RICE FARMING AND THE ORIGINS OF COOPERATIVE BEHAVIOR

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Abstract
This paper provides novel evidence for links between historic farming practices and current norms of cooperation. We hypothesize that the cooperation required in wetland rice farming gives rise to strong cultural norms of cooperativeness. We compare participants from prefecture cities that predominately practice wetland rice cultivation, to those from non-rice regions. A public goods game with and without punishment is the main measure for cooperativeness. Results indicate a strong and robust positive effect of wetland rice farming on cooperation and pro-social punishment. Complementary, consistent evidence from a natural field experiment and a survey further enriches our data. (JEL: C99, H41, N55, Z19)

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1. Introduction

In the broad context of exploring historical and cultural influences on economic development, a recent active body of research has established considerable variation in economic preferences both within and across countries (Falk et al., 2018). These preferences, particularly trust and patience, have been shown to be causally related to economic development (Algan and Cahuc, 2010; Dohmen et al., 2018; Knack and Keefer, 1997; Tabellini, 2010). The origins of these preferences have been the topic of both empirical and theoretical research (Galor and Özak, 2016; Nunn and Wantchekon, 2011), thus connecting cultural and historical differences to current economic development levels.

The preference for cooperation is another key element that influences economic development, the rule of law, and the quality of institutions (Herrmann et al., 2008; Knack and Keefer, 1997; Tabellini, 2008). Furthermore, there is mounting evidence that, just like trust and patience, preferences for cooperation vary across cultures and societies (Alesina and Giuliano, 2015; Butler and Fehr, 2018; Falk et al., 2018; Gächter et al., 2010; Herrmann et al., 2008). Yet, the cultural and historical origins of cooperative preferences remain mostly unexplored.

This paper addresses this gap by examining the connection between regional differences in historical agricultural activity and contemporary differences in cooperative preferences. In particular, we explore the relationship between historical agricultural practices that require high levels of cooperation and coordination and current cultural norms of cooperativeness as manifested in

social preferences. We address this question by examining the specific case of traditional wetland rice farming.

The influence of agricultural activities on people's beliefs and preferences has long been recognized.[1] Here, we focus on wetland rice cultivation. Talhelm et al. (2014) have described in some detail how traditional wetland rice farming differs from wheat farming. In particular, they highlight the high infrastructure costs in rice farming, derived from the need to level paddy fields, and to create and maintain an irrigation system. Secondly, wetland rice farming is highly labour intensive, particularly in certain seasons; in part due to the labour required for operating and maintaining the irrigation infrastructure. For small units (such as families) traditional wetland rice farming is therefore only possible by coordinating and cooperating extensively with other rice farmers within a village or across villages.

Talhelm et al. (2014) provide evidence that a history of wetland rice farming does indeed affect contemporary individuals. Their proposed 'Rice Theory' shows that students in traditional wetland rice farming regions have a more holistic thinking style, while students from other regions possess a more analytic thinking style. Their work is a seminal contribution in explaining eastern and western cultural differences. With their focus being on thinking styles, they do not, however, explore social preferences.

Furthermore, traditional wetland rice cultivation exhibits all three conditions that are likely to lead to the emergence of punishment as a

1. See the 'subsistence style theory' (Berry, 1967; Nisbett et al., 2001); and on the influence of agricultural practices on gender roles (Boserup, 1970).

strategy to sustain cooperation according to Ray (1998). Those conditions are: positive individual gain from successful cooperation, member's action must be observable by others, and sanctions must be enforceable. Wetland rice cultivation satisfies all these conditions. Farmers need to cooperate with each other to plant and collect wetland rice and each farmer's effort is easily observed by others in the paddy fields. Finally, it is relatively easy to know who are the free-riders and punish them in small and closed societies, such as villages.

To test whether wetland rice farming gives rise to cooperative behavior, and the role of punishment in that, we compare individuals from prefecture cities that predominately practice wetland rice cultivation, to those from other regions. Following Talhelm et al. (2014), we define a prefecture city to be predominantly wetland rice farming if more than 50% of its cultivated land is devoted to paddy fields. We collected the prefecture city level paddy field statistics from each provincial bureau of statistics website. In order to avoid changes caused by recent advances in technology, we use the earliest data available and soil suitability as an instrumental variable to reflect, as closely as possible, the historical farming situation.

The experimental sessions were conducted in four provinces in China. Two of which are wetland rice provinces (Zhejiang and Hunan province) and two non-rice provinces (Hebei and Shandong province). In each province, we recruited local, Han Chinese, and first year university students based on their hukou. Hukou is a household registration system employed in China. The policy requires that individuals must register the hukou at their city of residence and they can only register their hukou at one prefecture city. By local students we mean that their hukou was registered at the province of the experiment.

We implemented the public goods game (PGG), with and without punishment, as the main measure of cooperativeness. We also elicited subjects' thinking styles, social styles, social preference, risk attitude, and beliefs, by using the Triad task, which is one of the the main measures in Talhelm et al. (2014), individualism and collectivism questionnaire, an Ultimatum Game (UG), a Dictator Game (DG), a non-incentivized multiple price list lottery task (Holt and Laury, 2002), and a coordination game.

Our results reveal a robust and consistent effect of wetland rice farming on cooperative behavior. In both the PGG, with and without punishment, subjects from wetland rice prefecture cities contribute significantly more than their non-rice counterparts. Moreover, we find that wetland rice subjects are more predisposed to punish free-riders, defined as group members who contribute less than the punisher, while there is no difference in punishing cooperators, defined as group members who contribute more or equal than the punisher. These findings support our hypothesis. They are also in line with the result by Gavrilets and Richerson (2017) who find that norm internalization is promoted much more easily in groups that foster punishment.

These conclusions hold after we control for thinking styles, which is the main variable in Talhelm et al. (2014), and for the social styles measured by the individualism and collectivism questionnaire (Triandis and Gelfand, 1998). This suggests that the influence of wetland rice cultivation on cooperation is likely to be direct, rather than mediated via some psychological measure.

