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Master Specialisation: Behavioural Economics

Cooperation in Different Cultures:

A Comparative Study between Dutch and Chinese

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Abstract

This paper compared differences between Dutch and Chinese participants and investigated how social disapproval cue influences in the context of a standard public goods game. The experiment results shows that without exposure to the social disapproval cue, there is no significant difference in the contribution level between the Dutch and the Chinese participants. After introducing the social disapproval cue, the reaction is different between the Dutch and Chinese participants. For the Dutch subjects, it decreases the investment amount and encourages free-riding behavior, however, the converse is true for the Chinese subjects.

Acknowledgement

Table of Contents

1. Introduction

With globalisation intensifying in recent few decades, the cooperation of people from different cultural backgrounds and countries becomes increasingly inevitable in many respects. For instance, as an example of public affairs, the global climate stabilisation can be seen as a giant "public goods game" played by 7.2 billion people. The more free riders of energy consumption we have, the worse the climate will be (Milinski, M., Semmann, D., Krambeck, H. J., & Marotzke, J., 2006). Also, for actors from international cooperation, it is a challenge to do team works with staffs who have different cultural backgrounds.

It is interesting to question whether people cooperate differently under disparate cultures backgrounds and how can the cooperation behaviour be motivated accordingly. This paper will run public goods games in both the Netherlands and China. It will first test if cultural differences between notions of individualism and collectivism indeed play a role in cooperation level and then see how the social disapproval cue affect Dutch and Chinese participants differently.

2. Literature Review

2.1 Public Goods Game

Public goods game is a commonly used economic experiment to measure the cooperation levels among participants (Camerer, C. F., & Fehr, E., 2004). A standard public goods game requires an x amount of subjects in a group (x>2), and every subject will be given *m* tokens as endowment before each round begins. During each round, subjects can choose to invest *a* tokens to the public goods account ($0 \leqslant a \leqslant m$). While the rest of the tokens (*m-a*) will be kept by the participant, *a* tokens invested into the public goods account will be doubled into *2a* tokens before equally divided by all *x* participants. Suppose participant *i* (i=1,2,…,x) chose to invest *ai* tokens, and the sum of *x* participants' total investment amount is *A* (A=a1+a2+….+ax), then the payoff of participant *i* is P=(M-ai)+2A\x.

The subjects of this experiment are put into a dilemma of self-interest thought versus group-interest thought. It is evident that for a complete self-interested participant, *a*=0 will be the best strategy for him. Because the investment return per token is *2\x* tokens, and considering that *x*>2, *2\x* is greater than zero but no bigger than one token. If all participants in the group are self-interested ones, the equilibrium will end up with *x* free-riders (A subject is called a free-rider when he or she invests 0 tokens into the public goods account.). In this situation, everyone will get *m* tokens as their total payoff at the end of the game. But there is another possibility of this game. If all subjects choose to invest the entirety of *m* tokens, then each of them will end up with 2*m* tokens respectively. This scenario is obviously better than the payoff of *m* tokens for everyone.

If every participant invests zero token or all *m* tokens, what will appear are two extreme results between 0 and *m* in the public goods game; *a*=0 means no cooperation at all and *a=m* means maximum level of cooperation. In this paper, *a* refers to the contribution level. The better the contribution level, the higher the cooperation level participants will have. Moreover, in a case where if Group I ends up with higher average payoff than

Group II, thus Group I would be considered to have achieved a better result.

Researchers in the past have tried many ways to achieve a better result in the public goods game. For example, introducing punishment for free-rider is one commonly used incentive for cooperation and adding a threshold is another. The suppose payoff for a participant with an incentive is $p1$ while the payoff for the participant without incentive is $p0$. If $p1>p0$, then the result is better off with an incentive. If $p1<p0$, then the result is worse off with incentive. If $p1=p0$, then it is no different with incentive.

2.2 Former Studies on Public Goods Game

A lot of research has been done to figure out how people cooperate with each other in public goods games. Started from Bohm's research in 1972 that verified most people are not completely self-interested as predicted, countless experiments have been ran to identify subjects' social preferences. In the early stages of a Ledyard's public goods game research, it has concluded several factors that might enhance cooperation among people in a public goods game; communication, inclusion of a threshold, level of marginal per capita return (MPCR), gender and group size etc. (Ledyard, 1995). Later on, many researchers have realised that there are different types of participant strategies in the game, and they started to explore the reasons behind these various contribution patterns. For example, Andreoni and Miller (1995) found warm-glowing altruism phenomenon in their experiment. Then, Anderson et al. (1998) proved that altruism and decision-error together determined the contribution distribution among different participants. A similar conclusion has also been reached by Palfrey and Prisbrey (1997).

In the last decade, experiments are more focused on digging into the interaction types among the participants, which researchers believe are the causes of various contribution patterns. For instance, many research have looked into the dynamics of free-riding within public goods games and concluded that the "trust-believe" among a group is important for reducing the number of free-riders (i.e. Fischbacher, U., & Gächter, S., 2008; Fischbacher, U., Gächter, S., & Fehr, E., 2001). Although there are plenty of

experiments developed to identify interaction types, little has been done to dig into the very nature of participant interactions. As several social theories indicates, the type of subjects' original culture (collectivism or individualism) could significantly affect their general trust levels (Yamagishi, T., & Yamagishi, M., 1994; Huff, L., & Kelley, L., 2005), which makes them have different beliefs of about other participants' behavior.

