DEPARTMENT OF MANAGEMENT

The ingroup bias in dictator- and ultimatum games: testing the moderating role of interdependence and individual differences in values

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Contents

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Abstract

Both emotional and instrumental motives have been put forth to account for the ingroup bias in cooperative behaviors. Based on this, we hypothesized that the influence of Social Value Orientation on the ingroup bias in generosity and costly punishment would depend on which motive is more salient. For prosocials (who identify strongly with their group) we expected the bias to occur with increasing conservative values, while for self-interested proselfs, we expected increasing bias with increasing interdependence. We tested this in a two-part, pre-registered online experiment (n=795). In part 1 we categorized participants into two minimal groups created according to their preferences for paintings. In part 2 participants made incentivized decisions in economic games that affected themselves and another participant who had similar preferences (in-group member), different preferences (out-group), or unknown preferences (stranger), using a within-subject design. In the dictator game (DG), participants merely decided how to share an endowment with the other, while in the ultimatum game (UG), participants were interdependent with one- another: as a 1st player proposer, they risked punishment for offering a low share to the recipient; as a 2nd player recipient, they indicated the proposer's minimum share they would accept and not punish. Results corroborate the in-group bias in sharing, both in DG and, to a much lesser extent, in UG. In contrast, punishing decisions in UG were more pronounced in the outgroup, indicating greater tolerance towards ingroup individuals. None of the postulated interaction effects with SVO were confirmed.

Introduction

Despite a universal fairness norm, people tend to favor others who belong to their ingroup and are more cooperative and generous towards them compared to others who belong to a different group. This ingroup bias has been well documented, even in the absence of any external threats or in minimal groups defined by arbitrary characteristics (Balliet et al., 2014; Dunham, 2018; Otten, 2016). Not everyone, however, exhibits the bias to the same extent. Some research shows that there is individual consistency, so that "groupy" individuals who favor in-group members in one context (for example, a political affiliation), tend to be similarly biased in other contexts (for example, in minimal groups, see Kranton et al., 2020). Such heterogeneity raises the question as to who is more likely to display consistent in-group favoritism, and why.

Two theories have been put forth to explain why in-group favoritism emerges and persists, even in minimal groups. First, according to the social identity theory (SIT) (Tajfel & Turner, 1979), people self-categorize themselves in groups from which they derive an identity. Their identity is thereafter strengthened through emphasizing the positive aspects of the group and moderating the negatives. If the group does well, each member fares well by sharing the group's positive emotions (Aaldering et al., 2018). Second, according to the Bounded Generalized Reciprocity Theory (BGR) (Yamagishi & Kiyonari, 2000), the group is a container of social exchanges for members who derive economic benefits, prosperity, and a greater survival chance from the group. As long as group membership is common knowledge, BGR predicts that individuals who rely on and help one another in an interdependent fashion set the stage for bookkeeping, reputation formation, and indirect reciprocity.

Based on these theories, we can discern two motives that underscore in-group favoritism, namely the pleasure people derive through group belonging (SIT) and the pursuit of economic benefits to fulfill self-interest (BGR). These motives align well with individual differences in social value orientations (C. Declerck & Boone, 2016) a stable trait representing the extent to which people care about the outcome for others and put weight on equality (Van Lange, 2000). Individuals on the prosocial end of the spectrum intrinsically value equality and they put equal weight on outcomes for self and others. They may show genuine ingroup favoritism because they derive positive affect from seeing the group with whom they identify (and to whom they are affectively connected) do well (Stouten, et al., 2005), and don't need external incentives to be generous or share with them. On the opposite end of the spectrum, individuals with a proself inclination are economically motivated. They put more weight on outcomes for themselves, but they willingly share with others when there are external incentives to do so. An ingroup bias may surface when they belief that their contribution to the group is likely to yield a return from which they themselves will benefit (Boone, et al., 2010). For proselfs, giving is instrumental, and it may earn them good standing within their ingroup, and all the advantages that come with it. Their bias is driven by self-interest. Thus, it may very well be that both BGR and SIT account for the emergence of an ingroup bias, but that they apply to different individuals with diverging motives.

Empirical research investigating the link between Social Value Orientation (SVO) and ingroup favoritism, however, has yielded inconsistent results, with some studies showing that prosocials are more parochial (i.e., cooperating more with the in-group than with the outgroup, see Aaldering et al. 2018; de Dreu, et al., 2015), while others conclude that prosocials are universal cooperators and do not differentiate between in- and out-groups (Aaldering et al., 2013; Aaldering & Böhm, 2020; Thielmann & Böhm, 2016). No study so far has reported greater in-group favoritism for proselfs. A very plausible reason for these disparate results is that previous research on the relation between SVO and the ingroup bias typically assessed the level of cooperation in mixed-motive social dilemma games, such as the prisoner's dilemma or the public goods game. This is unfortunate because, due to their inherent ambiguity, these games obscure the true motives that underly the willingness to give: on the one hand, a cooperative decision can reflect the individual's social preference, while, on the other hand, the interdependent nature of these games induces strategic thinking, which means that some players will cooperate with the intent of eliciting reciprocity and initiate a lucrative relationship. This instrumental reason to cooperate cannot be disentangled from prosocial motives players may also harbor.

In the current study, we re-examine the relation between SVO and the ingroup bias in cooperative behaviors in the light of SIT and BGR. We postulate that SIT better predicts the ingroup bias of prosocials when decisions that affect others are unilateral, while BGR predicts an increase in the ingroup bias of proselfs as interdependence mounts. We furthermore expect that the ingroup bias of prosocials is contingent on, or exacerbated by, their level of conservatism. We test this for two types of cooperative behaviors, namely the decision to share with anonymous others, as well as the decision to punish others who don't share. Before describing the details of the experiment, we develop six specific hypotheses, which we pre-registered with the Open Science Framework (https://osf.io/dau7h/).

Sharing behavior by the 1st player in Dictator- and Ultimatum games

Playing the dictator game (DG) requires two players: a giver (1st player), and a receiver (2nd player). The 1st player is asked to split a monetary endowment in any amount with the receiver, and thereby holds the power to determine the outcome. The ultimatum game (UG) too, involves a 1st and 2nd player. In the UG, once the 1st player has proposed an offer, the 2nd player has a chance to either accept or reject the offer. If the 2nd player rejects the offer, neither player receives anything. Therefore, in DG, without economic benefits or threats, sharing is motivated by the individual's other-regarding preferences, while in the UG, sharing may just as well be strategic and inspired by the fear of rejection.

Prosocial individuals, who give to others because they value equality, are more likely to derive affective benefits from sharing with others with whom they identify and feel close to (Emonds et al., 2011; Declerck et al., 2014) which would make them more prone than proselfs to ingroup favoritism, in DG and UG alike (Bieleke et al., 2017). However, a large-scale study by Romano et al. (2018) investigating how SVO affected the in-group bias in trustworthiness (i.e., reciprocating a generous gesture) across 17 nationalities could not corroborate this. While a clear in-group bias emerged in their study, it was not moderated by SVO. Prosocials consistently reciprocated more, regardless of the nationality of the recipient. Thus, the intrinsic social norm that drove prosocials to reciprocate was universal and hardly biased by shared identity.

A possible reason why the identity-driven in group bias (based on SIT) and prosociality did not emerge in the study by Romano et al. (2018) is that there may be different types of prosocials based on other personal values they hold (Sagiv et al., 2017). Conservative values in particular tend to emphasize tradition, stability, hierarchy, and loyalty to one's own group (Schwartz et al., 2007). This often includes stronger emphasis on national, cultural, or religious identity, which would imply a preference for maintaining boundaries between groups. Political conservatives, identify more strongly with their own nation and displayed slightly greater national favoritism in their decisions to cooperate (Romano et al., 2021). In economic games conservative values tend to influence adherence to group norms and have been found to correlate with cooperative behaviors (Lönnqvist et al., 2011, 2013, Tao, 2014). When conservative values are combined with prosocial values, the ensuing generosity is likely to be constrained to people who are similar and hence it may be more directed toward the ingroup rather than generalized to all people. Therefore, we hypothesize:

H1: Individuals give more (in DG and in UG) to in-group- compared to out-group members, corroborating the in-group bias.

H2: Based on predictions by SIT, the in-group bias predicted in H1 will be strongest for conservative prosocials.

As the level of interdependence increases from DG to UG, the decision to share becomes more strategic because it will be influenced by beliefs about the other player. If the first player expects that the second player (who has the power to reject) will not tolerate an unequal offer, the portion of the endowment that will be shared increases. Accordingly, much research shows that individuals give more in UG than DG (Bechler et al., 2015; Blanco et al., 2011; Stagnaro et al., 2018; Wu et al., 2019; Yamagishi et al., 2012).

Given that proselfs are very sensitive to incentives to behave cooperatively (Boone et al., 2010), the threat of punishment may especially induce them to share in order to avoid being sanctioned for their selfishness. When there is common knowledge of who belongs to the in-group, there can be bookkeeping of whom shares with whom, making it possible for group members to reap future benefits from indirect reciprocity (Yamagishi & Kiyonari, 2000). Indeed, proselfs are more cooperative when they know that their behavior is made public within the group (Declerck et al., 2014). This may be especially relevant when there is interdependence (in the UG): by increasing their sharing behavior within an in-group where everybody knows each other, 1st players not only reduce the likelihood of direct negative reciprocity, but they also uphold a norm, inducing others in the group to share as well (for the same bookkeeping reason). In the long run, this norm pays off for everybody, including themselves. Following the logic of BGR, the increase in sharing as a result of increased interdependency when there is common knowledge should be more pronounced for proself individuals

Prosocials naturally share, so the marginal effect of interdependence would be less pronounced for them compared to proselfs. While the threat of punishment may still additionally incentivize them to share, it may at the same time reduce their affective motives underlying their generostiy. Thus, while we expect instrumental sharing in UG to be more efficacious for proselfs within an ingroup that fosters a sharing norm upheld by bookkeeping, it would have little or no effect on the ingroup bias of prosocials.