Several potential threats to inference, and possible alternative interpretations, are examined and ruled out. Firstly, by recruiting only Han Chinese first year University students, a number of potential confounds - such as educational

background, language, culture, and political institution – are controlled for by design. Secondly, we control for a large set of covariates which includes variables on economic development, land characteristics, and proxies for cultural traits.

We proceed to explore the robustness of our results by conducting a series of exercises. Firstly, we utilize subjects' hukou information and their fathers' birth places to check whether self-selection into rice or non-rice provinces biases our conclusion. Secondly, having conducted sessions in two rice provinces and in two non-rice provinces allows us to compare subjects from two distinct provinces that have the same agricultural background. If the results were driven by unobserved geographical or cultural differences, subjects from different provinces may behave differently, even after holding the type of farming practice constant. Lastly, we use wetland rice suitability as an instrument for the paddy field statistic. The results remain robust for all the aforementioned exercises, suggesting the effect of wetland cultivation on cooperation is likely to be more than a mere association.

Finally, we provide some additional data that supports the validity of our results beyond the laboratory-experimental context. We report results from a natural field experiment and from a survey regarding the provision of public goods. The natural field experiment is based on contributions to Wikipedia. The survey refers to the Chinese Family Panel Studies survey, a large, representative survey of the Chinese population. The questionnaire contains a variable that can be considered as a local public good—the tidiness of the street where the interviewees live. Though our complementary measures obviously have limitations, they do point to actual differences between regions with differing agricultural backgrounds, in the willingness to provide public goods. In all

cases the differences are in line with our experimental results and support the hypothesis we tested.

To the best of our knowledge, this is the first paper that shows traditional agricultural activities have a profound and lasting effect on contemporary individual's cooperation and punishment behavior. Our paper contributes to three distinct bodies of literature. Firstly, there are a number of papers exploring specifically the various possible effects of rice cultivation, focusing on thinking styles (Talhelm et al., 2014), cooperation (Chew et al., 2015), and innovation via social styles (Zhu et al., 2019). Our paper improves on this research by using more detailed data (prefectural rather than provincial level)[2], and more developed methodology (PGG with punishment). Importantly, we combined elements from all three papers, and are thus able to determine how the various effects of rice cultivation found in previous papers interact with or confound each other. We thus confidently conclude that the path to higher cooperation is not caused by psychological factors such as e.g. thinking styles. Moreover, suggestive evidence suggest that the higher cooperation is mediated via a pro-social punishment culture.

Secondly, this paper contributes to the body of research working with experimental behavioral methods, exploring how economic preferences and beliefs vary systematically across societies and countries. Differences in preferences including bargaining, coordination, risk, efficiency, fairness and

2. Zhu et al. (2019) use country level patent and rice statistics which is one level finer than prefecture. However, the difference is that we focus on cooperation while they focus on innovation.

cooperation have been found within and between countries including Israel, Japan, US, Yugoslavia, India, China, Norway, and also less developed and small-scale societies (Gächter et al., 2010; Henrich et al., 2001; Herrmann et al., 2008; Hsee and Weber, 1999; Jackson and Xing, 2014; Roth et al., 1991). See Falk et al. (2018) for a first comprehensive comparison on a wide range of economic preferences among individuals from 76 countries. It was always a plausible expectation to find differences in preferences between populations that vary significantly regarding their culture, economic development, and political-historical background, and this has now been well documented. Our present paper adds to this body of research by documenting in detail the perhaps more surprising differences (concerning the preference for cooperation) found between regions within one country, where ethnicity, economic development and 'culture' is constant.

Thirdly, the present paper contributes to the emerging body of literature that investigates the origins of observed differences in people's preferences. Studies have shown that current occupation that requires intensive cooperation leads to individuals being more cooperative (Gneezy et al., 2016; Leibbrandt et al., 2013). Unsurprisingly, this effect does not go beyond the individuals actually involved in the studied occupations. In contrast, subjects in our paper are university students, not rice farmers. As such, our paper is more in line with research on how historical practices and events shape present-day cultural norms that manifest in individuals' social preferences. For example, Alesina et al. (2013) trace the origins of less equal workplace gender norms to a historical practice of plough agriculture. Galor and Özak (2016) show a connection between traditional agriculture and future orientation, and Nunn

and Wantchekon (2011) find that the various levels of mistrust within Africa originate from different histories regarding the transatlantic and Indian Ocean slave trades. Enke (2019) shows that the heterogeneity of moral systems – bundles of psychological and biological functionalities that regulate human behavior in social dilemmas – can be attributed to the dynamic interaction between economic development and family network structures. The research focuses on the development of moral values people possess over the course of pre and post industrial revolution rather than their cooperativeness. Buggle (2020) finds that present day collectivist norms are linked to the historical practice of irrigation agriculture. The historical natural experiment of the Kuba kingdom (17th century) enables Lowes et al. (2017) to connect rule-obeying norms to historical forms of institution. Our present paper contributes to this as yet sparse research on historical institutional origins for contemporary norms and as such makes a case for the argument that regional differences in economic preferences are based in socio-economic history.

The remainder of the paper is structured as follows: Section 2 illustrates the experimental design. Non-parametric and regression results are presented in section 3. A series of robustness checks are ran in section 4. In section 5, we present two pieces of evidence from the field to show that our main results are not a product of artificial situations that subjects encounter in the lab. Section 6 concludes.

2. Experimental Design

2.1. Prefecture classification

Our subjects are university students from rice and non-rice prefecture cities in China. A prefecture city is the second administrative level, below a province. In our analysis we also treat Beijing, Shanghai, Tianjin and Chongqing as prefecture cities, despite technically being province-level cities. We classify a prefecture city as rice if more than 50% of its cultivated land is used for the cultivation of paddy-field rice, otherwise we classify the prefecture city as non-rice. Following Talhelm et al. (2014), we use percentage of paddy field out of the total cultivated land to classify rice and non-rice prefecture cities, instead of rice output. This is because some of the rice output is dry-land rice, which is not cooperation intensive. Moreover, since we are interested in the influence of traditional agricultural practices, rather than modern farming techniques, we use cultivation data from 1996,[3] which are the earliest available ones for most prefecture cities. We also use instrumental variable regressions using soil suitability data from the Food and Agriculture Organisation.

