

1 Does culture matter to prosocial behavior? Evidence from a
2 cross-ethnic lab experiment

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45 cross-ethnic lab experiment

46 *Abstract*

47 **Abstract: Objectives:** Recent investigations have uncovered large, consistent
48 deviations from the predictions of Homo economicus that individuals are entirely
49 self-regarding. Our study undertook a cross-cultural study of behavior search for the
50 evidences of other-regarding behaviors and its ethnic difference, and accounted for by
51 anatomy of culture.

52 **Method:** This study recruited 90 subjects of three ethnic groups from market
53 trade-based (ethnic Han), nomadism-based (ethnic Zang) and agriculture-based
54 (ethnic Bouyei) areas in China and conducted public good provision experiment with
55 stranger-treatment design.

56 **Results:** Under the assumption of self-regarding preferences, the Nash equilibrium is
57 zero contribution by all in public account using backward induction. However, we
58 found contributions did not reduce to zero over all three sessions. Besides, the
59 differences in contributions between ethnicities strongly depended on the degree of
60 ethnic dominance, and Zang harbored the strongest reciprocal preference generally
61 over all group structures. A particular set of measurable factors was identified as
62 proxies for cultural influences on behavioral differences observed in experiments
63 between ethnicities. The results showed all of the cultural factors accounted for the
64 behavioral differences between the ethnic Han and the other two minor ethnicities.
65 However, behavioral difference between minor ethnicities was attributed to group
66 structure only.

67 **Conclusions:** (1) People may harbor various forms of prosocial emotions in economic
68 affairs, and especially exhibit stronger at the initial phase rather than what canonical
69 model assumes. (2) Behavioral differences between ethnicities are prominent and can
70 be explained by differences in cultural influence.

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72 **Keywords:** Prosocial behavior
73 Public good provision game
74 Culture
75 Ethnicity
76 Group structure
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87 **1. Introduction**

88 A number of recent contributions have shown the consistent deviations from the
89 predictions of orthodox economics of *Homo economicus* by detecting the
90 other-regarding behaviors, i.e., prosocial behavior, in economic affairs (Andreoni,
91 1990; Camerer, 1997; Henrich, 2000; Glaeser et al., 2000). According to cultural
92 psychological theories, fundamental differences in how culture affects people's
93 perception of the world might predict differences in how people make economic
94 decisions (Miller, 1984; Shweder, 1990; Triandis, 1995; Levinson et al., 2007). In
95 recent years, much experimental work has focused on cultural effects on prosocial
96 behaviors (e.g., Burlando and Hey, 1997; Ockenfels and Weimann, 1999; Henrich,
97 2000; Glaeser et al., 2000; Fershtman, Gneezy, 2001; Castro, 2008). However, these
98 studies merely report the differences in prosocial behavior between ethnic groups and
99 naturally attribute the effects culture has on behavior to the individual level. Culture is
100 difficult to univocally define, although most commonly this term is used for tribes or
101 ethnic groups (in anthropology) or for nations (in political science, sociology and
102 management) (Hofstede, 2011). Until recently, economists have been reluctant to rely
103 on culture as a possible determinant of economic phenomena. Much of this reluctance
104 stems from the very notion of culture: it is so broad and the channels through which it
105 can enter the economic discourse are so ubiquitous (and vague) that it is difficult to
106 design testable (i.e., refutable) hypotheses (Guiso et al., 2006). A very small amount
107 of research has conducted analysis of the economic anatomy of culture. The work of
108 Chuah S. W., Hoffmann R., Jonesb and Williams (2009) examines bargaining
109 behavior in an experimental ultimatum game with Malaysian and UK subjects and
110 assesses to what extent attitudes in terms of culture may be responsible for the
111 prosocial behavioral differences using a number of comprehensive attitudinal surveys
112 of individuals sourced from the fourth wave (1999-2000) of the World Values Survey
113 (WVS, see Inglehart, 1997). Other research has mainly focused on the effects of
114 religions (Sosis and Ruffle 2004; Benjamin, Norenzayan A, Shariff A F, 2008; Choi
115 and Fisher, 2013).

116 In this study, we defined culture in a sufficiently narrow manner (i.e., the culture
117 of a particular people is a shared set of beliefs, values, conventions, ethnic affiliations
118 and way of economic life) to make it easier to identify the causal links from culture to
119 prosocial behavior. This study proceeded as follows: (1) We framed the standard
120 linear public good provision games and conducted three treatments based on the
121 games by manipulating the ethnic composition of the experimental groups, and then,
122 detected the prosocial behavioral differences between ethnicities. (2) We next assess
123 whether, and if so, in what ways, our subjects' different cultural backgrounds
124 generated any observed behavioral differences between ethnicities. Based on our
125 definition of culture, we collected a number of survey questions, including questions
126 sourced from WVS and regarding family status information, to combine with our own
127 questions (Prosocial Preference Survey, *PPS*. See *Table 7*). All the questions were
128 grouped into five independent sections that can provide measurements of dimensions

129 of culture in terms of prosocial preferences¹: people’s attitudes toward participation,
130 outgroup rejection (desirability as neighbors), religion, market interaction, and
131 centralization of power of a family. After the completion of the experimental game,
132 we distributed the questionnaire to collect the survey data from every subject during
133 an interval of 30 to 40 min. Then, we assess whether the differences in various
134 corresponding dimensions of culture exist between ethnicity. This study is intended to
135 account for the ethnic behavioral difference by more enriched anatomy of culture
136 (including both potential cultural dimensions- attitude and objective way of economic
137 life- according to the results of related studies) in order to reveal the pattern of cultural
138 influence on the ethnic behavioral difference more completely.

139 This paper is structured as follows: Section 2 introduces our experimental design.
140 Section 3 first provides the results of investigations into behavioral differences in
141 public good provision games and then identifies to what extent dimensions of culture
142 may be responsible for the behavioral differences in contributions observed in
143 experiments associated with different ethnicities. Finally, we present the conclusions
144 and discussion in Section 4.

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¹ WVS includes a broad scope and wide-ranging poll of socio-economic and political values and consists of more than 200 individual questions.

170 2. Experimental Design

171 The experiment was conducted at the Southwest University for Nationalities,
172 China. A total of 90 subjects were equally divided between three ethnicities. Our
173 sampling has the following considerations. First, we selected subjects from the ethnic
174 Han group, which is the majority, and from two ethnic minority groups, the ethnic
175 Zang, which is the largest minority group, and the ethnic Bouyei, which is a relatively
176 small minority group in China, to make a greater variation in ethnic population scales².
177 Second, these ethnicities exhibit different economic conditions. The ethnic Zang and
178 Bouyei practice nomadism and agriculture respectively, while the ethnic Han live in a
179 commercial economic society. Third, the participants are almost entirely freshmen
180 who have entered into college for less than three months and grew up in the original
181 regions of the ethnicities³. This is expected to reduce the influences from other
182 cultures and customs. Fourth, our recruitment proceeded in the following manner:
183 after obtaining the subject's file from the dean's office, we contacted their counselors
184 to inform the subjects to take part in the experiment rather than put up advertisements,
185 which would likely have induced sample selection bias; i.e., those who came to the
186 game could have had stronger cooperative tendencies. Additionally, we recruited from
187 a wide range of fields such as Economics, Ethnology, Sociology, Chemistry, Biology,
188 Psychology, Physics, Linguistics and Business.