Therefore, we propose:

H3: Individuals give to more to the ingroup when interdependence increases. (In UG compared to DG)

H4: Based on predictions by BGR, when there is interdependence (in UG), proselfs are more likely to show an ingroup bias compared to prosocials.

Accepting unfair offers as 2nd player in UG

An in-group bias can also apply to how one responds to violations of the fairness norm (i.e., to low offers in UG). In the literature, there are two opposing theories predicting a biased response to a breach of fairness.

First, the expectancy violation hypothesis proposes that in-group members would be punished more for fairness violations than out-group members (see review by McAuliffe & Dunham, 2016), which has been observed both with real group (Mendoza et al., 2014; Schiller et al., 2014) and minimal group (Guo et al., 2020; Valenzuela & Srivastava, 2012) manipulations. The underlying idea is that people consider members of their own group to be more supportive of group norms, and therefore they harbor the specific expectation that in-group members will adhere to these norms and share their benefits equally. In line with SIT, we would expect that those individuals who value equality and identify strongly with their group would be more emotionally appalled when facing an in-group member who is not willing to share. We expect that these individuals who themselves abide by the norm would not hesitate to reject low offers and pay the cost of punishment to enforce justice. This would be especially true for prosocial individuals who are themselves inclined to share equally and who are known to not tolerate fairness norm violations (Bieleke et al., 2017; Haruno et al., 2014).

Second, the tolerance hypothesis (see Apps et al., 2018 for real groups; Valenzuela & Srivastava, 2012 for minimal groups) or the 'mere preference' hypothesis (Guo et al., 2020; see also review by McAuliffe & Dunham, 2016) predicts instead that individuals would be more tolerant when receiving unequal offers from in-group- compared to out-group members. As the name suggests, the reason these authors postulate this is primarily on the basis that people have the natural tendency to be kind to in-group members. By being tolerant and not rejecting an unequal offer from an in-group member, a person accepts inequality but knows at the same time that no money is lost from the group. That is, the larger share of the norm violator may be perceived as unfair to the person, but it is still an economic benefit to the group as a whole. Rejecting an offer from an in-group member would be akin to destroying group property. Conversely, rejecting an unequal offer from an out-group member is destroying money that cannot benefit the in-group anyway. Thus, the bias to accept unequal offers from the in-group, and reject them from an out-group, is in line with BGR. Since accepting an unequal offer from an in-group member is economically less costly for both the group *and* the individual (who also keeps a portion of the endowment), the BGR theory predicts an increased tolerance for in-group members' unequal shares to hold especially for proself individuals.

Given the above, we state two sets of competing hypotheses with respect to a bias in accepting unequal offers:

> *H5a Individuals are more likely to reject unequal offers (as a 2nd player UG) from in-group relative to out-group members.*
>
> *H6a: Based on predictions by SIT, this in-group bias predicted in H5a will be strongest for conservative prosocials.*
>
> *H5b: Individuals are more likely to accept unequal offers (as a 2nd player UG) from in-group relative to out-group members.*
>
> *H6b: Based on predictions by BGR, this in-group bias predicted in H5b will be strongest for proselfs.*

Methods

Participants

Participants were recruited through the online platform Prolific (prolific.co) and were directed to the platform Gorilla (gorilla.sc) where they were informed that there would be two parts to the study. The two parts were conducted at two different times with roughly a one-week interval. Sample size was calculated *a priori* with G*power using an effect size of d = 0.3, which is reported in the meta-analysis by Balliet et al. (2014). We recruited participants (n = 824, Female = 408) from 45 nationalities who currently reside in one of the 19 countries that use the Euro (€) currency. After eliminating participants who either did not complete both the parts of the survey (some participants responded to all of 1st Player decisions but not 2nd Player), or failed to follow the instructions, we obtained a sample size of n = 795 (Female = 389) to test hypotheses H1-H4 regarding sharing behavior, and 774 participants (Female = 380) to test hypotheses H5-H6 on accepting unfair offers.

Demographics

Participants' age, gender, nationality, and country of residence were collected through Prolific. Ninety-nine percent of participants consented to providing demographic data (Table 1). Only those who completed the questionnaires of Part 1 of the study were invited to complete Part 2. In Part 2, participants were asked to make decisions as both 1st and 2nd player in DG and UG (Table 2).

Table 1. *Participant demographics*.

Age group	**Frequency**	**Nationality**	**Frequency**
	1st player (2nd player)		1st player (2nd player)
		Africa	3(3)
18-23	331 (328)	Asia	13(12)
		Baltic countries	47(45)
		Greece	97(91)
24-34	328 (322)	Italy	110(109)
		North America	1 (1)
		North-West Europe	66 (64)
35-45	84 (79)	Portugal	333 (327)
		South America	17 (15)
		South-East Europe	30 (31)
45+	47 (40)	Spain	71 (70)

For convenience, we report the nationalities categorized by countries/geographical regions. See appendix 1A for a full list of all countries.

Design and Procedure

Part 1 of the study comprised a survey in which we first assessed participants' SVO and level of conservatism. Next we categorized them into an in- and out-group based on their aesthetic preferences, similar to the minimal group paradigm methods which have repeatedly been shown to be effective (Kranton et al., 2020; Pechar & Kranton, 2017; Tajfel & Turner, 1979; Yamagishi & Kiyonari, 2000). Participants were shown 10 pairs of paintings and were asked to indicate each time which one they preferred. The first set of 5 pairs of paintings were by Klee and Kandinsky (shown side by side), followed by 5 pairs of abstract paintings of beaches and mountains (also shown side by side). It was also made clear to participants that they would be categorized into one of two groups based on their preferences, and that this would be relevant in Part 2 of the study. Following the same procedures as Kranton et al. (2020) participants were then ranked on the basis of percent similarity of their responses and divided into two groups. The instructions participants received for the group categorization are reproduced in Appendix 2.1.

In Part 2, participants were first shown the paintings once again and reminded that, based on the similarity of aesthetic preferences between all participants, they were now categorized into groups, and thereafter would be interacting with participants from both their "own" group (the ingroup), as well as the "other" group (the outgroup). In addition, they would also be interacting with some other participants whose group membership was unknown. This third category was added in order to be able to differentiate between a mere ingroup bias (when the participant shows a preference for their own group but does not differentiate between an outgroup- or unknown other) and an ingroup bias accompanied with outgroup derogation (when the participant treats the outgroup more harshly than the ingroup).

Next participants indicated their decisions in the economic games – first as a 1st player in DG and UG (randomized), always followed by the de 2nd player decision in UG. The specific instructions for each of the games are given in Appendix 2.2. In total, participants made 9 decisions, each time with a different partner, as summarized in Table 2. To incentivize participants, they were told they could earn an additional monetary bonus depending on the decisions they made in those games.

Importantly, throughout Part 2, participants were made aware that their group membership was also known to their interaction partners (except to the unknown partners). According to BGR, common knowledge of group membership is a necessary condition for an in-group bias to occur because reciprocal behavior can only be generalized within a group if everyone knows who does, or does not, belong to it (Romano et al., 2017; Valenzuela & Srivastava, 2012).

Finally, after completing the study, participants were paid for their participation depending on the amount of time they spent completing the task. In addition to this, in reference to Table 2, every participant was paired with a different player from their respective batch for each of the nine decisions that they made. Of those, one random decision as a 1st player and 2nd player was chosen per participant. The earning from both decisions was averaged and paid out as a bonus. For example, if, as a first player, they chose to keep €5 in the DG, while they accepted €3 as a 2nd player in the UG, they received €4 as a bonus. On average, the bonus for all participants was €5.

Table 2. *Details of the 9 decisions made by each participant. The order of 1st and 2nd player decisions were randomized, but 2nd player decisions always followed 1st player decisions*

Game	Role	Group membership of partner
DG	1st player	In-group
		Out-group
		Unknown
UG	1st player	In-group
		Out-group
		Unknown
	2nd player	In-group
		Out-group
		Unknown

Variables

For the first two hypotheses (H1 & H2) regarding sharing behavior, the dependent variable (DV) is continuous and indicates the amount that each participant decided to give away from a €10 endowment. In the DG, participants were specifically instructed that they could share any amount (between 1 and 10) without any consequences or feedback from their partner. In the UG, participants were instructed that, if their partner did not accept their offer, neither they nor the partner would receive anything. For H3 and H4 regarding the effect of interdependence, we compare how the shared amount changes between UG and DG and compute a difference score.

The final set of hypotheses (H5-H6) regarding the behavior of the second player in the UG, we used the strategy method to obtain a Minimum Accepted Offer (MAO). This method eliminates the need for deception. Participants were asked to indicate whether they intended to accept or reject each of the 5 possible offers (€5/4/3/2/1). The lowest amount that the participants intends to accept from each of their interaction partners, is their MAO (the DV). The higher the MAO, the higher the intention to reject. A high MAO indicates a willingness to punish a partner who is perceived to have violated the fairness norm.

For each of the six hypotheses, the main independent variable is whether the interaction partner is from the in-group, out-group, or someone whose group membership was not known.
The two moderating variables are SVO and conservatism.

SVO

This variable was assessed with two different questionnaires administered in counterbalanced order. With the Triple Dominance (TD) method, participants were asked to choose the option they liked best (given 3 available options) in 9 situations in which to share a number of valuable points between themselves and another person (Van Lange, 2000). Based on their responses, participants were categorized either as individualistic, competitive, or prosocial. Individualistic and competitive participants were combined and categorized as proselfs. 73.86% participants were classified as prosocial, 19.28% as proself, and 6.86% were unclassified.

