Social Preferences Across WEIRD and Non-WEIRD Cultures*

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Abstract

We conduct a direct, high–powered replication of Bruhin et al. (2019) to compare structurally estimated social preferences and their predictive performance between a WEIRD (Switzerland) and a non-WEIRD (Ghana) country. We present the original experimental design to 477 online participants from Ghana and assess whether the estimated social preferences differ from those in the original Swiss student sample. We find both similarities and differences between the two samples. In particular, whereas selfish and spiteful preferences are more prevalent in the Ghanaian sample, certain motives — such as aheadness aversion and positive reciprocity — are common to both countries. Furthermore, we test the predictive accuracy of estimated social preferences in trust and reward-and-punishment games. While only individual-level estimates accurately predict trustworthy, punishing, and rewarding behavior in the Ghanaian sample, both individual-level and finite mixture estimates successfully predict such behaviors in the Swiss sample. Our findings shed light on the performance of preference estimates and their measurement methods across populations.

1. Introduction

Understanding how social preferences shape behavior is central to Economics. They affect outcomes in labor markets, redistribution, cooperation, and punishment (Fehr and Charness, 2025) and have been formalized in models of inequality

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aversion, altruism, and reciprocity (e.g. Fehr and Schmidt, 1999; Levine, 1998; Rabin, 1993; Dufwenberg and Kirchsteiger, 2004). A growing literature measures such preferences using structural methods (Andreoni and Miller, 2002; Cappelen et al., 2007; Fisman et al., 2007; Bellemare et al., 2008; Iriberri and Rey-Biel, 2013; van Leeuwen and Alger, 2024). In particular, Bruhin et al. (2019) structurally estimate distributional and reciprocal preferences from a large set of binary choices with Swiss university students. They use those estimates to document i) a significant predictive power of social preferences in trust and reward-and-punishment games; and ii) their temporal stability.

While these structural approaches provide deep insights into people's broad altruistic inclinations, their domain of application in the literature is narrow. Most experimental studies have been conducted on student samples in Western, Educated, Industrialized, Rich, and Democratic (WEIRD) countries.[1] Yet, evidence suggests that students display systematically different behavior compared to the general population (Cappelen et al., 2015; Epper et al., 2024). Likewise, cross-cultural experiments reveal that preferences and behavior vary substantially across societies, with marked differences in fairness, punishment, and cooperation norms (Falk et al. (2018); also see Drouvelis (2021) for a review).[2]

We address this gap by directly replicating Bruhin et al. (2019) on an online sample from Ghana, a Sub-Saharan, non-WEIRD country. Using the same experimental design, we: (i) characterize the distribution of structural social preference parameters; and (ii) test their out-of-sample predictive validity in trust and reward-and-punishment games. The comparison with Swiss students from the original study allows us to assess both cross-cultural differences in structural estimates of social preferences alongside their predictive power.

Our findings provide strong evidence in favor of the hypothesis that preferences and behavior differ across cultures. Our structural estimates differ from those of Bruhin et al. (2019). In particular, we find a sizable proportion of selfish and spiteful individuals, in contrast with the substantial proportion of altruists (a minority in Ghana) observed in the Swiss data.[3] In addition, we find general

[1] See Henrich et al. (2010) for more details on what this nomenclature means and why it is important for research in Psychology and Economics.

[2] For the first wave of anthropological research documenting how culture shapes altruism, see Henrich et al. (2001), Henrich et al. (2005), Henrich et al. (2006), and Herrmann et al. (2008). For more recent evidence on how culture influences fairness, meritocracy, and honesty, see Cappelen et al. (2013), Jakiela (2015), Cohn et al. (2019), Almås et al. (2020), Almås et al. (2021), Drouvelis (2023), and Almås et al. (2025).

[3] It is important to note that spiteful individuals, although not present as a type in the finite-mixture estimates of Bruhin et al. (2019), have been documented when using Kerschbamer (2015)'s Equality Equivalence tests. See, for instance, a summary of the empirical results in Fehr and Charness (2025). That evidence, however, comes only from WEIRD countries and in

support for the hypothesis that social preferences drive behavior: in both our Ghana sample and Bruhin et al. (2019)'s Swiss sample, predictions based on social preference parameters are an important determinant of trustworthy, rewarding, and punishing behavior. However, in contrast to the replicated article, we find little support for the predictive validity of finite-mixture estimates, emphasizing the importance of individual-level estimates for predicting the variability of social behavior.

The paper proceeds as follows. Section 2 describes the experimental design. Section 3 presents the results and compares them to those of Bruhin et al. (2019). Finally, Section 4 concludes.

2. Experimental Design and Procedures

2.1. Experimental Tasks

As in Bruhin et al. (2019) (henceforth, BFS), subjects made 117 binary allocation decisions. Thirty-nine of these were **dictator games** in which subjects chose between two payoff allocations for themselves and an anonymous counterpart. The different dictator games manipulated the cost of increasing or decreasing the other player's payoff.

The remainder were 78 **reciprocity games** played as a second mover, which involved a first stage where the other person had to choose between enforcing a given monetary distribution or delegating a dictator game to the second mover. In 39 of those games, the first mover's enforceable distribution gave the second mover a higher (resp. lower) payoff than the two distributions they could choose as a second mover in the second stage. We refer to the reciprocity games in which the enforceable distribution gave a higher (resp. lower) payoff as negative (resp. positive) reciprocity games.

Each of the 39 positive and negative reciprocity games involved, for the second mover, a decision between two income distributions that were payoff-isomorphic to those in the 39 dictator games. Hence, the only difference between dictator and reciprocity games was whether the second mover should perceive the first mover as *kind* or *unkind*.

These 117 tasks allow for a clean identification of the following social preference utility function's parameters:

$$U_A = (1 - \alpha s - \beta r - \gamma q - \delta v) \cdot \pi_A + (\alpha s + \beta r + \gamma q + \delta v) \cdot \pi_B, \tag{1}$$

where A refers to the focal player, π_A (resp. π_B) represents her (resp. the other player's) monetary payoff, α, β, γ, and δ represent the parameters related

a substantially smaller quantity than the one we document for our Ghanaian sample.

to behindness aversion, aheadness aversion, positive reciprocity, and negative reciprocity, respectively, and s, r, q, and v are indicator variables that take the value of 0 or 1 depending on whether the relevant condition for a given parameter applies.