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3. One subject comes from the Yulin prefecture in Guangxi province. However, Guangxi does not have prefectural level cultivated land data. We use province level data instead. For Hebei we use prefectural level cultivated land statistics from 2007, which are the earliest available.

2.2. Subject recruitment

We conducted experiments in four public universities in the following provinces: Hebei, Shandong, Hunan and Zhejiang. Zhejiang and Hunan are prominent wetland rice farming provinces as the majority of cultivated land is devoted to paddy fields–the percentages are 78.2% and 84.3% respectively. On the other hand, Hebei and Shandong are non-rice provinces as the percentages are only 1.9% and 2.3% respectively. Importantly, the two rice provinces have been prominent wetland farming rice provinces since the Song Dynasty (Fan, 2007).

We used administrative data from the universities to recruit subjects with a local household registration (hukou). For individuals it is necessary to have a local hukou to gain access to a wide range of benefits provided by the local government. These benefits include education, welfare, eligibility to purchase a house and others. We wanted to recruit locally registered students to increase the chance of our subjects having been exposed for a long time to the norms and customs of each area. We also use the birth province of their fathers to identify subjects whose families may have moved from a non-rice region into a rice region or vice versa. There were only a handful of subjects recruited in a non-rice province who stated that themselves or their fathers had a hukou in a rice province. This is similar for subjects recruited in rice provinces. Excluding them from our analysis does not alter our findings. The above suggests that our results are unlikely to be driven by cooperative families self-selecting into rice regions.

Furthermore, we recruited exclusively Han Chinese subjects, the dominant ethnic group in China. Research shows that Han Chinese have shared cultural

origins (Wen et al., 2004). In addition, ethnic minority groups may have unique customs that confound our results. From the post-experimental questionnaire, we identified three subjects from ethnic minorities. Excluding them from the analysis yields similar results, hence we chose to keep them for the data analyses. We did not recruit Han Chinese from Tibet, Xinjiang, and Inner Mongolia, as these areas are traditionally herding regions and may have different cultural norms compared to areas where subsistence traditionally relied on agriculture (Nisbett et al., 2001). Finally, we recruited freshmen to minimize the indoctrination effect (Frank et al., 1993). It is also worth noting that the middle school curricula in China are busy and shared throughout the country. This is particularly the case in the last years of high-school, when students prepare for the National College Entrance Examination. These factors help homogenize, as much as possible, the experience of our subjects prior to beginning their university studies. There were 9 subjects who were not first year students. Including or excluding them does not affect our results and hence we include them in the analyses.

The recruitment process was as follows: Each University provided a list of qualified students from which we randomly drew a preliminary sample. Administrative employees from each university then tried to contact the selected students. We provided a script template to help with student recruitment. We emphasized that it was an economic study, they would receive monetary payments as compensation for their time, their decisions in the study would be anonymous and would not affect their records related to university in any way, and, most importantly, participation was voluntary. The overall show-up rate was about 60%.

It is worth re-emphasizing that our subjects were not professional farmers and they were less likely to self-select into rice or non-rice regions. These are vital conditions to identify the causal impact of culture on behavior as Guiso et al. (2006, p. 26) put it: "To claim a causal link, ..., focus on those dimensions of culture that are inherited by an individual from previous generations, rather than voluntarily accumulated."

2.3. Experimental Measures of Cooperative Behavior

We used the Public Goods Game (PGG) to measure subject's level of cooperation. Our subjects played eight periods of PGG under the no punishment condition followed by eight periods of punishment condition. They knew there would be another game after the no punishment condition, but they were not informed about its content until the no punishment condition was completed.

In the no punishment condition, subjects were randomly divided into groups of four and the group composition was fixed throughout the eight periods. In each period, each subject had an endowment of 20 points and was asked to decide how many points to contribute to a group account (the remaining points were allocated to their individual account). The total points in the group account were multiplied by 1.6 and then evenly distributed among all group members. In particular, each subject faced the following payoff function:

$$u_i = (20 - c_i) + (1.6 * \sum_{j=1}^{4} c_j) \ / \ 4$$

in which u_i is i's payoff, c_i is i's contribution to the group account, and $\sum_{j=1}^{4} c_j$ is the sum of contribution made by all group members.

Note that the contributor only gained 0.4 points for each point contributed to the group account. Therefore, contributing nothing always gave subjects the highest material payoff regardless of other group members' contribution. On the other hand, each point contributed to the group account increased the payoff of everyone by 1.6 points, and hence the group level payoff was highest if all group members contributed 20 points. In the latter case, each subject earned 32 points, which was higher than the self interested outcome (20 points).

After all subjects made their decisions, the amount of contribution of each subject, their earning from the group account, and their total earning in the current period were shown on their computer screen. The contribution of each group member was displayed in a random order on the computer screen in each period, so that subjects could not associate each contribution with a particular group member. Subjects needed to press the 'CONTINUE' button to proceed to the next round.

After the no punishment condition, the subjects were randomly regrouped and played eight periods of the punishment condition. The first part of the punishment condition was the same as the no punishment condition. Subjects chose their contribution level and then received information regarding other group members contribution. Afterwards, subjects proceeded to the punishment stage. At this point each subject chose how many punishment tokens to assign to other members of its group. They could assign at most ten punishment tokens. Each token cost one point to the punisher and reduced the earnings of the punished subject by three points. Punishment tokens received

could not reduce a subject's earnings below zero. However, negative profits were possible for some combinations of tokens received and assigned. This information was made clear to the subjects. Following the decision to punish came the information display stage. At this stage the subjects' final earnings were shown. They were informed about their earnings in the first stage, the total punishment tokens received and total punishment tokens assigned to others in the punishment stage, and their final earnings. The subjects were only told the total punishment tokens received but not who assigned the punishment.

2.4. Procedure at the lab

After all subjects had arrived in the lab and prior to getting any instructions of the study, they were asked to sign a consent form.