For the Slider Measure (SM), participants were asked to indicate their preferred option (from 9 available options) in 6 sharing situations, but this time using a slider measure(Murphy et al., 2011). In contrast to the categorical TD score, the slider measure results in a continuous variable expressed as an angle wherein angles below 22.45° indicate a proself orientation, while angles above 22.45° indicate a prosocial orientation. To obtain this final score, the ration of the mean amount allocated to self and other (subtracted by 50) in the 6 questions is first calculated. We take the inverse tangent of this ratio to obtain the SVO angle. Higher values of this angle indicate increasing weights put on equality.

$$\mathrm{SVO}^\circ = \arctan\left(\frac{(\bar{A}_o - 50)}{(\bar{A}_s - 50)}\right)$$

Using the SM with a sample of 795 participants, the average SVO angle was 26.55◦ (σ =13.51), which corresponds to a prosocial type (see Appendix 3.1 for the distribution). The frequency distribution was bimodal, with a peak within the prosocial orientation (69.22% participants were prosocial) and a peak within the proself orientation (30.78% of the sample was proself). While the bimodal distribution is not unusual (Bogaert et al. 2008)), the current population is skewed towards prosocials. In comparison, Ackermann and Murphy (2019) reported an average angle of 20.43◦ (σ = 13.58, n = 124) and 48.4% prosocials when assessed at the onset of an experiment.

The TD and the SM questionnaires correlated significantly ($r = 0.63$, $P <0.001$). To test the pre-registered hypotheses in this study, we use the continuous SM because, compared to the TD, it has the highest test-retest reliability (Bakker & Dijkstra, 2021).

Schwartz' Portrait Values Questionnaire

The portrait Values Questionnaire (Schwartz et al., 2011) asks participants to indicate on a scale of 1 to 7 the extent to which a description of a person fits their own profile. To obtain a measure of Conservatism, we used the mean score from the subscales of Security, Conformity, and Tradition (in total, 5 items). A factor analysis corroborated that all 5 items loaded onto 1 factor (loadings: 1.173, $x^2 = 55.25$, $P < 0.001$). As suggested by Schwartz (2021), we left out one item from the subscale of Tradition since the same item is also used to score the category of self-transcendence. As a whole, Schwartz' portrait values are considered reliable across studies, although previously reported Cronbach alpha's are quite low (alpha = 0.57 in Schwartz (2021) and alpha = 0.6 in Lindemann and Verkasalo (2010)). In this study Cronbach's alpha = 0.58.

Manipulation check

We used the Inclusion of Other in Self (IOS) scale (Aron et al., 1992) to assess how close an individual felt to their interaction partners. Participants were shown seven pairs of circles ranging from being completely separate to completely overlapping. Participants then indicate the pair of circles that best described their relationship with an interaction partner from either the in-group, out-group, or unknown group. We use the IOS to check the robustness of the minimal group paradigm, i.e., to make sure that participants identified more closely with their in-group in comparison to out-group and strangers.

Analyses

All the pre-registered hypotheses were tested on panel data using random effects GLS regressions with robust standard errors. We tested the main effect of group membership as well as the interactive effect of group membership and values.

We also included several control variables. To the main analyses we added the factors of age (continuous variable) and gender (female coded 1) because these two factors are known to affect fairness-related decisions and/or in-group favoritism (Romano et al., 2017). In the supplementary analyses, we report the analyses controlling for country and/or geographical region. Because we collected the data over 5 months during the pandemic, we also include a control variable ("batch") indicating whether the participant was recruited early or late in the study. Finally, we repeat all analyses testing interaction effects with SVO on a subgroup of participants whom we consider to be "consistent" prosocials (i.e., those who were classified as prosocial with both the TD and SM measures).

Pre-registration

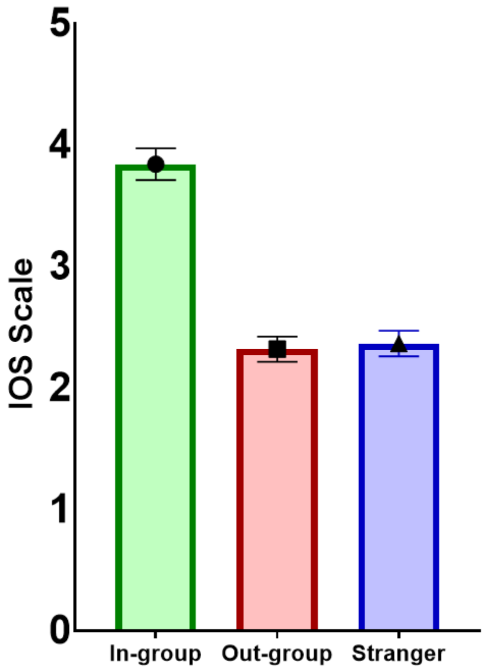
The hypotheses for this study, along with the experimental design and hypothesis tests were preregistered on OSF. They can be retrieved at https://osf.io/dau7h/.

Results

Manipulation check

Figure 1 shows that participants indicate significantly more closeness with members of their in-group compared to members of an out-group ($t(796) = 18.86$; $p<0.001$). Similarly, the degree of closeness differed between the in-group and unknown individuals ($t(796) = 17.68$; $P <0.001$), but there was no significant difference between out-group and unknowns ($t(801) = 0.712$; $P = 0.476$).

Figure 1. *Inclusion of Other in Self (IOS) Scale (Aron et al., 1992). Participants' degree of closeness with their own group, other group, and unknown individuals (strangers).*



Descriptives

Table 3 and Table 4 provide the mean, standard deviations, and zero-order correlations between the variables of interest for the 1st player DG and UG (Table 3), 2nd player UG (Table 4).

Table 3. *Means, standard deviations, and zero-order correlations between the variables of interest for DG & UG 1st player.*

	Mean	SD	1	2	3	4	5	6	7	8	9	10
1. DG (own)	3.960	1.755	1									
2. DG (other)	3.481	1.770	0.687**	1								
3. DG (unknown)	3.507	1.769	0.680**	0.736**	1							
4. UG (own)	4.791	1.078	0.343**	0.247**	0.260**	1						
5. UG (other)	4.625	1.131	0.280**	0.329**	0.335**	0.483**	1					
6. UG (unknown)	4.618	1.129	0.219**	0.254**	0.363**	0.408**	0.578**	1				
7. SVO SM Angle (Prosociality)	26.55	13.51	0.295**	0.329**	0.315**	0.122*	0.174**	0.110*	1			
8. Conservatism	6.011	1.324	0.062	0.024	0.083*	0.044	0.056	0.010	-0.045	1		
9. Age	27.50	9.035	0.072*	0.075*	0.087*	0.018	0.087*	0.033	-0.038	0.078*	1	
10. Gender (Female = 1)	0.489	0.500	0.056	0.049	0.039	0.071*	0.031	0.047	0.017	-0.016	0.05	1

*P <0.05; ** P<0.01

Table 4. *Means, standard deviations, and zero-order correlations between the variables of interest for UG 2nd player.*

	Mean	SD	1	2	3	4	5	6	7
1. MAO (own)	3.159	1.474	1						
2. MAO (other)	3.305	1.423	0.770**	1					
3. MAO (unknown)	3.303	1.444	0.742**	0.828**	1				
4. Prosociality	26.49	13.46	0.010	-0.018	-0.030	1			
5. Conservatism	5.997	1.308	-0.005	0.022	-0.007	-0.025	1		
6. Age	27.21	8.717	0.080*	0.049	0.062	-0.022	0.057	1	
7. Gender (Female = 1)	0.492	0.500	-0.062	-0.055	-0.032	0.011	-0.008	0.064	1

*P <0.05; ** P<0.001

The correlations in Table 3 show that, for the first player, games played with own, other, or unknown partners correlate highly, and that prosociality is significantly and positively correlated to each of the DG and UG decisions. All other significant correlations (with age, gender, and conservatism) are very low. Descriptives regarding the distribution of prosocials and proselfs, as well as sub-group descriptives of conservative prosocials, are reported in Appendix 3.2.

Test of preregistered hypotheses

In this section we report the statistical analyses that include gender and age as control variables. The results of the additional analyses including control variables (nationality and experimental batch), as well as sub-group analyses based on SVO and conservatism, are reported in Appendix 4. The main coefficients of interest (and significance levels) of these additional analyses differ only minimally from the results reported in this section.

Sharing behavior in DG and UG (H1-H2)

Figure 2 illustrates how much participants were willing to share with the in-group, out-group, and a stranger, revealing an in-group bias in the DG, and to a much lesser extent, also in the UG. To test the effect of group membership on "sharing" (H1) statistically, we conducted a GLS for DG and UG separately. Since the three decisions of each participant in this panel cannot be considered independent, we report robust standard errors. The results are shown in Table 5 (DG) and Table 6 (UG). The omitted category is the "Other" group, so the variable "Own" compares what participants shared with someone who had similar aesthetic preferences (an in-group member) relative to someone with different aesthetic preferences (an out-group member). The variable "Unknown" compares the amounts shared with someone (a stranger) whose aesthetic preferences are not known. If the out-group received substantially less than the unknown group, this would suggest a bias against the out-group. This is, however, not the case, as strangers were treated similarly as out-group.