In addition, we presented subjects ten **trust games**, in which they acted as second movers and had to decide how much money to give back to the first mover in the form of a binary decision between two alternatives, and two **reward and punishment games**, where experimental subjects could increase or decrease the first mover's payoff by adding or subtracting income at a cost to themselves.

2.2. Procedures

We directly replicate the second section of BFS in a sample drawn from the Ghanaian population. We recruited subjects online from BeSample's subject pool.[4] We implemented the 129 experimental games exactly as in BFS, only adjusting the exchange rate.[5] Before administering the 117 dictator and reciprocity games, participants completed comprehension tests, and during this sequence we also embedded five attention checks at random positions.[6] In addition, we collected data on participants' gender, income, field of study or work, age, cognitive ability, and Big Five personality traits.[7,8]

We recruited 477 participants, substantially more than the 174 in BFS's experiment. Following BFS, we excluded subjects whose estimated individual preference parameters fell outside the admissible range of [–3, 1], yielding a final sample of 333 participants.[9] This sample provides over 80% power to detect coefficients in the representative agent model reported in Table 1, even for coefficients 25% smaller than those reported in BFS, and nearly 100% power for the out-of-sample regressions reported in subsection 3.4. Detailed information on data collection, sample characteristics, and power calculations is provided in the Online Appendix.

[4] See `https://besample.app/`.

[5] To preserve incentive intensity across experiments, we apply an exchange rate such that expected earnings correspond to the same proportion of median income in each setting.

[6] In Figures A.1 to A.3 we present screenshots of the reciprocity and dictator games and attention checks.

[7] To adapt the experiment for online administration, we simplified the instructions to ensure clarity while preserving the original structure of the tasks.

[8] For details on the incentive compatibility of the games and on the identification strategy, we refer the reader to BFS.

[9] See BFS, Section 4, second paragraph.

3. Results

3.1. Representative Agent

Table 1 reports the structural estimates for the representative agent. Two out of the four preference coefficients replicate both the sign and statistical significance reported in BFS: aheadness aversion and positive reciprocity. Only the coefficient for positive reciprocity is statistically indistinguishable from that in BFS.

Table 1: Estimated preferences of the representative agent (K = 1)

	Ghana estimates	BFS Session 2	p-value of z-test with H_0: Ghana est. = BFS S2
α: Weight on other's payoff when behind	0.019	0.098***	0.000
	(0.016)	(0.013)	
β: Weight on other's payoff when ahead	0.123***	0.245***	0.000
	(0.017)	(0.019)	
γ: Measure of positive reciprocity	0.043***	0.029***	0.352
	(0.011)	(0.010)	
δ: Measure of negative reciprocity	0.041***	-0.043***	0.000
	(0.011)	(0.008)	
σ: Choice sensitivity	0.010***	0.019***	0.000
	(0.000)	(0.001)	
Number of observations	38,961	18,720	
Number of subjects	333	160	
Log likelihood	-17,040.14	-4,540.74	

Notes: Individual cluster-robust standard errors in parentheses. *** Significant at 1%. BFS Session 2 transcribed from BFS's Table 1. Third column reports p-values of independent-sample z-tests for each coefficient. For both the Ghana and BFS Session 2's estimates, samples exclude subjects with estimated individual parameter values outside the $[-3, 1]$ range.

The coefficient related to behindness aversion (α) is positive but not statistically significant in our Ghana sample.[10] This contrasts with BFS, where the coefficient was both positive and significant. The estimate for aheadness aversion (β) is positive and significant, consistent with the original study, but its magnitude is roughly half as large as in BFS' sample of Swiss university students.[11] This suggests that while both groups of individuals dislike advantageous inequality, this motive is substantially weaker among our Ghanaian subjects.

[10] An individual is behindness averse if $\alpha < 0$, as she attaches a negative weight to the other's payoff when behind. Therefore, behindness aversion is captured by $-\alpha$.

[11] Aheadness aversion is directly measured by β. An aheadness averse individual attaches a positive weight to the other's payoff when her own payoff is larger.

A notable difference emerges for negative reciprocity. Whereas in BFS it was negative and significant — indicating that Swiss subjects are willing to punish unkind behavior — in our replication the coefficient is positive and significant. This implies that Ghanaian subjects, on average, display a tendency to act kindly even toward individuals who have behaved unkindly.

Finally, the estimate of the choice sensitivity parameter σ is positive and significant in both samples, but is about half as large in Ghana (0.010 vs. 0.019 in BFS). Parameter σ governs the degree to which choices respond to differences in deterministic utility. The lower σ in Ghana indicates weaker responsiveness to payoff differences (i.e., more choice noise) relative to Switzerland.[12]

Overall, the representative agent analysis suggests some similarities in core motives, such as aheadness aversion and positive reciprocity, but also reveals meaningful cross-cultural differences, particularly regarding negative reciprocity and behindness aversion.

3.2. Finite-Mixture Estimates

We next examine heterogeneity in social preferences using finite-mixture modeling (see Table 2. Panel A: Our Study; Panel B: BFS). Following BFS, we rely on the normalized entropy criterion (NEC) to select the optimal number of types. As in the original paper, the NEC favors a three-type solution for our Ghana sample.[13]

One type is common to both studies: the **Strongly Altruistic** type. In BFS, this type represents the second largest group (35.6%), while in our replication it appears as the smallest group (26.5%). Remarkably, the estimates for distributional concerns in this type are nearly identical across samples. The weight attached to the other's payoff when behind is 0.193 in BFS and 0.196 in Ghana, while it reaches 0.494 in BFS and 0.442 in Ghana. This suggests that when altruism is strong, it is expressed similarly across cultures. However, the coefficient for positive reciprocity is roughly half as large in Ghana as in Switzerland. Finally, and as with the representative agent, the negative reciprocity coefficient is positive and significant in Ghana, indicating a preference for kindness even toward unkind individuals.

The most common type differs across the two samples, highlighting an important cultural difference. In the Swiss sample, the **Moderately Altruistic** type dominates (52.4%). In contrast, the most common type in Ghana (40.7%) is **Spiteful**, attaching a negative weight to the other player's payoff irrespective of whether she is behind or ahead.