We administered a battery of tasks in the following order: a multiple price list risk elicitation task, the Triad Task, the Dictator Game, the Ultimatum game, a coordination game and a Public Goods Game (hereafter PGG) with and without punishment. The games prior to the PGGs were played without providing any feedback so as to minimize their impact on subsequent games. The participants knew that each session consisted of several parts, but they did not know the content of the forthcoming parts until the corresponding instructions were provided. One of the five games was randomly selected for payment (Dictator game, Ultimatum game, Coordination game, and the PGGs). If the PGGs were chosen, the experimenter would further draw one period. Subjects' earnings were exchanged to Chinese Yuan at the rate: 1 points = 0.5 Yuan (about 8 US Cents).

Since the literature in social psychology suggests that collective societies value group membership, we conducted a priming treatment in half of the sessions. The procedure was simple. In Hebei for example, after all subjects arrived in the lab and were waiting for instructions, the experimenter stated: please note that all of you are from Hebei province. We find that priming has no effect on subjects' behavior, we therefore pool the data from priming and no-priming sessions for the analyses.

The experiment was conducted between Oct 2015 and Jan 2016 in China. All the tasks were programmed using z-Tree (Fischbacher, 2007). There were a total of 524 subjects. 116 subjects in Hebei, 156 subjects in Shandong, 128 subjects in Hunan and 124 subjects in Zhejiang. We ran 6 sessions per province. All the sessions were conducted on Saturdays and Sundays. Each session lasted for about 2 hours. The average earnings were 30 Yuan (about 5 US dollars), including a 15 Yuan show-up fee. The earnings were comparable to the hourly minimum wage.

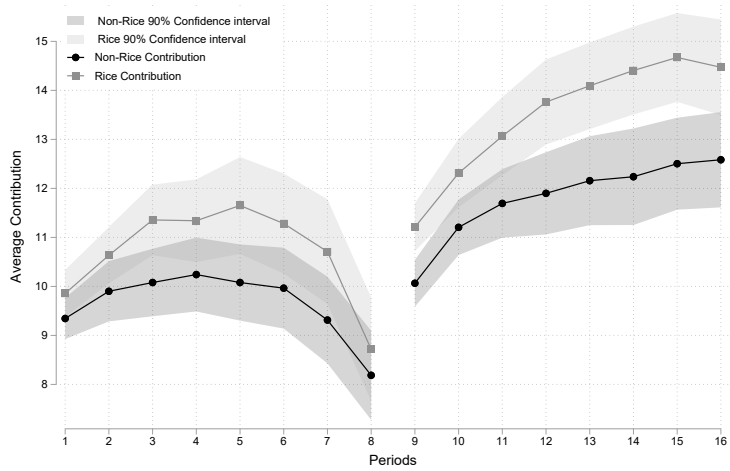
3. Main Results: Rice Cultivation and Cooperative Behavior

We find that groups consisting of subjects from rice prefecture cities contribute more than their non-rice counterparts in both the no punishment condition (periods 1 - 8) and the punishment condition (period 9 - 16).[4] In particular, in

4. We exclude mixed groups from figure 1 and the corresponding non-parametric tests since the analysis is based on the group level and we are interested in the rice/non-rice comparison. We include them in later regression analyses that are based on individual decisions. The results are very similar.

the no-punishment condition, the difference is 11% and is marginally significant (Mann-Whitney U Test at the public goods group level: $p = 0.071$. The p-value drops further if we remove the last period to account for the end-game effect: $p = 0.052$). In the punishment condition, the difference increases to 15% and is highly significant (Mann-Whitney U Test at the public goods group level: $p = 0.012$). These findings are depicted in figure 1.

FIGURE 1. Group Level Average Contribution in the Public Goods Game



Periods in the horizontal axis, group level average contribution in the public goods game in the vertical axis. Periods 1-8 are always the no punishment condition and periods 9-16 are always the punishment condition. The difference in the no punishment condition is weakly significant: Mann-Whitney U Test at the public goods group level: $p = 0.071$, while the difference is stronger in the punishment condition: $p = 0.012$.)

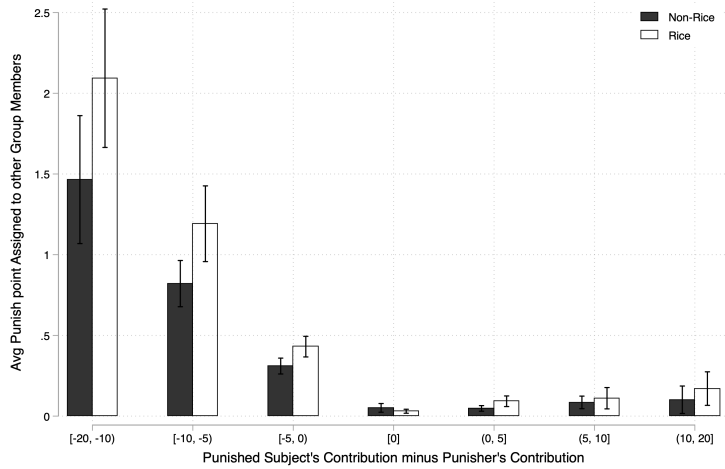
Besides higher contribution, subjects from rice prefecture cities also assign more punishment points to free-riders. Following Herrmann et al. (2008) and Gächter et al. (2010) we define free-riders as subjects who contribute less than the assigner's contribution and define cooperators as subjects who contribute more or equal than the assigner's contribution (hereafter we use assigner to refer to the punisher and use receiver to refer to the punished subjects).

Another method that is also widely used in the literature to classify free-riders and cooperators is to compare group member's contribution with other group member's average contribution. Under this method, the variable of interest is usually the total punishment points *received* by free-riders. We reach similar conclusions if we use this method: free-riders from rice prefecture cities receive more punishment points than free-riders from non-rice prefecture cities. The reason we did not use this method to present the results related to punishment behavior is that we believe defining free-riders and cooperators from the assigner's perspective is more appropriate since we are interested in how subject punish other group members, instead of the amount of punishment points they receive.