Figure 2. *Mean amount in Euros (€) shared with in-group ("own"), out-group ("other"), and unknown participants in (a) DG and (b) UG as 1st player.*

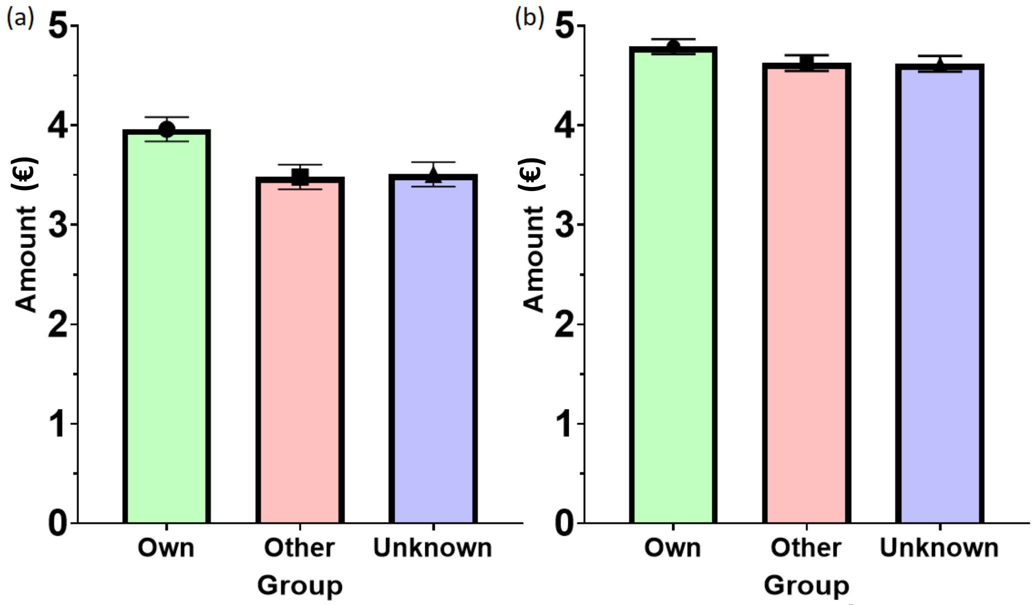


Table 5. *Unstandardized GLS regression coefficients (with robust standard errors in parentheses) showing the effect of the variables of interest on sharing behavior in DG.*

n = 790	Model 1 (r^2 = 0.02)	Model 2 (r^2 = 0.12)	Model 3 (r^2 = 0.13)	Model 4 (r^2 = 0.13)
Own	0.48 (0.05)**	0.48 (0.05)**	0.49 (0.22)*	-0.01 (0.48)

Unknown	0.03 (0.05)	0.03 (0.06)	0.03 (0.05)	0.27 (0.05)
Age	0.01 (0.01)*	0.02 (0.01)*	0.02 (0.01)*	0.02 (0.01)*
Gender Female=1)	0.17 (0.11)	0.15 (0.14)	0.15 (0.10)	0.15 (0.10)
Prosociality		0.04 (0.004)**	0.04 (0.004)**	0.06 (0.01)*
Conservatism		0.09 (0.04)*	0.09 (0.04)*	0.15 (0.11)
Own x Prosociality			-0.004 (0.004)	0.02 (0.02)
Own x Conservatism			0.01 (0.32)	0.09 (0.08)
Prosociality x Conservatism				-0.003 (0.004)
Own x Prosociality x Conservatism				-0.003 (0.003)
constant	2.99 (0.18)**	1.32 (0.31)**	1.31 (0.32)**	0.90 (0.71)

*P <0.05; ** P<0.01

Table 6. *Unstandardized GLS regression coefficients (with robust standard errors in parentheses) showing the effect of the variables of interest on sharing behavior in UG.*

n = 790	Model 1 ($r^2 = 0.01$)	Model 2 ($r^2 = 0.03$)	Model 3 ($r^2 = 0.03$)	Model 4 ($r^2 = 0.03$)
Own	0.17 (0.04)**	0.17 (0.04)**	0.18 (0.19)	0.43 (0.46)
Unknown	-0.01 (0.04)	-0.01 (0.04)	-0.01 (0.04)	-0.01 (0.04)
Age	0.01 (0.003)	0.01 (0.003)	0.01 (0.003)	0.01 (0.003)
Gender (Female=1)	0.11 (0.06)	0.10 (0.06)	0.10 (0.06)	0.09 (0.06)
Prosociality		0.01 (0.002)*	0.01 (0.003)**	0.02 (0.01)
Conservatism		0.03 (0.02)	0.03 (0.03)	0.08 (0.06)
Own x Prosociality			-0.002 (0.003)	-0.01 (0.01)
Own x Conservatism			0.07 (0.03)	-0.03 (0.07)
Prosociality x Conservatism				-0.002 (0.002)
Own x Prosociality x Conservatism				0.002 (0.002)
constant	4.42 (0.10)**	3.91 (0.19)**	3.90 (0.21)**	3.62 (0.40)**

*P <0.05; ** P<0.01

The regression analysis indicates that participants shared significantly more with their in-group compared to out-group in DG (Table 5; model 1, b = 0.48, S.E. = 0.05, P < 0.01) and in UG (Table 6, model 1, b = 0.17, S.E. = 0.04, P < 0.01), thereby corroborating H1. This in-group bias remains when controlling for age, gender, nationality, and batch (Appendix 4.2 for DG & 4.3 for UG).

To test H2, we added the continuous variables SVO and conservatism (with higher numbers corresponding to increasing prosociality and conservatism) and their interaction effects in models 2, 3, and 4 (Table 5 and 6). The main effects of prosociality and conservatism are significant in DG (**SVO:** b = 0.04, P < 0.01; **Conservatism:** b = 0.09, P = 0.021, Table 5, model 2). Thus, both prosocials and conservative individuals are more likely to share. Only prosociality remains significant in UG although the coefficient is smaller than in DG (b = 0.01, P < 0.01, Table 6, model 2).

The postulated three-way interaction of group membership, SVO, and Conservatism (computed in model 4) is not significant in either of the economic games (**DG:** b = -0.003, P = 0.225; **UG:** b = 0.002, P = 0.494). Thus, the data do not support H2 which proposed that the in-group bias would be the strongest for conservative prosocials.

We next explore if the predicted interaction effects of values and the in-group bias would be observable in a subgroup of “consistent prosocials” (79.87% of our sample qualified for this criteria) which we define as individuals that met the prosociality criterion based on both the slider- and the triple dominance measures (see Methods section). These additional analyses (reported in Appendix 5), however, still do not find evidence that either consistent prosocials, or conservative consistent prosocials, have a more pronounced in-group bias.

Sharing behavior with increasing interdependence (H3-H4)

Figure 2 also reveals that, consistent with much previous research (Bechler et al., 2015; Blanco et al., 2011; Stagnaro et al., 2018; Wu et al., 2019; Yamagishi et al., 2012), sharing is considerably increased in the UG where interdependence is greater, due to the fact that the recipients can deprive the proposers of their entire endowment.

To find out if the effect of interdependence on the ingroup bias differs for prosocials and proselfs, we conduct another GLS where we estimate sharing in the DG (the dependent variable) relative to sharing in the UG (shown in Table 7). Unlike hypothesized in H3, model 4 indicates a negative interaction effect between the type of game and in/out-group (b = -0.29, P < 0.01), indicating again that the relative increase in giving observed in UG (compared to DG, see model 1, b = 1.92, P < 0.01)) wanes when the other is from one’s own group.

Table 7. *Unstandardized GLS regression coefficients (with robust standard errors in parentheses) showing the effect of increased interdependence, group membership, and SVO on sharing behavior.*

n = 787	Model 1 (r^2 = 0.11)	Model 2 (r^2 = 0.12)	Model 3 (r^2 = 0.18)	Model 4 (r^2 = 0.18)	Model 5 (r^2 = 0.19)
UG	1.02 (0.05)**	1.02 (0.05)**	1.02 (0.05)**	1.12 (0.06)**	1.92 (0.13)**
Age	0.01 (0.004)*	0.01 (0.004)*	0.01 (0.004)*	0.01 (0.004)*	0.01 (0.004)*
Gender (Female=1)	0.14 (0.07)	0.14 (0.07)	0.12 (0.07)	0.12 (0.07)	0.12 (0.07)
Own		0.32 (0.03)**	0.32 (0.03)**	0.47 (0.05)**	0.57 (0.12)**
Unknown		0.01 (0.03)	0.01 (0.03)	0.01 (0.03)	0.01 (0.03)
Prosociality			0.03 (0.003)**	0.03 (0.003)**	0.04 (0.004)**
UG x Own				-0.29 (0.05)**	-0.33 (0.14)*
UG x Prosociality					-0.03 (0.004)**
Own x Prosociality					-0.004 (0.004)
Own x UG x Prosociality					0.002 (0.004)
constant	3.31 (0.13)**	3.20 (0.13)**	2.47 (0.14)**	2.41 (0.14)**	1.99 (0.16)**

*P <0.05; ** P<0.01

While proselfs adapted their behavior more in response to the increase in interdependence (see the significant interaction effect in model 5), they did not differentiate between in- and out-group. The postulated three-way interaction of economic game, group membership, and Prosociality (H4) is not significant (model 5, b = 0.002, P = 0.722). Robustness checks show that, when adding control variables or conducting sub-group analyses (Appendix 4.4), the effect size remains similar to the one reported here.

Accepting/rejecting unfair offers (H5-H6)
The results testing the hypotheses regarding the effect of group membership on accepting vs rejecting unfair offers by 2nd player UG are illustrated in Figure 3 and detailed in Table 8.