[12] This difference could be partially explained by the fact that BFS's data was collected in a laboratory setting, whereas our Ghana data was collected online.

[13] Appendix A.5 provides the results for alternative specifications with $K = 2$ (Table A.7) and $K = 4$ (Table A.8).

Table 2: Finite mixture estimations with $K = 3$ (Ghana vs. BFS Session 2)

Panel A. Ghana			
	Strongly Altruistic	Spiteful	Behindness Averse (low intensity)
π: Type share	0.265***	0.407***	0.328***
	(0.025)	(0.028)	(0.026)
α: Weight on other's payoff when behind	0.196***	-0.191***	-0.018**
	(0.029)	(0.040)	(0.008)
β: Weight on other's payoff when ahead	0.442***	-0.111***	-0.010
	(0.025)	(0.036)	(0.009)
γ: Measure of positive reciprocity	0.053***	0.079**	0.010
	(0.021)	(0.029)	(0.008)
δ: Measure of negative reciprocity	0.042*	0.083***	0.012
	(0.022)	(0.028)	(0.009)
σ: Choice sensitivity	0.015***	0.006***	0.037***
	(0.001)	(0.000)	(0.003)
# subjects		333	
# observations		38,961	
Log likelihood		-13,923.70	
NEC		0.00136	
Panel B. BFS - Session 2 (Table 2)			
	Strongly Altruistic	Moderately Altruistic	Behindness Averse
π: Type share	0.356***	0.544***	0.100***
	(0.039)	(0.041)	(0.024)
α: Weight on other's payoff when behind	0.193***	0.061***	-0.328***
	(0.019)	(0.009)	(0.073)
β: Weight on other's payoff when ahead	0.494***	0.095***	-0.048
	(0.020)	(0.012)	(0.053)
γ: Measure of positive reciprocity	0.099***	-0.005	-0.028
	(0.024)	(0.006)	(0.030)
δ: Measure of negative reciprocity	-0.082***	-0.019***	-0.015
	(0.018)	(0.007)	(0.035)
σ: Choice sensitivity	0.019***	0.049***	0.015***
	(0.001)	(0.004)	(0.002)
# subjects		160	
# observations		18,720	
Log likelihood		-3,166.32	
NEC		0.00204	

Notes: Robust clustered standard errors in parentheses. Significance levels: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$. Panel A reports Ghana estimates; types are labeled descriptively ("Strongly Altruistic", "Spiteful", "Behindness Averse (low intensity)") and do not correspond to BFS's classification. Panel B reproduces BFS Table 2, Session 2. For both the Ghana and BFS Session 2's estimates, samples exclude subjects with estimated individual parameter values outside the $[-3, 1]$ range.

The final type in both samples only displays statistically significant behindness aversion. However, the intensity and prevalence of this type differ sharply. In BFS, the behindness aversion coefficient is large in absolute value (-0.328) and the type accounts for just 10% of the sample. By contrast, in Ghana the coefficient is an order of magnitude smaller (-0.018), implying negligible behavioral consequences (e.g., a rejection in the Ultimatum Game of offers below 1.7% of the endowment).

We therefore describe it as **Behindness Averse (low intensity)**. This type is much more common in Ghana, comprising 32.8% of the sample.

3.3. Individual-Level Estimates

We now turn to the distribution of parameter estimates at the individual level. Table 3 compares descriptive statistics between the two studies.

Table 3: Summary statistics of individual parameter estimates (Ghana vs. BFS Session 2)

	Median	Mean	S.D.	Min.	Max.
Panel A. Ghana					
α: Weight on other's payoff when behind	-0.031	-0.076	0.477	-2.819	0.992
β: Weight on other's payoff when ahead	0.019	0.040	0.417	-2.538	0.888
γ: Measure of positive reciprocity	0.022	0.041	0.359	-2.730	0.971
δ: Measure of negative reciprocity	0.010	0.034	0.340	-2.414	0.976
σ: Choice sensitivity	0.019	0.118	0.218	0.001	0.824
Panel B. BFS - Session 2 (Table 5)					
α: Weight on other's payoff when behind	0.060	0.048	0.236	-1.636	0.401
β: Weight on other's payoff when ahead	0.169	0.225	0.248	-0.405	0.905
γ: Measure of positive reciprocity	0.000	0.030	0.166	-1.087	0.679
δ: Measure of negative reciprocity	-0.010	-0.045	0.119	-0.553	0.229
σ: Choice sensitivity	0.069	0.269	0.278	0.007	0.886

Notes: Panel A reports Ghana estimates. Panel B reproduces BFS Table 2, Session 2. For both the Ghana and BFS Session 2's estimates, samples exclude subjects with estimated individual parameter values outside the $[-3, 1]$ range.

Behindness Aversion. In Ghana, more than half of the sample displays behindness aversion, with a median α estimate of -0.031. This is the reverse of BFS, where the median estimate was positive (0.060). Thus, Ghanaians are more concerned with disadvantageous inequality than Swiss participants.

Aheadness Aversion. In both samples, the mean and median estimates are positive, showing that dislike of advantageous inequality is a common motive. However, the magnitude is far smaller in Ghana. The median estimate in Ghana is only 11% of that in Switzerland, and the mean estimate is only 18%. Combined with the reversal in behindness aversion, this implies that Swiss subjects tend to be substantially more altruistic than Ghanaian subjects. This pattern aligns with the finite-mixture findings: strong and weak altruistic types represent 90% of the Swiss subjects, but the altruistic type in Ghana comprises only 26.5% of the sample.

Positive Reciprocity. The mean and median estimates are positive in both samples, indicating that over half of subjects in each country are motivated to match kindness with kindness. Positive reciprocity is more pronounced in Ghana, with the average estimate 37% higher than in Switzerland.

Negative Reciprocity. The Ghana sample displays positive mean and median estimates, suggesting that individuals derive utility from being kind even toward those who have been unkind. In the Swiss students sample, the opposite pattern emerges: negative reciprocity estimates are negative, indicating a preference for punishment of unkindness.