189 The whole experiment was divided into two phases with 45 participants in each
190 phase. In the first phase, we conducted 3 consecutive treatment sessions, each
191 composed of 10 decision-making rounds. In other words, participants played 30
192 rounds of public good provision games in total. In the first treatment session, all the
193 subjects were randomly divided into 9 groups, and every group had 5 subjects who
194 were aware that they played in a group comprised of different ethnicities (labeled
195 'diverse group'). In the second treatment session, the subjects were randomly divided
196 within a sample of their own ethnicity (labeled 'homogeneous group'). In the third
197 treatment session, we firstly randomly selected 9 subjects equally from three
198 ethnicities and then matched every subject with 4 other subjects different from his/her
199 ethnic affiliation from the rest of the subjects (labeled 'one ethnicity dominant group').
200 To avoid the order effect, in the second phase, we conducted the treatment sessions in
201 the following order: the 'homogeneous group,' the 'one ethnicity dominant group' and
202 then the 'diverse group'. Most experiments usually provide predictions of behavior by
203 playing repeated games with subjects as many one-shot games. However, the results
204 from Botelho, Harrison, Pinto Costa and Rutström (2009) argue that there is some
205 chance that subjects will meet in multiple rounds, and the assumption that subjects
206 treat random strangers designs as if they were one-shot experiments is false; thus, a
207 reputation effect may develop. Therefore, the group structures were public
208 information over all sessions, although the subjects were not allowed to obtain the

² The population proportion in China of Han, Zang and Bouyei are 91.6%, 0.47% and 0.22%, respectively (National Bureau of Statistics of China. China Statistical Yearbook. <http://www.stats.gov.cn/tjsj/pcsj/rkpc/6rp/indexch.htm>).

³ Five participants quit the experiment for personal emergencies and another five subjects who shared their same ethnicities, but study in higher grade were in stead.

209 information on recruitment numbers of any ethnicity and types of ethnicities to make
210 them feel there was no chance that they would meet the same person in any other
211 round to rule out reputation effects as well as effects of ethnic stereotype, and thus
212 develop an instinct towards prosocial behavior (Fershtman and Gneezy, 2014).

213 All sessions used the standard linear public good provision game including both
214 neutrally worded and written instructions (See *Appendix B*). Five subjects in a group
215 were endowed with 50 tokens each at the beginning of each round and each token was
216 converted into money using an exchange rate of 1RMB (0.16US\$)⁴ at the end of the
217 experiment. They decided on the allocation of their endowment between a private and
218 public good. Each token held in private earned one token for the participant only
219 whereas each token placed in the public good earned 0.5 times the token for each
220 member of group. Let $g_i(0 \leq g_i \leq 50)$ be the subject i ' contribution to the group
221 account and let π_i be the payoff given by

$$222 \quad \pi_i = 50 - g_i + 0.5 \sum_{i=1}^5 g_i \quad (1)$$

223 We followed the experimental design of Neugebauer, Perote, Schmidt and Malte
224 (2009) and asked subjects to report the guess values of the mean group contribution
225 after the decision-making in each round, and they received information feedback
226 about the actual mean group contribution at the end of each round. Note that by
227 requiring the reporting of the expected mean contributions, we might be forcing
228 subjects to think more carefully about his/her economic decision than they otherwise
229 would have. The total payoffs of a subject in each round included the payoffs from the
230 group project as well as from guessing (*Appendix B* provides the computational
231 formula of the payoffs). At the end of the experiment, the final payoff each subject
232 received was his/her average payoff over 30 rounds⁵.

233 **3 Results**

234 In this section, we provide detailed descriptions and statistical tests of the results.
235 We focused on the behavioral differences from the experiment in Section 3.1. In
236 section 3.2, we assessed to what extent the corresponding indicators from *PPS* were
237 responsible for the behavioral differences associated with ethnicity observed in the
238 experiment. A description of the variables is presented in *Table 1*.

⁴ 'RMB' is the Chinese currency, and the exchange rate was 6.1 RMB per dollar in November, 2014. Herein, we provide both values as RMB (US\$).

⁵ The final payoff each subject received was determined by the total payoff of the whole game (e.g., Putterman L and Anderson, 2006; Neugebauer, Perote, Schmidt and Malte, 2009) rather than in a random manner (e.g., Anderson, Mellor and Milyo, 2008) because in each round, participants may believe that there is a low possibility (1/30) that this round will be selected and hence do not treat it carefully. Hence, the final payoff is determined by the average payoff of 30 rounds in our experiment.

239 **3.1 Results from experiment on behavioral differences**

240 *A. Are there any differences in the trends of the contributions over time*
241 *between ethnicities?*

242 ***Result A: The results from the ethnic Bouyei and Han are supportive of declining***
243 ***trends of contributions, whereas the results from ethnic Zang show a roughly***
244 ***increasing trend. Moreover, the guess values gradually decrease over time for all***
245 ***ethnicities.***

246 The three ethnicities exhibited distributions with no contributions at full-riding
247 and full cooperation. The results from the total sample did not strongly support the
248 declining trend of contributions, and trends were prominently different between
249 ethnicities. Interestingly, the contributions in the first round over all three sessions
250 were very close among ethnicities and are approximately 1/3 of the endowments
251 (17RMB (2.8US\$)), which demonstrated an imprinted tendency to cooperate.
252 Afterwards, the ethnic Bouyei and Han exhibited a declining trend with strong
253 regularity, as observed in previous studies. We believed that this less cooperative
254 behavior arose from the gradual mistrust in others over time rather than out of
255 punishment of others⁶. The mistrust led to the instinctive human desire
256 for self-preservation which is the fundamental behavioral principle of humanity under
257 ‘Hobbes Jungle’ that approximates our design with absence of formal social norm
258 (such as no design of punishment rules) argued by Hobbes T and Jean-Jacques
259 Rousseau (this argument is cited from Meng Li, 2013). However, even under the
260 mechanism of information feedback, the cooperation level of the ethnic Zang roughly
261 showed a rising trend. Additionally, in contrast to the ex ante unknown number of
262 periods (Fehr and Gächter, 2000), we deliberately designed the experiment with ex
263 ante known and found that the most generous cooperation occurred at the final round
264 for the ethnic Zang and Bouyei. Some other studies have also detected the same
265 phenomenon in experiments and explained that many subjects are willing to have a
266 final attempt (Zhou and Song, 2008). Nevertheless, we provided a plausible reason,
267 on the basis of our informal return visit, that some subjects who contributed less over
268 time would feel guilt that they had reduced the group’s payoff once. This may led to
269 the highest contributions of them out of the intention of compensation at the final
270 round.

271 ***B. Do behavioral differences between group structures exist? And ethnic difference***
272 ***in contribution depends on group structure?***

273 ***Result B: Ethnic diversity did not necessarily reduce the level of cooperation, and***

⁶ However, another possible reason to explain the reduction in contribution over time is that subjects are willing to punish free-riders. The less contribution he/she makes to the group account, the less payoff is received by the free-riders from free-riding. This is a potential way to punish free-riders in public good experiments without a punishment mechanism design, and humans reciprocate wrongs by harming the offender, even at a cost to themselves (Fehr and Gächter, 2000; de Quervain, Fischbacher, Treyer, Schellhammer, Schnyder, Buck, Fehr, 2004). However, we believe subjects’ motivation to reduce contributions is out of gradual mistrust in others rather than punishment of free-riders, according to our informal callback survey that inquired about the motivation of subjects to reduce contributions.