Figure 3. *Mean of minimal accepted offers (MAO) by 2nd players in UG in Euros (€), categorized by group membership.*

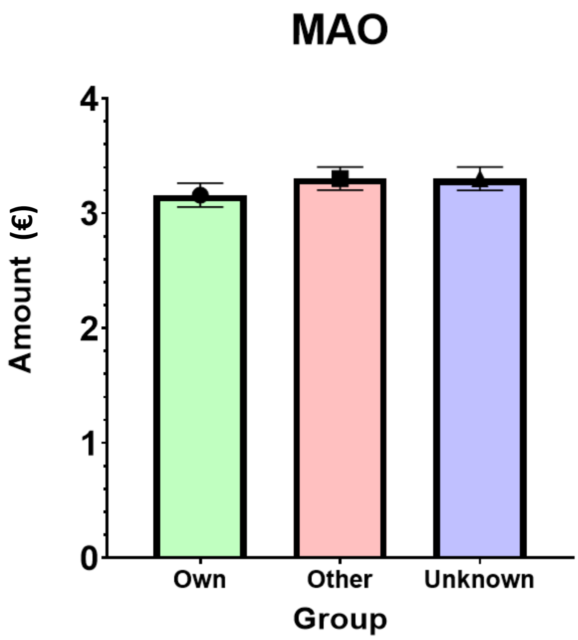


Table 8. *Unstandardized GLS regression coefficients (with robust standard errors) of the variables of interest for participants' MAO.*

n = 774	Model 1 (r^2 = 0.002)	Model 2 (r^2 = 0.01)	Model 3 (r^2 = 0.01)	Model 4 (r^2 = 0.01)	Model 5 (r^2 = 0.01)
Own	-0.14 (0.04)**	-0.14 (0.04)**	-0.23 (0.09)*	-0.17 (0.18)	0.28 (0.33)
Unknown	-0.001 (0.03)	-0.01 (0.03)	-0.005 (0.03)	-0.01 (0.03)	-0.01 (0.03)
Age		0.01 (0.01)*	0.01 (0.01)*	0.01 (0.01)	0.01 (0.01)
Gender		-0.17 (0.10)	-0.17 (0.10)	-0.16 (0.09)	-0.16 (0.09)
Prosociality		-0.002 (0.004)	-0.002 (0.004)	0.01 (0.02)	0.02 (0.02)
Conservatism		-0.003 (0.04)	-0.003 (0.04)	0.06 (0.08)	0.08 (0.08)
Own x Prosociality			0.003 (0.003)	0.003 (0.003)	-0.01 (0.01)
Own x Conservatism				-0.01 (0.03)	-0.08 (0.05)
Prosociality x Conservatism				-0.002 (0.003)	-0.003 (0.003)
Own x Prosociality x Conservatism					0.003 (0.002)
constant	3.30 (0.51)**	3.11 (0.29)**	3.14 (0.29)**	2.73 (0.51)**	2.85 (0.52)**

*P <0.05; ** P<0.01

The data support the tolerance hypothesis (H5a), namely that participants are significantly more willing to accept unfair offers from their in-group compared to an out-group. This is indicated by the significantly lower MAO for one's own group (see Table 8, model 1, b = -0.14, P <0.01).

The main effects of SVO (b = -0.002, P = 0.593) and Conservatism (b = -0.001, P = 0.979), however, are not significant. This also extended to the interactions: neither SVO nor Conservatism are found to be significant moderators of the in-group bias on rejection behavior (Table 8, Model 4-5). Hence hypothesis 5b cannot be accepted.

Analyses controlling for batch and nationality (Appendix 4) show that the coefficients of interest (namely the estimates for SVO and conservatism and their interaction with "own group") do not change substantially.

Discussion

Biases in favor of one's own group have been well documented thus far and can be accounted for by two leading theories, namely SIT and BGR. In the current study we aimed to show that SIT and BGR do not apply to all situations and all individuals, but we hypothesized that SIT would predict an ingroup bias in the DG for conservative prosocials, while BGR could account for the ingroup bias of proselfs as interdependence increased in the UG.

First, according to SIT, an in-group bias manifests itself on the basis of shared identity without any instrumental benefits. This would be the case in the DG, where sharing decisions are altruistic and there are few (if any at all) economic motives to share. Consistent with H1, we find a significant in-group bias in DG with a moderate effect size of d = 0.27, exceeding the previously reported effect size of d = 0.19 reported in the meta-analysis by Balliet et al. (2014). The in-group bias continues to exist in UG, albeit with a smaller effect size of d = 0.15. However, unlike predicted by H2, the in-group bias in DG and UG is not stronger for conservative prosocials. Similar to Romano et al. (2018), we find that prosocials consistently shared more than proselfs, regardless of the group membership of their interaction partner. As such, prosocials seem to be uniformly universal, and we find no evidence for a conservative parochial subgroup.

Second, according to BGR, an in-group bias is instrumental and occurs when group members can reap the benefits of generalized sharing. This would be the case when there is common knowledge of group membership, and sharing is a well-established group norm sustained through indirect reciprocity. Unlike what would be predicted by BGR, the increase in amounts shared in UG (compared to DG) is significantly greater for the out-group than the in-group, irrespective of individual differences in SVO (opposite of H3 and not supporting H4). This means that (in this experiment) the effect of increasing interdependence from DG to UG did not motivate participants to share with their ingroup members in order to uphold a group norm which would facilitate generalized reciprocity within the in-group, but more likely, it increased the fear of retaliation by outgroup members, (i.e., having a low offer rejected). Thus we must concur with other literature that, in the UG, expectations of retaliation is the driving force behind sharing, and that this accounts for the overall weaker ingroup bias in sharing behavior in the UG compared to the DG (e.g., Camerer & Thaler, 1995). We note especially the similarity with the study of Stagnaro et al. (2018) who report a near abolishment of the ingroup bias in UG in two experiments. While the current experiment differs in its explicit implementation of common knowledge of group membership, the data show that strategic incentives to share, also with outgroup members, trump the reputation benefits that can accrue in the ingroup. Such instrumentality seems to hold for proselfs and prosocials alike.

Third, the data on 2nd player UG shows a significantly higher incidence of rejection towards out-group members. By backward induction, participants who are harsh against the out-group might also expect more punishment from them, which would incentivize them to increase their share with out-group members, to avoid such punishment. This is exactly what we found: participants were more generous towards the outgroup out of fear of retaliation (opposite H3), while they were kind to ingroup members and not punitive. The latter finding supports H6a, the tolerance hypothesis, and contradicts

H5a, the expectancy violation hypothesis. Again, this appears to be true for both prosocials and proselfs alike (contradicting H5b-6b), and is consistent with the results of a large-scale experiment by Yamagishi et al. (2012). These authors found no relation between participants' actual rejection of unfair offers in the UG and their prosocial tendencies in other games that had various levels of interdependence. Instead of serving a punitive role to deter norm violators, these authors ascribe rejection behavior as a tacit strategy to assert one's strength and avoid being treated as a weak or inferior person. From an evolutionary standpoint, it would make sense to assert one's strong position especially towards the outgroup. This alternative hypothesis seems to be a better fit with our data.

Finally, while the data show an in-group bias, there is no indication of out-group derogation, as partners with an unknown group membership were not treated more unfairly than partners from the "other" group with different aesthetic preferences. This finding is consistent with much literature indicating that an in-group bias can exist without a dislike for the out-group (e.g., Brewer (1999)). While this should not be surprising when group membership is based on a preference for a particular painting, or other minimal characteristics (Otten, 2016), out-group derogation without an additional provocation (like competition) is not easily observed, not even in field studies with realistic or rival groups. Bouckaert and Dhaene (2004) report that men of either Belgian or Turkish descent living in the same city and running small businesses trusted and reciprocated each other equally, regardless of which group or ethnicity they belonged to.

Testing hypotheses with an experimental approach imposes limitations, which may have inadvertently influenced the results and explain why none of the hypothesized moderating effects of values hold true. Considering the predictive value of SVO across many different experimental paradigms that involve fairness and intergroup conflicts (e.g., De Dreu, 2010), it is surprising that in this experiment none of the biases were differentially affected by SVO. Several aspects of our experimental design may have contributed to the lack of significant effects.

First, the minimal group paradigm (MGP), while holding the advantage of having a grouping variable that is unrelated to the dependent variables of sharing and punishing, may be less effective (compared to realistic groups) in aligning participants with their in-groups (Pinter & Greenwald, 2011). Without additional polarizing factors, such as the intergroup conflicts incorporated in intergroup prisoner's dilemma-like experiments (de Dreu et al., 2012; De Dreu et al., 2015), MGP might thwart especially prosocials' feelings of connectedness, which in turn would affect their willingness to share with or punish fellow group members (Rahal et al., 2020). Possibly the emotional cues elicited in polarized, realistic groups, such as football fans (Apps et al., 2018) or race (Mendoza et al. 2014), would lend themselves more to find out if prosocials and proselfs have differential responses towards in- and out-groups.

Second and similar to the above limitation, the use of the strategy method to assess 2nd players' accept/reject decisions for each of the possible offers in the UG is likely to also have blunted emotions and restrained participants from responding intuitively (Declerck et al., 2009; Mallucci et al., 2019). By being able to contemplate all possible outcomes, participants were able to deliberate how to respond to low offers, which may have reduced (especially prosocials') inequity aversion (Haruno et al., 2014).

The third and fourth limitation that may have obscured interaction effects between values and biases is the choice of, respectively, questionnaires and recruitment platform. While we used two well-validated SVO measures and we repeated analyses with a subgroup of participants who had consistent scores with both measures, the mean prosociality score is higher than in previous reports (Bakker & Dijkstra, 2021; de Matos Fernandes et al., 2022), which may be an indication that the population recruited with an online platform may not have been representative, or that there might have been a desirability bias in the answers they provided. Also, the choice of Schwartz' conservatism subscale may not have lent itself well to differentiate between parochial and universal values (Howat, 2021). Schwartz himself reported that people across the world significantly differ in the way they apply these values when interacting with out-groups (Schwartz, 2007), which may have been the case since it was commonly known that the participant pool was international and heterogeneous. Also, the items of the conservatism scale may have been too loosely connected (given the low Cronbach alpha), so that it did not truly measure a single underlying stable trait. Finally, we note from the demographic data that the participants recruited are distributed in unequal proportions across different countries and age categories. While we tried to control for this in supplementary analyses, it remains possible that demographic characteristics, or other values that we did not measure, obscure the effect of SVO and conservatism we opted to study.

