Cooperation during cultural group formation promotes trust towards members of out-groups

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People often cooperate with members of their own group, and discriminate against members of other groups. Previous research establishes that cultural groups can form endogenously, and that these groups demonstrate in-group favouritism. Given the presence of cultural groups, the previous literature argues that cultural evolution selects for groups that exhibit parochial altruism. The source of initial variation in these traits, however, remains uninforme

1. Introduction

In-group favouritism, or solidarity, is a well-documented aspect of human behaviour [1–8]. People offer preferable treatment towards members of their own group and discriminate against those belonging to other groups [4–10]. Various explanations have been offered for in-group favouritism. One is based on intergroup conflicts [5], and argues that winning groups usually exhibit above-average levels of in-group solidarity [11]. The result is evolutionary group selection for in-group favouritism. Another explanation is that, due to the high frequency of in-group interactions, it became evolutionarily advantageous for a reciprocal altruism heuristic to emerge [12].

Regardless of the selection mechanism, in-group favouritism may have coevolved with group culture [13], a process that may explain features of the contemporary socio-economic landscape [9]. For example, cultures that include a strong focus on lineage (e.g. Italy, Taiwan and Hong Kong) also have economies characterized by many small enterprises, which Fukuyama [9] argues may derive from family-oriented favouritism. While this is advantageous in many ways, in some cases it might also facilitate the emergence of out-group discrimination. The conditions under which parochial altruism (in-group favouritism combined with out-group discrimination) emerged remain a topic of active scholarly debate [5,7,13,14].
Most previous research explains parochial altruism by beginning with the assumption that multiple cultural groups coexist [4,7,8,10,15–17]. Recent research extends this by showing that cultural groups can emerge endogenously [13], and that these groups display parochial altruism. At the same time, there are widely documented cross-cultural differences in parochial altruism, in that people from different cultures behave differently towards members of in-groups and out-groups, particularly with respect to altruism, reciprocity and punishment decisions [18–20]. Left unexplained, however, are the sources of variation in parochial altruistic tendencies.

Research on small-scale societies suggests that the nature of the production process may have helped to plant the seeds of preference variation among cultural groups, particularly with respect to propensities for pro-sociality [14,21–23]. Henrich et al. [14] studied cross-cultural differences in cooperation, finding that group-level differences in pro-social activities can be largely explained by differences in pay-offs to cooperation and market integration. In particular, these pay-offs are positively correlated with pro-social behaviours within a group [14,21–24]. They also argue that individual-level economic and demographic variables seem not to explain behaviour either within or across groups. Our paper demonstrates that the extent of cooperation within the economic production environment can significantly impact the nature of parochial altruism displayed by a cultural group.

To investigate connections between cooperative culture and parochial altruism, we induce two distinct cultural groups. Our experimental approach draws from social identity theory [25]. Such studies typically either prime existing social identities (such as occurs, for example, in the stereotype threat literature [26]), or alternatively induce (artificial) group identities. Our study uses the latter, denoted by Tajfel and Turner [25] as the minimal group paradigm (MGP). This name draws attention to the idea that groups are created using trivial and almost meaningless tasks.

Our specific design is inspired by the MGP reported by Tajfel & Turner [27]. It involves randomly assigning subjects to groups and then asking each group to complete tasks. While similar, our procedure differs from Tajfel & Turner [27] in certain key respects. First, as for Chen & Li [4], our procedure facilitates social interaction within group members (but not between groups). Second, the nature of the social interaction is endogenous to each group’s production task. This latter is the unique and crucial feature of our design. In particular, one of the production tasks turns out to generate relatively more social interaction among group members.

Our primary hypothesis is that the extent of cooperation within the economic production environment impacts the nature of parochial altruism displayed by a cultural group. The existing literature suggests two likely directions for this effect. First, some studies have argued that more cooperative societies are also more open to cooperation with outside groups [9,21–23]. By contrast, other studies suggest sharing and exchange among in-group members reinforce in-group favouritism, but also build boundaries outside the group, thus reducing cooperation with out-groups [10]. Our results offer support for the former: members of all cultural groups display in-group favouritism, but only those with a culture of independent production (IP) display out-group discrimination.

