Social Class and Income Inequality is Associated with Morality: Empirical Evidence from 67 Countries

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Abstract

A fundamental characteristic of modern societies is economic inequality, where deprived individuals experience chronic economic scarcity. While such experiences have been shown to produce detrimental outcomes in regards to human judgment and decision-making, the consequences of such scarcity for our morality remain debated. We conduct one of the most comprehensive tests of the relationship between experiences of relative chronic economic scarcity and various measures linked to morality. In a pre-registered study, we analyse data from a large, cross-national survey ($N = 46,450$ across 67 countries) allowing us to address important limitations related to measurement validity and external validity in past research. Our findings demonstrate that experiences of relative chronic economic scarcity, as indexed by (1) low subjective socioeconomic status at the individual level, and (2) income inequality at the national macro level, predict higher levels of moral identity, higher morality-as-cooperation, a larger moral circle, and importantly; more prosocial behaviour. The results appear robust to several advanced control analyses. Finally, exploratory analyses indicate that observed income inequality at the national level does not significantly moderate the predicted effect of subjective socioeconomic status. Our findings have vital implications for understanding human morality under chronic resource scarcity.

Main Text

Experiences of relative chronic economic scarcity is a structural characteristic of modern societies and a persistent cause of concern[1,2]. Here and in previous research relative economic scarcity is typically conceptualized as low socio-economic status (SES) at the individual level and income inequality (GINI) at the national macro level (see e.g., ref.[3−8]). A large and expanding body of literature has found that experiences of such scarcity, as well as other types of resource deprivation, can drastically distort human cognition and behaviour[6,9−14]. Specifically, relative economic scarcity has been shown to decrease cognitive functioning, increase future discounting, and lead to more impulsive and risk-seeking behavioural manifestations[6, 9−13,15−18]. Yet, the implications of relative economic scarcity on human morality remain highly debated and extant findings are contradictory.

Existing research appears to be split between two theoretical paradigms; one predicting mainly *negative* outcomes on moral behaviour, and the other mainly arguing the reverse. Concerning research suggesting negative effects of chronic economic scarcity on morality, a selection of studies has found that resource deprived individuals act greedier[17,19], are more inclined to engage in cheating behaviours to obtain resources[20−22], exhibit less prosocial intentions[23], and tend to donate less of their personal income to charitable giving[24,25]. These findings are consistent with highly destructive but prevalent stereotypes and folk beliefs depicting individuals with low SES as irresponsible, dishonest, and "milking the system" (see ref.[26] for a review).

In contrast to this line of literature, other studies have found that resource deprived individuals act in *less* unethical ways and exhibit *more prosocial* responses[8,27−31]. One of the most prominent studies from this body of research has shown that lower social class individuals act in a more generous, charitable, helpful, and trusting way compared to individuals with higher social class[28]. The main theoretical argument behind such findings is that relative resource scarcity is thought to increase individuals' contextual orientation in their display of moral behaviour[27]. That is, individuals with lower social class demonstrate an externally-focused cognitive and relational orientation, which enables them to exhibit greater empathy, more compassion, and more prosocial behaviour towards their peers[27], because they know that their immediate environment can aid them in achieving better life outcomes[32]. Several findings have added robustness to these results by showing that individuals subject to chronic economic scarcity elicit greater prosocial behaviours, especially toward their low-social class peers[31], as manifested through more prosocial actions[28] and a greater proportion of their income donated to charity compared to higher-income individuals[33].

However, underscoring the mixed nature of the current state-of-the-art, a recent pre-registered and high-powered replication of ref.[28] have not yielded the same conclusion[34,35] and a large-scale conceptual replication of the same mechanism even found the opposite relationship, such that individuals with higher social class were found to act more prosocial than their lower social class counterparts, albeit with varying country-level effects[23]. With respect to country-level effects, recent research has moreover found that the effects of social class on prosocial intentions and behaviours could be contextually contingent, indicating that the level of

regional economic inequality might be an important moderator[36,37]. Vitally, these studies have focused on U.S. data, thereby limiting the generalizability of the obtained findings.

As a direct consequence of the mixed findings and the contextual variance, in this pre-registered analysis, we conduct one of the most comprehensive tests of the relationship between experiences of relative economic scarcity and measures linked to moral psychology and behaviour. We rely on a large, largely representative, cross-national survey (N = 46,450 across 67 countries; see Fig. 1 for a country and region overview of the sample), thus providing a unique opportunity to achieve three important main objectives. Specifically, this research design (1) maximizes external validity, providing higher generalizability than prior studies which typically rely on data from a single country; (2) enables a statistically well-powered test of the relationship between experiences of economic scarcity, as indexed by socio-economic status at the individual level and GINI coefficients at the macro level, and morality across cultural and national contexts; and (3) allows us to examine whether the level of economic inequality at the national level moderates the relationship between SES and morality. This is an important extension of past research, as prior studies have been characterized by low external validity from underpowered laboratory experiments[38–43], replicability concerns in the form of null-findings, results that are in the opposite direction as those reported in the original research[34], and potential contextual sensitivity by variations in time, culture, or location[44–47], which could explain part of the inconsistencies in the literature[19,23].