Table 4: Predictive power of preference estimates in the Trust Games

OLS regression with dependent variable: trustworthy [0/1]					
Panel A: Ghana sample					
Intercept	0.450**	0.445**	0.398**	0.400**	0.400**
	(0.182)	(0.182)	(0.166)	(0.167)	(0.167)
Prediction based on type-specific estimates		0.072		0.444***	-0.045
		(0.051)		(0.052)	(0.048)
Prediction based on individual-specific estimates			0.480***		0.489***
			(0.036)		(0.037)
Difference between predictions (indiv.–type)				0.489***	
				(0.037)	
Additional control variables	Yes	Yes	Yes	Yes	Yes
Number of observations	3,330	3,330	3,330	3,330	3,330
Number of subjects	333	333	333	333	333
R^2	0.029	0.032	0.163	0.163	0.163
Panel B. BFS - Session 2 (Table 6)					
Intercept	0.392	0.233	0.228	0.215	0.215
	(0.294)	(0.210)	(0.191)	(0.196)	(0.196)
Prediction based on type-specific estimates		0.607***		0.650***	0.352***
		(0.033)		(0.033)	(0.057)
Prediction based on individual-specific estimates			0.577***		0.298***
			(0.031)		(0.053)
Difference between predictions (indiv.–type)				0.300***	
				(0.053)	
Additional control variables	Yes	Yes	Yes	Yes	Yes
Number of observations	1,600	1,600	1,600	1,600	1,600
Number of subjects	160	160	160	160	160
R^2	0.059	0.349	0.343	0.374	0.374

Notes: Robust SEs clustered at the individual level in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Additional control variables include: Big Five personality traits, cognitive ability, age, gender, education, monthly income, and field of study/work. For the Ghana sample, we use the logarithm of income winsorized at the 99th percentile due to the presence of an extreme outlier.

Taken together, these results highlight systematic differences in motivational structures across the two samples. In Ghana, anti-social choices can be traced to

Table 5: Predictive power of preference estimates in the Reward–Punishment Games

OLS regression with dependent variable: reward/punishment					
Panel A: Ghana sample					
Intercept	131.226**	131.893**	143.513***	143.677***	143.677***
	(53.637)	(53.555)	(53.469)	(53.415)	(53.415)
Prediction based on type-specific estimates		0.043		0.249***	0.013
		(0.075)		(0.084)	(0.077)
Prediction based on individual-specific estimates			0.237***		0.237***
			(0.049)		(0.050)
Difference between predictions (indiv.–type)				0.237***	
				(0.050)	
Additional control variables	Yes	Yes	Yes	Yes	Yes
Number of observations	1,332	1,332	1,332	1,332	1,332
Number of subjects	333	333	333	333	333
R^2	0.037	0.037	0.059	0.059	0.059
Panel B. BFS – Session 2 (Table 7)					
Intercept	59.976	-13.644	-31.029	-36.756	-36.963
	(87.566)	(68.128)	(63.755)	(62.194)	(62.228)
Prediction based on type-specific estimates		1.123***		1.065***	0.716***
		(0.089)		(0.084)	(0.122)
Prediction based on individual-specific estimates			0.637***		0.349***
			(0.052)		(0.074)
Difference between predictions (indiv.–type)				-0.348***	
				(0.074)	
Additional control variables	Yes	Yes	Yes	Yes	Yes
Number of observations	640	640	640	640	640
Number of subjects	160	160	160	160	160
R^2	0.035	0.267	0.251	0.302	0.302

Notes: Robust SEs clustered at the individual level in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Additional control variables include: Big Five personality traits, cognitive ability, age, gender, education, monthly income, and field of study/work. For the Ghana sample, we use the logarithm of income winsorized at the 99th percentile due to the presence of an extreme outlier.

the strong concern for disadvantageous inequality and the prevalence of spiteful preferences, while prosocial actions are supported by positive reciprocity and a tendency to act kindly even toward unkind counterparts. In Switzerland, anti-social choices are primarily associated with strong negative reciprocity, whereas prosocial actions are rooted in altruistic preferences and aheadness aversion. These contrasts are consistent with the finite-mixture results: altruistic types dominate in Switzerland, while in Ghana they constitute a minority.

3.4. Out-of-Sample Predictive Power

Tables 4 and 5 present the predictive performance of the models in the trust and reward-and-punishment games. Socioeconomic characteristics and personality traits alone explain very little of the variation in behavior: in Ghana, R^2 equals 0.029 for trust games and 0.037 for reward-and-punishment games, while in Switzerland the corresponding figures are 0.059 and 0.035.

Adding type-specific predictions yields virtually no explanatory power in the Ghana sample (raising R^2 by at most 0.003), whereas in Switzerland they increase R^2 by 29 percentage points in trust games and 23.2 points in reward-and-punishment games. In turn, adding individual-specific predictions substantially improves model fit in both countries. In Ghana, R^2 rises from 0.029 to 0.163 in trust games — more than a fivefold increase — and from 0.037 to 0.059 in reward-and-punishment games. In Switzerland, the inclusion of individual predictions raises explanatory power by almost sixfold in trust games (from 0.059 to 0.343) and by more than sevenfold in reward-and-punishment games (from 0.035 to 0.251).

Including both type-specific and individual predictions removes the apparent disparity across samples but masks important differences. In Ghana, only individual predictions remain significant once both are entered, whereas in Switzerland both predictors retain significance.

4. Discussion

We replicate Session 2 of Bruhin et al. (2019) with a large Ghanaian sample to examine whether the same distributional and reciprocity preferences emerge across contexts, and to assess the out-of-sample predictive power of structurally estimated social preferences.

Positive reciprocity and aheadness aversion replicate in both samples, yet clear differences arise. Ghanaian participants tend to behave kindly even toward unkind counterparts, exhibit weaker concerns for advantageous inequality, and display a higher prevalence of spite and a lower prevalence of altruism compared to Swiss participants.

These patterns resonate with Falk et al. (2018), who document low average levels of altruism and positive reciprocity across Sub-Saharan Africa, coupled with low levels of negative reciprocity. They also align closely with Davies and Fafchamps (2021), who study relational contracting in Ghana and the UK using repeated gift-exchange games. They document that while UK employers adopt trigger strategies that reward high effort and punish shirking—behaving, Ghanaian employers rarely reduce wages after low effort.