2.3 Individualist Culture and Collectivist Culture

Hofstede (1980 & 1984) has mentioned his "4-D model" (four dimensions) of cultural differences and one of the 4-D is Individualism vs Collectivism. According to Hofstede, in an individualistic culture, an individual has a distant and loose relationship with the society. A person in individualistic culture should only be responsible for him/herself or his/her family. However, in a collectivist culture, the concept of "we-ness" is much stronger. Individuals have a closer and tighter relationship with their society. A person in a collectivist culture should be responsible for all the members of an 'in-group', which refers to relatives and friends. While protecting an "in-group" interests is a common social obligation, one can also expect to be looked after by his/her 'in-group'.

Based on Hofstede's study, China is a typical collectivist society because of the philosophical influence of Confucius. Hence, the Chinese culture is defined to be one of 'high power distance' and 'low individualism'. On the contrary, the Netherlands has a high individualism and low power distance according to Hofstede's empirical research in 1988. In fact, it is one of the most individualistic culture in the world. The individualism level is even higher than of New Zealand and Canada. (Hofstede, G., 1984 & Hofstede, G., & Bond, M. H.,1988). Thus, China and the Netherlands are qualified as the exemplaries of a collectivist and individualist culture, respectively.
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2.4 Cultural Differences and Public Goods Game

Previously, several studies have been conducted on the impacts of cultural differences in a public goods game. Burlando, R., & Hey, J. D. (1997) conducted a public goods game with Italian and British subjects. The result showed that different cultural

backgrounds lead to different social norms, which resulted in the various attitudes toward free riders and their contribution amounts to the public account. In 1994, Parks and VU ran a 30 periods public goods game experiments with 80 subjects that have either American or Vietnamese cultural backgrounds. The researchers concluded that subjects with high collectivist culture are much more positive in cooperation attitudes by having significantly more money invested in the public account (Parks, C. D., & Vu, A. D., 1994). After this study, more research were done in comparison between collectivist cultures and individualist cultures. In 1997, an experiment between the East and West Germans of their level of cooperation showed showed that the East-German subjects are significantly more "selfish" than the West-German subjects, which reveals that even with the same language and historical background, the difference in ideology can lead to a different level of contribution.

Cason et al. (2002) compared Japanese subjects with American subjects. Interestingly, they discovered that Japanese participants are more likely to 'act mean' in the initial stages, but eventually, Japanese participants achieved better results as compared to their American counterparts. Furthermore, Cadsby et al. (2007) did a cross study of cultural and gender differences among Canadian and Japanese subjects. The experiment has reached three conclusions: 1) Females in general contributed much more tokens than males. 2) If only consider females, the Japanese and Canadian subjects have similar contribution level, 3) If consider both male and female, contrary to the original hypothesis, the Japanese subjects behaved significantly more self-interested than the Canadian subjects.

Yet, not all research agrees that cultural differences plays a role in individuals' cooperation behavior. The research of Brandts, J., Saijo, T., & Schram, A. (1999) shows little behavioral difference among participants from Japan, Netherlands, Spain and the U.S.. This conclusion is partially conflict to Cason's study mentioned above. The confliction of results between the two studies might be caused by the differences in the design of the experiments. While Brandts et al. (1999) used 4 participants in a group

with only one trail, Cason et al. (2002) used 2 participants in a group with two trails.

A majority of past experiments have supported that there is a significant influence on cultural differences toward the cooperation level amongst participants. Also, most of them conclude that there are positive impacts of collectivism culture towards contribution level as compared to individualism culture. Based on that, the first hypothesis of this paper is:

H1a0: Without receiving the social disapproval cue, there is no difference in the contribution level between Dutch and Chinese participants.

H1b0: Without receiving the social disapproval cue, Chinese participants on average invest no more than Dutch participants in the public goods game.

2.5 Social Disapproval Cue

In order to encourage participants have sustainable cooperation in the repeated public goods game, economists have attempted many ways. Either using punishment or reward (Fehr & Gächter, 2000; Walker & Halloran, 2004; Gürerk et al., 2006; Sefton et al., 2007), or setting a threshold (Cadsby, C. B., & Maynes, E. 1998&1999; Croson, R. T., & Marks, M. B. 2000) proved to be quite effective in persuading participants to contribute more. But these are all monetary ways of encouraging participants to cooperate, which means participants will have direct economic losses if they do not cooperate with each other. This paper is more interested in social-related nonmonetary ways of motivating participants. Are there any proven efficient methods of encouraging participants better off without monetary cost?

The answer is yes. Masclet et al (2003) conducted an experiment that verified simple expression of social disapproval or approval towards other participants' action will influence the level of contribution just as strong as monetary ways.

In order to find out if social disapproval method of encouraging cooperation among participants works both in collectivist culture and individualist culture, this experiment

will create a cue that implies strong social disapproval towards free-riders in an instruction manual. Theoretically, both Dutch and Chinese subjects should be better off with the social disapproval cue. The second hypothesis of this paper will be as follows.

H2a0: The Dutch participants who received the social disapproval cue do not contribute more on average as compared with the Dutch participants who did not receive the social disapproval cue.

H2b0: The Chinese participants who received the social disapproval cue do not contribute more on average as compared with the Chinese participants who did not receive the social disapproval cue.

There is a possibility that the social disapproval cue could have different effects on the Chinese and Dutch participants. However, due to the limited relevant studies, the premises of such differences is unclear.

H3a0: The effect of social disapproval cue on the Dutch participants' average contribution level is no different than the effect of social disapproval cue on the Chinese participants' average contribution level.