To probe the internal validity and contextual sensitivity of our results, we rely on advanced statistical methods in the form of multi-level modelling and cross-validations using machine learning algorithms, in order to identify robust individual and country-level associations between our measures of relative economic scarcity and morality. In doing so, we contribute with a robust cross-cultural and externally valid extension of previous research[28,29,34,35,44,48,49] on how experiences of chronic resource scarcity might affect moral psychology and behaviour. A contribution which, we argue, has important implications for our understanding of how scarcity affects human behaviour in general.

Results

We begin by analysing the relationship between relative scarcity and morality using multi-level modelling, both on the individual level (SES) and on the group level (GINI), and whether there might be any country-level differences in such a relationship. Table 1 reports full models for our four dependent variables, with standardized b-coefficients allowing for a direct comparison of the effect sizes and model fit statistics. Sample sizes for each model are reported, given that these varied slightly due to some participants being able to refrain from replying to certain measures in the survey. As a robustness check, we also ran our models with imputed data where the missing values were estimated using non-parametric random-forest estimations. The results remained robust to this imputation of data and are depicted in the *Supplementary Table S3.*

Table 1 | Multilevel Models

Predictors	Moral Identity		Morality-as-Cooperation		Moral Circle		Prosocial Behavior	
	Std. b (95% CI)	p	Std. b (95% CI)	p	Std. b (95% CI)	p	Std. b (95% CI)	p
Subjective SES	-0.13 (-0.14 – -0.12)	**<0.001**	-0.07 (-0.08 – -0.06)	**<0.001**	0.02 (0.01 – 0.02)	**0.001**	-0.08 (-0.09 – -0.07)	**<0.001**
GINI Index	0.12 (0.04 – 0.21)	**0.004**	0.03 (-0.04 – 0.10)	0.426	0.09 (0.03 – 0.14)	**0.001**	0.04 (-0.02 – 0.11)	0.215
Gender	0.06 (0.05 – 0.06)	**<0.001**	0.04 (0.04 – 0.05)	**<0.001**	0.09 (0.08 – 0.10)	**<0.001**	0.08 (0.07 – 0.08)	**<0.001**
Age	0.04 (0.03 – 0.05)	**<0.001**	0.01 (0.00 – 0.02)	**0.021**	0.07 (0.06 – 0.08)	**<0.001**	0.05 (0.04 – 0.06)	**<0.001**
SES * GINI	-0.00 (-0.01 – 0.01)	0.728	-0.01 (-0.01 - -0.00)	**0.003**	-0.00 (-0.01- 0.01)	0.896	-0.00 (-0.01 – 0.01)	0.963
Random Effects								
σ^2	177.64		122.73		25.88		1150.57	
τ_{00}	25.51 $_{country}$		12.75 $_{country}$		1.25 $_{country}$		95.62 $_{country}$	
ICC	0.13		0.09		0.05		0.08	
N	67 $_{country}$		67 $_{country}$		67 $_{country}$		67 $_{country}$	
Observations	44967		45078		45722		46026	
Marginal R^2 / Conditional R^2	0.037 / 0.158		0.008 / 0.101		0.019 / 0.064		0.016 / 0.092	
AIC	360839.713		345035.822		278759.371		455276.033	

As illustrated in **Table 1**, after controlling for age and gender, individual-level lower subjective SES predicts higher Moral Identity (b[95% CI] = -0.13[-0.14, -0.12], P<0.001), higher Morality-as-Cooperation (b[95% CI] = -0.07[-0.09, -0.07], P<0.001), more prosocial behaviours in the form of donation intentions towards national and international charities (b[95% CI] = -0.08[-0.08, -0.06], P<0.001), but a smaller Moral Circle (b[95% CI] = 0.02[0.025.85e-03, 0.02], P<0.001); that is, a smaller group of people to whom participants are concerned in terms of whether something good (or bad) will happen to them. Visualizations of these results are illustrated in **Figure 2**.

Corroborating these results, higher degrees of country-level economic inequality (i.e., GINI) also predicts higher individual-level Moral Identity (b[95% CI] = 0.12[0.04, 0.21], P<0.001), but interestingly a greater Moral Circle (b[95% CI] = 0.09[0.03, 0.14], P<0.001). This type of country level economic inequality, however, does not predict individual level differences in Morality-as-Cooperation (b[95% CI] = 0.03[-0.04, 0.10], P=0.435) or prosocial behaviours (b[95% CI] = 0.04[-0.02, 0.11], P=0.220), as is the case with subjective SES. Hence, these results indicate that individuals living in contexts of greater economic inequality put more importance in both symbolizing and internalizing a moral identity, as well as reporting to have a larger moral circle. Visualizations of these associations are illustrated in **Figure 3**. However, it is important to note that economic inequality does not meaningfully moderate

the effect of low SES on any of our indicators of morality. Thus, we cannot claim that individuals living with low SES in more economically unequal countries exhibit more moral behaviour and a higher moral character than their more affluent counterparts. Instead, our results indicate that exposure to relative resource scarcity on the individual level (low SES) might partially elicit the same effects as resource scarcity on the national level (GINI).