Structurally estimated other-regarding and reciprocity motives improve our ability to predict behavior, but in our Ghanaian sample this holds only at the individual level. Type-specific predictions from finite mixtures, which strongly predict out-of-sample behavior in Bruhin et al. (2019), explain virtually none of the variation in Ghana. This highlights limits to the generalizability of finite-mixture estimation for predicting social behavior.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the author(s) used Grammarly, ClaudeAI, and ChatGPT in order to improve the readability and language of the manuscript. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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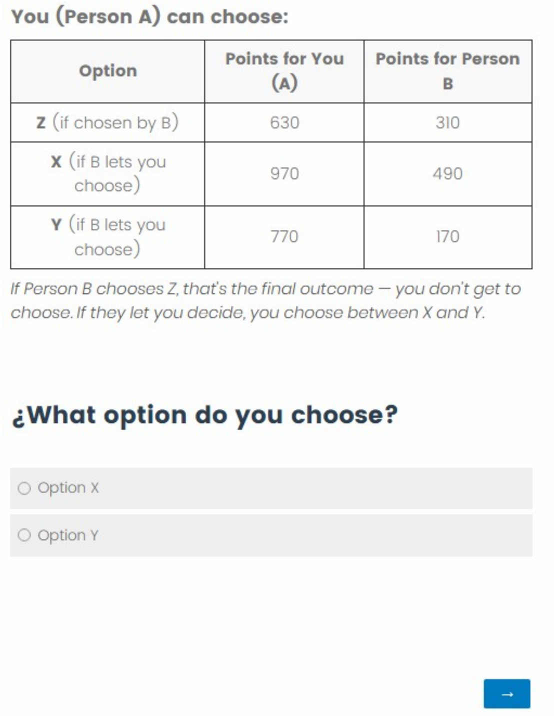
Appendix A. Online Appendix

Appendix A.1. Task and Attention Check Screenshots



You (Person A) can choose:

Option	Points for You (A)	Points for Person B
Z (if chosen by B)	630	310
X (if B lets you choose)	970	490
Y (if B lets you choose)	770	170

If Person B chooses Z, that's the final outcome — you don't get to choose. If they let you decide, you choose between X and Y.

¿What option do you choose?

○ Option X

○ Option Y

→

Figure A.1: Screenshot of a reciprocity game.

You have the following two options:

	Points Person A (You)	Points Person B
Option X	330	680
Option Y	330	1060

Which option do you choose?

○ Option X

○ Option Y

→

Figure A.2: Screenshot of a dictator game.

This is an attention check. To show that you are paying attention, please choose Option Y.

Option	Points for You (A)	Points for Person B
Z (if chosen by B)	810	280
X (if B lets you choose)	670	420
Y (if B lets you choose)	530	780

If Person B chooses Z, that's the final outcome — you don't get to choose. If they let you decide, you choose between X and Y.

Make your choice:

○ Option X

○ Option Y

→

Figure A.3: Screenshot of an attention check.

Appendix A.2. Sample Characteristics

Table A.6: Subject characteristics (Full, Core, and Excluded samples)

Panel A: Numeric variables

	Full sample (N=477)					Core sample (N=333)					Excluded (N=144)				
	Median	Mean	S.D.	Min.	Max.	Median	Mean	S.D.	Min.	Max.	Median	Mean	S.D.	Min.	Max.
Conscientiousness (BFI–S)	4.0	3.6	2.4	-6.0	6.0	4.0	3.7	2.3	-6.0	6.0	4.0	3.5	2.4	-3.0	6.0
Openness (BFI–S)	18.0	17.7	2.6	3.0	21.0	18.0	17.6	2.7	3.0	21.0	18.0	17.9	2.6	6.0	21.0
Extraversion (BFI–S)	10.0	10.0	2.5	2.0	14.0	10.0	9.9	2.5	2.0	14.0	11.0	10.1	2.5	2.0	14.0
Agreeableness (BFI–S)	4.0	3.1	2.3	-6.0	6.0	4.0	3.2	2.3	-6.0	6.0	3.0	2.9	2.2	-3.0	6.0
Neuroticism (BFI–S)	5.0	4.2	1.7	1.0	7.0	5.0	4.1	1.7	1.0	7.0	5.0	4.3	1.7	1.0	7.0
Cognitive ability	4.0	3.9	2.4	0.0	12.0	4.0	4.0	2.4	0.0	12.0	3.5	3.8	2.4	0.0	12.0
Monthly income[a]	107.7	336.0	797.3	0.0	1.9046×10^8	100.0	374.7	928.1	0.0	1.9046×10^8	120.0	246.4	323.2	0.0	2,000.0
Age (years)	26.0	26.9	5.3	18.0	53.0	26.0	26.9	5.3	18.0	53.0	26.0	26.8	5.4	18.0	43.0
Attention score	5.0	4.6	0.8	1.0	5.0	5.0	4.6	0.8	1.0	5.0	5.0	4.6	0.7	1.0	5.0
Survey duration (minutes)	62.0	81.0	82.4	11.8	749.9	62.4	81.4	77.3	14.5	610.0	61.5	80.0	93.3	11.8	749.9

Panel B: Categorical variables

Variable	Level	Full (N=477)	Core (N=333)	Excluded (N=144)
Education				
	Masters degree	14 (2.9%)	8 (2.4%)	6 (4.2%)
	PhD or MD	4 (0.8%)	4 (1.2%)	0 (0.0%)
	Primary school	1 (0.2%)	1 (0.3%)	0 (0.0%)
	Secondary school	71 (14.9%)	44 (13.2%)	27 (18.8%)
	Undergraduate degree	310 (65.0%)	220 (66.1%)	90 (62.5%)
	University (partial)	77 (16.1%)	56 (16.8%)	21 (14.6%)
Area of study/work				
	Architecture	6 (1.3%)	3 (0.9%)	3 (2.1%)
	Arts	96 (20.1%)	68 (20.4%)	28 (19.4%)
	Engineering	102 (21.4%)	72 (21.6%)	30 (20.8%)
	Health	74 (15.5%)	53 (15.9%)	21 (14.6%)
	Law	7 (1.5%)	5 (1.5%)	2 (1.4%)
	Mathematics	60 (12.6%)	41 (12.3%)	19 (13.2%)
	Natural sciences	45 (9.4%)	31 (9.3%)	14 (9.7%)
	Social sciences	87 (18.2%)	60 (18.0%)	27 (18.8%)
Gender				
	Female	112 (23.5%)	81 (24.3%)	31 (21.5%)
	Male	365 (76.5%)	252 (75.7%)	113 (78.5%)

Notes: The Core sample excludes subjects with individual parameter estimates outside the $[-3, 1]$ interval. Means and standard deviations for *Monthly income* use 99% winsorization with cutoffs computed on the Full sample, while medians, minima, and maxima use raw values. Panel B displays counts with column percentages.

