Humans prefer to copy success rather than the social norm in a cooperative game

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ABSTRACT

It is often claimed that human cooperation is special, and can only be explained by gene-culture co-evolution favouring a desire to follow pro-social norms. If this is true then individuals should be motivated to both observe, and copy, common social behaviours (social norms). Previous economic experiments, using the public goods game, have suggested individuals are motivated to follow social norms. However, natural selection should favour individuals whom prefer to discover and copy successful behaviours, and previous experiments have often not shown examples of success. Here we test, on 489 participants, if individuals are more motivated to learn about, and more likely to copy, either common or successful behaviours. Using the same cooperative game and instructions, we find that individuals are primarily motivated to copy successful rather than common behaviours. Consequently, social learning disfavours costly cooperation, even when individuals can observe a stable, pro-social, norm. Our results suggest that human social learning mechanisms have evolved to maximize personal success, and call into question explanations for human cooperation based on cultural evolution and/or a desire to follow social norms.

MAIN TEXT

INTRODUCTION

Humans often appear to cooperate in ways that cannot be explained by genetical evolution¹⁻³. For example, individuals may tip a waiter in a restaurant they'll never visit again, and give food to food banks or blood to blood banks, even though they'll never learn who benefited⁴⁻⁶. Likewise, in laboratory experiments, many individuals pay for fair outcomes⁷, to share financial windfalls, and to trust, reward or punish strangers⁸⁻¹⁰.

A proposed explanation for such cooperation is that humans have evolved culturally, through the behavioural, rather than genetical, copying of traits, to prefer fair outcomes and to cooperate even when it is against an individual's material or genetic interest¹¹⁻¹⁷. The mechanisms for such cultural evolution rely on the hypothesis that humans learn by observing others (social learning) and desire to follow common social behaviours (conform with social norms).^{11,18} If people copy common behaviours, this can standardize behaviours within groups and allow a process of cultural group selection to favour more altruistic groups. Subsequently, gene-culture coevolution can favour individuals willing to sacrifice their own well-being, in order to comply with (and enforce) the social norm ('norm psychology')^{13,18}.

Experiments using social dilemmas, such as the public-goods game, have provided evidence that a norm psychology can favour cooperation. In the public-goods game, individuals can pay a monetary cost to financially benefit members of their group. Financially speaking, the group does best if everyone contributes, but individuals do best if they contribute nothing¹⁹⁻²². Many studies have shown that individuals tend to contribute partially, and that most will, when shown the average contribution of their group, approximately match it (follow the social norm)^{2,18,23-29}. When the game is repeated, contributions typically decline, although if there is the opportunity to punish others that deviate from the typical behaviour, this can stabilize contributions around an emerging social norm^{1,30}.

However, cultural and genetical evolution can pull in opposing directions³¹. And while it appears obvious that individuals sometimes copy other individuals, especially in domains such as fashion and language^{32,33}, it is not so clear that individuals copy costly behaviours³⁴⁻³⁶. Instead, natural selection may have favoured individuals that copy successful behaviours^{31,37,38}. For example, if one observes a prestigious, successful, individual at the gym, one may be motivated to imitate their exercise, clothing and diet, but not necessarily whether they donate to a charity box on their way out or not^{39,40}. Alternatively, individuals may appear to conform with the average level of tax compliance, but actually prefer to copy tax avoidance behaviours if such behaviours are associated with being successful⁴¹⁻⁴⁴. If individuals are primarily motivated to copy successful, rather than common, behaviours, then this will undermine cooperation in situations with no personal benefit⁴⁵⁻⁴⁷.