Variance partition coefficients[50] for the models indicated that the majority of the variance could be attributed to the individual level (Moral Identity = 87.4%, Morality-as-Cooperation = 90.6%, Moral Circle = 95.4%, Prosocial Behaviour = 92.3%) with variance at the country-level ranging from 4.6% at the lowest (Moral Circle) to 12.6% at the highest (Moral Identity). We assume that some of this lack of country-level variance is due to common-methods variance inflating the estimates at the individual level[51,52]. Additionally, this lack of country-level variance indicates that the relationship between relative economic scarcity and moral character and behaviour might be fairly robust across different cultural contexts. The robustness of these cross-cultural relationships also aligns with recent findings using the same data to investigate differences in donation behaviour, in-group favouritism, and age across the 67 countries[53].

When exploring the relationship between the moral measures and the individual-level measure of relative resource scarcity (subjective SES) on the country and region-level, the directions of the effects generally remained stable. Nevertheless, notable country-level differences in effect sizes were observed (*Supplementary Tables S1, S2, S4, S5, S6 and S7*). For instance, country-level correlations indicated that associations between SES and Moral Identity were larger and highly significant for countries such as Australia (r[95% CI] = -0.29[-0.33, -0.25], P < 0.001) and France (r[95% CI] = -0.24[-0.30, -0.19], P < 0.001), while smaller and non-significant for countries such as Ghana (r[95% CI] = 0.03 [-0.18, 0.12] P > 0.999) and Iraq (r[95% CI] = 0.04[-0.05, 0.12], P > 0.999). Also, region-level correlations indicated that associations between the same variables were larger in world regions such as Asia (r[95% CI] = -0.19[-0.21, -0.17], P < 0.001), while smaller in Europe (r[95% CI] = -0.07[-0.09, -0.06], P < 0.001).

Lastly, when running country-level Nested OLS models (another form of multi-level modelling) for all dependent moral measures, notable differences in effect sizes and predictive power emerged. For instance, when comparing country-level associations between prosocial behaviour and SES, significant negative associations were found in India (b[95% CI] = -0.24[-0.32, -0.16], P<0.001) and South Africa (b[95% CI] = -0.18[-0.27, -0.09], P<0.001), while significant positive associations were found in Russia (b[95% CI] = 0.10[0.02, 0.18], P=0.017) and Latvia (b[95% CI] = 0.10[0.03, 0.16], P=0.003). These findings illustrate notable contextual differences between how and when experiences of resource scarcity on the individual level might affect moral character and behaviour (*Supplementary Tables S4, S5, S6, S7).

Overall, and despite these cross-national differences, our results indicate robust associations between individual-level (SES) and country-level (GINI) chronic economic scarcity and validated indicators of moral character and behaviour. Hence, contrary to current theoretical paradigms concerning resource scarcity and moral behaviour[6,15,17,19,20] and our pre-registered prediction (https://aspredicted.org/727eq.pdf), we find evidence for the notion that relative chronic economic deprivation is not associated with a "depletion" of moral character or that it makes individuals less prosocial, but rather results in *more* moral outcomes.

Discussion

To date, research investigating how chronic economic scarcity might affect human morality has been mixed and at times contradictory. Based on research showing that scarcity impedes cognitive functioning[10,12], directs attention towards short-term gratification[18,54-56], and increases economic risk-taking[57-62] together with a selection of recent findings highlighting a possible *causal* link between individual experiences of resource scarcity and unethical behaviour[19,20,35,63,64], our pre-registration postulated that individuals with higher SES, living in more economically equal societies, would elicit greater moral character and behaviour than their lower-class counterparts. However, we found the exact opposite. Aggregating the data across 67 countries, socioeconomic status was *negatively* associated with moral identity (**Fig. 1a**), morality-as-cooperation (**Fig. 1b**) as well as prosocial behaviour in the form of donation intentions towards national and international charities (**Fig. 1d**), while being *positively* associated with the size of one's moral circle (**Fig. 1c**). As such, individuals with less financial resources not only seem more inclined to perceive themselves as moral individuals (i.e., moral identity), but also seek to project such behaviour towards their peers and in-group (i.e., morality-as-cooperation, moral circle, and prosocial behaviour). Importantly, we show that this

relationship, at least to some extent, holds on the national level such that individuals living in countries with high economic inequality (GINI), and thus a greater degree of relative economic scarcity, report a stronger moral identity (**Fig. 2a**) but also a greater moral circle (**Fig. 2c**). These associations are highly robust in cross-validations with supervised machine learning algorithms (10-folds, 200 repetitions; *Supplementary Table S8*).

Yet, the contrast between our pre-registered predictions and the empirical results raises the question of how our results be interpreted? Concerning prosocial behaviour, a selection of findings shows that chronic scarcity (i.e., low social class) can increase prosocial behaviour[8,28,31,44]. As previous research (ref.[27,28,48,65]) has argued that individuals living with lower social class have an increased contextual social orientation (vs. individualistic), the link between prosocial behaviour and relative resource scarcity appears meaningful in that resource deprived individuals, while having less available resources themselves, may still exhibit more prosocial behaviours towards others, as such prosocial actions could aid in generating better future life-outcomes (i.e., by reciprocation).