Figure 2 shows the average punishment points assigned to others, conditional on the difference in contribution level between themselves and other group members. It indicates that whenever the receiver's contribution is less than that of the assigner's, subjects from rice prefecture cities assign more punishment points than subjects from non-rice prefecture cities. The [0] category implies the receiver's and assigner's contributions are the same. Therefore, the three categories to the left of [0] are cases in which the assigner's contribution is higher. If we pool the three categories to the left of [0] into one punishing free-riders category, the results indicate that subjects from rice prefecture cities assign 50% more punishment points to free-riders compared to their non-rice counterparts and the difference is highly significant (Mann-Whitney U Test at the individual level: $p = 0.003$). Figure 2 also illustrates that there is no difference in how subjects punish cooperators. Indeed, if we merge the four categories to the right of category [0], inclusive, the difference is

not significant (Mann-Whitney U Test at the individual level: $p = 0.587$). The results are similar if we remove the [0] category from the punishing cooperators category.

FIGURE 2. Punishment Points Assigned to Others



The x-axis is the difference between the receiver's and the assigner's contribution. It is constructed by firstly calculating the contribution difference and then classifying the difference into seven categories. For example, [-20, -15) means the receiver's contribution is between 20 (inclusive) and 15 (exclusive) points *lower* than that of the assigner's. The y-axis is the average punishment points assigned to others conditional on these seven categories. If we merge all the categories in which the receiver contributes less than the assigner (the three categories to the left of [0]), the difference is highly significant (Mann-Whitney U Test at the individual level: $p = 0.003$). If we merge all the remaining categories in which the receiver's contribution is at least the same as the assigner's, the difference is insignificant ($p = 0.587$).

Results from non-parametric tests so far suggest that wetland rice cultivation is associated with higher contribution in the public goods game and higher punishment points assigned to free-riders. We now turn to more formal tests of the relationship between rice cultivation and cooperative behavior. In particular, we investigate the following equation:

$$y_{it} = \alpha + \beta * \%\ \text{Paddy Field}_{prefecturecity} + \mathbf{X}_i{}'\mathbf{T} + \varepsilon_{it} \qquad (1)$$

where i indexes individuals and t indexes periods in the public goods game. %Paddy Field$_{prefecturecity}$ is the percentage of cultivated land devoted to paddy field at the prefecture city level. The results are similar if we use an indicator variable which equals one if the subject comes from rice prefecture cities and zero otherwise. $\mathbf{X}_i$ is the set of baseline covariates, which includes dummies for gender, science or liberal arts track for senior high school, single child, and the priming treatment. It also includes age and their family income level relative to their town of residence.

The results from non-parametric tests conducted previously carry over to the regression analyses. Estimates of equation 1 on contribution in the public goods game are reported in table 1. The results demonstrate that the percentage of paddy field is positively and significantly associated with contribution in public goods game without punishment (columns 1-2) and with punishment (columns 3-4). Column 1 reports results for the no punishment condition without the baseline covariates. The coefficient suggests that a 10% increase in the percentage of paddy field leads to a 0.13 increment in contribution. At first glance, this effect seems quantitatively small. However, to gain a more accurate picture of the effect of rice cultivation on cooperative behavior, one needs to acknowledge the fact that the percentage of paddy field in rice prefecture cities is much higher than non-rice prefecture cities. The difference is nearly 80 percentage points (2.6% compared to 81%) in our data. Given this, the coefficient in column 1 implies subjects from rice prefecture cities contribute about 1.04 (0.13×0.8) points more than their non-rice counterparts. The coefficient from the punishment condition (column 3) suggests the difference is about 1.44 points. These results are robust after controlling for the set of

baseline covariates (columns 2 and 4). Moreover, the results indicates that males and students who chose the science track in high school contribute more in the public goods game.

TABLE 1. Contribution in the Public Goods Games

	No Punishment Condition		Punishment Condition	
	(1)	(2)	(3)	(4)
Perc. Paddy Field	1.270**	1.114**	1.783***	1.495***
	(0.505)	(0.491)	(0.437)	(0.382)
Male		2.032***		2.238***
		(0.407)		(0.300)
Science Orient (Dummy)		0.833**		1.454***
		(0.362)		(0.354)
Single Child (Dummy)		-0.268		0.0346
		(0.355)		(0.303)
Age		0.0221		0.0327*
		(0.0209)		(0.0170)
Priming Treatment (Dummy)		-0.427		-0.0724
		(0.417)		(0.333)
Relative Income		-0.466		-0.131
		(0.360)		(0.292)
Period	1.178***	1.178***	2.218***	2.218***
	(0.147)	(0.147)	(0.270)	(0.270)
Period Squared	-0.142***	-0.142***	-0.0736***	-0.0736***
	(0.0156)	(0.0156)	(0.0101)	(0.0101)
Constant	7.940***	7.509***	-3.962**	-5.928***
	(0.323)	(0.853)	(1.675)	(1.846)
R-Squared (Overall)	0.0250	0.0744	0.0580	0.141
Observations	4192	4192	4192	4192

Notes: Random Effects Linear regressions. Columns 1 and 2 show contribution in the no punishment condition; columns 3 and 4 show contribution in the punishment condition. Clustered standard errors at the prefecture city level are reported in parentheses (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

We now turn to the subject's punishment behavior. In particular, we estimate equation 1 using punishment points assigned to other group members as the dependent variable. We also estimate the equation separately for punishing free-riders and for punishing cooperators (free-riders and cooperators are defined by the same method as in figure 2). The corresponding results are shown in columns 1-2 and columns 3-4 of table 2 respectively.