In addition, many previous experiments have not been able to cleanly distinguish whether individuals prefer to follow the social norm or be successful. This is for three reasons: 1) studies have only provided information on which behaviours are common, and not the relative success of different behaviours. Consequently, individuals in these experiments could not copy successful behaviours, and may have only copied the common behaviour

because they were unsure how to maximize income. Outside the laboratory, in the ‘real world’, individuals will likely be able to observe both common and successful behaviours, and so could choose to follow either; 2) studies have shown a declining social norm, making it hard to test if individuals are copying non cooperators or trying to match a declining social norm^{26,47}. Although some experiments have stabilized the social norm by allowing individuals to punish each other, this can stop individuals from copying the successful behaviours for fear of being punished^{1,30}; 3) studies have provided individuals with information from their own small group, which confounds social learning with social interactions (reciprocity⁴⁸, signalling⁴⁹⁻⁵¹, revenge^{52,53} etc)^{23,24,26,34,45,46}.

We experimentally tested if individuals prefer to copy either the social norm (norm-psychology hypothesis) or successful behaviours (success-psychology hypothesis) in a costly cooperative game. We showed individuals a social norm, and measured rates of copying and the consequences for cooperation (how it culturally evolved over several rounds), depending upon whether or not we also included information on successful behaviours. To enable comparisons with previous studies, we used a linear public goods game, with the same payoffs and instructions, and a similar pool of participants (students in Switzerland)²⁶. This means that the participants knew, in theory, how to be successful.

However, in contrast to many previous studies^{23,24,26,34,45,46}, the social information we showed individuals never came from their own group, but rather it came from a larger pool of individuals involved in a previous experiment (Figure 1). This prevented any within group interactions and prevented social learning from changing the social information itself^{47,54,55}. We also ensured individuals observed a stable social norm by allowing individuals in the previous experiment to punish each other, which stabilized cooperation¹. This meant that if individuals in the current experiment copied the social norm, even imperfectly, cooperation would not decline, in contrast to studies where individuals observed their own small group²⁶, or a declining social norm elsewhere⁴⁷.

Figure 1. Social information. Participants played a 6-round public goods game in groups of four, where they were provided with no information about their own earnings nor about the behaviour of their groupmates. Instead, we only showed them information about behaviours in a previous experiment. The norm-psychology hypothesis predicts that individuals will copy the social norm, whereas the success-psychology hypothesis predicts that individuals will copy examples of success.

RESULTS & DISCUSSION

Following success and not the social norm. We repeated a standard public goods game, with standard instructions and payoffs, for six rounds. To test how social learning affects cooperation, we showed individuals social information from a previous experiment in-between each round (Figure 1). We found that when we showed individuals examples of successful behaviours, this led to less cooperation (lower contributions, Figure 2 and Electronic Supplementary Material Figure 1). Specifically, in support of the success-psychology hypothesis, we found that contributions declined faster when participants could observe both success and the social norm rather than just the social norm (Generalized linear mixed model with binomial logit-link function with random intercept for each participant, GLMM: Contribution $\sim$ Treatment*Period, Estimate $\pm$ standard error = -0.05 $\pm$ 0.018, $z = -2.741$, $P = 0.006$). Providing examples of Success led to lower levels of contributions in every round where participants were given social information (Figure 2; Generalized linear model with a quasi-binomial logit-link function, GLM: Contribution $\sim$ Treatment, by Round₍₁₋₆₎: R1: $t_{1,239} = -1.536$, $P = 0.125$; R2: $t_{1,239} = -3.542$, $P < 0.001$; R3: $t_{1,239} = -5.708$, $P < 0.001$; R4: $t_{1,239} = -4.201$, $P < 0.001$; R5: $t_{1,239} = -4.164$, $P < 0.001$; R6: $t_{1,239} = -2.057$, $P = 0.0404$). For histograms of all contribution decisions see Electronic Supplementary Material Figures 2-4.

We then analysed how each individual behaved. We calculated each individual's average contribution during all the rounds with social information (i.e. ignoring the first round). We found that these average contributions significantly depended on treatment (Figure 3; Kruskal-Wallis test, $\chi^2 = 28.8$, $df = 2$, $P < 0.001$, $N = 368$; Supplementary Figure 5). Individuals contributed less on average when shown both success and the social norm rather than just the social norm (Median contribution for Shown +Success = 2.9 (15%); and for Shown Social Norm = 6.1 MU (30%): Kruskal-Wallis test, $\chi^2 = 29.9$, $df = 1$, $P < 0.001$, $N = 240$).