3. Experimental Design

3.1 Participants of the Experiment

The public goods experiment is conducted both in the Netherland and China. All participants are volunteers who are college students with similar educational background. The Dutch participants are from Erasmus University and the Chinese participants are from Shanghai Jiao Tong University and Fudan University.

3.2 Experiment Procedures

There are two incentives in this experiment; first, there is a flat-rate show-up fee that contains 10 EUR for every subject in the Netherlands and 50 CNY for every subject in China[1]. Second, in order to motivate subjects to make decisions that reveal their true motives, the waiting time were used as task-related incentives. Each token received was worth 0.1 minutes, and the more tokens participants get, the lesser their waiting time was.

As for the experiment procedure, each subject was asked to bring an electronic device that can be connected to the internet (i.e. mobile phones, tablets, laptops, etc.) so that they can access the website: http://veconlab.econ.virginia.edu/ to participate in the experiment. After entering the lab, each of them received an instruction manual written in their native language. In the instruction manual, subjects were provided with a session name that they could use to access the website: veconlab.econ.virginia.edu and each "session" contained a group of 5 participants. The session names were randomly assigned to each subject and the subjects were only informed of their own session name, which prevents them from knowing the rest of the four participants in their group. During the experiment, no communication was allowed.

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[1] Based on exchange rate, 10 EUR is approximately equals to 70 CNY, but considering that CNY has an official exchange rate and the price level are different among Eurozone, purchasing power parities (PPP) exchange rate is more suitable to use here. Based on PPP exchange rate data provided by OECD in 2015, 10 EUR is equal to about 44 CNY. The reason of giving 50 CNY instead of 44 CNY to Chinese participants is presented in part 5.3 Limitations and Implications for Further Studies.

Half of the groups from each country were given instruction manual with the social disapproval cues and the rest half will be given a standard experimental instruction without the cue. The social disapproval cue is a paragraph as follows: A "**free-rider** means someone that only enjoys benefits but makes no contribution or very little contribution to the group. In this case, the free-rider refers to someone who invests no tokens or only a small amount of tokens. Noticing that **a single free-rider** in this experiment can increase the waiting time of other group members by up to **12 minutes!**" Note that the instruction manual without the social disapproval cue is carefully written by neutral words that only contains objective descriptions of the public goods game rules. This is intended to assure that there will be no other emotional trigger in the experiment besides the social disapproval cue.

Also, considering that the average English reading level is very likely to be different between the Dutch and the Chinese participants, the instruction manual was translated into both Dutch and Chinese language so that none of the participants will encounter any problems with reading the instruction manual or understanding the rules of the game.

3.2 Experiment Content

The public goods game starts with 30 initial tokens every round with participants deciding the distribution of the 30 tokens between their private account and the public account. The amount they choose to invest has to be an integer. The tokens that are invested in the public account will be doubled and equally distributed among the 5 group members. After everyone makes their decision, the result of each subject's payoff in this round is shown automatically on the screen. The game has 10 rounds in total. The multiple rounds settings are intended to see the cooperation behave tendency in each group. The participants' final gain is the accumulation of their payoffs in 10 rounds. Each subject will be given an initial waiting time of 40 minutes, and every token in the game is worth 0.1 minutes. At the end of the game, participants are required to wait, 40 minutes subtracting the total token value-minutes.

3.4 Dependent and Independent Variables

In this experiment, the dependent variable will be the contribution and the contribution is measured by every participant's invested token amount in each round. Every participants' contribution in every round is one observation. Since this is a dataset in which student's contribution are observed across 10 rounds, the penal data is chosen because it has the advantage to account for students' heterogeneity. In addition, there will be six independent variables. Firstly, 1) age, 2) female and 3) education level; will be used as control variables. Secondly, there will be two dummy variables to put the hypothesis to test. 4) Dutch and 5) Cue. Cue=1 means that the participants have received the social disapproval cue towards free-riders from the instruction manual, and Cue=0 means the participants have received a neutral instruction manual. Finally, to test if the cue has different effects under different cultural backgrounds, an interaction variable 6) Dutch x Cue will be introduced[2].

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[2] Note that Dutch x Cue= Dutch*Cue

4. Results

4.1 Description of data

In total, there are 20 students from Erasmus University Rotterdam and 65 students from Fudan University and Shanghai Jiao Tong University who participated in this experiment. Besides 17 Chinese participants who are MBA students with age between 30 to 40, most of the participants are bachelor and master students within a similar age range and major but (significantly) younger than the MBA students. As for the sex ratio in each country, 40% Dutch participants are female while 61.5% of Chinese participants are female. Table 1 is a brief summary of the data. It shows the average contribution of subjects in each round and its standard deviation

The data in Table 1 shows that there is a gap between Dutch and Chinese in total average investment amount (4.96 tokens), but if only look into data without the cue, on average, the contribution level of the Dutch participants and the Chinese participants are not far from each other (9.07 and 9.79). This implies H1a0 cannot be rejected. The result of Mann-Whitney U test z=0.256, p=0.798 further confirms no rejection of H1a0. This also means that H1b0 cannot be rejected. Also, there is a huge difference between Dutch students and Chinese students if receive the cue (6.36 and 16.05, respectively). It is interesting to see that after receiving the cue, while Chinese subject increased their investment by a huge amount (on average 6.26 tokens), Dutch subjects decreased their investment for average 2.71 tokens. Fig.1 and Fig.2 plot the development of the contributions over the rounds. This data seems to suggest that hypothesis H2a0 and H2b0 might not be accepted. The result of Mann-Whitney U test z=2.828, p=0.0047 and z=-9.305, p=0.00 suggest the rejection of H2a0 and H2b0. Moreover, H3a0 should be rejected with p<0.00 based on Mann-Whitney U test.