The relationship we find between chronic economic scarcity (SES and GINI, respectively) and moral identity suggests that perceiving oneself as a moral individual (internalized moral identity) and exhibiting moral behaviour towards others (symbolized moral identity) is more important for individuals living with less available resources. Lower class individuals could act more moral, because they are more sensitive to their social environment as their life tends to be influenced by forces which they cannot necessarily control (e.g., relying on government policies, help from charity organizations, and decisions of job managers)[27,66]; see also[67]. Acting as a moral individual might not be as important if you perceive the world from a more individualistic perspective, which people of higher social class tend to do[27].

The link we find between relative resource scarcity and morality-as-cooperation indicates that the moral valence of cooperation principles receives higher importance in populations where resources are scarce. At a general level, managing external constraints and depending on other individuals requires some, albeit differing, degrees of cooperation in order to gain fruitful outcomes[68]. Consequently, morality is considered a central foundation of cooperative behaviour[69,70] and one of the main functions of morality is to promote fruitful cooperation[68-73]. The concept of morality-as-cooperation used in the analysis conceptualizes that certain forms of cooperative behaviour, such as helping a family or group member, reciprocating, and sharing resources are considered morally good in all cultures[69,74]. Our results indicate that individuals living with chronic economic scarcity are more inclined to value whether someone helped a member of their family or worked to unite a community when they decide on whether something is right or wrong[69,74]. Thus, our findings on morality-as-cooperation suggest that resource deprived individuals are particularly prone to consider their external environment when making moral decisions, likely because they know that they depend on such cooperative connections to obtain more favourable life outcomes.

Regarding the link between chronic economic scarcity and the size of one's moral circle, we find that individuals with lower social class tend to have a smaller moral circle than individuals with a greater access to economic resources (**Fig. 2c**), while individuals living in more economically unequal societies tend to have a larger moral circle (**Fig. 3c**). From an evolutionary perspective, the observed positive relationship between SES and the size of one's moral circle might be explained by models of parochial altruism[75,76]. In other words, resource deprived individuals may act increasingly altruistic towards their in-group in order to facilitate successful cooperation, but display less moral behaviour towards out-groups in order to successfully protect in-group members.

While the results of the present study originate from a large, representative, cross-cultural sample and appear highly robust, the magnitude of the associations reported herein is relatively small and the general explanatory power of our models is modest by conventional standards. Nevertheless, psychological and cognitive phenomena related to human morality are expected to be influenced by a plethora of different factors[77-80], which means that small effect sizes are to be expected as long as these phenomena are not examined in controlled lab conditions, but rather in real-world settings[81-85]. Recently, research has started to adopt the approach of examining human psychology using more externally valid data sources as the increased computational power of personal computers has allowed scholars to assess very large datasets, with advanced statistical tools, such as machine-learning and neural network models[86,87]. For example, recent scholarly work relying on such methods has documented small but highly robust associations between physical topography and human personality traits[88]. Therefore, while the effect

sizes from our analysis are small, this does not imply that they lack practical relevance[88-90]. Effect sizes that are considered small by arbitrary standards can have a large impact when evaluated over time[77,91] or at scale[92-94]. This is particularly true for human psychology, where effects can accumulate over time, thus underscoring the fact that while an effect might be small when measured at a single point in time, it can have large ultimate consequences[77]. Also, psychological processes, especially regarding morality, are characterized by "difficult-to-influence" dependent variables, which emphasize that robust small effects are theoretically important[95]. For instance, our findings demonstrate that an increase of one standard deviation in SES is associated with a decrease of 2.84% in donation value towards national and international charities, which might seem trivial when considered at the individual level, but can have large consequences for societal outcomes at the population level[77,80,96,97].

A final note should be that the dataset used in the present investigation was collected during the COVID-19 pandemic. While the general idea regarding the pandemic seems to be that "COVID-19 does not discriminate," recent studies have shown that vulnerable individuals, such as those with discriminated ethnicities or those who are economically disadvantaged, have higher mortality rates than their less vulnerable counterparts[98,99]. The results of the current study not only show a general link between relative resource scarcity and human morality, but also suggest that this association is present when people with the least resources experience an extraordinary increase in the level of risk and exposure to threat. As research has argued that hostile environments motivate people with less available resources to engage in prosocial behaviour[28,100], our findings may therefore be stronger than similar investigations conducted during pre- or post-pandemic times or data collected in the absence of other public crises (e.g., financial recessions, droughts, terrorism attacks, and wars).

In conclusion, the present research demonstrates that social class and income inequality predicts multiple dimensions of human morality. These findings underline the complex impact that social class and inequality have on the way individuals morally respond and act. We consequently urge future research to further investigate how moral character and behaviour might be affected by experiences of chronic resource scarcity and how such knowledge might be utilized to help the ones with the least, the most.