Figure 2. Following success and not the social norm. Shown are the mean contributions per treatment per round of the game (filled circles, solid lines) plus 95% non-parametric bootstrapped confidence intervals. Also shown are the mean values of social information that we showed before rounds 2-6 (empty grey circles, dashed lines). Being shown examples of the 'highest earners' (+Success treatment) led to a significantly greater decline in contributions than when shown just the social norm (GLMM: Contribution ~ Treatment*Period, $z = -2.741$, $P = 0.006$) or the identical information framed as the 'lowest contributors' (+Free Riders treatment) (GLMM: Contribution ~ Treatment*Period, $z = -2.219$, $P = 0.026$).

Figure 3. Learning from others' success. We calculated each individual's mean contribution over the five rounds with social information, and the corresponding mean value of information shown. Shown are the distributions, and median, of these individual mean contributions, depending on treatment. Dashed lines are the mean value of the social information shown: Social Norm (blue) or Success (red). The median contribution is closest to the social information in the Shown +Success treatment. Showing individuals not just the social norm but also examples of the 'highest earners' (+Success) reduced the median individual average contribution from 6.1 MU (30%) to 2.9 MU (15%). In contrast, showing individuals the identical information but framed instead as the 'lowest contributors' (+Free Riders) only reduced the median individual average contribution to 5.0 MU (25%) (Kruskal-Wallis test, $\chi^2 = 28.8$, $df = 2$, $P < 0.001$).

Learning from others' success. In the standard public goods game, the highest earning individuals are those that contribute the least. Therefore, when we showed individuals examples of successful behaviours, we were also showing them the behaviour of those individuals who contributed the least. To test that individuals were learning from others' Success, and not merely conditioning their contributions on the behaviour of Free Riders, we used a control treatment. Our control treatment showed the identical information as in the Shown Success treatment, but it was described differently: instead of telling the participants they were observing the behaviour of the highest earners (Shown +Success), we told them they were observing the lowest contributors (Shown +Free Riders). This framing effect allow us to eliminate all the effects that are not due to learning about others' success.

We found that the decline in contributions in our Shown +Success treatment was due to learning about others' success, in support of the Success-Psychology hypothesis. Specifically, contributions declined faster when participants were told they were observing the highest earners (+Success) rather than when they were told they were observing the lowest contributors (+Free Riders) (Figure 2; GLMM: Contribution ~ Treatment*Period, estimate $\pm$ standard error = -0.04 ± 0.018 , $z = -2.219$, $P = 0.026$). Being informed about success rather than the lowest contributors led to lower levels of cooperation in every round containing social information (Figure 2; Round two onwards: Generalized linear model with a quasi-binomial logit-link function, GLM: Contribution ~ Treatment, by Round₍₁₋₆₎: R1: $t_{1,255} = -1.599$, $P = 0.111$; R2: $t_{1,255} = -2.632$, $P < 0.01$; R3: $t_{1,255} = -3.413$, $P < 0.001$; R4: $t_{1,255} = -2.915$, $P < 0.01$; R5: $t_{1,25} = -2.610$, $P < 0.01$; R6: $t_{1,255} = -2.713$, $P < 0.01$). Likewise, when we compared each individual's overall average contribution, we found that success was key (Figure 3; Median contribution for Shown Success = 2.9 (15%), and for Shown Free Riders = 5.0 (25%), Kruskal-Wallis test, $\chi^2 = 10.6$, $df = 1$, $P = 0.001$, $N = 256$; Supplementary Figure 5).

In contrast, there was no significant difference in the overall mean level of contributions for those in the Shown Social Norm or Shown +Free Riders treatments (averaging across all rounds with social information, Figure 3; Kruskal-Wallis test, $\chi^2 = 3.0$, $df = 1$, $P = 0.082$, $N = 240$). While there was no significant difference, the contributions were lower in the Shown +Free Riders treatment than in the Shown Social Norm treatment. This difference was only 0.8 MU compared to the reduction by 2.6 MU in the Shown +Success treatment.