Table 1. Summary of Average Contribution with and without Cue

Netherlands	Without Cue Contribution	With Cue Contribution	Total
Round	Mean(SD)	Mean(SD)	Mean(SD)
1	11.4(8.68)	12.2(10.50)	11.8(9.38)
2	11.5(8.55)	12.5(9.91)	12(9.03)
3	8.7(7.94)	10(8.42)	9.35(8.0)
4	10.8(6.60)	6.6(6.40)	8.7(6.68)
5	10.7(9.14)	3(3.50)	6.85(7.81)
6	13(10.03)	3(3.27)	8(8.90)
7	6.2(6.53)	5.5(4.79)	5.85(5.58)
8	5.9(6.61)	5.7(7.60)	5.8(6.93)
9	5.2(4.71)	2.7(3.74)	3.95(4.33)
10	7.3（7.35）	2.4（4.70）	4.85（6.51）
Total	9.07(7.85)	6.36(7.47)	7.72(7.76)
N	100	100	200
China	Without Cue Contribution	With Cue Contribution	Total
Round	Mean(SD)	Mean(SD)	Mean(SD)
1	10.63(9.94)	14.87(7.47)	12.58(9.07)
2	9.94(8.73)	15.83(7.49)	12.66(8.64)
3	10.57(8.42)	15.53(7.87)	12.86(8.48)
4	12.17(8.69)	14.83(8.49)	13.4(8.63)
5	9.97(8.55)	15.67(7.58)	12.6(8.55)
6	10.2(8.05)	17.03(8.40)	13.35(8.84)
7	7.77(8.12)	17.13(7.78)	12.09(9.19)
8	9.34(9.14)	17.4(7.38)	13.06(9.24)
9	8.57(9.06)	16.63(8.61)	12.29(9.67)
10	8.77(10.51)	15.57(11.72)	11.91(11.51)
Total	9.79(8.92)	16.05(8.29)	12.68(9.17)
N	350	300	650

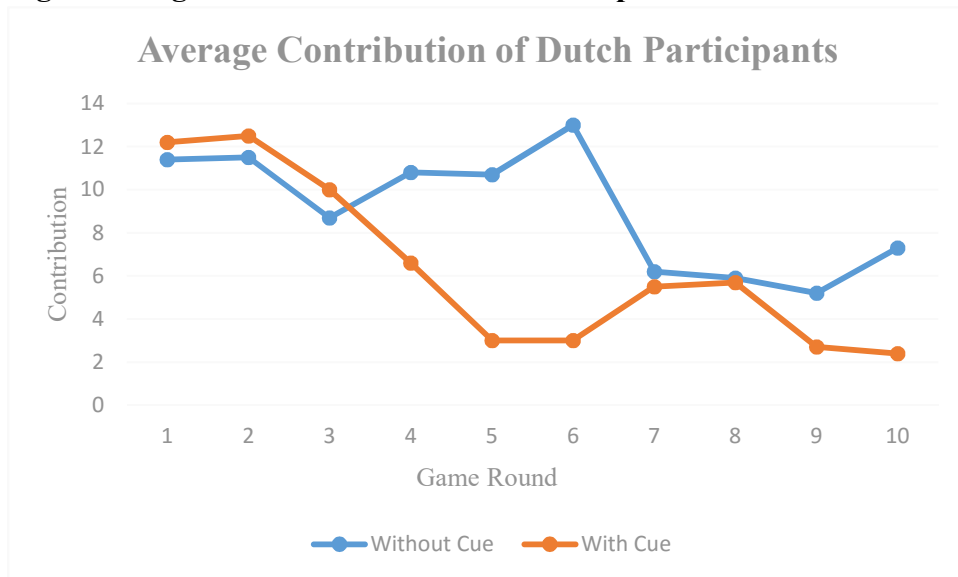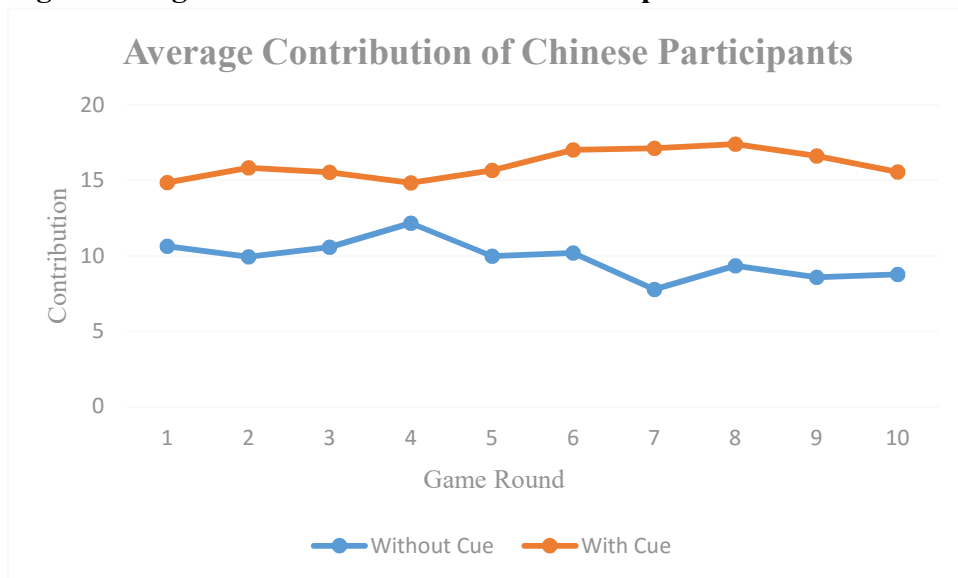**Fig. 1 Average Contribution of Dutch Participants with and without Cue**