Methods

The present study was pre-registered on AsPredicted before the data was accessed (https://aspredicted.org/727eq.pdf, August 3rd 2020). While we generally adhered to the pre-registered analysis plan, there are some deviations, which should be noted. Specifically, for our main analysis we employed multilevel correlation analysis, nested OLS regressions, multi-level modelling (Linear Mixed Effects models) and cross-validations instead of standard Pearson's correlations and simple OLS regression, thus addressing the same questions as pre-registered but with more sophisticated and robust methods.

The data was obtained from the International Collaboration on Social & Moral Psychology of COVID-19 (ICSMP)[101]. This project was a large-scale collaboration between more than 200 researchers from 67 different countries with a goal to create an online survey to measure psychological factors underlying the attitudes and behavioural intentions related to COVID-19. The project received ethical approval from the institutional review board at the University of Kent (ID 202015872211976468) and informed consent was obtained from all participants prior to their voluntary participation in the study. The dataset contains self-reported demographics and social and moral psychology data from 46.450 individuals from 67 countries and 5 different regions of the world. Each national team responsible of collecting data in their country translated the English survey into their nations' language using the standard forward-backward translation method. Every participating country was asked to collect data from at least 500 participants, nationally representative with respect to gender and age. The data was collected between April-May 2020 and was administered using an online survey. Every participating individual answered questions regarding demographics and self-reported public health behaviours as well as a series of psychological measures. Scale order was randomized for every participant. The dataset was cleaned by the lead methodologists from the ICSMP project for the initial publication using the dataset[101]. 50,944 participants answered the survey. 2,049 participants were excluded for not having completed the full survey. 131 participants were excluded for being younger than 18 y/o or older than 100 y/o. Lastly, participants who failed attention checks were removed which resulted in a final sample of 46,450 participants. 30 countries were able to collect fully representative samples with respect to sex and age. 44 countries were able to collect more than 500 subjects. Participant's mean age was 43 years and 51.6% were females.

In addition to data from the ICSMP, we obtained the most recent GINI Indexes from the World Bank[102], for every country included in the study, with few exceptions. Taiwan GINI data was obtained from Statista[103], Cuban GINI data was obtained from Reuters[104] and New Zealand and Singapore GINI data was obtained from Knoema[105,106]. Region names was obtained from the World Bank Development Indicators[107].

Variables

Moral Identity was measured using a scale of 10-items[96] such as "It would make feel good to be a person who has these characteristics", which would be answered based on a description of a person who has the characteristics: "caring, compassionate, fair, friendly, generous, helpful, hardworking, honest, kind". Each item was measured using a 10-point slider with three labels: 0 = "Strongly disagree", 5 = "Neither agree nor disagree", 10 = "Strongly agree". Items 3 and 4 were reverse scored. Results were aggregated into a single-scale (Cronbach's a = .729), instead of two subscales (internalization and symbolization), as in the original publication developing the scale[96]. Hence, our aggregated measure of moral identity indicates 1) how important moral identity is to one's self-definition (*internalization*) and to what degree individual's express this moral identity (*symbolization*), but does not distinguish between the two respectively.

Morality-as-Cooperation was measured using a 7-item scale adapted from ref.[108]. Each item represented one question out of three from each of the seven "relevance items" from the Morality-as-Cooperation questionnaire[108]. The questions chosen from the original scale were the ones with the highest predictive validity[101]. Individuals were initially asked the following: "When you decide whether something is right or wrong, to what extent are following considerations relevant to your thinking?". Here, the "family" item was labelled "Whether or not someone helped a member of their family". The "group" item was labelled "Whether or not someone worked to unite a community". The "reciprocity" item was labelled "Whether or not someone showed courage in the face of adversity". The "deference" item was labelled "Whether or not someone deferred to those in authority". The "fairness" item was labelled "Whether or not someone kept the best part for themselves". The "property" item was labelled "Whether or not someone kept something that didn't belong to them." Each item was measured using a 10-point slider with three labels: 0 = "Strongly disagree", 5 = "Neither agree nor disagree", 10 = "Strongly agree". All 7-items were aggregated into our single measure of Morality-as-Cooperation (Cronbach's a = .732). In the original publication developing the scale, test-retest correlations for the full scale was shown to range from .79 to .89[108].

Moral Circle was measured using a single-item scale with 16 levels[109], asking participants to indicate the extent of their moral circle, where moral circle means "the circle of people or other entities for which you are concerned about right and wrong done toward them." The scale ranges from 1 = "all of your immediate family" to 16 = "all things in existence". Test-retest reliability of a similar scale has previously been shown to be .61.[110]

Prosocial behaviour was measured using a hypothetical choice task with three items. This task asked individuals how much (in percent), if given a median income, they would be willing to 1) keep to themselves, 2) donate to a *national* charity and 3) donate to an *international* charity. We formed our measure of prosocial behaviour, by aggregating the second and third item, across individuals.

Subjective socioeconomic status (SES) was measured using the single-item MacArthur ladder scale[110]. This scale uses a picture of an 11-step ladder and asks participants where, in their country, they would stand if the top indicated the people who are the best off – those who have the most money, the most education and the most respected jobs, while the bottom are the people who are the worst off – those who have the least money, least education, and the least respected jobs or no jobs. Participants indicated their standing in their respective society from 0 (absolute bottom) to 10 (absolute top).