Copying others' success. The cultural evolution of behaviour requires that individuals copy one another (social transmission). We therefore recorded how often participants' contributions exactly matched the previous social information we had shown them. When we showed individuals just the social norm by itself, they matched it 9% of the time, significantly more than expected by chance, and thus consistent with the Norm-Psychology hypothesis (Binomial sign tests, random probability of matching set to 1 in 21 options = 0.048: frequency of matching Social Norm was 50 in 560 trials, $P < 0.001$; frequency of matching success was 21/560, $P = 0.320$; 35% of individuals matched the social norm at least once, and 18% of individuals matched success, which they could not see, at least once).

However, we found a clear preference for matching examples of success over the social norm (Figure 4). When we showed individuals examples of both the social norm and of success, they matched the social norm only 2% of the time, which was significantly less often than those shown only the social norm, and significantly less often than expected by chance (10 in 640 trials, $P < 0.001$; GLM aggregating data by participant: Times matched Social Norm ~ Treatment, $t = -4.4$, $P < 0.001$, $df = 238$). Instead, in support of the Success-Psychology hypothesis, individuals shown both forms of social information showed a clear and significant preference for matching success, doing so 15% of the time (97 in 640 trials, $P < 0.001$; GLMM controlling for participant within Shown Success treatment: Matching frequency ~ Type of information, $z = -7.2$, $P < 0.001$, $df = 126$; 55% of participants matched with Success at least once, and only 8% with the Social Norm at least once).

Again, we find that the effect of success is not due to showing participants the identical behaviour of the lowest contributors (Free Riders). Individuals were significantly less likely

to match identical behaviours when framed as the lowest contributors (Shown +Free Riders) compared to when they were framed as the highest earners (Shown +Success) (GLM: Times matched success ~ Treatment, $t = -2.8$, $P = 0.005$, $df = 254$). Instead, individuals shown both free riders and the social norm were significantly likely to match either the social norm, or the lowest contributors, more than expected by chance (obviously an individual could only match one or the other each time) (Social Norm, 48 in 640 = 8%, $P = 0.002$; Free Riders, 61 in 640 = 10%, $P < 0.001$; 34% of participants matched with Success at least once, and 25% matched the Social Norm at least once).

Figure 4. Copying success and not the social norm. We estimated how often individuals copied the social information by recording how often their contributions matched the previous social information (blue = matched social norm; red = matched success, along with 95% binomial confidence intervals). We also show the expected frequency of chance matching, calculated as $1/21$ (because contributions could range from 0-20 MU). The social norm was shown in all three treatments, but success was not shown in the Shown Social

Norm treatment and was framed as the 'lowest contributors' rather than the 'highest earners' in the Shown +Free Riders treatment. In support of the Success-Psychology hypothesis, Individuals shown both the social norm and the highest earners (+Success) matched success more (GLMM: Matching frequency ~ Type of information, $z = -7.2$, $P < 0.001$, $df = 126$); Individuals shown the identical behaviour but framed as the lowest contributors (Free Riders) did not match success as much (GLM: Times matched Success ~ Treatment, $t = -2.8$, $P = 0.005$, $df = 254$).

Choosing to learn about success. Next, instead of controlling what behaviours individuals saw, we let them choose. This allowed us to directly test if individuals cared more about observing the social norm or examples of success (Figure 5). We found that most individuals preferred to see examples of success rather than the social norm. Specifically, when the choice was free but compulsory (Forced Choice Test, $N = 61$), most individuals, nearly two-thirds, chose to see examples of Success, consistent with the Success-Psychology hypothesis (38 of 61, versus 23 choosing to see the Social Norm). Likewise, when the choice was costly, but optional, the most popular choice was to be shown examples of success ($N = 26/60$), and not the social norm ($14/60$), with one-third of individuals declining to pay for access to social information ($N=20/60$).