In conclusion, this experiment successfully replicates prior studies that have relied on MGP showing a significant ingroup bias in sharing behavior, both in DG and, to a much lesser extent, in UG. While SIT can account for the bias in a non-strategic setting, we cannot derive from the data that SIT applies especially, or more to individuals holding conservative and prosocial values, neither can we infer that BGR applies more to proself individual's sharing behavior compared to prosocials. The data does suggest, however, that participants in general fear retaliation especially from out-group members, as the increase in sharing between DG and UG is significantly larger for the out-group. Consistently, we also find an overall bias in responses to unfair offers in UG, with more rejection of out-group members' low offers, and more tolerance for in-group members.

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Appendices

Contents

Appendix 1: Participant demographics

Nationality of participants (list of countries by geographical region)

CONTINENT	COUNTRIES
North-West Europe	*Austria, Belgium, Finland, France, Germany, Ireland, Netherlands, Luxembourg, Sweden, United Kingdom*
South-East Europe	*Albania, Croatia, Cyprus, Hungary, Moldova, Romania, Serbia, Slovenia*
Mediterranean	*Italy, Greece, Portugal, Spain*
Baltic countries	*Estonia, Latvia, Lithuania*
Others	*China, India, Israel, Lebanon, Pakistan, Philippines, Russia, Sri Lanka, Turkey*
Africa	*Algeria, Nigeria, Uganda*
North-America	*United States of America*
South-America	*Argentina, Brazil, Columbia, Cuba, Peru, Venezuela*

Appendix 2: Supplementary methods

Appendix 2.1: Participants' instructions for Part 1 of the study

(For the minimal group categorization during Part 1 of the online study. Participants were aware that there would be a Part 2 to the study during which they would be interacting with others).

To conclude Part 1 of this study, we will now ask you about your aesthetic preferences.

Your responses today will be used to match you with other participants in Part 2.

You will be shown 10 pairs of paintings.

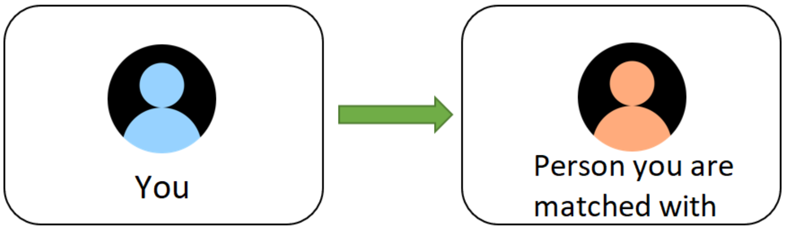
For each pair, indicate your preference by clicking on the painting you like best.

The group with participants who have preferences most similar to yours, will be called your OWN group, while the rest will be called the OTHER group.

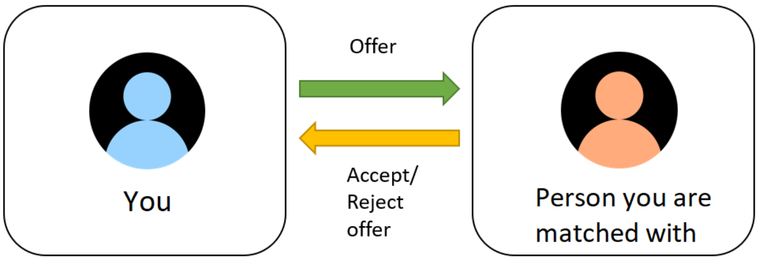
Appendix 2.2: Participants' instructions for Part 2 of the study.

(Instructions for the economic games played during Part 2, wherein each decision involved two people).

You have €10 to share with the person that you are matched with.



When you see this illustration with one arrow, you decide how much to keep for yourself and how much to share with the person you are matched with. He/she cannot decide anything.



When you see this illustration with the double arrow, the person you are matched with can accept or reject the offer made by you.

If this person accepts, you both receive the money. If they reject , neither of you receive anything.

- ***1st player instructions:***

You will now be given money and have to make decisions.

For each decision, you have €10 at your disposal.

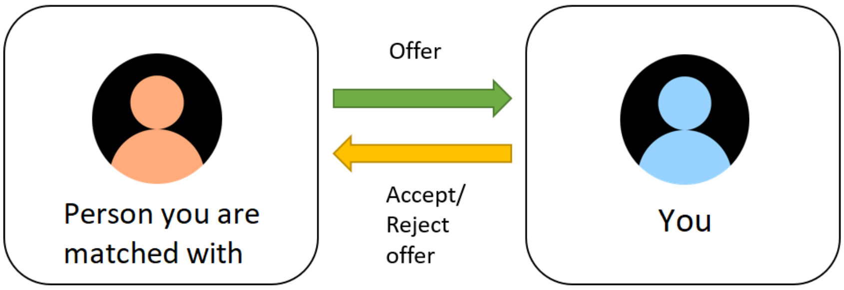
REMEMBER: you will be matched with a different person for each decision.

Also remember: you cannot go back once you click next. So answer each question carefully before proceeding.

How much of your €10 do you want to give to this person from your OWN/OTHER group/UNKNOWN person?

- ***2nd player instructions:***

We now reverse the role.



The person you are matched with has €10 at their disposal and will decide how much to share with you.

You will now be asked whether you intend to accept or reject each of the following offers that could possibly be given to you.

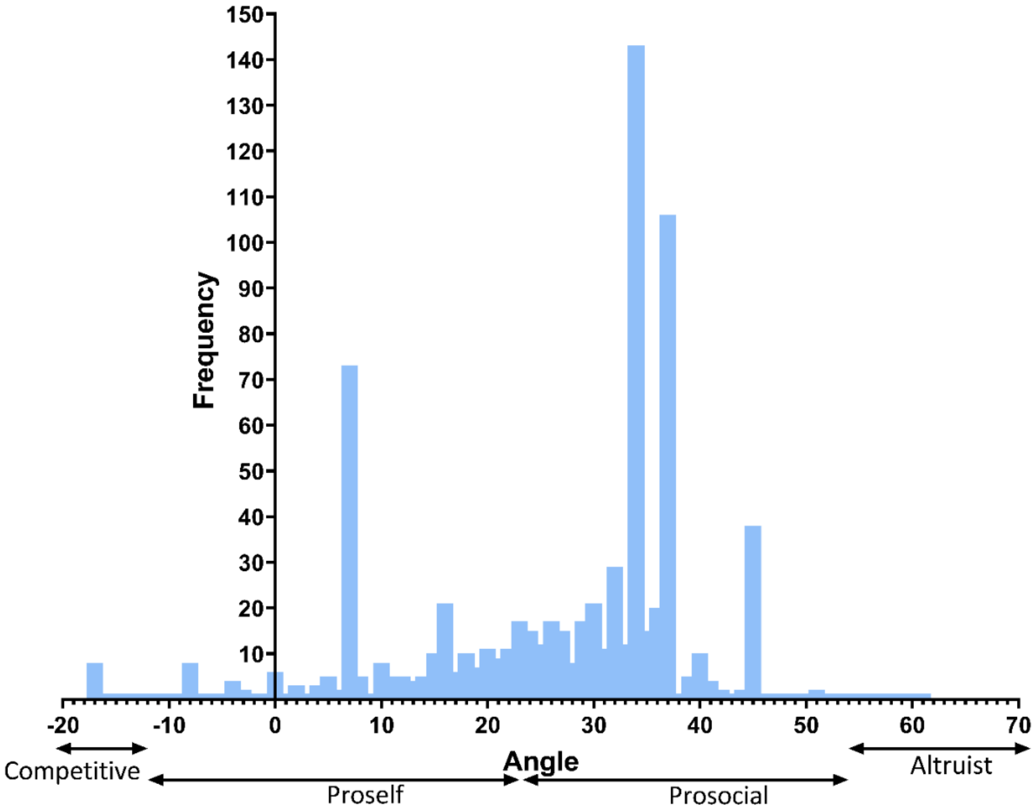
Remember that this person can be from your OWN group, the OTHER group, or have an UNKNOWN group membership.

For each of these possible amounts, accept or reject the offers made to you by an UNKOWN person/a person from your OWN/OTHER group.

Appendix 3: Supplementary results (descriptive)

Appendix 3.1: Distribution of prosociality

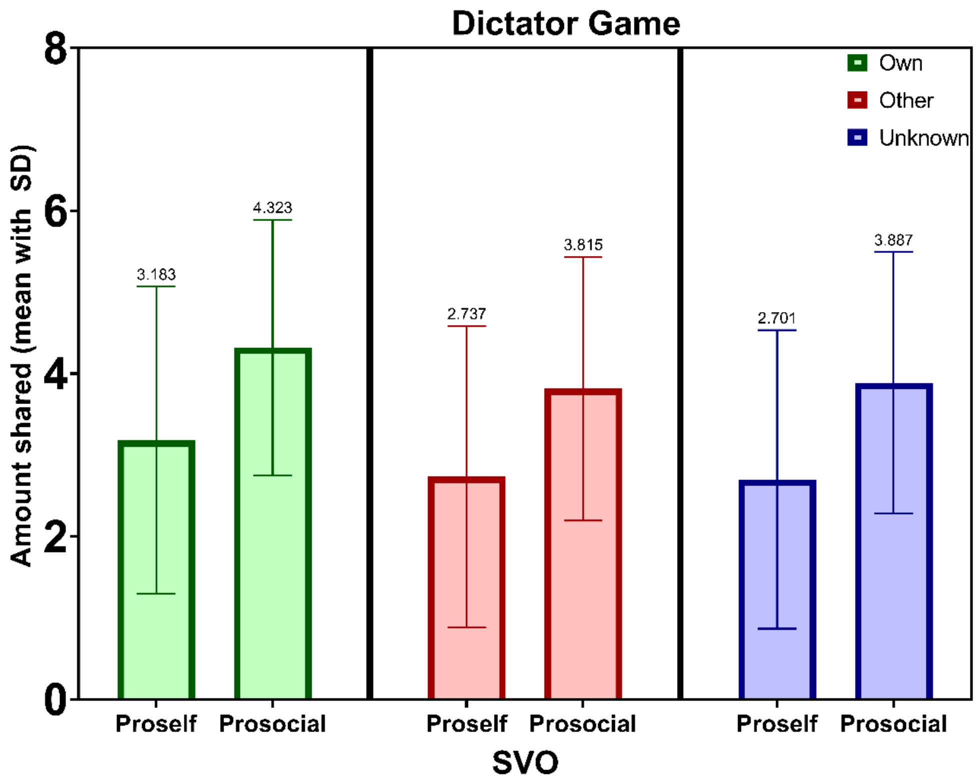
3.1.1 Frequency Distribution of altruistic, prosocial, proself, and competitive value orientation based on the angle score obtained using the Slider Measure (n = 795).