GINI Index, as measured by the World Bank, is based on primary household survey data obtained from statistical agencies and World Bank country departments[102]. It measures the amount of income inequality, where 0 = total equality and 100 = total inequality. For more info on specific measurement and methodology, see PovcalNet from the World Bank (iresearch.worldbank.org/PovcalNet/index.htm).

Correlations

Due to the nested structure of our data, the correlations between the variables; subjective socioeconomic status (SES)[110], moral identity[96], morality-as-cooperation[108], moral circle[109] prosocial behaviour were calculated using multilevel Pearson's correlations with country as the random intercept. We also calculated grouped correlation coefficients for every country and region in the dataset, in order to identify country-level differences of interest (*Supplementary Tables S1 and S2*). Correlations between our dependent variables and the independent variable "GINI Index" was calculated as single-level Pearson correlations without the multilevel nesting, as the GINI Index would not be different per individual measure, as it constitutes a country-level measure.

Multilevel Models

We performed two specific forms of multi-level modelling.

Firstly, we performed linear mixed effects modelling[111], where we regressed our dependent variables with our two main independent variables, covariates and country as the random intercept. Two-tailed significance testing (a = .05) was applied for all analyses. For ease of reporting and interpretation, we standardized parameters to report *b*-coefficients and 95% confidence-intervals of our analysis.

Secondly, we performed Nested Ordinary Least Squares (OLS) regressions on all of our dependent variables, with the independent variable subjective socioeconomic status, as only this variable would variate on the individual level, as GINI is a country-level measure. Country was used as nesting, such that we simultaneously ran 67 OLS regressions for each of our dependent variables. This then allowed us to identity the individual country-level coefficients for each of our models. Full model results of these models are reported in *Supplementary Tables S4, S5, S6, S7* and visualizations are reported in *Supplementary Figures S1, S2, S3, S4.*

Cross Validations

As a robustness check to access the predictive power of our models, we applied 10-fold cross validation, with 200 repetitions on all multi-level models. Cross-validation is a form of supervised machine-learning which splits the dataset into *K* number of independent datasets (in our case 10) and then uses every dataset in turn as the validation set, where the other *K-1* datasets then act as the calibration sets. Each fold of the data leads to a different estimate of the *Root Mean Square Error* (RMSE) of the model and therefore the process is repeated multiple times (in our case, 200) to get reliable estimates. While cross-validation can be used as a procedure in model-selection, in this article we used the procedure to validate the robustness of our models[112]. That is, our cross validations provide confidence in the reported findings, by illustrating that the included model results are in fact the ones with the lowest *RMSE*. The full results of all cross validations can be found in the *Supplementary Table S8.*

Data availability

Code availability

Declarations

Author Contributions

All authors conceived the core research idea and designed the study. C.T.E. collected, pre-processed and analysed the data from the International Collaboration on the Social & Moral Psychology of COVID-19. All authors contributed to interpretation of the results. All authors wrote the manuscript and approved of the final version.

Competing interests

The authors declare no competing interest.

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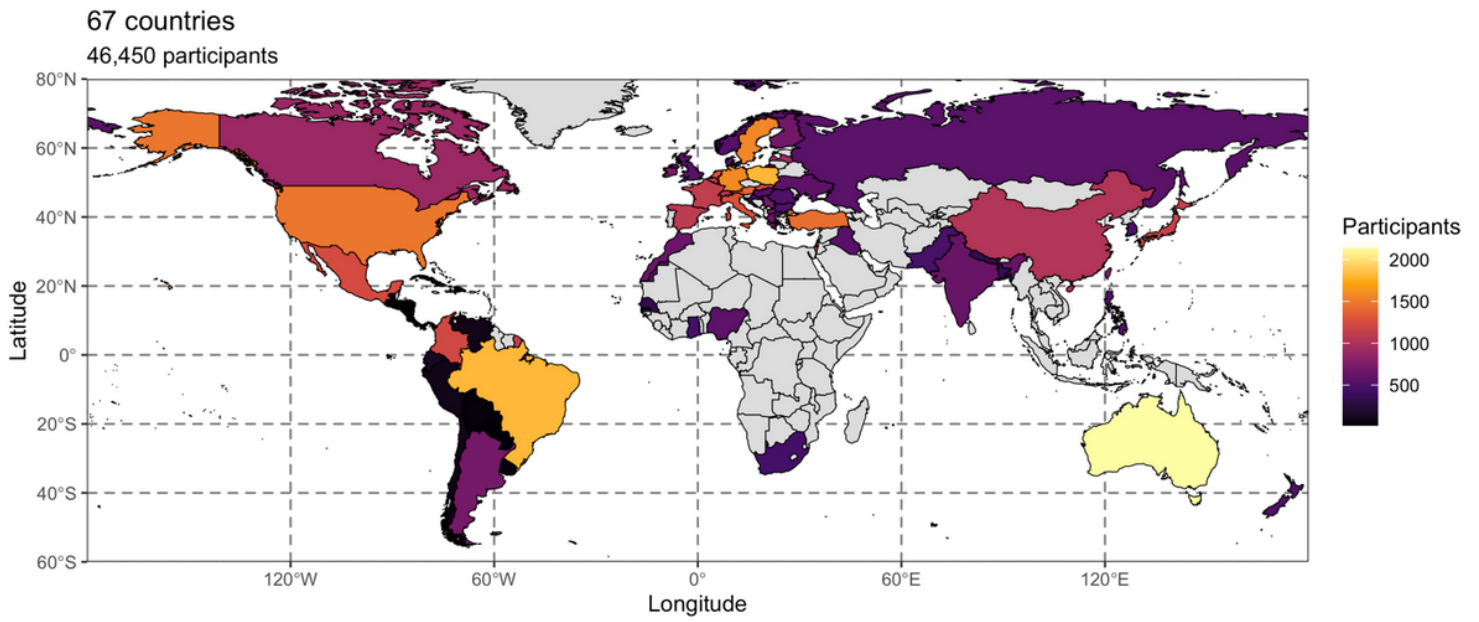
Figures