The results demonstrate a significant and consistent association between rice cultivation and the punishment of free-riders (table 2 columns 1-2). The paddy field coefficient in column 1 implies subjects from rice prefecture cities on average assign about 0.22 (0.27×0.8) more punishment points than subjects from non-rice prefecture cities. Readers might notice that we controlled for the assigner's and receiver's contribution (we refer to them as "contribution effects"). The inclusion of contribution effects is essential to obtain a clean inference on how rice cultivation influence punishment behavior. Otherwise, it is not clear whether the difference in the punishment behavior originates from attitudes towards free-riders or from the difference in cooperation between assigners and receivers. The coefficients of the contribution effects are also intuitive. They suggest that the larger the difference in contribution between cooperators and free-riders, the more punishment points are assigned to free-riders. We include the baseline covariates in column 2 and the results remain robust. Columns 3 and 4 show that the percentage of paddy field is also positively associated with punishment towards cooperators. However, the effect is quantitatively small, as the coefficient is much smaller than the coefficient for punishing free-riders. In addition to total punishment points assigned to others, we also investigates the effect of rice cultivation on the probability of punishing and the intensity of punishment. The conclusions are similar: the percentage of paddy field is positively associated with the probability and intensity of punishing free-riders, while not significant in regressions related to punishing cooperators.

TABLE 2. Punishment Behavior

	Pro-Social Punishment		Anti-Social Punishment	
	(1)	(2)	(3)	(4)
Perc. Paddy Field	0.269***	0.254***	0.0347**	0.0354**
	(0.0738)	(0.0727)	(0.0168)	(0.0171)
Punisher Contribution	0.0731***	0.0679***	-0.0104***	-0.0104***
	(0.00984)	(0.00993)	(0.00284)	(0.00280)
Punished Contribution	-0.138***	-0.137***	0.00260	0.00243
	(0.0122)	(0.0120)	(0.00318)	(0.00323)
Male		0.219***		0.0115
		(0.0656)		(0.0140)
Science Orient (Dummy)		0.0688		0.000637
		(0.0459)		(0.0184)
Single Child (Dummy)		-0.0959		-0.0187
		(0.0601)		(0.0141)
Age		-0.00422*		-0.0000131
		(0.00252)		(0.000721)
Priming Treatment (Dummy)		0.0443		0.00221
		(0.0496)		(0.0147)
Relative Income		0.0648		0.0104
		(0.0491)		(0.00989)
Constant	0.718***	0.636***	0.127***	0.112***
	(0.117)	(0.155)	(0.0340)	(0.0373)
R-Squared (Overall)	0.187	0.197	0.0325	0.0343
Observations	3843	3843	8733	8733

Notes: We run Random Effects Panel regressions. The dependent variable is the punishment points assigned to other group members. Columns (1) and (2) are results on punishment points assigned to other group members who contribute less than the punisher (pro-social punishment). Columns (3) and (4) are results on punishment points assigned to other group members who contribute more than or equal to the punisher (anti-social punishment). Clustered standard errors at the prefecture city level are reported in parentheses (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

4. Examining Potential Confounds

Results from the previous section suggest the percentage of rice paddy field is associated with cooperation and punishment behavior in the public goods game. However, these results do not necessarily imply that rice cultivation has a causal impact on cooperative and punishment behavior. Alternatively, it could be other characteristics that correlate with both wetland rice farming and cooperation, thus bias the OLS estimates away from zero.

We conduct three exercises to demonstrate differences other than rice cultivation are unlikely to bias our results. The first step is to control for a

large set of covariates. Since it is impossible to control for *all* the potential confounds, one can argue that our results obtained from the first step still suffer from omitted variable bias. To address this concern, in the second step, we take advantage of our experimental setting that we conducted sessions in two rice provinces and in two non-rice provinces. The idea is that if our results are driven by unobservable geographical or cultural differences, we may also observe differences in cooperative behavior between subjects from the two rice provinces as well as between subjects from the two non-rice provinces. As such, our second approach of dealing with the omitted variable bias issue is to investigate whether subjects from the two (non) rice provinces differ from each other. Lastly, we use wetland rice suitability at the prefecture city level as an instrument for the percentage of paddy fields.

4.1. Controlling for Observables: Economic Development, Land Characteristics, Cultural Traits

Studies have shown that economic development has a profound influence on individual's level of trust and cooperation (Henrich et al., 2010, 2001; Inglehart and Baker, 2000; Khadjavi et al., n.d.). Therefore, the difference in cooperative behavior could be attributed to the higher level of economic development among rice prefecture cities rather than traditional rice cultivation itself. To check, we control for GDP per capita at the prefecture city level for 2014, the latest available data when we conducted the experiment. We also control for subject's hukou type (rural or urban), since the Urban-Rural inequality gap in China is substantial (Yusuf, 2008; Sicular et al., 2007). Column (1) of tables 3 and 4 presents the estimates controlling for economic development. The percentage of

paddy field remains positive and significant in contribution without punishment (Panel A), with punishment (Panel B), and punishment to free-riders (Panel C).

Different geo-climate conditions between rice and non-rice prefecture cities might foster different social norms that in turn influence cooperative behavior. To rule out this alternative explanation, we control for geo-climate characteristics and a large set of cultural covariates.

The geo-climate variables are from the International Institute for Applied Systems Analysis (IIASA) and Food and Agriculture Organization (FAO) data base. We use terrain slope, soil depth, and land cover pattern. We control for the three geo-climate condition measures in column 2 of tables 3 and 4. Percentage of paddy rice losses its significance in contribution without punishment, though the sign is still positive (column 2 of Panel A). This suggests that inherent pro-sociality or other factors are not sufficient on their own to sustain cooperation. However, the percentage of paddy field rice remains significant in the punishment condition (Panel B) and with respect to the punishment behavior (Panel C).

Furthermore, we control for a set of variables related to cultural traits. We consider these cultural traits as proxies for geo-climate conditions, which allow us to control for a wide range of unobservable geo-climate variables. The validity of this strategy relies on the assumption that if geo-climate factors do have profound influences on human's beliefs and behavior, its affect should encompass a large set of traits, not cooperative behavior only.