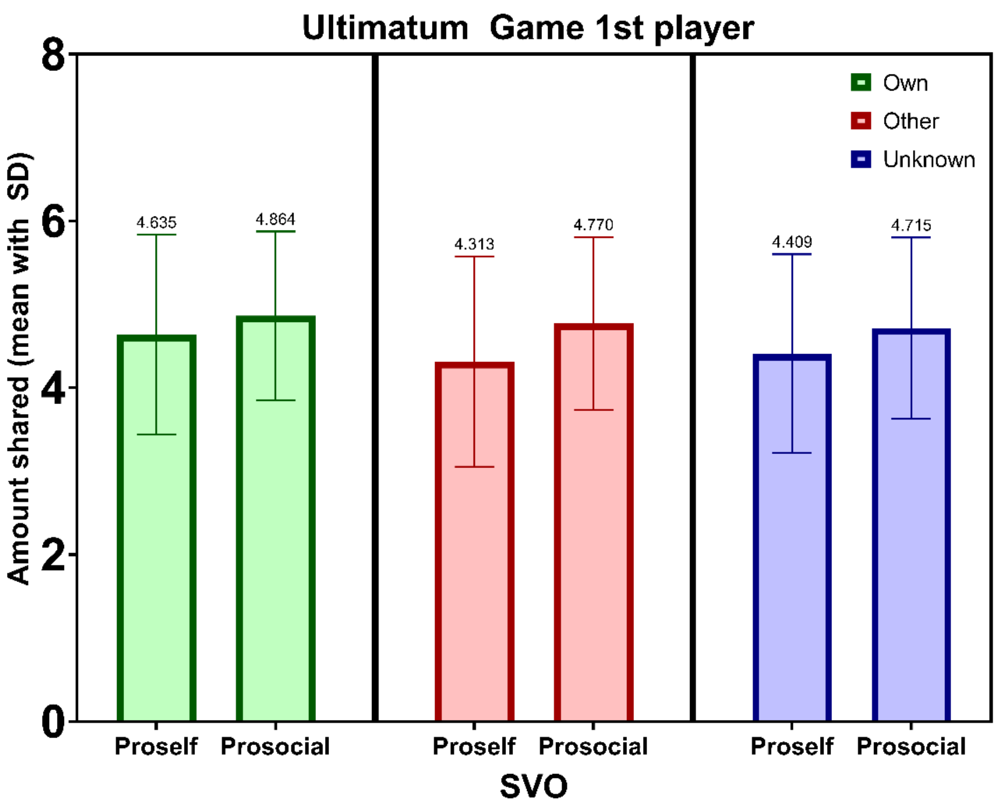
Appendix 3.2: Means and standard deviations.

(Sharing amount in Euros (€) with a member of own group, other group, or unknown group membership, decomposed by SVO using Slider Measure*).*

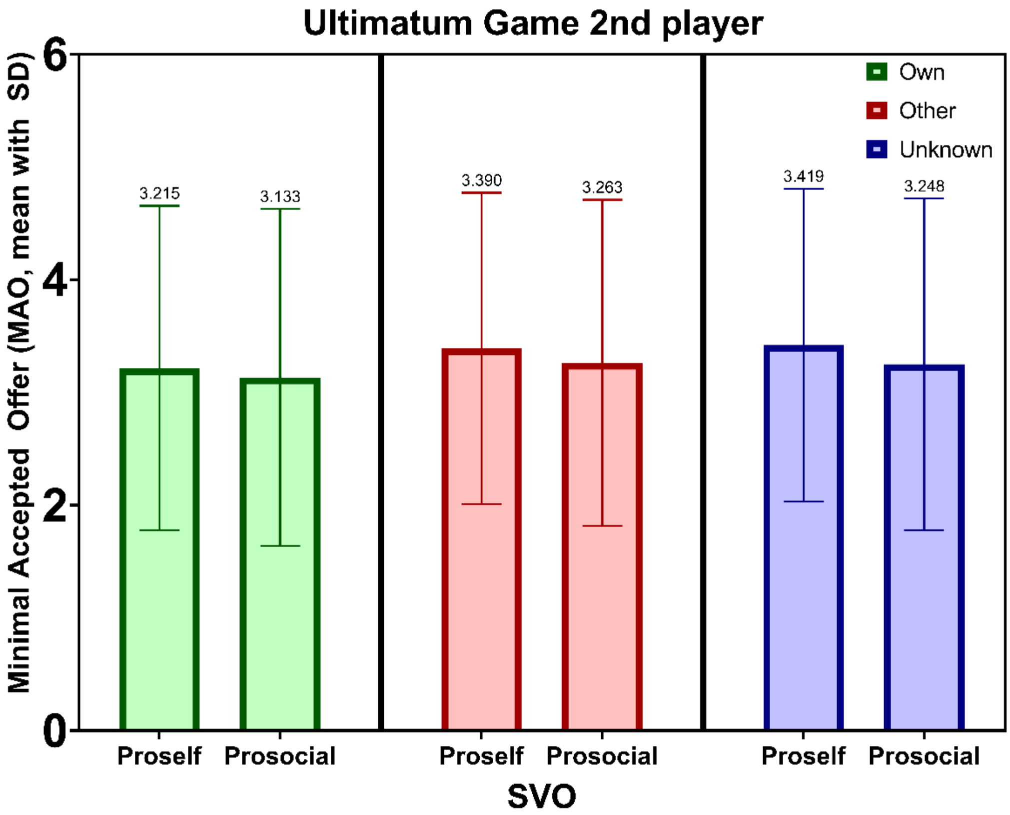
3.2.1 Sub-group means and standard deviations for amount shared (€) by Proselfs and Prosocials in DG.



3.2.2 Sub-group means and standard deviations for amount shared (€) by Proselfs and Prosocials in UG.



3.2.3 Sub-group means and standard deviations of Proselfs' and Prosocials' MAO (€) in UG.



Appendix 4: Supplementary results (inferential)

Appendix 4.1: Legend

Gender	**0 Male** **1 Female**
Batch	0 Early 1 Late
Region	0 Mediterranean 1 North-West Europe 2 South-East Europe 3 Baltic 4 Others 5 Africa 6 North-America 7 South-America

Appendix 4.2: Dictator Game (DG, H1 & H2)

Table S1. Unstandardized GLS regression coefficients (with robust standard errors in parentheses) showing the effect of the variables of interest on sharing behavior in DG. This table replicates the results of Table 5 in the main text with the addition of the control variables of batch and region.

n = 787	Model 1 (r^2 = 0.04)	Model 2 (r^2 = 0.13)	Model 3 (r^2 = 0.13)	Model 4 (r^2 = 0.14)
Own	0.48 (0.05)**	0.48 (0.05)**	0.52 (0.22)*	-0.03 (0.48)
Unknown	0.03 (0.05)	0.03 (0.06)	0.03 (0.05)	0.27 (0.05)

Age	0.01 (0.01)*	0.02 (0.01)*	0.02 (0.01)*	0.02 (0.01)*
Gender	0.14 (0.11)	0.13 (0.10)	0.13 (0.11)	0.15 (0.10)
Prosociality		0.04 (0.004)**	0.04 (0.004)**	0.06 (0.01)*
Conservatism		0.09 (0.04)*	0.09 (0.04)*	0.15 (0.11)
Batch	0.16 (0.16)	0.23 (0.11)*	0.23 (0.11)*	
Own x Prosociality			-0.004 (0.004)	0.02 (0.02)
Own x Conservatism			0.01 (0.32)	0.09 (0.08)
Prosociality x Conservatism				-0.003 (0.004)
Own x Prosociality x Conservatism				-0.003 (0.003)
Region: 1	0.24 (0.18)	0.14 (0.15)	0.15 (0.15)	0.15 (0.15)
2	0.33 (0.30)	0.30 (0.30)	0.28 (0.30)	0.28 (0.30)
3	-0.07 (0.23)	-0.17 (0.22)	-0.16 (0.22)	-0.16 (0.22)
4	-0.12 (0.32)	-0.25 (0.28)	-0.25 (0.28)	-0.25 (0.28)
5	0.93 (0.41)*	0.85 (0.26)*	0.86 (0.28)*	0.86 (0.28)*
6	1.21 (0.95)**	0.91 (0.11)**	0.84 (0.12)**	0.84 (0.12)**
7	-1.02 (0.36)*	-0.69 (0.33)*	-0.70 (0.33)*	-0.70 (0.33)*
constant	2.87 (0.20)**	1.16 (0.32)**	1.15 (0.33)**	0.72 (0.72)

*P <0.05; ** P<0.001

Appendix 4.3: Ultimatum Game (UG) 1st player (H1 & H2)