Overall, there was significant support for the success-psychology hypothesis, with 1.7 participants motivated to see examples of success for every participant motivated to see the social norm (Binomial Sign Test, two-tailed P-value on 64 Successes in 101 trials = 0.005, Figure 5). Although we cannot rule out that in each treatment individuals were indifferent between seeing the social norm or examples of success, we can rule out in each case a significant preference to see the social norm, contradicting the norm-psychology hypothesis (Binomial Sign Tests: Forced Choice, two-tailed P-value on 38 successes in 61 trials = 0.072 Costly Choice, two-tailed P-value on 26 successes in 40 trials = 0.081).

Figure 5. Choosing to see Success and not the social norm. We let some participants choose which social information to be shown, either the Social Norm, or Success, for the rest of the experiment. In the Forced Choice Test, they had to make this choice to proceed, even if they had no desire to see social information. In the Costly Choice Test, they could pay 1 Monetary Unit, one time, for this information, or they could choose to not pay, and receive no

information. The most popular choice in both tests was to be shown success, and overall, there was a significant preference to be shown success over the social norm (Binomial Sign Test, P -value on 64 Successes in 101 trials = 0.005).

Evolving preferences: Learning from success decreases the concern for fairness. Finally, because a desire for fairness is thought to underpin the desire to follow social norms¹⁸, we measured each individual's desire for equitable outcomes (social preferences). We did this using an established technique, the strategy method, both before and after the game with social information²³. This allowed us to test if social learning could affect not only the expression of cooperation, which often depends on beliefs about other individuals, but also social preferences, which do not²⁶. Overall, even though social preferences are often thought to be stable⁵⁶⁻⁵⁸, we found that showing individuals examples of success significantly reduced concerns for fairness (Electronic Supplementary Material Figure 6, Electronic Supplementary Material Results). Therefore, exposure to examples of success, for just five rounds, not only changed behaviour (contributions in the repeated public goods game), but also preferences, as typically measured⁵⁹.

Conclusion

We found that most individuals, when facing a social dilemma, preferred to learn about, and copy, examples of successful behaviour, even though this meant deviating from a commonly known social norm (Figures 3-5). Consequently, social learning did not stabilize cooperation, even though there was a visible and stable pro-social norm, when individuals could also observe examples of success (Figure 2). These results suggest that those previous studies, which did not include examples of success, may have over-estimated the rate of norm conformity. Even if humans do have a norm psychology, it is less motivating than their 'success psychology'. Therefore, cultural evolution models should not assume that because individuals conform in one domain, they will also conform in social dilemmas^{37,60-64}. And policy makers should not overly-rely on people's desire to follow social norms, unless they can prevent people seeing examples of success.

METHODS

Overview

To test if individuals prefer to copy either the social norm or examples of successful behaviour, we conducted an economics experiment in which we controlled each individual's access to social information during a social dilemma. To make sure our results were relevant to the literature we replicated a common experimental design for the social dilemma (linear public goods game), using the same parameters, instructions and control questions²⁶. In total, we gave money to 489 participants at the University of Lausanne, Switzerland, and made them decide how much to keep for themselves and how much to contribute to a group-fund that was personally costly but benefited their group. They had to make this decision six times, and we measured how much they contributed to the group fund depending on what social information they received. This allowed us to investigate how different forms of social information affected the dynamics of cooperation, and if individuals were motivated to see or copy common or successful behaviours

The key distinction in our experiment was that the participants were unaware of the behaviour in their own group, nor their own earnings. Instead, we only showed them information stemming from the behaviour of a previous, currently unpublished, experiment utilizing the same public goods game (Figure 1). By withholding information from participants on their own group, we prevented our participants from having emotional or strategic reactions to individuals in their own group, or from learning about how their own actions affected their own earnings. Furthermore, one key advantage of using this previous experiment was that it utilized a well-known punishment design¹, and therefore cooperation was relatively stable, allowing our participants in this study to observe a stable social norm (because punishment often prevents the usual decline in contributions).