2. Experiment design
To form cultural groups, we used a production process similar to that reported by Eckel & Grossman [15]. We conducted 14 sessions where we induced cultural groups. Thirteen of these sessions consisted of 10 subjects randomized into two groups of five each, and one session included two groups of four subjects. In order to induce cultural groups, each group member was asked to complete one puzzle, and members of the same group were asked to complete the same puzzle in an open environment conducive to cooperation (see §4). Different groups, however, were separated into different rooms.

We used two different puzzles: one (a triangle puzzle) required relatively more cooperative production (CP), whereas the other (a square puzzle) required relatively more IP. There was competition between groups to finish the puzzles fastest, with each member of the fastest group earning an additional two dollars. The winning group was not announced until the conclusion of the experiment (see the electronic supplementary material for puzzle game instructions).

A total of 202 people participated in our experiment. Those in the baseline condition participated first in a group production task (see §4), and then made trust decisions (as described below). Those in the baseline condition did not participate in a group production task; thus, they made their trust decisions without the experience of a competitive group culture formation process. We did not include any pre-trust game task in baseline, due to the fact that any group activity could potentially generate group culture and correspondingly impact trust decisions. A total of 64 subjects participated in the baseline condition, with 32 subjects randomized into the role of investor and the other 32 subjects randomized into the role of trustee.

After completing the production task, participants made decisions in the modified trust game of Charness & Dufwenberg [28] (figure 1). This game includes the possibility that a trustee who tries to reciprocate an investor’s trusting action will fail to be able to do so. Importantly, whether a trustee chooses to reciprocate is hidden from the investor, who sees only the outcome of the trustee’s action. This feature is important for us as we are interested in knowing whether investors respond to a failure of reciprocity differently between in-group and out-group trustees. Such differences can emerge, for example, if investors are more likely to believe that failed reciprocity is due to bad luck with in-group trustees, but purposeful defection by out-group trustees.

Each investor type (CP or IP) decided whether to choose IN or OUT according to whether they were matched with an in-group or out-group trustee. Trustees were asked to make their decisions assuming their investors chose IN. In particular, each trustee type (CP or IP) decides whether to choose ROLL or DON’T ROLL according to whether they were matched with an in- or out-group investor. The Nash equilibrium of this game is {OUT, DON’T ROLL}, meaning the investor does not trust and the trustee defects.

Participants played two periods of this game. In addition, we elicited investors’ expectations regarding trustees’ reciprocity towards in-group and out-group investors (see §4).

3. Results and discussion
We found CP and IP tasks to require different levels of cooperation. CP groups completed their tasks significantly
more slowly \((n = 12\), time = 218 s; figure 2) than IP groups \((n = 12\), time = 102 s, \(p = 0.033\), two-sided Mann–Whitney U-test\). We also compared the puzzle pieces a participant initially received with the pieces ultimately included in his/her completed puzzle. Participants ending with a relatively greater number of new pieces evidently engaged in relatively more exchange and cooperation with other group members. Indeed, we observe a strong correlation between time taken to complete the puzzle and the frequency of sharing and exchange among group members. Those who completed their puzzle using relatively more new pieces also took longer to finish the task \((n = 20\), time = 215 s) than those who used fewer new pieces \((n = 26\), time = 103 s, \(p < 0.001\)). It follows that, overall, participants in CP groups spent more time with the task and experienced more cooperation than did participants in IP groups.