274 *ethnic dominance may pose a greater barrier to cooperation. However, ethnic*
275 *dominance merely had an overall effect; i.e., it decreased contributions of all*
276 *subjects in GS3 and did not change the subjects' relative contribution between the*
277 *group structures in which his/her ethnicity was designed as dominant and minor*
278 *ones. There were remarkable ethnic differences in contributions in most situations,*
279 *and the two largest differentiations both appeared in the GS3 (between the Zang*
280 *and other two ethnicities). However, when subjects acted as minor ethnicities in*
281 *GS3, the differences between ethnicities vanished.*

282 A few studies have shown that ethnic diversity frequently reduces team
283 performance in both public and private sectors (Watson, Kumar and Michaelsen, 1993;
284 Pelled, Eisenhardt and Xin, 1999; Pitts and Jarry, 2007; Castro, 2008; Hur, 2013),
285 whereas the conservative estimates of the experimental study by Waring and Bell
286 (2013) indicates that ethnic dominance has a much larger negative effect on
287 contributions in the public goods experiment than does caste diversity in India. We
288 found multi-faceted results for different ethnicities in our study. Statistical power
289 analysis of the non-parametric Mann-Whitney U(*MWU*) test cannot reject the null
290 hypothesis that contributions of the ethnic Zang between group structures come from
291 the same distribution, which means ethnic diversity has no significant effect on the
292 level of cooperation of ethnic Zang (the mean contributions in *GS1*, *GS2* and *GS3*
293 were 16.7RMB (2.74US\$), 17.4RMB (2.85US\$) and 16.9RMB (2.77US\$),
294 respectively). However, we found that contributions were significantly different
295 between all group structures for ethnic Bouyei, which confirms group structure-bias
296 (the mean contributions in *GS1*, *GS2* and *GS3* were 15.0RMB (2.46US\$), 18.5RMB
297 (3.03US\$) and 13.2RMB (2.16US\$), respectively). The mean level of contribution in
298 *GS2* was the statistically highest, which suggests that the ethnic Bouyei regard a
299 group structure composed of their own ethnicity members more favorably than the
300 other two group structures. By contrast, ethnic diversity promoted the cooperation of
301 ethnic Han (the mean contributions in *GS1*, *GS2* and *GS3* were 17.5RMB (2.87US\$),
302 15.8RMB (2.59US\$) and 13.6RMB (2.23US\$), respectively). We may thus conclude
303 that the ethnic interactions entail additional complexities rather than one single law.
304 The statistical results from the ethnic Han conflict with the conjecture that the lowest
305 level of cooperation would appear in *GS1*: *GS1* had the highest degree of diversity but
306 prior researchers have suggested that humans cooperate more with in-group members
307 (de Cremer and Vugt 1999; Goette et al., 2006). In contrast, ethnic dominance may
308 pose a greater barrier to cooperation than ethnic diversity, and cooperation is much
309 more likely to be determined by interactions at a finer scale (Posner, 2004; Waring
310 and Bell, 2013); we found that mean contributions in *GS3* were lower than the other
311 two group structures for the ethnic Bouyei and Han. We further computed *P-values*
312 from *MWU* to compare the contributions of subjects when acting as a dominant and as
313 a minor affiliation in *GS3*. We found an interesting result: although ethnic dominance
314 decreased cooperation, contributions under the two situations were not significantly
315 different ($p=0.14$, 0.56 for the ethnic Bouyei and Han, respectively). This result
316 revealed that the only overall effects of ethnic dominance were that selfish-bias was
317 more likely to be elicited by all members and the reduction in contributions affects all

318 members rather than only the subjects from minor affiliations. This leaves open the
 319 possibility that people may be sensitive to the terms of the group structure (in terms of
 320 being a ‘diverse group’, ‘homogeneous group’ or ‘one ethnic affiliation dominant
 321 group’) rather than his/her ethnic affiliation status in terms of the composition of
 322 ethnic population.

323 We also found the evidence that group structure played an important role in
 324 determining the ethnic difference in contribution. The two greatest contribution gaps
 325 appeared in *GS3* (between the ethnic Zang and Bouyei, differences in mean
 326 contributions in *GS1*, *GS2* and *GS3* were 1.7RMB (0.28US\$), -1.1RMB (-0.18US\$)
 327 and 3.7 RMB (0.61US\$), respectively) and between the ethnic Zang and Han, and the
 328 greater contribution gaps appear in *GS2* than *GS1* (differences in average
 329 contributions in *GS1*, *GS2* and *GS3* were -0.8RMB (-0.13US\$), 1.6RMB (0.26US\$)
 330 and 3.3RMB (0.54US\$), respectively). Besides, we found an interesting result that
 331 acting as the minor ethnicity in *GS3*, there were insignificant differences in
 332 contribution between ethnicities, i.e., the behaviors of all
 333 ethnicities exhibited consistency ($p=0.19$ between Zang and Bouyei, and $p=0.64$
 334 between Bouyei and Han). The evidence from our experiment confirmed the
 335 importance of degree of ethnic diversity (or ethnic dominance) in determining ethnic
 336 differences on cooperative behavior.

337 ***C. What forms of prosocial preferences are elicited in the experiment and was there***
 338 ***any difference in their intensity between ethnicities?***

339 ***Result C: Reciprocity preference was generally observed over all group structures***
 340 ***for all ethnicities, and it appeared to be stronger in GS1 than in GS2. The ethnic***
 341 ***Zang generally showed larger coefficient of Guess than the other two ethnicities,***
 342 ***which indicated their stronger reciprocity preference. Moreover, the results showed***
 343 ***that subjects may harbor other forms of prosocial preferences besides reciprocity as***
 344 ***the significant coefficients of $AVReal_{it-1}$, and a comparison of coefficients’ size***
 345 ***indicated that ethnic Bouyei and Zang reacted more intensively than the ethnic***
 346 ***Han.***

347 We divided the panel data by ethnic affiliation and estimated the following
 348 *Eq.(2)*, which captured the panel data dynamics for the contributions. *Eq.(2)* explained
 349 subject’s contributions in terms of their own past contributions, their guesses about
 350 average contributions and the lagged average contribution of group members. We
 351 used generalized method of moments (*GMM*) to ensure the consistency of the
 352 parameter estimates of the corresponding dynamic panel data structures.

$$353 \quad CB_{i,t} = \alpha + \beta_1 CB_{i,t-1} + \beta_2 Guess_{i,t} + \beta_3 AVReal_{i,t-1} + \varphi_i + \varepsilon_{i,t} \quad (2)$$

354 Ashraf, Bohnet and Piankov (2005) decompose prosocial preferences in dictator
 355 and trust games by phase-sequence design and define trustor’s expected value of the
 356 fraction returned by trustee as an independent variable of trust, which we infer may
 357 explain the conditional preference, i.e., reciprocity. Similarly, the guess value was
 358 regarded as a proxy indicator measuring the intensity of reciprocal preference in our
 359 experiment. More contributions would be made as a result of more expected
 360 contributions from others. The results showed that reciprocal preference was observed

361 over nearly all group structures and was strongest in *GS1* for all ethnicities, which
362 remarkably indicated that subjects reciprocated more in ethnically diverse than in
363 ethnically homogeneous groups (See Table 4). This result contradicted our expectation
364 that the strongest reciprocity would occur in *GS2*. Although acting as minor
365 affiliations in *GS3*, the ethnic Bouyei and Han also exhibited strong
366 reciprocal preferences. By contrast, for the ethnic Zang, the contributions were
367 uncorrelated with the guesses, which demonstrated the constant intensity of
368 this preference: no matter how much the dominant ethnicity contributed to the group
369 account, the contributions elicited by reciprocity preferences remained unchanged
370 ($p=0.28$). On the whole, the ethnic Zang may have a stronger reciprocal preference
371 because the coefficients of ‘Guess’ were generally larger in magnitude than other two
372 over all group structures.