From the social psychology literature we borrowed questionnaire based measures for thinking styles, individualism and collectivism. To measure

TABLE 3. Controlling for Observables

Panel A: Contribution in the no Punishment Condition								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Perc. Paddy Field	1.127**	0.841	1.133**	1.124**	1.190*	1.189*	1.521**	0.893
	(0.491)	(0.550)	(0.483)	(0.487)	(0.610)	(0.640)	(0.755)	(0.560)
Constant	7.731***	9.407***	7.245***	5.226***	3.984	8.264***	-0.422	6.346
	(0.912)	(1.800)	(2.512)	(1.136)	(3.514)	(1.917)	(4.525)	(4.587)
Development Covariates	Yes						Yes	Yes
Land Characteristic Covariates		Yes					Yes	Yes
Cultural Covariates (Questionnaire)			Yes				Yes	Yes
Culture Covariates (Behavioural)								
Risk Attitude				Yes			Yes	Yes
Coordination				Yes			Yes	Yes
UG Offer					Yes	NA	Yes	NA
DG Offer					Yes	NA	Yes	NA
UG MAO					NA	Yes	NA	Yes
DG Belief					NA	Yes	NA	Yes
Baseline Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Period and Period Sq	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared (Overall)	0.0747	0.0720	0.0793	0.0836	0.139	0.0769	0.147	0.110
Observations	4176	4080	4184	4192	2096	2096	2024	2032
Panel B: Contribution in the Punishment Condition.								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Perc. Paddy Field	1.538***	1.706***	1.497***	1.480***	1.618***	1.516***	2.559***	1.827***
	(0.387)	(0.498)	(0.377)	(0.378)	(0.564)	(0.551)	(0.665)	(0.662)
Constant	-5.966***	-6.547***	-8.160***	-7.645***	-15.89***	-5.050*	-26.34***	-6.478
	(1.961)	(2.496)	(2.978)	(2.007)	(5.699)	(2.881)	(6.113)	(4.656)
Development Covariates	Yes						Yes	Yes
Land Characteristic Covariates		Yes					Yes	Yes
Cultural Covariates (Questionnaire)			Yes				Yes	Yes
Culture Covariates (Behavioural)								
Risk Attitude				Yes			Yes	Yes
Coordination				Yes			Yes	Yes
UG Offer					Yes	NA	Yes	NA
DG Offer					Yes	NA	Yes	NA
UG MAO					NA	Yes	NA	Yes
DG Belief					NA	Yes	NA	Yes
Baseline Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Period and Period Sq	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared (Overall)	0.143	0.137	0.146	0.148	0.171	0.142	0.197	0.165
Observations	4176	4080	4184	4192	2096	2096	2024	2032

Notes: Clustered standard errors at the prefecture city level are reported in parentheses (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

TABLE 4. Controlling for Observables Continued

Panel C: Punishment Point Assigned to Free-Riders								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Perc. Paddy Field	0.278***	0.301***	0.274***	0.270***	0.298***	0.257**	0.361***	0.232**
	(0.0740)	(0.0735)	(0.0723)	(0.0733)	(0.103)	(0.108)	(0.127)	(0.0970)
Constant	-1.579**	-1.742**	-2.231***	-1.584**	-2.355	-1.360	-2.768	-1.931*
	(0.754)	(0.771)	(0.845)	(0.746)	(1.563)	(0.928)	(1.807)	(1.163)
Development Covariates	Yes						Yes	Yes
Land Characteristic Covariates		Yes					Yes	Yes
Cultural Covariates (Questionnaire)			Yes				Yes	Yes
Culture Covariates (Behavioural)								
Risk Attitude				Yes			Yes	Yes
Coordination				Yes			Yes	Yes
UG Offer					Yes	NA	Yes	NA
DG Offer					Yes	NA	Yes	NA
UG MAO					NA	Yes	NA	Yes
DG Belief					NA	Yes	NA	Yes
Baseline Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Period and Period Sq	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Contribution Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared (Overall)	0.198	0.200	0.199	0.200	0.220	0.188	0.232	0.227
Observations	3823	3775	3829	3843	2001	1842	1947	1794

Notes: Clustered standard errors at the prefecture city level are reported in parentheses (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

thinking styles we used the triad task developed by Ji et al. (2004). The questionnaire shows respondents lists of three items, such as monkey, banana, and elephant. Subjects are asked to choose which two items among the three belong to the same category. Ji et al. (2004) find stark differences between Chinese and US subjects. More related to this study, Talhelm et al. (2014) find that subjects from rice and non-rice provinces in China also respond differently. The second and third covariates are both obtained using the individualism and collectivism questionnaire developed by Triandis and Gelfand (1998). Importantly, individualism and collectivism are two distinct measures. This concept is first proposed by Hofstede in his influential work on cultural dimensions theory (Hofstede, 1980). It has inspired a large literature in the

field of social psychology and is considered one of the most important cultural traits. Moreover, recent studies suggest that individualism and collectivism is related to important economic behavior such as competitiveness (Leibbrandt et al., 2013) and trade (Hajikhameneh and Kimbrough, 2019). Our results remain robust after controlling for these cultural covariates (column 3 of tables 3 and 4).

We also use games from the experimental economics literature to account for subjects' social preferences and beliefs. It is established in the literature that social preference, beliefs, and risk attitudes are important factors that influence behavior in social dilemma situations (Butler and Fehr, 2018; Fischbacher and Gächter, 2010; Fischbacher et al., 2001; Mengel, 2018). To test whether the influence of wetland rice cultivation on cooperation operates directly, or indirectly via the aforementioned preferences and beliefs, we administered three games and a lottery task to measure them. In particular we administered the dictator game (DG), the ultimatum game (UG), the stag hunt game (SH), and a non-incentivized multiple price list lottery task (Bolton and Ockenfels, 2000; Fehr and Schmidt, 1999; Holt and Laury, 2002).

In the DG, subjects are randomly divided into first movers and second movers. The first mover's task is to allocate money between herself and an anonymous second mover. The second mover has no influence over the first mover's decision. While the first movers are making their choices, we ask second movers the amount they expect to receive, which reflects their beliefs on others' social preferences. The UG is similar to the DG except that the second mover can reject the allocation made by the first mover, in which case both parties earn nothing. We employed the minimal acceptable offer method, in which

second movers need to pre-specify the minimum amount they would accept. The allocation is automatically rejected if the first mover offers less than that amount. Subjects' roles are fixed in the two games to minimize reciprocity concerns.