Our manipulation successfully created cultural groups. In particular, our expectation elicitation (see §4) revealed systematically different expectations between CP and IP regarding the decisions of out-group trustees. CP investors expected out-group trustees to reciprocate more \((\text{mean} = 0.47, n = 34)\) than IP investors \((\text{mean} = 0.26, n = 35, p = 0.005)\). Consistent with these expectations, CP investors \((\text{mean} = 0.59, n = 34)\) trusted out-group members significantly more than did IP investors \((\text{mean} = 0.29, n = 35, p = 0.012\); figure 3). On the other hand, our manipulation did not change the rate of in-group favouritism. CP \((n = 34, \text{mean} = 0.65)\) and IP \((n = 35, \text{mean} = 0.60)\) investors did not display differences in expectations regarding in-group trustees’ reciprocation rates \((p = 0.41)\); and CP \((n = 34, \text{mean} = 0.74)\) and IP \((n = 35, \text{mean} = 0.69)\) investors trusted in-group members at the same rate \((p = 0.653)\).

Differences between CP and IP investors were apparent in relation to investors in baseline. IP investors expected less reciprocation from out-group trustees \((n = 35, \text{mean} = 0.26)\) than the overall rate of reciprocation expected by baseline investors \((n = 32, \text{mean} = 0.51, p < 0.001)\). IP investors \((n = 35, \text{mean} = 0.29)\) also trusted out-group members significantly less than the overall rate of trust displayed in baseline \((n = 32, \text{mean} = 0.56, p = 0.023\); figure 3). Thus, IP investors displayed out-group discrimination. No difference was observed between CP investors’ \((n = 34, \text{mean} = 0.47)\) expectations regarding per cent of out-group members who would reciprocate and rates of reciprocation expected in baseline \((n = 32, \text{mean} = 0.51, p = 0.507)\). Consistent with this, CP investors \((n = 34, \text{mean} = 0.47)\) displayed the same level of trust towards out-group members as investors in baseline \((n = 32, \text{mean} = 0.51, p = 0.834)\). Hence, CP investors did not display out-group discrimination.

CP investors displayed the same rate of trust for both in-group \((\text{mean} = 0.74)\) and out-group \((\text{mean} = 0.59, n = 34, p = 0.203\); figure 3), whereas IP investors presented strong in-group favouritism \((\text{mean} = 0.69 \text{ for in-group}; \text{mean} = 0.29 \text{ for out-group}; n = 35, p = 0.001)\). When combined with the out-group discrimination indicated above, it follows that IP investors displayed parochial altruism, whereas CP investors did not.

Variation in expressions of parochial altruism between CP and IP persisted to the second round. CP investors \((n = 25, \text{mean} = 0.72)\) trusted out-group members significantly more than their IP counterparts \((n = 24, \text{mean} = 0.38)\), even after experiencing deflection from in-group members (electronic supplementary material, figure S5; \(p = 0.016)\). In addition, CP investors continued not to present differences in rates of trust towards new in- or out-group trustees \((n = 25, \text{mean} = 0.72 \text{ for both}; p = 1.000)\). In-group favouritism was not observed among IP investors \((n = 24, \text{mean} = 0.58 \text{ for in-group}; \text{mean} = 0.38 \text{ for out-group}; p = 0.15)\). This result is driven largely by reduced trust frequencies towards in-group members following betrayal. CP investors \((n = 25, \text{mean} = 0.72)\) continued to trust out-group trustees significantly more than IP investors \((n = 24, \text{mean} = 0.38, p = 0.016)\). In addition, we found that reciprocity towards out-group members in the second round was generally higher in CP than IP (see the electronic supplementary material, table S2).

Systematic differences in beliefs and behaviours between CP and IP groups stem from differences in their respective group formation processes. In relation to IP, participants in CP cooperated more during group formation as a consequence.