Fig. 2 Average Contribution of Chinese Participants with and without Cue

4.2 Regression Results

Table 2. Regression Results

	Contribution
Age	2.455[*]
	(1.67)
Age^2	-0.0283
	(-1.33)
Female	-0.424
	(-0.30)
Master	3.565
	(0.89)
Bachelor	9.495[*]
	(1.88)
Cue	6.251[***]
	(4.16)
Dutch	1.999
	(0.82)
Dutch x Cue	-8.405[***]
	(-2.70)
_cons	-39.55
	(-1.50)
N	850

Age^2=Age square

Dutch x Cue=Dutch*Cue; It means cross effects of Dutch and Cue.

t statistics in parentheses

[*] $p < 0.10$, [**] $p < 0.05$, [***] $p < 0.01$

To further investigate the influence of the different variables on contribution level, a random effect regression is applied. For control variables, age is significant at 10 percent level, which means age did have influence on contribution level of participants. The result shows that in over the ages represented in this study, contribution level tends to increase with age. Also, though several previous studies have reported that females are more generous than males in group contribution (Cadsby, C. B., & Maynes, E., 1998; Cadsby, C. B., Hamaguchi, Y., Kawagoe, T., Maynes, E., & Song, F., 2007), this study find no difference between female and male participants. As for educational backgrounds, MBA is the omitted variable in this model. Table 2 shows that there are little difference between the investment level of MBA students and master students but bachelor students tend to invest more than MBA students with 10% significance level.

Surprisingly, unlike most of the previous studies predicted, independent variable Dutch is not significant in this model (p=0.414), which means when there is no cue, the Dutch and the Chinese participants presented similar contribution level in the public goods game. This result fits what has been observed in Table 1 and in the Mann-Whitney U test, which is, under no cue, the average contribution level of Dutch subjects (9.07) and Chinese subjects (9.79) are very close to each other. Thus, hypothesis H1a0 and H1b0 cannot be rejected.

Evidently, Cue has highly significant positive influence towards a subject's contribution level (p<0.01). Compared with those who received no cue, participants who received the cue will on average contribute 6.25 more tokens.

Further into the interaction effect of Dutch and Cue, a linear combination of parameters is tested. The random effect regression can be written as following equation.

$$Y_{it} = \alpha + \beta_1 age^2 + \beta_2 age + \beta_3 female + \beta_4 master + \beta_5 bachlor + \beta_6 Cue$$
$$+ \beta_7 Dutch + \beta_8 Cue * Dutch + \varepsilon$$

i=1, 2, …, 85; i represent different participants

t=1, 2, …., 10; t represent round of the public goods game.

Then we get a parameter table as follows.

Table 3. Parameter Table

		NL	
		0	1
Cue	0	$\alpha + \beta_1 + \beta_2 + \beta_3 + \beta_4 + \beta_5$	$\alpha + \beta_1 + \beta_2 + \beta_3 + \beta_4 + \beta_5 + \beta_7$
	1	$\alpha + \beta_1 + \beta_2 + \beta_3 + \beta_4 + \beta_5 + \beta_6$	$\alpha + \beta_1 + \beta_2 + \beta_3 + \beta_4 + \beta_5 + \beta_6 + \beta_7 + \beta_8$

To be exact, if $(\alpha + \beta_1 + \beta_2 + \beta_3 + \beta_4 + \beta_5 + \beta_6) - (\alpha + \beta_1 + \beta_2 + \beta_3 + \beta_4 + \beta_5 + \beta_6 + \beta_7 + \beta_8) = -\beta_7 - \beta_8 = 0$ is tested. With the result of p=0.015, it proves that the social

disapproval cue has different effects towards the Dutch and Chinese participants. Therefore, the movements of contribution triggered by cue are towards different directions. The cue significantly increased the contribution amount of the Chinese participants while it decreased the contribution level of the Dutch participants. Thus, hypothesis H3a0 is rejected.

Furthermore, the social disapproval cue can also influence the number of free-riders. The free-riders who contributes no more than 3 tokens among the Dutch participants showed up more frequently — it increased from 29% to 45% — but the free-riders frequency among Chinese participants reduced from 30% to 10.7%.

As a lot of former studies have pointed out, it is very common for participants to free-ride in the last round of multiple-round public goods games because there are no consequences of free-riding anymore. A regression about 10th round contribution level is run to find if cultural difference and social disapproval cue will influence the investment amount in the last round.