Table S2. Unstandardized GLS regression coefficients (with robust standard errors in parentheses) showing the effect of the variables of interest on sharing behavior in UG. This table replicates the results of Table 6 in the main text with the addition of the control variables of batch and region.

n = 790	Model 1 (r^2 = 0.01)	Model 2 (r^2 = 0.03)	Model 3 (r^2 = 0.03)	Model 4 (r^2 = 0.03)
Own	0.16 (0.04)**	0.16 (0.04)**	0.19 (0.19)	0.45 (0.46)
Unknown	-0.01 (0.04)	-0.01 (0.04)	-0.01 (0.04)	-0.01 (0.04)
Age	0.01 (0.003)	0.06 (0.003)	0.01 (0.003)	0.01 (0.003)
Gender	0.09 (0.06)	0.09 (0.06)	0.09 (0.06)	0.09 (0.06)
Prosociality		0.01 (0.002)**	0.01 (0.003)**	0.02 (0.01)
Conservatism		0.04 (0.02)	0.04 (0.03)	0.09 (0.06)
Batch	0.01 (0.06)	0.31 (0.06)	0.03 (0.06)	0.03 (0.06)
Own x Prosociality			-0.002 (0.003)	-0.01 (0.01)
Own x Conservatism			0.05 (0.03)	-0.03 (0.07)
Prosociality x Conservatism				-0.002 (0.002)
Own x Prosociality x Conservatism				0.002 (0.002)
Region: 1	0.14 (0.08)	0.12 (0.08)	0.12 (0.08)	0.12 (0.08)
2	0.17 (0.10)	0.16 (0.10)	0.16 (0.10)	0.15 (0.10)
3	0.02 (0.14)	-0.01 (0.14)	-0.01 (0.14)	-0.003 (0.14)
4	-0.31 (0.31)	-0.36 (0.31)	-0.36 (0.31)	-0.36 (0.31)
5	0.21 (0.11)	0.18 (0.16)	0.18 (0.16)	0.18 (0.15)
6	0.28 (0.49)**	0.22 (0.07)*	0.22 (0.07)*	0.22 (0.07)*
7	-0.18 (0.28)	-0.90 (0.29)	-0.90 (0.29)	-0.90 (0.29)
constant	4.40 (0.11)**	3.85 (0.20)**	3.84 (0.21)**	3.54 (0.40)**

*P <0.05; ** P<0.001

Appendix 4.4: Interdependence (DG vs UG, H3 & H4)

Table S3. Unstandardized GLS regression coefficients (with robust standard errors in parentheses) of the variables of interest for H3 and H4 pertaining to increasing interdependence (increase in giving behavior in UG compared to DG). This table replicates the results of Table 7 in the main text with the addition of the control variables of batch and region.

n = 787	Model 1 (r^2 = 0.12)	Model 2 (r^2 = 0.13)	Model 3 (r^2 = 0.18)	Model 4 (r^2 = 0.18)	Model 5 (r^2 = 0.19)
UG	1.02 (0.05)**	1.02 (0.05)**	1.02 (0.05)**	1.12 (0.06)**	1.92 (0.13)**
Age	0.01 (0.004)*	0.01 (0.004)*	0.01 (0.004)*	0.01 (0.004)*	0.01 (0.004)*
Gender	0.12 (0.08)	0.14 (0.07)	0.11 (0.07)	0.11 (0.07)	0.11 (0.07)
Own		0.32 (0.03)**	0.32 (0.03)**	0.47 (0.05)**	0.57 (0.12)**
Unknown		0.01 (0.03)	0.01 (0.03)	0.01 (0.03)	0.01 (0.03)
Prosociality			0.03 (0.003)**	0.03 (0.003)**	0.04 (0.004)**
Batch	0.09 (0.08)	0.09 (0.08)	0.14 (0.07)*	0.14 (0.07)*	0.14 (0.07)*
UG x Own				-0.29 (0.05)**	-0.34 (0.14)*
UG x Prosociality					-0.03 (0.004)**
Own x Prosociality					-0.004 (0.004)
Own x UG x Prosociality					0.002 (0.004)
Region: 1	0.19 (0.11)	0.19 (0.11)	0.12 (0.09)	0.12 (0.09)	0.12 (0.09)
2	0.25 (0.17)	0.25 (0.17)	0.21 (0.18)	0.21 (0.18)	0.21 (0.18)
3	-0.02 (0.15)	-0.02 (0.15)	-0.07 (0.14)	-0.07 (0.14)	-0.07 (0.14)
4	-0.21 (0.25)	-0.21 (0.25)	-0.26 (0.21)	-0.26 (0.21)	-0.26 (0.21)
5	0.57 (0.16)**	0.57 (0.16)**	0.56 (0.10)**	0.56 (0.10)**	0.56 (0.10)**
6	0.75 (0.06)**	0.75 (0.06)**	0.46 (0.06)**	0.46 (0.06)**	0.46 (0.06)**
7	-0.60 (0.27)	-0.60 (0.27)	-0.39 (0.27)	-0.39 (0.27)	-0.39 (0.27)
constant	3.23 (0.14)**	3.12 (0.14)**	2.36 (0.15)**	2.31 (0.15)**	1..89 (0.17)**

*P <0.05; ** P<0.001

Appendix 4.5: Ultimatum Game (UG) 2nd player (H5 & H6)

Table S4. Unstandardized GLS regression coefficients (with robust standard errors) of the variables of interest for participants' MAO. This table replicates the results of Table 8 in the main text with the addition of the control variables of batch and region.

n = 774	Model 1 (r^2 = 0.002)	Model 2 (r^2 = 0.03)	Model 3 (r^2 = 0.03)	Model 4 (r^2 = 0.03)	Model 5 (r^2 = 0.03)
Own	-0.14 (0.04)**	-0.14 (0.04)**	-0.23 (0.09)*	-0.17 (0.18)	0.28 (0.33)
Unknown	-0.001 (0.03)	-0.01 (0.03)	-0.005 (0.03)	-0.01 (0.03)	-0.01 (0.03)
Age		0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
Gender		-0.20 (0.10)*	-0.20 (0.10)*	-0.20 (0.09)*	-0.20 (0.09)*
Prosociality		-0.002 (0.004)	-0.003 (0.004)	0.01 (0.02)	0.02 (0.02)
Conservatism		-0.003 (0.04)	-0.003 (0.04)	0.05 (0.07)	0.08 (0.08)
Batch		0.11 (0.10)	0.11 (0.10)	0.11 (0.10)	0.11 (0.10)
Own x Prosociality			0.003 (0.003)	0.003 (0.003)	-0.01 (0.01)
Own x Conservatism				-0.01 (0.03)	-0.08 (0.05)
Prosociality x Conservatism				-0.002 (0.003)	-0.003 (0.003)

Own x Prosociality x Conservatism					0.003 (0.002)
Region: 1		0.32 (0.15)*	0.32 (0.15)*	0.32 (0.15)*	0.32 (0.15)*
2		0.66 (0.21)*	0.66 (0.21)*	0.65 (0.21)*	0.65 (0.21)*
3		0.23 (0.19)	0.23 (0.19)	0.23 (0.19)	0.23 (0.19)
4		0.30 (0.39)	0.30 (0.39)	0.30 (0.39)	0.30 (0.39)
5		0.76 (0.57)	0.76 (0.57)	0.77 (0.56)	0.77 (0.56)
6		1.87 (0.11)**	1.87 (0.11)**	1.83 (0.13)**	1.83 (0.13)**
7		-0.12 (0.34)	-0.12 (0.34)	-0.12 (0.34)	-0.12 (0.34)
constant	3.30 (0.51)**	3.05 (0.30)**	3.08 (0.30)**	2.74 (0.51)**	2.58 (0.52)**

*P <0.05; ** P<0.001

Appendix 5: Sub-group analyses with consistent SVO

(For participants whose SVO was consistent for both SM and TD measures)

Table S5. Unstandardized GLS regression coefficients (with robust standard errors) of the three-way interaction of all analyses in the aforementioned Appendix 4 for the sub-group of participants (N= 631) with a consistent SVO (participants who were classified as prosocial with both the TD and SM measures).

n = 635	DG 1st player (r^2 = 0.14)	UG 1st player (r^2 = 0.04)	Interdependence (r^2 = 0.20)	UG 2nd player (r^2 = 0.04)
Own	-0.44 (0.64)	0.26 (0.63)	0.56 (0.15)**	-0.02 (0.43)
Unknown	0.09 (0.05)	0.003 (0.04)	0.05 (0.03)	0.007 (0.03)
UG			2.01 (0.17)**	
Angle	0.04 (0.03)	0.04 (0.01)*	0.05 (0.005)**	-0.001 (0.02)
Conservatism	0.03 (0.15)	0.14 (0.08)	0.06 (0.03)	-0.04 (0.11)
Age	0.02 (0.01)*	0.004 (0.003)	0.01 (0.004)*	0.002 (0.007)
Gender	0.14 (0.12)	0.16 (0.07)*	0.15 (0.08)	-0.22 (0.11)
Own x Prosociality	0.03 (0.02)	-0.009 (0.02)	-0.004 (0.005)	-0.007 (0.01)
Own x Conservatism	0.17 (0.10)	-0.01 (0.09)		-0.02 (0.07)
UG x Own			-0.45 (0.18)	
UG x Prosociality			-0.03 (0.005)**	
Prosociality x Conservatism	0.001 (0.004)	-0.003 (0.002)		0.0002 (0.003)
Own x Prosociality x Conservatism	-0.005 (0.003)	0.001 (0.003)		0.0002 (0.002)
Own x UG x Prosociality			0.001 (0.005)	
constant	1.47 (0.91)	3.22 (0.49)**	1.51 (0.26)**	3.55 (0.71)**