Appendix A.3. Power Analyses

We conducted power analyses for the coefficients in the representative agent model reported in Table 1 and for the out-of-sample regressions reported in Tables 4 and 5.

Appendix A.3.1. Representative Agent Model

We ran three Monte Carlo simulations. Each simulation was parameterized by a vector $\psi = (\alpha, \beta, \gamma, \delta, \sigma)$, where the elements represent the four parameters of the social preference model and a choice-sensitivity parameter. The parameter vectors used in the three simulations are presented in Table A.7.

Table A.7: True Parameters in Simulations

Simulation	α	β	γ	δ	σ
ψ_1	0.098	0.245	0.029	-0.043	0.019
ψ_2	0.073	0.184	0.022	-0.032	0.014
ψ_3	0.019	0.123	0.043	0.041	0.010

The first set of simulation parameters in Table A.7 corresponds to the estimates from BFS's Session 2. The second set represents a scenario in which the true coefficients are 75% of the original values, reflecting weaker distributional and reciprocal motives as well as noisier responses. The final set of parameters corresponds to our ex post power analysis, using the estimates obtained from our Ghanaian sample. This last simulation allows us to assess (i) whether our design provides sufficient power to detect the coefficients we found, and (ii) whether the simulated bias of our parameter estimates is acceptably small.

This analysis is important because the variance–covariance matrix of the estimated model depends on the magnitude of the coefficients, implying that the optimality of the experimental design may vary with their scale. Thus, this exercise tests whether the combination of the 117 tasks in the original design and our sample size allows us to detect coefficients that deviate from those in BFS. In turn, it helps determine whether our estimates arise from noisier responses or suboptimal design — or instead reflect genuine cross-cultural differences in social preferences.

For each simulation, and following BFS, we ran a Monte Carlo program with $R = 1{,}000$ replications. Each run assumed $n = 333$ subjects, matching the sample size of our experiment. For each parameter vector ψ, we report the true coefficients, the average estimated coefficients, the simulated statistical power for each coefficient (i.e., the proportion of replications rejecting the null that a coefficient equals zero), the average $\text{Bias}(\hat{\rho}) = \frac{1}{R}\sum_{r=1}^{R}(\hat{\rho}_r - \rho)$, and the standard error of the bias. Table A.8 presents the simulation results in three panels.

As shown in Table A.8, both the mean bias and its standard error are negligible across all simulations. The results confirm that the sample size used in our replication study is sufficient to estimate all coefficients precisely. The only coefficient with power below 80% is α, which captures behindness aversion, and only in Simulation 3. This indicates that, ex post, we do not have enough power to detect statistical significance for that coefficient given our estimates. Nevertheless, its very small bias supports interpreting its estimated magnitude as a reliable measure of behindness aversion in our sample (see Table 1).

Appendix A.3.2. Out-of-Sample Regressions

To assess the statistical power of the regressions reported in Tables 4 and 5, we computed R^2-based power tests. Specifically, we calculated the power to detect the smallest difference in R^2 between the baseline regression (first column) and any augmented specification, given the subset of coefficients tested for significance (one or two), the number of control variables (11 sociodemographic covariates in the baseline plus one variable for each of the 333 clusters), and the sample size ($n = 3330$ in the trust regressions and $n = 1332$ in the reward-and-punishment regressions).

Table A.8: Simulation Results

Simulation 1: ψ_1					*Original BFS coefficients*
Parameter	True Value	Mean Estimate	Simulated Power	Mean Bias	SE Bias
α	0.098	0.098	100%	0.0002	0.0005
β	0.245	0.245	100%	-0.0001	0.0005
γ	0.029	0.029	100%	-0.0002	0.0006
δ	-0.043	-0.043	100%	-0.0005	0.0006
σ	0.019	0.019	100%	0.0000	0.0000
Simulation 2: ψ_2					*Coefficients 75% of BFS*
Parameter	True Value	Mean Estimate	Simulated Power	Mean Bias	SE Bias
α	0.073	0.074	100%	0.0002	0.0002
β	0.184	0.184	100%	0.0001	0.0002
γ	0.022	0.022	82.9%	-0.0002	0.0002
δ	-0.032	-0.032	99.3%	-0.0002	0.0002
σ	0.014	0.014	100%	0.0000	0.0000
Simulation 3: ψ_3					*Coefficients of this paper*
Parameter	True Value	Mean Estimate	Simulated Power	Mean Bias	SE Bias
α	0.019	0.019	53.6%	0.0004	0.0003
β	0.123	0.123	98.7%	0.0001	0.0003
γ	0.043	0.043	89.0%	-0.0002	0.0003
δ	0.041	0.041	88.2%	-0.0002	0.0003
σ	0.010	0.010	100%	-0.0000	0.0000

Trust Games. For the trust regressions in BFS, the baseline model (11 covariates) had $R^2 = 0.059$, and the smallest R^2 among the augmented regressions in Table 4 was 0.343, implying an effect size of 0.432. With $n = 3330$, the resulting statistical power is effectively 100%. In our data, the baseline regression had $R^2 = 0.029$, while the regression including individual-specific estimates yielded $R^2 = 0.163$, corresponding to an effect size of 0.16. With $n = 3330$, our ex post power is virtually 100%.