373 We were able to trace unconditional prosocial preferences by specifying lagged
374 $AVReal_{it-1}$ in regression models. The lagged $AVReal_{it-1}$ was expected to be
375 uncorrelated with CB because the groups were randomly assigned in each round.
376 However, the result conflicted with our expectation in *GS2*. The negative sign of the
377 coefficients of lagged $AVReal_{it-1}$ demonstrate that the lower average contribution to
378 the group account in the last round increased one’s contribution in the following round
379 even if the group had been randomly reassigned. The subjects may harbor
380 unconditional emotions such as earning inequality aversion, hoping that earning was
381 fairly assigned to the members of his/her own ethnicity when they lie in a
382 homogeneous group, and this allowed us to conjecture that a shared ethnic affiliation
383 may serve as coordination devices for shared expectations, namely the pursuit of
384 earning equality. A comparison of the size of the coefficients between the ethnicities
385 suggests that the ethnic Bouyei and Zang reacted more intensively than the ethnic
386 Han.

387 **3.2 The results of assessing the explanatory power of culture**

388 After discussing the differences in prosocial behavior between ethnicities based
389 on the public good provision experiment, next we identified the cultural explanatory
390 variables for the behavioral differences, and we conducted our analysis as follows: (1)
391 First we examined whether the ethnic affiliation itself predicted the observed
392 behavioral difference. To accomplish this task, we regressed the contribution to the
393 group account exclusively on subject ethnic affiliation and other variables controlling
394 for individual characteristics because ethnic affiliation is considered to be aggregative
395 predictor for culture and is normally characterized in terms of culture (Betancourt and
396 Lopez, 1993) (See results of *Model 1* in Table 6). Regressing the contribution on a
397 dummy variable for subject ethnic affiliation resulted in coefficients with strong
398 explanatory power (the ethnic affiliation predicted differences in contributions
399 between the ethnic Zang and Bouyei at 1% significance and between the ethnic Zang
400 and Han at 5% significance). Additionally, we also found that two variables of
401 individual characteristics, major and gender, were responsible for the cooperative
402 behavior.

403 (2) Although ethnic affiliation per se provided strong explanatory power, our task

404 was to investigate how culture operated. We decomposed the conception of culture
405 into five dimensions grouped by measurable variables and then measured their ability
406 to explain behavioral differences (*Participation*, *Outgroup Rejection*, *Religion*,
407 *Market Interaction* and *Centralization of Power*). Before carrying out this
408 measurement, we assessed to what extent cultural differences exist between ethnicities
409 in terms of their responses to these cultural questions. We subjected each group of
410 items to separate factor analysis and used the Varimax rotation method to obtain
411 parsimonious factor solutions and retained only those with eigenvalues greater than
412 1.5 (these factors and the individual items that constitute them are outlined in
413 *Appendix A*). Afterwards, a series of Mann-Whitney tests were conducted on
414 differences in scores between ethnicities (See *Table 5*). The results showed that there
415 was no significant difference in terms of *PC* (*Participation*) in a range of voluntary
416 associations (p= 0.26 for Zang vs. Bouyei; p= 0.13 for Bouyei vs. Han; p=0.71 for
417 Han vs. Zang) as well as *OR* (*outgroup rejection*) in a range of living environments
418 with different types of neighbors (p=0.86 for Zang vs. Bouyei; p=0.18 for Bouyei vs.
419 Han; p=0.28 for Han vs. Zang) between all ethnicities. Moreover, we found the ethnic
420 Zang and Han were statistically the most and least religious respectively based on the
421 comparison of *RL* (*Religion*). We also found that the ethnic Han showed the highest
422 level of involvement in market economies (*Market Interaction*), but there was no
423 evidence of differences between the ethnic Bouyei and Zang (p= 0.9 for Zang vs.
424 Bouyei; p=0.10 for Bouyei vs. Han; p=0.09 for Han vs. Zang). Finally, the ethnic
425 Zang also exhibited a higher degree of centralization of power of family
426 (*Centralization of Power*, p= 0.04 for Zang vs. Bouyei; p= 0.57 for Bouyei vs. Han;
427 p<0.01 for Han vs. Zang). We dropped the insignificant cultural factors, *PC* and *OR*,
428 and then regressed the contribution on the remaining ones and their interaction terms
429 with ethnic affiliation, while still keep ethnic affiliation and other variables controlling
430 for individual characteristics in the regression model (see the results of Model 2 in
431 *Table 6*),

$$432 \quad CB_i = \alpha + \beta_1 RL_i + \beta_2 MI_i + \beta_3 CP_i + \beta_4 EA_i \times RL_i + \beta_5 EA_i \times MI_i \\
= \beta_6 EA_i \times CP_i + \beta_7 EA_i + \beta_8 MJ_i + \beta_9 GD_i + \beta_{10} EP_i + \beta_{11} EY_i + \beta_{12} GS + \varepsilon_i \quad (3)$$

433 By decomposing culture, The results showed that the cultural factors also
434 provided powerful predictors, based on the observed significant values of interaction
435 terms (cultural factors interacted with ethnic affiliation); however, once they are
436 specified in the regression model, the values of the coefficients of *EA* (ethnic
437 affiliation) varied significantly, but the *adjusted R²* varied relatively little (the *adjusted*
438 *R²* of *Model 1* and *Model 2* were 0.29 and 0.35, respectively, and the coefficients of
439 individual characteristic variables were not sensitive to this change). This may imply
440 multicollinearity, and therefore we next regressed *EA* on all cultural factors and found
441 all of them were significantly correlated to *EA*. This result may suggest that a
442 particular set of measurable variables identified in our survey is capable of serving as
443 proxies for the cultural influences on economic behavior⁷. Interestingly, we found the

⁷ The adjusted R² of the regression model is far below 1 also indicated there were still other potential variables accounting for culture that we did not identify.