Figure 1

World map of ICSMP survey. The map highlights the countries and regions who collected data for the ICSMP Survey. Sample sizes are scaled to colour. Grey areas identify areas where it was not possible to obtain samples.
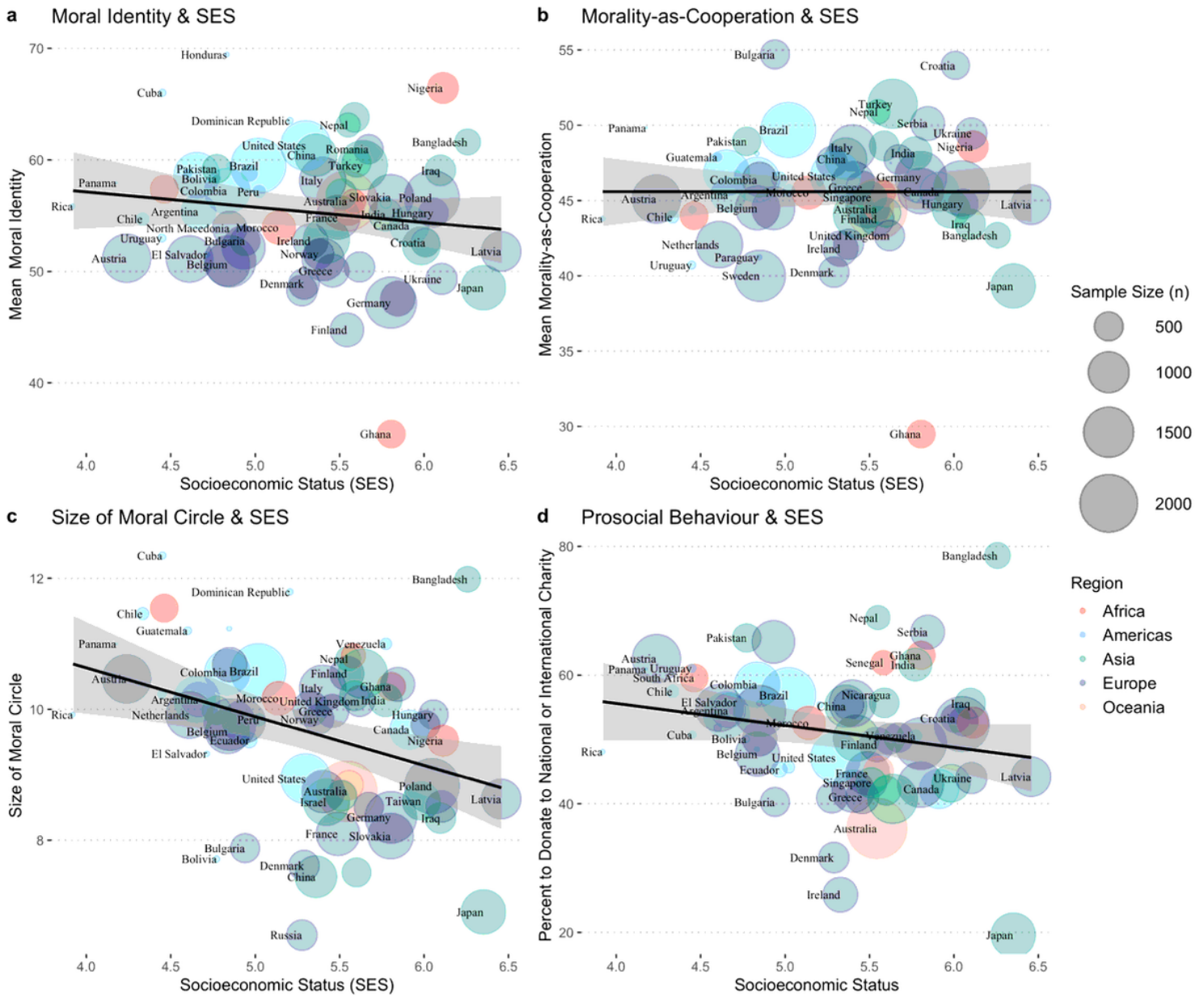
Figure 2