Table 4. Regression Results for 10th Round

	Contribution
Age	2.598
	(1.03)
Age^2	-0.0361
	(-0.98)
Female	0.842
	(0.35)
Master	-4.214
	(-0.61)
Bachelor	2.973
	(0.34)
Cue	7.257***
	(2.80)
Dutch	2.197
	(0.52)
Dutch x Cue	-10.81**
	(-2.01)
_cons	-34.81
	(-0.77)
N	85

Age^2=Age square

Dutch x Cue=Dutch*Cue; It means cross effects of Dutch and Cue.

t statistics in parentheses

$^{*} p < 0.10$, $^{**} p < 0.05$, $^{***} p < 0.01$

Interestingly, besides variable Cue and interaction variable Dutch*Cue, none of the other independent variables are significant. Which implies that age, gender, education, cultural background was all irrelevant for the investment decision in the last around. Only the social disapproval cue will influence contribution level of participants. Also, the linear combination of parameters test results (p=0.62) shows that cue work differently in China and the Netherlands, which is the same as the all rounds regression result above.
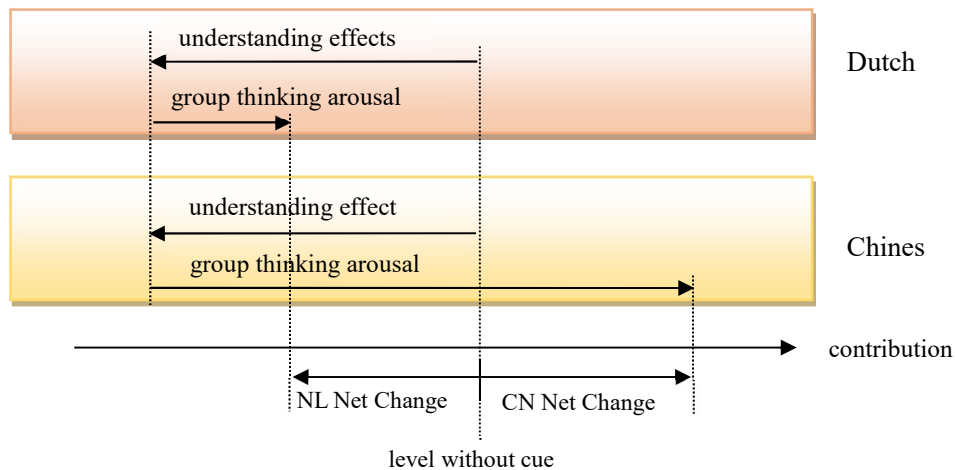
5. Discussion and Conclusion

5.1 Discussion of Results

The differences with previous research is that, this experiment found that without introducing the social disapproval cue, participants with different cultural backgrounds invest similar amounts towards public accounts. There are several possible explanations for this results. One of the possibility is that most of the participants from China are affected by the one-child policy, which means they are the only child in their family. Evidence has shown that as compared to a Chinese who has siblings, the younger Chinese generations who were raised as the only child are more self-centered and have more individualistic mindset, as they descried themselves (Wang, Q., Leichtman, M. D., & White, S. H., 1998). It suggests that the 'only-child' background made the Chinese participants behave more individualistic in the public goods game.

Another explanation for the results is a model shown in Fig.3., It presents that the Chinese and the Dutch participants had the same original contribution level when both received no cue, and what the social disapproval cue triggered are two influences. Firstly, there was an understanding effect. As some of the Dutch participant reported after the experiment, their "selfish" behavior was triggered by the cue because they had no idea how to play this complicated game at first, but after reading the cue, it seems clear that free-riding was the best strategy for them. Due to the extra information provided by the cue, it helped the participants to better understand the rules and to make a decision that is more beneficial for themselves. Secondly, group thinking arousal was also switched on by this cue. Several participants in China that received the cue reported that they have invested all 30 tokens into public accounts in the first few rounds, because they wanted to "sacrifice myself to improve the investment atmosphere in my group so that the whole group could be 'better off". These participants had such a strong group thinking mindset that they even put group utility ahead of their own. This type of investment is unique for groups that received the cue, it is not observed in groups that did not receive the cue.

Fig.3 Two Influences of Social Disapproval Cue

For the different influence directions of the cue, it could be that the understanding effects are stronger than group thinking arousal for the participants with an individualistic cultural background, while for the participants with a collectivist cultural background, group thinking arousal surpasses understanding effects. Some studies in the past might have triggered group thinking without even noticing it, resulting them in finding participants of collectivist cultural background to contribute more on average than the participants of individualist cultural background.

Another intriguing phenomenon is that the tendency of contributions by rounds of Chinese participants looks more flat as compared to the Dutch participants (see Fig,1 & Fig,2). The difference of average contribution amount between rounds are smaller for the Chinese participants. They were ranging their investment amounts between 12 to 14 tokens. One potential explanation is that because this experiment gives 40 minutes as an initial waiting time, most of the Chinese participants started to calculate how many tokens on average they needed to contribute at minimum to avoid the punishment. (In order to obtain extra personal information such as gender, age and education level, instruction manuals were asked to be returned after the experiment ended. On instruction manuals that were returned by the Chinese participants, a lot of relevant calculation marks were found. No such marks were made on the instruction manuals of the Dutch participants.) Based on their calculations, if everyone in the group on average

invests 33% of their tokens in each round, eventually none of the group member needs to wait. It is interesting to see how participants among a collectivist culture unconsciously make strong assumptions regarding the decisions of other participants in the game. Surprisingly, as shown in Table 1, the average contribution without cue is 9.79, which is very close to the "ideal" results of calculation.