444 differences in the three dimensions of culture, *RL*, *MI* and *CP* may not give rise to the
445 behavioral differences between the two minor ethnicities (the ethnic Zang and Bouyei
446 (all the coefficients of the three dimensions interacted with ethnic affiliation were
447 insignificant at 10%)), whereas the impacts of cultural differences on behavioral
448 differences are generally strong between the two minor ethnicities and the ethnic Han
449 (the coefficients of $EA \times RL$ and $EA \times MI$ are significant at 1%, and the coefficients of
450 $EA \times CP$ is significant at 10% between the ethnic Zang and Han). The negative effect
451 of its interaction with ethnic affiliation indicates that religious attitudes of the minor
452 ethnicity may influence economic prosocial behavior more strongly than among the
453 ethnic Han. Although the role of a religion might depend highly upon ethnic
454 affiliation, it operates in different ways. Ethnic Zang believe in Mahayana Buddhism
455 that people pray for delivering all living creatures from torment as the highest priority
456 of spiritual practice rather than for themselves (which is the practice of ethnic Han)
457 (Hua Z, 2013) that may induce stronger economic prosociality. Ethnic Bouyi practice
458 polytheistic worship (State Nationalities Affairs Commission, 2008) and we
459 conjecture this religious sentiment that reveres the nature influences the prosocial
460 disposition. The result from the negative sign and strong significance of the
461 coefficients for *MI* deviates from the finding of Henrich et al (2001) and suggests that
462 more self-regarding preferences may be elicited by higher level of market interactions.
463 Nevertheless, a self-regarding preference is elicited less for the two minor ethnicities
464 compared to the ethnic Han by market interaction because only the interaction effect
465 between EA^3 and *MI* is significant and has a positive coefficient. The same is true for
466 centralization of power of a family. The larger magnitude of *CP* indicates that the
467 subjects who suffer more from tyranny in family relations may behave in a more
468 other-regarding manner because we found the sign of *CP* was positive and significant
469 at 1%, and the effect of *CP* on prosocial behavior differed weakly depending on the
470 subject's ethnic affiliation. The negative sign of the interaction effect between ethnic
471 affiliation and centralization of power of a family ($EA^3 \times CP$) means *CP* had less
472 impact on the two minor ethnicities compared to the ethnic Han.

473 (3) Actually, we had not addressed *GS* (group structure), which we viewed as a
474 very important implicit cultural factor for measuring ethnic identity (ethnic prejudice).
475 We generated various composition of groups in terms of ethnic proportions to
476 determine indirectly how ethnic identity (or prejudice) as an additional cultural factor
477 accounts for behavioral differences. To accomplish this task, we ran another
478 regression model including group structure as a dummy variable (See results of *Model*
479 *3* in Table 6). We noticed that the results of *Model 2* and *Model 3* were robust in terms
480 of sign, magnitude and statistical significance of coefficients for the previous five
481 cultural factors and their interactions with ethnic affiliation and variables of individual
482 characteristics as well. However, the values of the coefficients of *EA* (ethnic affiliation)
483 varied significantly accordingly, whereas the *adjusted R*² of the model varied only
484 slightly (the *adjusted R*² of *Model 2* and *Model 3* were 0.35 and 0.42, respectively).
485 We then regressed *EA* on all the cultural factors as well as *GS* and found that *EA* had a
486 significant correlation with *GS*. This also suggest that *GS* is capable of accounting for
487 *EA*. These results of analysis from *Model 3* confirmed what we detected from the

488 economic experiment in a statistical manner that group structure was responsible for
489 the behavioral differences on the basis of the significant coefficients of the interaction
490 term ($EA \times GS$). For example, the statistical results showed that as the differences in
491 contributions in GSI between the ethnic Zang and other two ethnicities are defined as
492 reference points ($EA^2 \times GS^1$, $EA^3 \times GS^1$), the switch of group structure from GSI to $GS2$
493 induced an increase in contribution differences between the ethnic Zang and Bouyei
494 (the coefficient is 3.16 significance at 5%) and a decrease in contribution differences
495 between the ethnic Zang and Han (the coefficient is -2.62 significance at 10%). The
496 plausible reason was the sentiment towards ethnic composition vary in ethnic
497 affiliation that lead to behavioral difference. As a whole, all cultural factors were
498 responsible for behavioral differences between the ethnic Han and the two minor
499 ethnicities (the interaction effect between any of the cultural factors was significant at
500 10% at least), and it was interesting that the behavioral difference was attributed to the
501 group structure between the two minor ethnicities only.

502 **4 Conclusions and Discussion**

503 A number of public good provision experiments confirm the existence of
504 prosocial behavior because the contribution proportions are more than nothing, but
505 interestingly, it declines with repetition and converges to lower levels (Isaac, Walker
506 and Thomas, 1984; Andreoni, 1988; Andreoni, 1995; Sonnemans, Schram and
507 Offerman, 1999; Fischbacher, Gächter and Fehr, 2001). Other mechanisms need to be
508 developed to prevent the reduction of public good provisions in the game, such as
509 voluntary punishment (Forsythe, Horowitz, Savin and Sefton, 1994; Fehr and Gächter,
510 2002; Andreoni and Miller, 2002; Falk, Fehr and Fischbacher, 2005; Bochet, Page and
511 Putterman, 2006; Carpenter, Bowles, Gintis and Hwang, 2009; Choi and Ahn, 2003)
512 and full refund rules (Isaac, Schmidt, Walker, 1989; Bagnoli and McKee, 1991).
513 However, we found evidence of a roughly increasing trend over time for ethnic Zang
514 in a game without any anti-declining mechanism⁸, even if they expected
515 self-regarding behavior in strangers. In contrast, the other two ethnicities presented
516 clearly declining trends of contributions, which exhibited the more self-regarding
517 preference over time in comparison. Group structure varying in ethnic composition
518 strengthen the fascination regarding human nature. It appears, based on our data, that
519 three distinct degrees of ethnic diversity (or ethnic dominance), i.e., compositions of
520 groups in terms of ethnic proportions, influence cooperative behavior in different
521 ways, and we found diverse results. Evolutionary theory suggests that humans have
522 evolved to create ethnic groups for stabilized cooperation and solving collective
523 action problems related to adaptive challenges (Wilson and Wilson, 2007; Waring and
524 Bell, 2013). However, ethnic dominance posed a remarkably greater barrier to
525 cooperation than ethnic divisions between group structures for the ethnic Bouyei and
526 Han. Reduction in ethnic diversity to homogeneous groups (from GSI to $GS2$) did not

⁸ Actually, we designed an aid-declining mechanism in the game, namely an information feedback mechanism, in which subjects received information about payoffs and partners' contributions until the end of the experiment, and the evidence from Neugebauer T, Perote J, Schmidt U and Malte L (2009) suggest that this mechanism is destructive to efficiency.

527 increase contributions for the ethnic Zang and Han compared to the increase for the
528 ethnic Bouyei. Moreover, it was noteworthy that the term of ethnic composition
529 ('diverse', 'homogeneous' or 'dominant' which can be collectively termed as 'group
530 structure-bias') may play a more important role in determining behavioral patterns
531 than 'individual-bias'(due to identity or prejudice to individuals out of his/her ethnic
532 affiliation as some studies claim (Becker, 1957, 1993; Fershtman and Gneezy, 2001))
533 because we found that subjects of the two minor ethnicities acting as the dominant
534 ethnicity in *GS3* contributed much less than they did in *GS1*. Meanwhile, we also
535 found that the ethnic Han contributed more in *GS1* than in *GS2*, in contrast to the
536 argument that ethnic identity is a means to create boundaries that enable a group to
537 distance themselves from one another (Barth, 1969). Additionally, by using guess
538 values as an independent variable to isolate reciprocity preferences from other
539 possible forms of prosocial preference using model regression, we found clear
540 evidence that the reciprocity norm was behaviorally relevant. The
541 reciprocity preference exists in all ethnicities across all group structures because
542 marginal effects of $Guess_{it}$ were generally over 0.5; overall, the ethnic Zang exhibited
543 the strongest reciprocity preference. Moreover, there was clear evidence in our data
544 that were other forms of prosocial preference besides reciprocity, as demonstrated by
545 the negative correlation between CB_{it} and $lagged\ AVReal_{it-1}$ in *GS2*. In general, we
546 have shown based on the results of the experiments that people may harbor various
547 forms of prosocial emotions in economic affairs, and especially exhibit stronger at the
548 initial phase rather than what the textbook representation of Homo economicus
549 predicts.