Figure 1. The modified trust game. Investor decides whether to choose IN or OUT when s/he is matched with an in-group or out-group trustee. Assuming the investor chooses IN, trustee decides whether to choose ROLL or DON’T ROLL depending on whether s/he is matched with an in-group or out-group investor. This game has a hidden action in the sense that when the trustee chooses ROLL, chance determines whether the investor receives $12 or $0 (with probabilities 5/6 or 1/6). Trustee decisions are unobservable, and trustees have a pecuniary incentive to choose DON’T ROLL. If investor foresees this, it will lead to the [OUT, DON’T ROLL] outcome, which is the unique subgame perfect Nash equilibrium for this game.

Figure 2. Distribution of time to complete two puzzle tasks. Those who worked on the CP (triangle) puzzles (black bars, mean = 218 s, n = 12 groups) spent significantly more time than those who worked on IP (square) puzzles (white bars, mean = 102 s, n = 12 groups, p = 0.02). Further, we recorded the number of puzzle piece exchanges by comparing the specific pieces used in each person’s finished puzzle to the specific pieces initially distributed to each person. The median percentage of new pieces included in a finished puzzle is 50%; and 14 observations exactly equal 50%. The result is robust to including these 14 in either group \((p < 0.001)\). The number above each bar represents the mean fraction of new pieces in completed puzzles. People who spent more time finishing the task were more likely to be working on the triangle puzzle, and also engaged in more exchange of puzzle pieces \((n = 27, \text{mean} = 72\% \text{ new pieces})\), as compared with those who exchanged fewer pieces \((n = 33, \text{mean} = 30\% \text{ new pieces}; p < 0.001)\).
of their more challenging group production task. Our data suggest that this impacted expectations and beliefs. In particular, we observed that investors who experienced more CP were more likely to believe in the trustworthiness of out-group trustees than investors who experienced more IP. This was reflected in significantly more trusting decisions by CP towards out-group members. It is worth noting that connections between beliefs and behaviour can be formalised in our environment. In particular, when viewed through the lens of the Fehr–Schmidt [26] model of social preferences (see the electronic supplementary material), differences in expectations we elicit can well explain differences in frequencies of trust and reciprocity, though to a lesser extent than trust. IP trustees we observe.

4. Methods and summary

A total of 202 subjects at George Mason University participated in our experiment (42% female and 58% male). A total of 138 subjects participated in the culture condition, with each session consisting of two groups of the same size. One group solved triangle puzzles (CP), whereas the other solved square puzzles (IP). Fourteen sessions were conducted (all with 10 subjects except for one session with eight subjects). A total of 64 subjects were included in baseline without-group cultural formation. On average, subjects earned about $15 for a 50 min session.

(a) Production tasks

Each participant received an envelope containing four cardboard pieces (figure 4). We designed the puzzle so that solving squares required a lower degree of cooperation, whereas solving triangles required a higher degree of cooperation. In particular, each of the pieces of the square puzzle included one of the square’s corners, and there were no other right-angles included in the puzzle pieces (figure 4a). Then, we used a right isosceles triangle puzzle, cut so its pieces included only one right angle (one of the triangle’s corners). The other pieces were shaped so that it was difficult to determine quickly how to assemble them to form the triangle (figure 4b). Successfully completing the task required each group member to make an identical square/triangle.

(b) The trust game

In each session, half of the subjects were randomly assigned as investor and the other half of the subjects as trustee in a two-period sequential trust game described by Charness & Dufwenberg [28] (figure 1). Subjects were randomly
re-matched with a new partner in period 2. Subjects were paid based on a randomly chosen period. In period 2, they played the same game using all potential outcome scenarios that could have resulted from their period 1 decisions.

(c) Belief elicitation

After finishing the trust game, and prior to receiving feedback, investors (trustees) were asked to guess how many trustees (investors) reciprocated (invested) for both in-group and out-group matches. Participants earned $1 for each correct answer, and nothing otherwise.

Endnote

1Unless otherwise noted, all p-values are based on two-sided Mann–Whitney U-tests.

References

17. Lorenz G, Huffman D, Meier S. 2006 The impact of group membership on cooperation and norm enforcement: evidence using random assignment to


