found evidence of self-serving bias regarding preferences for redistribution in favour of health. This is consistent with earlier findings that self-interest may overweigh other-regarding motives or fairness views when considering redistributive justice (Dana et al., 2007; Cappelen et al., 2007; Williams, 2021; Chanel et al., 2022).

Before interpreting these results, it is worth noting that health and the environment are associated with different needs—or wants—according to Maslow's hierarchy (1943), which from the bottom upwards include: physiological, safety, love and belonging, esteem, and self-actualisation. Each of these needs must be fulfilled before considering satisfying the next one. Health comes under subsistence needs, which must be satisfied before moving up in the hierarchy to consider more secondary needs (including the environment).

For health, we found no influence from any significant socio-demographic characteristic (except from employed females). Although respondents' current state of health (health status, preventive efforts, risk-taking behaviours), perceived health and anticipated future health cannot be observed in the survey data, these unobservables did influence support for redistribution in favour of health. Self-serving bias is therefore measured by the brute luck component, which here played a significant role in explaining willingness to redistribute.

For the environment, several socio-demographic variables significantly explained willingness to redistribute. The negative effect of income may be related to the fact that higher social classes are less likely to support redistribution (Bai et al., 2022). In addition, the wealthy have other means of avoiding the negative consequences of environmental quality, often are less exposed to negative environmental externalities (air or water pollution, toxic waste, noise, natural hazards). They are also better equipped to reduce negative environmental externalities through costly behaviours, like avoidance, changing locations or better prevention (Champonnois and Chanel, 2022). Finally, the effects of perceived brute luck are well aligned with established theories suggesting that longer-term (environmental) collective interest relates to dispositional optimism.

Our study is subject to certain limitations. First, the data were cross-sectional from three surveys, with no repeated observations that might have captured individual heterogeneity over time but with a possible risk of having captured the pooling effect on the individual responses. However, this study presents an empirical approach to estimate the influence of perceived brute luck, including variables affecting the direction as well as the intensity of response. Second, we cannot disentangle the mechanisms behind the differing influences of brute luck on willingness to redistribute in favour of health and of the environment. In other words, are these differences due to intrinsic differences in fairness views or attributable to the extent of the self-serving bias affecting health? Tinghög et al. (2017) concluded that respondents' fairness preferences depend on the outcomes generated by luck, but also that such preferences differ depending on the type of luck (brute or option) and are subject to self-serving bias. Answering this question would require a specific laboratory experiment.

Overall, this empirical study raised the question of fairness views and self-serving bias when considering redistribution in favour of health and the environment, by focusing on perceived brute luck. It suggests an avenue for future studies on attitudes towards redistribution in favour of other priorities (education and training, unemployment and social action, aid to poor countries, subsidies from public finances) to address inequalities arising from other factors (option luck, effort or social circumstances), from initial opportunities (cultural, institutional, and other contextual factors) or from intergenerational endowments.

Data availability

Underlying data can be provided upon reasonable request.

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Notes

1 See Appendix. The government interventions were Education and training, Unemployment and social action, Aid to poor countries, Environment, National defence, Crime and justice, Local economic development, and Health.

2 The advantage of non-parallel regression models is limited to some extent by the fact that the lines must eventually intersect, making negative predicted values unavoidable for some combinations of the explanatory variables. This is not considered a serious issue (McCullagh and Nelder, 1989), and never occurred in our two estimates.

References

Ami D, Aprahamian F, Chanel O, Luchini S (2011) A test of cheap talk in different hypothetical contexts: the case of air pollution. Environ Resour Econ 50(1):111–130

Atkinson AB, Rainwater L, Smeeding TM (1995) Income distribution in OECD countries, evidence from theLuxembourg income study. In: Volume 18 of OECD Social Policy Studies. Organization for Economic Co-operation and Development, Paris, France

Bai J, Xu B X, Yang S L, Guo Y Y (2022) Why are higher-class individuals less supportive of redistribution? The mediating role of attributions for rich-poor gap. Current Psychol 290:1–11

Biel A, Thøgersen J (2007) Activation of social norms in social dilemmas: a review of the evidence and reflections on the implications for environmental behaviour. J Econ Psychol 28:93–112

Brant R (1990) Assessing proportionality in the proportional odds model for ordinal logistic regression. Biometrics 46:1171–1178