550 Culture is a useful variable to uncover economic behavior, and a stream of
551 studies are in favor of this viewpoint (e.g., Chuah, Hoffmann, Jonesb and Williams,
552 2009). We found supportive evidence from our empirical results that a particular set of
553 measurable factors identified as proxies for cultural influence statistically accounted
554 for ethnic differences in prosocial behavior. A wave of recent studies confirm the
555 impact of religion on prosociality; religious people demonstrate highly prosocial
556 behavior (Georgianna, 1984; Darley and Batson, 1973, Bushman et al., 2007;
557 Saroglou et al., 2009). However, it facilitates in different manners as the differences in
558 doctrine and variability in concerned deities and this may also influence prosociality.
559 Our results on the market interaction from the whole sample contradicted the findings
560 of Henrich et al. (2001), which found strong evidence that prosocial norms increase
561 with greater market integration and other studies also confirm the positive impact of
562 market-based elements, such as competitiveness and market-centric language, on
563 prosocial preferences (Chen, 2010; Al-Ubaydli et al., 2013). However, when we
564 regressed the three ethnic affiliation samples separately, the results were multi-faceted.
565 The results showed that the coefficients of *MI* are negative (-1.54 ($p<0.01$) for the
566 ethnic Zang and -0.65 ($p=0.09$) for the ethnic Bouyei), whereas it is positive for the
567 ethnic Han (1.33 ($p<0.01$)). We made an informal return visit to subjects to inquire
568 about their views on this. Interestingly, we received the unanimous response of two
569 minor ethnicities that they did not have faith in the power of the market economy to
570 develop prosocial norms. They considered the market economy to be filled with

571 deception, mistrust and mutual hurt, and expect it to induce indifference,
572 callousness and the moral decline of human nature. However, the ethnic Han stated
573 that the market economy achieves reciprocity. As the ethnic Han are more involved in
574 the market economy, based on the larger magnitude of *MI*, we believed it may give
575 rise to stronger reciprocal preferences. Few studies have addressed the impact of
576 centralization of family authority with reference to the impact of democracy and
577 freedom on individual prosocial preference, as we have learned. Weber, Unterrainer
578 and Schmid (2009) investigate whether organizational democracy influences the
579 development of a social-moral climate and prosocial behavioral orientation, and the
580 findings suggest that as the level of participation in decision-making processes
581 increase, higher levels of prosocial and community-related behavioral orientations
582 (characterized by behaviors such as mutual help and solidarity) are exhibited. By
583 contrast, other research on children's prosocial behavior claims that the degree of
584 democracy in the family is irrelevant to prosociality (Li, 2000). However, our results
585 from this economic experimental study suggest on the contrary that lower
586 participation in decision-making of significant family affairs induced by centralized
587 authority was associated with higher levels of economic prosociality and may impact
588 minor ethnicities more because the results showed a positive sign of coefficient of *CP*
589 and a negative sign of coefficient of the interaction term, $EA^3 \times CP$, although it is
590 relatively weak. These findings from the economic anatomy of culture support the
591 contention that some dimensions of culture play an important role in affecting the
592 cooperative behavior, and more crucially, they may have different marginal effects in
593 magnitude between ethnicities and may even affect in opposite ways as what we have
594 detected from the results of *MI*. It shows the diverse ways of cultural influence in
595 shaping prosocial behaviors between ethnicities.

596 The research limitations of our study lie particularly in the design of the
597 questions on religion, market interaction and centralization power of family, which
598 were relatively crude and therefore may have impacted or influenced the
599 interpretation of the findings. The definition of the word 'god' varies throughout the
600 various religious traditions of China; for example, the ethnic Zang believe in the
601 Indian Mahayana form of Buddhism, whereas the ethnic Bouyei believes in many
602 gods (e.g., River, Lake or Pond). There are probably different affect and
603 comprehension of gods across ethnicities; further work is necessary to make
604 distinguishing questionnaires on the basis of notions of god. We merely selected
605 necessary questions to measure market interaction and ignored other economic
606 variables such as capital loans. The centralized authority of family may take the form
607 of imposing values on family members, and it should also be considered. Additionally,
608 we only addressed some dimensions of culture in terms of prosociality by measurable
609 variables; more complete approach is required to explore the missing dimensions of
610 culture.

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Table 1
Descriptions of variables.

Variable	Description
<i>CB</i> Contribution to group account	<i>Z-CB</i> Mean contribution to group account of all ethnic Zang subjects over 10 rounds in all sessions
	<i>By-CB</i> Mean contribution to group account of all ethnic Bouyei subjects over 10 rounds in all sessions
	<i>H-CB</i> Mean contribution to group account of all ethnic Han subjects over 10 rounds in all sessions
	<i>Total-CB</i> Mean contribution to group account of all subjects over 10 rounds in all sessions
<i>Guess</i> Guess value of mean group contribution	<i>Z-Guess</i> Mean guess value of all ethnic Zang subjects over 10 rounds in all sessions
	<i>By-Guess</i> Mean guess value of all ethnic Bouyei subjects over 10 rounds in all sessions
	<i>H-Guess</i> Mean guess value of all ethnic Han subjects of over 10 rounds in all sessions
	<i>Total-Guess</i> Mean guess value of all subjects over 10 rounds in all sessions
<i>AVReal</i>	Mean contribution to group account of five subjects in a group
<i>GS</i> Group Structure	<i>GS1</i> =‘diverse group’; <i>GS2</i> =‘homogeneous group’; <i>GS3</i> =‘one ethnic affiliation dominant group’
<i>EA</i>	Ethnic affiliation
<i>PC</i>	Cooperation
<i>OR</i>	Outgroup Rejection
<i>RL</i>	Religion
<i>MI</i>	Market interaction
<i>CP</i>	Centralization of power of a family
<i>MJ</i>	Major
<i>GD</i>	Gender
<i>EP</i>	Expenditure monthly
<i>EY</i>	Average years of education of family members
<i>t, t-1</i>	The <i>t</i> period, one period lagged

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784 **Table 2**
 785 **Test on differences in contributions between three group structures.**

Group Structures	GS1 VS. GS2			GS2 VS. GS3			GS3 VS. GS1		
	Zang	Bouyei	Han	Zang	Bouyei	Han	Zang	Bouyei	Han
Mann-Whitney Test	-0.37 (0.70)	-3.70 (0.00) ***	1.36 (0.17)	0.36 (0.71)	6.16 (0.00) ***	3.01 (0.00) ***	-0.02 (0.98)	1.91 (0.05) **	3.94 (0.00) ***

786 ^a Z-values in parentheses. * coefficient is significantly different from zero at 0.10 level. **
 787 coefficient is significantly different from zero at 0.05 level. *** coefficient is significantly different
 788 from zero at 0.01 level.