5.2 Conclusion

This paper compared differences between Dutch and Chinese participants and investigated how social disapproval cue influences in the context of a standard public goods game. The regression results imply that without exposure to social disapproval cue, there are no significant differences of the contribution level between the Dutch and the Chinese participants. The social disapproval cue can significantly influence investment decision both in individualist culture and collectivist culture but the impact of cue is different under different types of culture. For the Dutch subjects, it decreases the investment amount and encourages free-riding behavior, however, the converse is true for the Chinese subjects. Thus, hypothesis H1a0, H1b0 cannot be rejected and H2a0, H2b0 and H3a0 are rejected.

There are several suggestions regarding the cooperation level can be made from this conclusion. First, if the conclusion holds in general, it implies that diverse ways of motivation are required for people from different cultural backgrounds to make the cooperation result become better. For example, as for environmental issue, publicity about high carbon life's harm towards the whole human kind is likely to have positive influence towards people from collectivist culture, but it could have negative influence towards people from individualist culture. For policy makers, they should try to avoid the understanding effects and encourage group thinking arousal to achieve better results for society. Moreover, employees who received the same incentives from the company might act differently toward group cooperation due to the difference in cultural backgrounds. It will be hard to run an efficient team in a multi-cultural group if managers do not know how to trigger group thinking arousal accordingly. Individuals

from a collectivist culture tend to make assumptions of group members and choose the strategy that is the most ideal in order to reach the maximum welfare for the group. Whereas, if they cooperate with individuals from an individualist culture, conflicts are likely to happen. Employees with an individualistic cultural background who tend to be self-interested, might be considered as "selfish" by individuals of collectivist background. Furthermore, it seems that when the regulation is phrased in a neutral tone, cultural differences will have little impacts towards cooperation contribution decision. Which means a consensus can be encouraged by ways of language.

5.3 Limitations and Implications for Further Studies

There are several limitations in this paper. For Instance, due to restrictions of resources and time, participants in Netherlands is much lesser than participants in China. In addition, the flat-rate show up fee is different between the Dutch and the Chinese participants due to some restrictions. For the Dutch participants, the flat-rate show up fee was 10 EUR per person, and for the Chinese, it was 50 CNY per person. Although, based on 2015 OECD database, the PPPs of 10 EUR is approximately equal to 44 CNY, '4' is considered to be an unlucky number in Chinese culture, which means 50 CNY is the minimum necessary payment amount in in this experiment. It could cause different motivation between the Dutch and the Chinese participants. Besides, due to the linguistic differences, the Dutch and the Chinese instruction manual might be understood differently by participants. Although both Dutch and Chinese instruction manual are translated from English and was kept as much as possible to the same meaning as in English, it is still inevitable to have some differences between the two instruction manual.

For future studies, it is necessary to enlarge the sample size of Dutch participants. Also, it is unclear yet what exactly triggered different impacts of social disapproval cue on the participants of both individualist and collectivist culture. It will be helpful to test the impact of one-child policy on Chinese participants and examine the existence of understanding effects and group thinking arousal.

6. Appendix

6.1 English version Instruction Manual

Experiment Instruction

Hello, welcome to this public goods experiment.

Please read this instruction quietly by your self. Please **do not communicate** with others during the experiment. If you have any questions during the experiment, please **raise your hand silently**, and the experimenter will come to answer questions in private.

1) First, use one of your electronic devices to access http://veconlab.econ.virginia.edu/

2) Choose "**Login as Participants**"

3) Click "**Login**" button below "**Initial Login for All Programs**". Please **DO NOT** click "Emergency Restart" button

4) Enter "**nyw1**" as your session name

5) Fill in your name and surname. (Please leave the password part blank)

6) Wait for others and start with the game

Read Before the game starts

You will be matched with the **same person** for all rounds. All of you will begin with **30 token**, which you may decide to keep or invest. You will begin **each round** with a new endowment of **30 token**, irrespective of how many tokens you may have kept or invested in previous rounds. The tokens that invested in the public account will be **doubled** and equally distributed among the **5 group members**. Which means, for every invested token, you will receive **0.4 tokens**, knowing that you will also receive **0.4 tokens** if other group member invest their tokens.

Example: Suppose in the 3rd round, you choose to invest 17 tokens out of 30, and the other 4 participants chose to invest 10, 15, 12, and 20 tokens. Then your total gain in the 3rd round will be:

$$(30\text{-}17)+\frac{(17+10+15+12+20)\times 2}{5}=42.6 \text{ tokens}$$

There will be a total of **10 rounds** in this experiment. Your earnings for each round will be calculated for you and added to previous earnings, as will be shown in the total earnings column of the record form that you will see on screen.

In this experiment, we use **waiting time** as incentives. Your performance in the game will decide how much time you have to wait after the experiment ended. The initial waiting time is **40 minutes**. Each token is worth **0.1 minutes**. Your final waiting time will be **40-total token value minutes**.

Example: Suppose you get 374 tokens after all 10 rounds of the public goods game, your token value is 374*0.1=37.4 minutes. So you need to wait for 40-37.4=2.6 minutes

IMPORTANT!

Free-rider means someone that only take benefits but makes no contribution to the group. In this case, free-rider refers to someone who invest 0 token in the game.

Noticing that **a single free-rider** in this experiment can increase the waiting time of other group members by up to **12 minutes!**

Instructie Experiment

Welkom bij dit publieke goederen experiment.

Lees deze instructie alsjeblieft in stilte door. **Communiceer niet** met anderen tijdens het experiment. Als je vragen hebt tijdens het experiment, **steek dan je hand in stilte omhoog**, dan zal de experimentator de vragen komen beantwoorden.