Country and region-level relationship between moral identity, morality-as-cooperation, size of moral circle, prosocial behaviour and socioeconomic status. a, Association between socioeconomic status (SES) and degree of individual-level moral identity. b, Association between SES degree of morality-as-cooperation. c, Association between SES and the size of one's moral circle, where size indicates the circle of people or other entities for which one is concerned whether right or wrong is done towards them. d, Association between SES and prosocial behaviour, where such behaviour is measured as the amount of money (out of a median income) one would be willing to donate to a national or international charity.
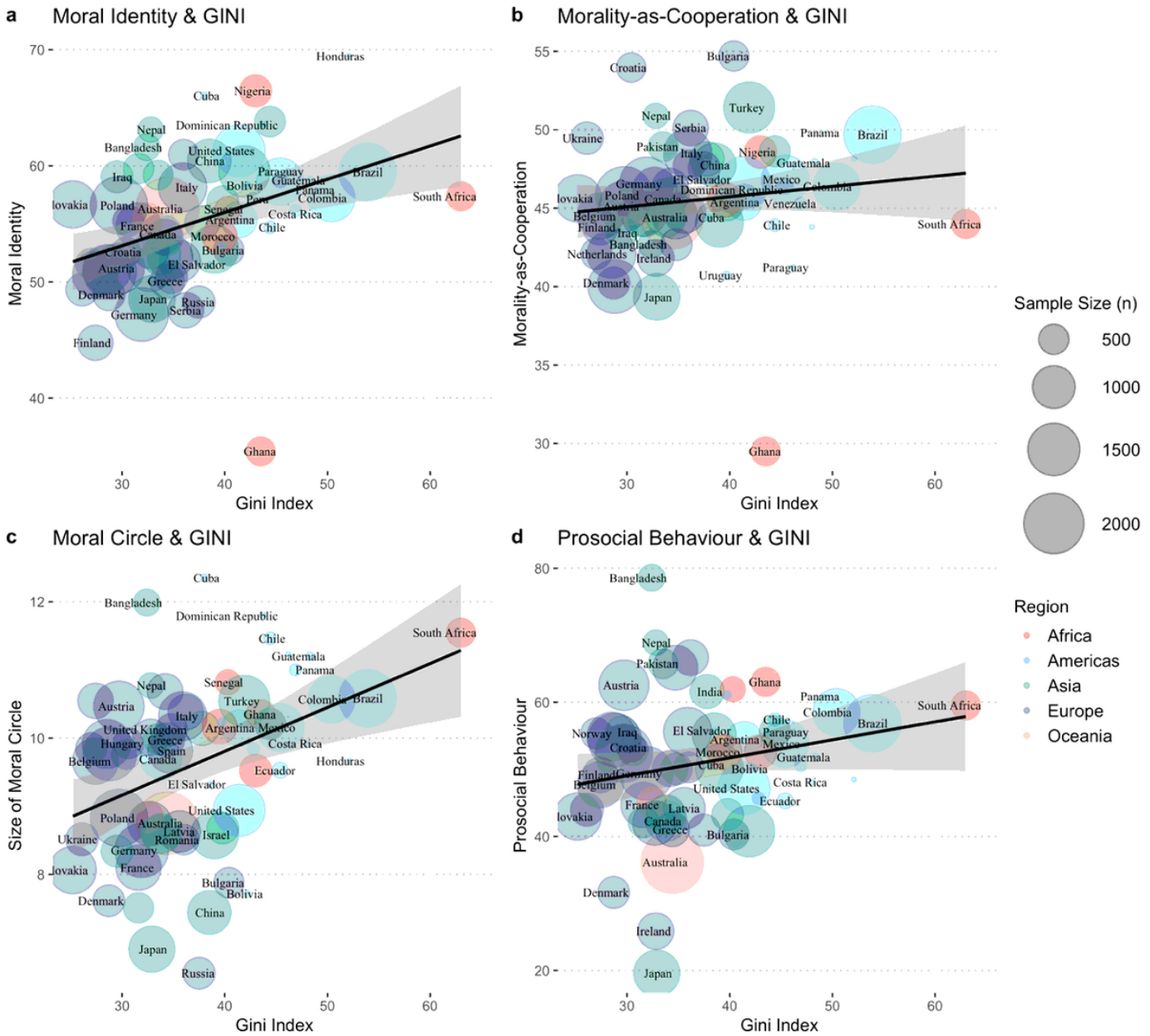
Figure 3

Country and region-level relationships between moral identity, morality-as-cooperation, size of moral circle, prosocial behaviour and level of income inequality. a, Association between level of income inequality (GINI) and how much moral identity individuals exhibit and report to have. b, Association between level of income inequality (GINI) and morality-as-cooperation. c, Association between level of income inequality (GINI) and the size of one's moral circle, where size indicates the circle of people or other entities for which one is concerned whether right or wrong is done towards them. d, Association between level of income inequality (GINI) and prosocial behaviour, where such behaviour is measured as the amount of money (out of a median income) one would be willing to donate to a national or international charity.

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