789
 790 **Table 3**
 791 **Test on differences in contributions between ethnicities in various group**
 792 **structures.**

Ethnicity	Zang vs. Bouyei			Bouyei vs. Han			Han vs. Zang		
	GS1	GS2	GS3	GS1	GS2	GS3	GS1	GS2	GS3
Mann-Whitney Test	2.03 (0.04) **	-1.186 (0.235)	3.89 (0.00) ***	-1.78 (0.07) *	3.82 (0.00) ***	0.14 (0.88)	0.27 (0.78)	1.78 (0.07) *	4.21 (0.00) ***

793 ^a P-values in parentheses. * coefficient is significantly different from zero at 0.10 level.
 794 ** coefficient is significantly different from zero at 0.05 level. *** coefficient is significantly
 795 different from zero at 0.01 level.

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816 **Table 4**
817 **Results of panel data regression.**

	Zang			Bouyei			Han		
Ethnicity									
Dependent variable									
CB _{it}	GS1	GS2	GS3 Minor	GS1	GS2	GS3 Minor	GS1	GS2	GS3 Minor
Independent Variable									
CB _{it-1}	0.18 (0.00)***	0.17 (0.00)***	-0.17 (0.13)	-0.08 (0.12)	0.39 (0.00)***	-0.28 (0.00)***	0.35 (0.00)***	0.16 (0.01)***	0.24 (0.10)*
Guess _{it}	0.95 (0.00)***	0.82 (0.00)***	0.16 (0.28)	0.77 (0.00)***	0.63 (0.00)***	0.76 (0.00)***	1.10 (0.00)***	0.60 (0.00)***	0.54 (0.00)***
AVReal _{it-1}	-0.10 (0.27)	-0.23 (0.05)**	0.09 (0.59)	-0.20 (0.33)	-0.29 (0.04)**	-0.33 (0.01)***	-0.33 (0.23)	-0.19 (0.07)*	-0.08 (0.67)
Intercept	0.04 (0.98)	3.93 (0.07)*	13.94 (0.00)	9.04 (0.00)***	6.30 (0.02)**	11.36 (0.00)***	-1.04 (0.62)	4.87 (0.00)***	4.57 (0.24)

818 ^a ‘GS3 Minor’ refers to samples that consist of subjects as minor ethnicities in GS3.
819 ^b P-values in parentheses. * coefficient is significantly different from zero at 0.10 level.
820 ** coefficient is significantly different from zero at 0.05 level. *** coefficient is significantly
821 different from zero at 0.01 level.

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823 **Table 5**
824 **Results of the factor analysis of social survey.**

Factor	Eigenvalue of Factor1	Mean Score of Factor 1		
		Zang	Bouyei	Han
PC	2.06	0.07	-0.22	0.14
OR	1.84	-0.06	-0.11	0.17
RL	4.68	0.84	-0.25	-0.59
MI	1.51	-0.17	-0.13	0.27
CP	2.32	0.46	-0.11	-0.30

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832 **Table 6**
 833 **Ordinary least squares regression result for contribution.**

Independent Variable		Dependent Variable: Contribution		
		Regression Models		
		Model 1 (Ethnic affiliation only)	Model 2 (Ethnic affiliation + Culture)	Model 3 (Ethnic affiliation + Culture + Group structure)
EA×RL	EA ² ×RL		-0.41 (0.65)	-0.41 (0.64)
	EA ³ ×RL		-2.86 (0.00) ^{***}	-2.86 (0.00) ^{***}
EA×MI	EA ² ×MI		0.09 (0.87)	0.09 (0.87)
	EA ³ ×MI		2.07 (0.00) ^{***}	2.07 (0.00) ^{***}
EA×CP	EA ² ×CP		0.15 (0.80)	0.15 (0.80)
	EA ³ ×CP		-0.77 (0.06) [*]	-0.77 (0.06) [*]
RL			1.52 (0.00) ^{***}	1.52 (0.00) ^{***}
MI			-0.93 (0.04) ^{**}	-0.93 (0.04) ^{**}
CP			1.28 (0.00) ^{***}	1.28 (0.00) ^{***}
EA	EA ²	-1.16 (0.00) ^{***}	-0.42 (0.00) ^{***}	1.04 (0.00) ^{***}
	EA ³	-1.10 (0.02) ^{**}	-0.35 (0.04) ^{**}	0.77 (0.07) [*]
MJ		-3.57 (0.00) ^{***}	-2.37 (0.00) ^{***}	-2.37 (0.00) ^{***}
GD		1.97 (0.00) ^{***}	2.38 (0.00) ^{***}	2.38 (0.00) ^{***}
EP		0.0004 (0.46)	-0.00005 (0.93)	-0.00005 (0.93)
EY		-0.08 (0.23)	-0.05 (0.48)	-0.05 (0.48)
GS	GS ²			0.41 (0.69)
	GS ³			0.31 (0.76)
EA×GS	EA ² ×GS ²			3.16 (0.02) ^{**}
	EA ³ ×GS ²			-2.62 (0.06) [*]
	EA ² ×GS ³			-1.60 (0.26)
	EA ³ ×GS ³			-3.69 (0.00) ^{***}
Constant		17.26 (0.00) ^{***}	15.16 (0.00) ^{***}	14.92 (0.00) ^{***}

834 ^a 'EA' is a dummy variable and ethnic Zang is defined as a reference, 'EA²' and 'EA³' refer to the
 835 ethnic Bouyei and Han, respectively.

836 ^b 'GS' is a dummy variable and the group structure *GS1* is defined as a reference, 'GS²' and 'GS³'
 837 refer to the group structures, *GS2* and *GS3*.

838 ^c we classify all the majors as two categories, art and science. Thus, 'MJ' is a dummy variable and
 839 the majors belonging to art are defined as the reference.

840 ^d 'GD' is a dummy variable and male is defined as the reference.

841 ^e P-values in parentheses. * the coefficient is significantly different from zero at the 0.10 level. ** the
 842 coefficient is significantly different from zero at the 0.05 level. *** the coefficient is significantly
 843 different from zero at the 0.01 level.