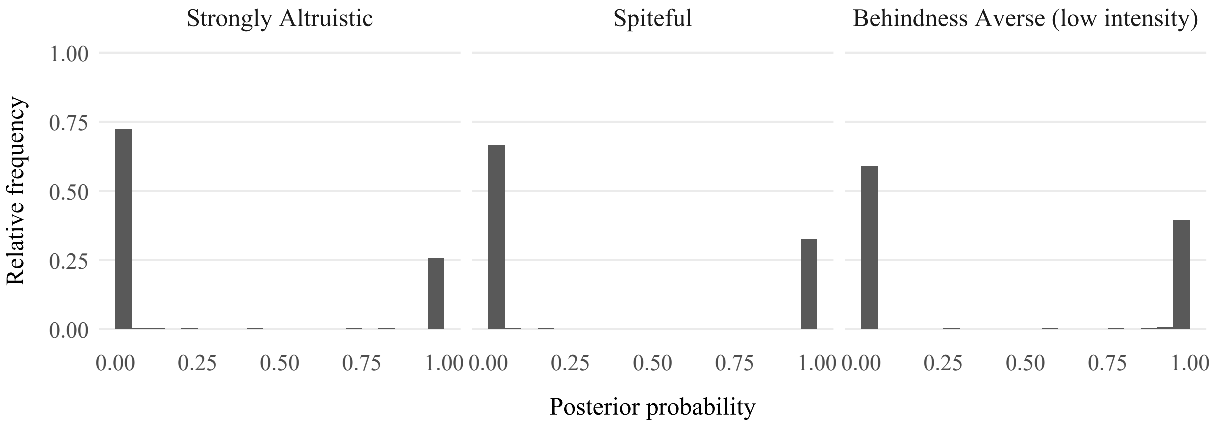
Reward-and-Punishment Games. For the punishment regressions in BFS, the baseline regression had $R^2 = 0.035$, and the smallest R^2 among the augmented regressions was 0.251, implying an effect size of 0.288 and virtually 100% power with $n = 1332$. In our data, the baseline regression had $R^2 = 0.037$, and the augmented regression including individual-specific estimates had $R^2 = 0.059$, corresponding to an effect size of 0.02. With $n = 1332$, the ex post statistical power is 99.8%.

Overall, these calculations show that the ex ante statistical power for replicating BFS's out-of-sample analyses is effectively 100%. Even under conservative assumptions and smaller effect sizes — such as those found in our punishment regressions — the lower bound of our ex post power remains well above the convential 80% threshold.

Appendix A.4. Posterior Probabilities of Type-Membership

The finite mixture approach not only characterizes the preferences associated with each type but also yields posterior probabilities indicating each individual's likelihood of belonging to a particular type (see BFS for additional details). A well-fitting model produces high certainty in type assignment, meaning that an individual's posterior probability for one type is close to 1 and near 0 for the others. Figure A.4 displays the distribution of these posterior probabilities for the estimates reported in the main text. The histograms show that intermediate probabilities are rare, suggesting that nearly all participants are clearly assigned to one of the three preference types. Moreover, for each type, the proportion of subjects with a posterior probability close to 1 closely matches the estimated population share of that type.

Figure A.4: Distribution of posterior probabilities of individual type-membership.



Appendix A.5. Distribution of individual and type-specific estimates

Figures A.5 and A.6 show the distribution of individual-specific parameter estimates, alongside the type-specific estimates derived from the finite mixture model assuming $K = 3$ preference types. The clustering of individual estimates reflects the inferred classification of participants into preference types, based on their posterior probabilities of type membership π_{ik}. The ellipses around the type-specific estimates indicate 95% confidence intervals.

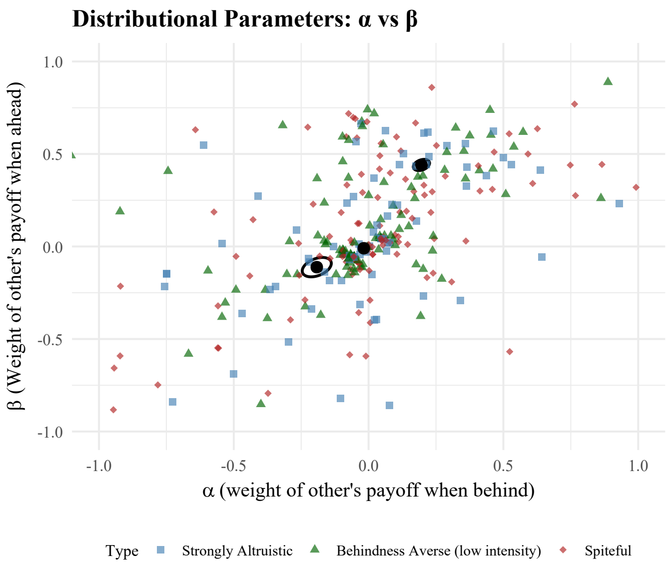


Figure A.5: Distribution of α and β estimates

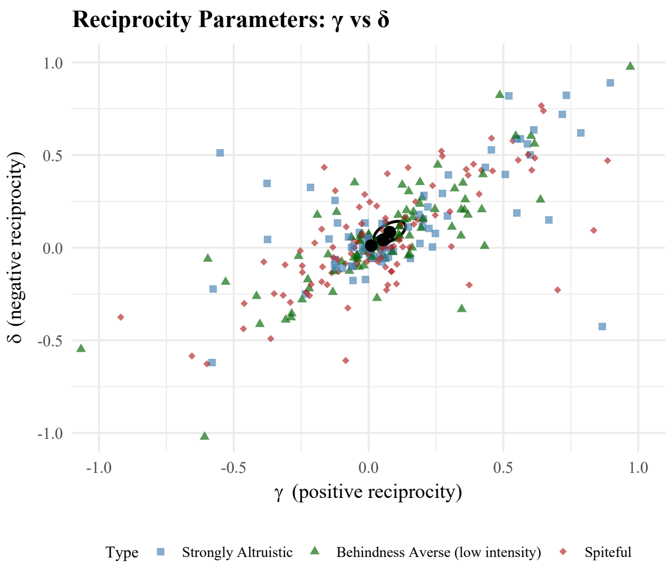


Figure A.6: Distribution of γ and δ estimates

Appendix A.6. Finite Mixture Model With 2 and 4 Types

Table A.9: Finite mixture estimations with $K = 2$ (Ghana sample)

	Strongly Altruistic	Spiteful
π: Type share	0.654***	0.346***
	(0.029)	(0.029)
α: Weight on other's payoff when behind	0.068***	-0.226***
	(0.019)	(0.058)
β: Weight on other's payoff when ahead	0.178***	-0.136**
	(0.025)	(0.053)
γ: Measure of positive reciprocity	0.031***	0.088**
	(0.011)	(0.035)
δ: Measure of negative reciprocity	0.029***	0.089**
	(0.011)	(0.035)
σ: Choice sensitivity	0.016***	0.005***
	(0.001)	(0.000)
# subjects	333	
# observations	38,961	
Log likelihood	-15,453.80	
NEC	0.005774	

Notes: Robust clustered standard errors in parentheses. Significance levels: $^{***}p < 0.01$, $^{**}p < 0.05$. Types are labeled descriptively ("Strongly Altruistic", "Spiteful") and do not correspond to BFS's classification. Sample exclude subjects with estimated individual parameter values outside the $[-3, 1]$ range.