In total, our experimental design had five different treatments, three of which controlled exactly what information our participants saw in between rounds of decision making, and two which let individuals choose. We showed individuals either examples of common behaviour (the 'social norm') alone, or we included examples of successful behaviours. Our third treatment was a control, that merely changed the description of the successful behaviours from 'highest earners' to 'lowest contributors', but showed identical information otherwise. We also used two choice treatments that let participants choose to see either common or successful behaviours.

Participants and Location

We conducted all our experimental sessions at the HEC-LABEX facility for behavioural economics experiments, located at the Faculty of Business and Economics (HEC), University of Lausanne (UNIL), Switzerland. LABEX forbids deceiving participants and requires that all experimental designs obtain ethical approval from the LABEX ethics committee (Our ethics submission is in the Electronic Supplementary Material). We aimed for 496 participants, and managed to involve 489 participants (262 Female, 217 Male, 1 Other, 12 declined to answer). We recruited our participants from the HEC-LABEX participant pool using ORSEE and forbid entry to participants from our previous experiments⁶⁵. Participants were mostly students enrolled at either UNIL or the Swiss Federal Polytechnic School (EPFL). The counts of their self-reported age ranges were: Under 20 = 153; 20-25 = 307; 26-30 = 23; 30-35 = 4; More

than 35 = 1; declined to answer = 4. The experiment was conducted in French and the ORSEE filter required that they claimed to have a level of B2 French.

Data collection

We collected data across two periods, the autumn semester of 2019 (29th November to 5th December, involving 237 participants across 20 sessions of ideally 12 participants but was only 11 in three sessions) and the autumn semester of 2020 (12th to 21st October, involving 252 participants across 16 sessions of ideally 16 participants but was only 12 participants in one session). We had planned the second bout of data collection for Spring 2020 but had to postpone when UNIL closed on March 13th 2020 in response to the Covid-19 Pandemic. The second bout of data collection was therefore conducted in line with Covid-19 health regulations (masks, hand disinfectant, open windows, and empty desks between each participant). All data were anonymous and collected electronically. Data are publicly available as a Dryad dataset⁶⁶.

Financial incentives

We paid all participants that showed up a 10 CHF show up fee. Then, for each decision, participants had to choose how to allocate 20 Monetary Units (MU). Each MU was worth 0.05 CHF, so 20 MU was worth 1 CHF. The total endowment was 10 CHF. All earnings were rounded up to the nearest CHF, and the mean average payment was 23.3 CHF, ranging from 18 CHF to 28 CHF, with a median and a mode of 23 CHF.

Experimental design and procedure

A copy of key instructions are in the Electronic Supplementary Material Methods and all experimental files are publicly available as a Dryad dataset⁶⁶. Upon arrival, participants completed a paper consent form outlining who was funding and conducting the study, that they had already earned their show up fee and what the minimum and maximum possible additional earnings were. The rest of the experiment was then conducted entirely in z-Tree.⁶⁷

We gave participants the instructions describing the decision in the public good game, followed by four multi-part questions that involved calculating hypothetical payoffs for different scenarios. These instructions and control questions had been copied, and translated into French, from those that have been made publicly available in a prior study which concluded individuals prefer to match the average group contribution (social norm)²⁶. When the participants had to answer a question, there was a calculator available, and a help box at the bottom of the screen which contained a copy of the instructions so they did not have to remember the exact details of the payoff formulas. For each question we allowed a finite amount of time (either 2 or 4 minutes depending on the level of complexity) before automatically showing all participants the correct answers.

We also maintained the same parameters of the public goods game as in the original instructions, with groups comprising four participants each endowed with 20 MU and a marginal per capita return (MPCR) of 0.4. This meant that all contributions were multiplied by 1.6 before being shared out equally. Therefore, the group income maximizing decision was to contribute fully (20 MU from each group member), but the individual payoff

maximizing decision in a single round of the game was to contribute nothing (0 MU), regardless of what one's groupmates contributed.