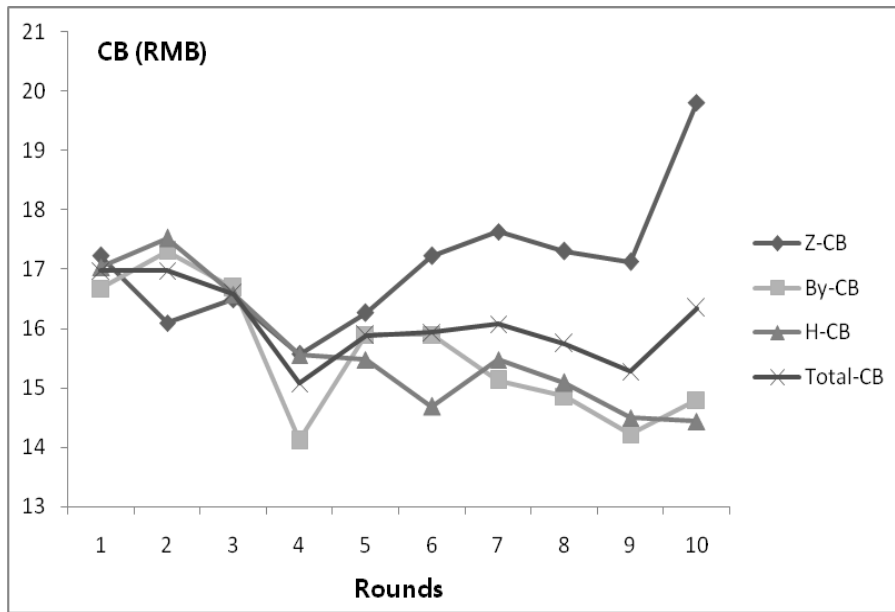
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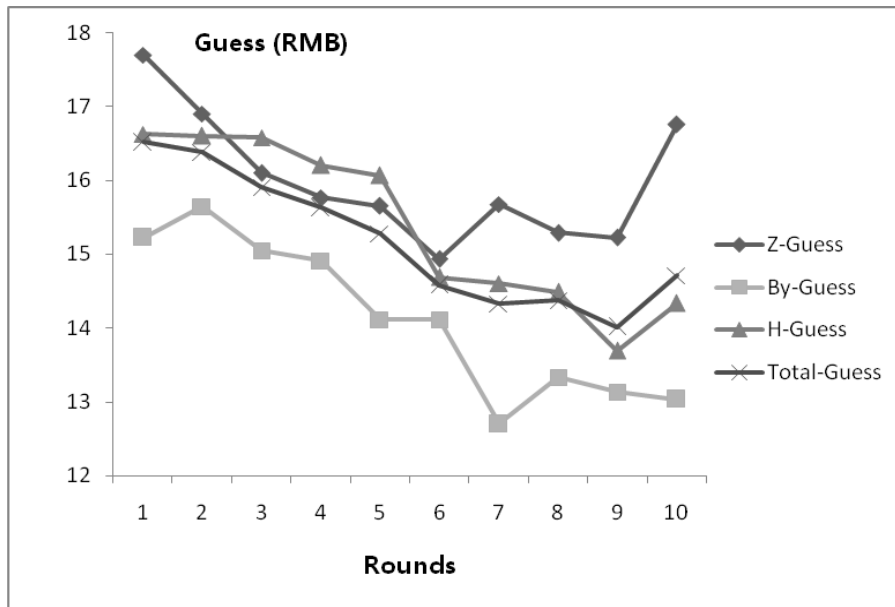


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Fig 1. Trends of contributions to group account over 10 rounds



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Fig 2. Trends of guesses over 10 rounds

860 **Appendix A**

861 **Prosocial Preference Survey**

<p>Part A Participation</p> <p>Answer for each organization and each activity (1=Active; 2=Inactive; 3=No):</p>		<p>(a1) Church or religious organization: (a2) Sport or recreational organization: (a3) Art, music or educational organization: (a4) Environmental organization: (a5) Petition signing: (a6) Boycotts:</p>
<p>Part B Outgroup Rejection</p> <p>Do you mind if you have these types of people as neighbors? (1=I don't mind; 2= I don't know; 3=Prefer not)</p>		<p>(b1) Criminals: (b2) Heavy drinkers: (b3) Immigrants/foreign workers: (b4) People who have AIDS: (b5) Drug addicts: (b6) Homosexuals: (b7) People significantly different in social status: (b8) People significantly different in wealth:</p>
<p>Part C Religion</p> <p>Extent of agreement on these conceptions: (1=Strongly disagree; 2= Disagree; 3=Neutral; 4=Agree; 5=Strongly agree)</p>		<p>(c1) Belief in absoluteness of good and evil: (c2) Belief in necessity of religious upbringing: (c3) Belong to a religious denomination: (c4) Belief in god: (c5) Belief in life after death: (c6) Belief in soul: (c7) Belief in heaven and hell: (c8) Belief in importance of religion in life: (c9) Belief in necessity of religion for human: (c10) Deriving comfort and strength from religion:</p>
<p>Part D Market Interaction</p> <p>What proportions of these necessities are purchased from markets (0% indicates the necessity is self-sufficient, while 100% is totally purchased from market)</p>		<p>(d1) Clothing; (d2) Food (Rice/noodle); (d3) Vegetables</p>
<p>Part E Centralization of Power</p> <p>Has some family member who makes decisions of these home affairs alone according to his/her</p>		<p>(e1) Significant economic affairs: (e2) Children's education: (e3) Children's marriage:</p>

family status (1= has; 0=has not)

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884 **Appendix B**

885 **Experimental Instruction**

886 The instructions were read aloud by an experimenter as the students followed
887 along on their computer screens.

This is an experiment, funded by a research foundation to study decision making. The instructions are simple. If you follow them carefully, you may earn a considerable amount of money which will be paid to you in cash at the end of experiment and the amount you earn will depend on you and other's decisions. Please make sure you understand the decision process and remember any communication is forbidden.

Group

You are about to participate experiment of a group decision-making that consists of three sessions, and every session includes 10 rounds, in other words, you will complete 30 rounds. During each round, you will be placed in a group with other four participants (a group of five). You will not know the identities of the other four members of your group in any given decision round, nor will you be told their identities after the experiment is over. At the beginning of each round, groups will be randomly assigned that you have no chance to meet the same person in any other round, i.e., group composition will be randomly changed from round to round. Moreover, you will not know additional information that we will not provide during the whole process.

Earnings

You will receive an initial endowment of 50 token (1 token= 1RMB (0.16US\$)) in each round and have to decide on the allocation of your endowment between a private and public good. Each token placed in private one earns one token back while each token placed to public good earn 0.5 times token to each member of group. Your payoff will be determined as:

$$(amount\ in\ personal\ account) + (0.5)(total\ in\ group\ account)$$

In addition to, you will be asked to guess the mean group contribution after decision-making in allocation in each round. Your payoff from guessing will be determined as follows (in RMB):

$$\left(\frac{1}{400}\right) \times (100 - |your\ guess - the\ actual\ average\ group\ contribution|)^2$$

However, the calculation may be kind of complicated, note that the closer your guess is to the average group contribution, the higher is your payoff. Your total payoff in each round includes the payoff from the group decision as well as from guessing. At the end of the experiment, your earning is the average total payoff in 30 rounds. In each round, you will allowed to have 2 minutes to make decision, and if it is not enough, please let us know and more minutes will be allowed.

Scenarios

You belong to a different ethnicity. The experiment includes three sessions and

each session corresponds to a single scenario. The scenario in the first session is that all of you are randomly divided into several groups and have to be aware that you play in a group probably with participants from different ethnicities. In the second session, you play in a group in which all the other participants belong to the ethnicity of your own. At the beginning of each round in third session, we will randomly select several participants. If you are selected, you will play in a group with other four participants belong to an ethnicity different from yours, and if not, you will play in a group with four other participants, only one of whom belongs to a different ethnicity from yours.

There will be some key questions which test whether you are familiar with the experiment institution. Our experimenters will check your answers and rectify the wrong ones with explanation, and if you have any more questions, please ask them before the experiment begins.

GOOD LUCK!

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