Table A.10: Finite mixture estimations with $K = 4$ (Ghana sample)

	Behind. Averse (low int.)	Strongly Alt.	Ahead. Averse (low int.)	Spiteful
π: Type share	0.321***	0.261***	0.251***	0.167***
	(0.029)	(0.024)	(0.026)	(0.028)
α: Weight on other's payoff when behind	-0.015*	0.192***	0.034	-0.506***
	(0.008)	(0.028)	(0.035)	(0.109)
β: Weight on other's payoff when ahead	-0.006	0.441***	0.058*	-0.328***
	(0.009)	(0.024)	(0.033)	(0.073)
γ: Measure of positive reciprocity	0.008	0.049**	0.070**	0.118**
	(0.008)	(0.021)	(0.035)	(0.054)
δ: Measure of negative reciprocity	0.009	0.037*	0.076**	0.124**
	(0.008)	(0.021)	(0.034)	(0.052)
σ: Choice sensitivity	0.038***	0.015***	0.005***	0.009***
	(0.005)	(0.000)	(0.000)	(0.001)
# subjects		333		
# observations		38,961		
Log likelihood		-13,562.36		
NEC		0.002212		

Notes: Robust clustered standard errors in parentheses. Significance levels: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. Types are labeled descriptively ("Behindness Averse (low intensity)", "Strongly Altruistic", "Aheadness Averse (low intensity)" and "Spiteful") and do not correspond to BFS's classification. Sample excludes subjects with estimated individual parameter values outside the $[-3, 1]$ range.

Appendix A.7. Finite Mixture Model with 2, 3 and 4 Types, Only Fully Attentive Subjects

Table A.11: Finite mixture estimations with $K = 2$. Ghana sample restricted to fully attentive participants.

	Strongly Altruistic	Spiteful
π: Type share	0.471***	0.529***
	(0.034)	(0.034)
α: Weight on other's payoff when behind	0.179***	-0.105***
	(0.031)	(0.025)
β: Weight on other's payoff when ahead	0.326***	-0.056**
	(0.031)	(0.023)
γ: Measure of positive reciprocity	0.041*	0.031*
	(0.023)	(0.018)
δ: Measure of negative reciprocity	0.039*	0.028
	(0.023)	(0.018)
σ: Choice sensitivity	0.009***	0.015***
	(0.001)	(0.001)
# subjects	239	
# observations	27,963	
Log likelihood	-11,092.39	
NEC	0.006065	

Notes: Robust clustered standard errors in parentheses. Significance levels: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. Types are labeled descriptively ("Strongly Altruistic", "Spiteful") and do not correspond to BFS's classification. Sample excludes subjects with estimated individual parameter values outside the $[-3, 1]$ range as well as those who did not obtain a perfect score in the attention checks.

Table A.12: Finite mixture estimations with $K = 3$. Ghana sample restricted to fully attentive participants.

	Strongly Altruistic	Spiteful	Homo Economicus
π: Type share	0.282***	0.391***	0.327***
	(0.031)	(0.033)	(0.031)
α: Weight on other's payoff when behind	0.217***	-0.217***	-0.010
	(0.031)	(0.053)	(0.009)
β: Weight on other's payoff when ahead	0.416***	-0.121***	0.001
	(0.028)	(0.046)	(0.011)
γ: Measure of positive reciprocity	0.039	0.082**	0.004
	(0.027)	(0.038)	(0.010)
δ: Measure of negative reciprocity	0.033	0.086**	0.000
	(0.026)	(0.035)	(0.010)
σ: Choice sensitivity	0.015***	0.006***	0.040***
	(0.001)	(0.000)	(0.005)
# subjects		239	
# observations		27963	
Log likelihood		-9,736.89	
NEC		0.001686	

Notes: Robust clustered standard errors in parentheses. Significance levels: $^{***}p < 0.01$, $^{**}p < 0.05$. Types are labeled descriptively ("Strongly Altruistic", "Spiteful", "Homo Economicus") and do not correspond to BFS's classification. Sample excludes subjects with estimated individual parameter values outside the $[-3, 1]$ range as well as those who did not obtain a perfect score in the attention checks.

Table A.13: Finite mixture estimations with $K = 4$. Ghana sample restricted to fully attentive participants.

	Homo Economicus	Strongly Altruistic	Spiteful	Ahead. Averse (low int.)
π: Type share	0.321***	0.274***	0.175***	0.231***
	(0.034)	(0.030)	(0.035)	(0.031)
α: Weight on other's payoff when behind	-0.008	0.215***	-0.498***	0.027
	(0.008)	(0.032)	(0.123)	(0.042)
β: Weight on other's payoff when ahead	0.003	0.423***	-0.330***	0.070*
	(0.010)	(0.028)	(0.086)	(0.042)
γ: Measure of positive reciprocity	0.002	0.042	0.125*	0.053
	(0.009)	(0.027)	(0.066)	(0.043)
δ: Measure of negative reciprocity	-0.000	0.033	0.135**	0.053
	(0.011)	(0.026)	(0.065)	(0.040)
σ: Choice sensitivity	0.042***	0.015***	0.009***	0.005***
	(0.007)	(0.001)	(0.001)	(0.001)
# subjects	239			
# observations	27,963			
Log likelihood	-9,495.63			
NEC	0.002490			

Notes: Robust clustered standard errors in parentheses. Significance levels: $^{***}p < 0.01$, $^{**}p < 0.05$. Types are labeled descriptively ("Homo Economicus", "Strongly Altruistic", "Spiteful", "Aheadness Averse (low intensity)") and do not correspond to BFS's classification. Sample excludes subjects with estimated individual parameter values outside the $[-3, 1]$ range as well as those who did not obtain a perfect score in the attention checks.