We then we made participants play the repeated version of the public goods game ($N=4$, $MPCR = 0.4$) for 6 rounds in constant groups (partner matching). We randomly assigned participants to one of five treatments, which differed only in the information shown to participants in-between each round.

In all treatments, we prevented participants from learning anything about their own group. They did not learn about the behaviour of their groupmates, nor about their own earnings. Instead, participants could only observe information about the behaviour relating to 20 participants that had participated in a previous experiment (Figure 1). This social information all stemmed from a particular experiment that involved four sessions of twenty participants playing the same public goods game for a length of five rounds. Each session in this experiment was randomly assigned to receive information from one of the four previous sessions and the corresponding round of the game. This is why we had six rounds, because after the first round, we showed information from the first round of the other experiment, and so on.

We chose the information from one of our own previous experiments involving punishment (currently unpublished). This had the benefit of providing social information for this study where the mean cooperation level was generally constant (stable social norm, because punishment often prevents the usual decline in contributions). Our participants in this study were not aware that punishment was a feature of the source sessions. Success was calculated on the earnings before punishment, future studies will look at the interaction between social learning and punishment behaviours.

In total, we had five treatments. Participants knew that they and everyone else in their group would receive the same information or the same options for information. Three treatments examined how different forms of social information affect the dynamics of cooperation. In all three of these treatments we allowed players to infer the social norm, by showing them the overall average contribution of all 20 players to the public good. In our baseline treatment, this was the only information (Shown Social Norm, $N = 112$). Our other two treatments showed identical information, but were framed differently. In one, we allowed players to infer the successful strategy, by showing them the average contribution of the five players that were each the highest earner in their group (Shown +Success, $N = 128$). As a control, we replicated the Shown-Success treatment but framed the 'highest earners' within each group as the 'lowest contributors' within each group (Shown +Free Riders, $N = 128$). If individuals are motivated to match the social norm, or the contributions of their groupmates, even imperfectly, then the best bet is to follow the average of the 20 participants from the previous experiment. In contrast, if individuals are motivated to improve their own payoff, then their best bet is to follow the behaviour of the highest earners.

To analyze the preferences and desire of individuals for social information we used two treatments: a forced choice test (Forced Choice Test, $N = 61$), and an optional but costly choice test (Costly Choice Test, $N = 60$). In both treatments, after the first round,

participants made their choice between seeing either the overall average (Shown Social Norm) or the average of the highest earners (Shown Success) and their choice applied to all the remaining rounds. In the Costly-Choice treatment, they had to pay 1 monetary unit to make their choice, or they could choose to not pay and not receive any information.

Before and after the repeated public good game with social information, we also made participants complete the 'strategy method' to identify social preferences²³ (Electronic Supplementary Material Figure 7). We used the same instructions as used and made publicly available by others²⁶. We used the same classification scheme as recently recommended by⁵⁹. However, to measure the frequency of confused participants, we also had them make the same decisions but for a special case where they were in a group with three computer players. We told them that the computer would make a random decision from 0 to 20, for each of their virtual group members, and that the participant was the only person who would be affected by these decisions^{29,68}. If participants fully understand the game and are income-maximizers, then they will only contribute 0 MU when playing with computers.

The players completed these two sets of conditional entries on the same screen, side by side, with either the human or the computer scenario on the left side (randomly assigned and counter balanced). After all the participants had made their decisions, we only showed them limited feedback in order to prevent them from learning either about the game's payoffs or about the behaviour of other people. We did this by only showing what the computer had chosen, but not what their human groupmates had chosen, nor their own payoffs.

Finally, we asked the participants to kindly complete a questionnaire as we prepared their cash payments.

Statistical analyses

We analysed the data using R-Studio and the zTree package⁶⁹. All statistical tests were two-tailed.

Data availability

The raw data files have been stored on Dryad.

Code availability

The experimental code files and the analysis code files have been stored on Dryad.

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