1) Ten eerste, gebruik een van je elektrische apparaten om toegang te krijgen tot http://veconlab.econ.virginia.edu/

2) Kies "**Login as Participants**"

3) Klik op de knop "**Login**" onder "**Initial Login for All Programs**". KLIK NIET op de "Emergency Restart" knop

4) Voer "**nyw1**" in als je "**Session Name**"

5) Vul je naam en achternaam in. (Laat het wachtwoord blanco)

6) Wacht op de anderen en begin met het spel

Lees dit voor het spel begint

Je wordt gekoppeld aan **dezelfde persoon** voor alle ronden. Jullie beginnen allemaal met **30 tokens**, en je mag zelf beslissen om die te houden of te investeren. Je begint **iedere ronde** met een nieuwe set van **30 tokens**, ongeacht hoeveel tokens je in eerdere ronden hebt gehouden of hebt geïnvesteerd. De tokens die worden geïnvesteerd in het publieke account worden **verdubbeld** en gelijk verdeeld over de 5 leden van de groep. Dus, voor elke token dat je investeert krijgen jij en alle leden van je groep **0.4 tokens**. Je houdt de tokens die je niet investeert.

Voorbeeld: Stel dat je ervoor kiest om 17 van de 30 tokens te investeren, en de andere 4 deelnemers kiezen ervoor om 10, 15, 12 en 20 tokens te investeren. Je opbrengst in die ronde is dan:

$$(30-17)+\frac{(17+10+15+12+20)\times 2}{5}=42.6 \text{ tokens}$$

Er zijn in totaal **10 ronden** in dit experiment. Je opbrengst voor iedere ronde zal voor je worden berekend en worden opgeteld bij eerdere opbrengsten, en dit zal worden weergegeven in de kolom totale opbrengst op het formulier dat je op het scherm zult zien.

In dit experiment gebruiken we **wachttijd** als aansporing. Je prestatie in het spel bepaalt hoe lang je moet wachten nadat het experiment is afgelopen. De initiële wachttijd is **40 minuten**. Ieder token is **0.1 minuut** waard. Je totale wachttijd is **40 – de totale minutenwaarde van de tokens**.

Voorbeeld: Stel dat je na alle 10 ronden van het publieke goederen spel 374 tokens hebt. Dan is de waarde van je tokens 374*0.1=37,4 minuten. Dus moet je 40-37,4=2,6 minuten wachten.

Belangrijk!
Free-rider betekent iemand die alleen van de voordelen geniet, maar geen bijdrage aan de groep levert. In dit geval refereert free-rider aan iemand die geen tokens of slechts een kleine hoeveelheid tokens investeert. Wees je ervan bewust dat in dit eperiment **een enkele free-rider** de wachttijd voor andere leden van de groep kan doen oplopen tot 12 minuten!

实验指南

欢迎参加公共品博弈实验，请在实验开始前安静地阅读本指南。如果有任何相关实验的问题请举手示意。实验中**请不要互相交流**，谢谢配合。

1) 使用你手中任意一个能上网的电子设备连接进入 http://veconlab.econ.virginia.edu/
2) 选择 "**Login as Participants**"
3) 点击在 "**Initial Login for All Programs**" 下方的 "**Login**" 按钮。**请勿点击** "Emergency Restart"
4) 在 "**Session Name**" 处输入 "**nyw7**"
5) 请用拼音填写您的姓（surname）和名（name），**注意空着密码栏不要填写**
6) 等待其他人完成登陆，准备开始博弈
注意：请不要在博弈的过程中关闭页面

博弈须知
本博弈 **5 人**一组，每一轮你都将与同样的组员进行博弈。在每一轮开始前你都会被给予 **30 个代币**（token）你可以选择投资或是保留。如果你选择保留，手中的代币数量将不变，如果你选择投资，这些投资的代币将进入公共账户，公共账户的代币会被**翻倍**，然后平均地分配给组内的五个人。也就是说，如果你投资 1 代币，你将得到 0.4 代币，同样的，你的队友每投资 1 代币你也将得到 0.4 代币。无论你之前投资或是保留了多少代币，每一轮你都会得到新的 30 个代币。

举例：假设你选择在本轮中投资 17 个代币留下 13 个，而其他的四个人分别选择投资 10, 15, 12, 和 20 代币，那么你这一轮的所得代币如下：

$$(30\text{-}17)+\frac{(17+10+15+12+20)\times 2}{5}=42.6 \text{ tokens}$$

本实验共有 **10 轮**博弈，你的总收入将会是每轮所得的累加。屏幕中将会显示每一轮你的收入和截止本轮你的总收入。

在本实验中，我们将使用**等待时间**作为惩罚。你在博弈中的表现将决定你需要在博弈结束后再在教室中等待多久。每个代币相当于 **0.1 分钟**，初始的等待时间是 40 分钟，你最终需要等待的时间是 **40 分钟 - 10 轮得到的总代币*0.1 分钟**。
举例：假设你在十轮公共品博弈过后最终得到了 374 个代币，那么你的代币将等值于 374*0.1=37.4 分钟，所以你最终需要等待 40-37.4=2.6 分钟。
如果你最终所得超过了 400 代币，那么恭喜你，你将不需要留在教室中等待，十轮博弈结束后即可离开。

重要提示!
猪队友指那些享受着组内福利而自己却不肯付出的人。在这个试验中，猪队友指那些每轮博弈都**不投资或者只投资很少数额**的人。

请注意一个猪队友就能增加每人平均多达 **12 分钟**的等待时间!

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