Cappelen A, Hole A, Sorensen E, Tungodden B (2007) The pluralism of fairness ideals: An experimental approach. Am Econ Rev 97(3):818–827

Cappelen A, Konow J, Sorensen E, Tungodden B (2013) Just luck: An experimental study of risk-taking and fairness. Am Econ Rev 103(4):1398–1413

Champonnois V, Chanel O (2022) Accounting for subsistence needs in non-market valuation: a simple proposal. J Environ Plan Manag (forthcoming). https://doi.org/10.1080/09640568.2021.2008884

Chanel O, Luchini S, Teschl M, Trannoy A (2022) Preferences for redistributive justice: a micro-society experiment. Mimeo AMSE, 34p

Charness G, Rabin M (2002) Understanding social preferences with simple tests. Quart J Econ 117(3):817–869

Dana J, Weber RA, Kuang JX (2007) Exploiting moral wiggle room: Experiments demonstrating an illusory preference for fairness. Econ Theory 33(1):67–80

Durante R, Putterman L, Van der Weele J (2014) Preferences for redistribution and perception of fairness: an experimental study. J Europ Econ Assoc 12(4):1059–1086

Dworkin R (1981) What is equality? Part 2: equality of resources. Philosophy Pub Affairs 10(4):283–345
Fleurbaey M (2001) Egalitarian opportunities. Law Philosophy 20:499–530
Frohlich N, Oppenheimer J, Kurki A (2004) Modeling other-regarding preferences and an experimental test. Pub Choice 119(1-2):91–117
Heckhausen J, Wrosch C, Schulz R (2010) A motivational theory of life-span development. Psychol Rev 117:32–60
Lefranc A, Pistolesi N, Trannoy A (2009) Equality of opportunity and luck: Definitions and testable conditions, with an application to income in France. J Pub Econ 93(11-12):1189–1207
Lorenzoni I, Nicholson-Cole S, Whitmarsh L (2007) Barriers perceived to engaging with climate change among the UK public and their policy implications. Global Environ Change 17:445–459
Maslow AH (1943) A theory of human motivation. Psychol Rev 50(4):370–396
McCullagh P, Nelder JA (1989) Generalized linear models, 2nd edn. Chapman and Hall, London, UK
Mouter N (2019) The politics of cost-benefit analysis. in oxford research encyclopedia of politics. Oxford University Press, Oxford
Nyborg K (2014) Project evaluation with democratic decision-making: What does cost–benefit analysis really measure? Ecol Econ 106:124–131
Peterson B, Harrell Jr. FE (1990) Partial proportional odds models for ordinal response variables. Appl Stat 39(2):205–217
Roemer JE, Trannoy A (2016) Equality of opportunity: theory and measurement. J Econ Literature 54(4):1288–1332
Scheier MF, Carver CS (1985) Optimism, coping and health: Assessment and implications of generalized outcome expectancies. Health Psychol 4:219–247
Schneider U, Pfarr C, Schneider BS, Ulrich V (2012) I feel good! Gender differences and reporting heterogeneity in self-assessed health. Europ J Health Econ 13(3):251–265
Stephens JC (2019) Energy democracy: redistributing power to the people through renewable transformation. Environ: Science Policy Sustain Develop 61(2):4–13
Tinghög G, Andersson D, Västfjäll D (2017) Are individuals luck egalitarians? An experiment on the influence of brute and option luck on social preferences. Front Psychol 8:460
Vallentyne P (2002) Brute luck, option luck, and equality of initial opportunities. Ethics 112(3):529–557
Williams M (2021) Do distributional preferences reverse on a dollar? An experiment. Rev Econ Anal 13(4):407–426
Williams R (2006) Generalized ordered logit/Partial proportional odds models for ordinal dependent variables. Stata J 6(1):58–82

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Author contributions

Both the authors contributed to conceptualisation, methodology, formal analysis, data curation, writing and revision of the paper.

Competing interests

The authors declare no competing interests.

Ethical approval

This article does not contain any studies with human participants performed by any of the authors.

Informed consent

This study uses data generated from anonymous survey with no individual identification identifiable by the user. Furthermore, datasets are handled in accordance to the "Database and Privacy" law, Number 78–17 of 6 January 1978, France concerning data processing and privacy. In addition, formal consent to participate was obtained from each respondent and data are used in an aggregated manner.

Additional information

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