The SH is an one-shot, two-player coordination game with the payoff matrix shown in figure 5. Restricting ourselves to pure strategy equilibria, ('hare', 'hare') is the risk dominant equilibrium, whereas ('stag', 'stag') is the Pareto efficient equilibrium. A player should choose 'stag' only if she is sufficiently sure the other player will also choose 'stag'. Hence, we use the choice in SH as a measure of their beliefs regarding others' actions.

TABLE 5. Payoff matrix of the Stag Hunt Game

	Stag (@)	Hare (#)
Stag (@)	(30, 30)	(12, 22)
Hare (#)	(22, 12)	(22, 22)

The results controlling for variables measured from the experimental economics literature are shown in columns 4-6 of tables 3 and 4. Column 4 controls for subjects' risk attitudes and their beliefs in the SH game. Columns 5 and 6 controls for first mover's and second mover's behavior in the DG and UG, respectively. It is not possible to run one regression to include both first movers and second movers, as they are different subjects. Our main results remain significant.

We control for all the covariates in columns 7 and 8 and the results are robust except for contribution in the no punishment condition: the percentage of paddy field is not significant for the second movers in the DG and UG.

4.2. Examining Cross Provincial Differences

In the previous section, we show that our results are robust to the inclusion of a large set of control variables. However, unobservable cultural and geo-climate differences across rice and non-rice regions can still potentially bias the results. We tackle this omitted variable bias issue by comparing subjects from Hunan to subjects from Zhejiang (the two rice provinces) as well as comparing subjects from Hebei to subjects from Shandong (the two non-rice provinces). If it is indeed the case that unobservable cross provincial differences drive cooperative behavior instead of rice cultivation, then it is likely we should observe differences in behavior between subjects from the two rice provinces as well as between subjects from the two non-rice provinces. We test this in table 6 and the results indicate that once the type of farming is held constant, there is no difference between subjects from different provinces. For the contribution in the PGGs, we drop groups that have subjects from both rice and non-rice prefecture cities (as in figure 1). For the punishment behavior we include all subjects since it is based on individual level behavior. The results are similar if we keep these subjects or run regressions with the full set of controls. Additionally, we find no difference in the probability of punishment and the intensity of punishment. The results also hold for punishing cooperators.

4.3. IV results

Our third and final strategy to address the concern of omitted variable bias is to use wetland rice suitability index to instrument for the percentage of paddy fields. This exercise addresses the concern that cooperative individuals may

TABLE 6. Cross Province Comparison

Non-Rice Provinces			Rice Provinces		
Hebei	Shandong	z score	Hunan	Zhejiang	z score
Panel A. *Group Level Average Contribution in the no Punishment condition*					
10.38 (n=28)	9.05 (n=35)	1.535	11.04 (n=30)	10.36 (n=31)	0.822
Panel B. *Group Level Average Contribution in the Punishment condition*					
12.45 (n=28)	11.25 (n=34)	1.287	13.30 (n=30)	13.69 (n=31)	0.368
Panel C. *Individual level Average Punishment Points Assigned to Free-Riders*					
0.44 (n=103)	0.42 (n=130)	0.459	0.63 (n=110)	0.69 (n=113)	1.451

Notes: For Shandong province, the number of groups changes from 35 in the no punishment condition to 34 in the punishment condition. This is due to the fact that we drop groups that consist subjects from both rice and non-rice regions, since because the unit of analyses is the group level average. The random regroup after the no punishment condition results in more mixed groups being created.

have self-selected into wetland rice farming. The IV estimate, combined with the fact that we have very low migration from one type of region to the other, suggests that self-selection is unlikely to bias our findings. The suitability index is taken from the IIASA and FAO's Global Agro-ecological Zones (GAEZ v3.0) (IASA/FAO, 2012). It includes rice suitability index for five arc-minute by five arc-minute grid-cells globally. We used two indexes to instrument wetland rice paddy field: irrigation-low-labour input and irrigation-mediate-labour input since these conditions resemble traditional wetland farming. The irrigation-high-labour input, on the other hand, refers to the usage of fully mechanical machinery and hence requires low labour intensity. The first and second stage 2SLS estimates are reported in table 7. The percentage of paddy field remains positive and significant when we control for the baseline covariates (see columns 1, 4 and 7). The magnitude of the coefficient is also similar to that measured by OLS.

One concern of using rice suitability index as an instrument is that the exclusion restriction cannot be taken for granted. The reason is that the index is essentially a function of a set of geo-climate conditions. These geo-climate conditions themselves might relate to both social norms and cooperative behavior. Therefore, the suitability index could influence cooperation through channels other than rice cultivation. We follow Alesina et al. (2013) to address this issue. In particular, we check the robustness of the IV estimates by controlling for the full set of covariates that are potentially correlated with the suitability index. The results remain robust (see columns 2-3, 5-6, and 8-9).

TABLE 7. Wetland Rice Suitability as IV

Panel A: First Stage 2SLS Estimates.									
	Contribution no Punish Condition			Contribution Punish Condition			Punish Points to Free-Riders		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Irrigation-low-labour input	0.017***	0.022***	0.021***	0.017***	0.022***	0.021***	0.017***	0.022***	0.021***
	(0.006)	(0.003)	(0.002)	(0.006)	(0.003)	(0.002)	(0.006)	(0.003)	(0.002)
Irrigation-intermediate-labour input	0.041***	0.164*	0.020***	0.041***	- 0.164*	0.020***	0.042**	0.021**	0.018**
	(0.016)	(0.009)	(0.008)	(0.016)	(0.009)	(0.008)	(0.016)	(0.009)	(0.007)
F-Stat	124.56	164.27	194.82	124.56	164.27	194.82	139.92	207.52	213.18
Panel B: Second Stage 2SLS Estimates.									
Perc. Paddy Field	1.493***	2.164***	1.154*	1.776***	2.904***	2.168***	0.232***	0.337***	0.195*
	(0.513)	(0.812)	(0.593)	(0.473)	(0.721)	(0.737)	(0.0741)	(0.112)	(0.104)
Constant	7.340***	-1.919	5.900	-6.009***	-27.15***	-7.061	-1.548**	-2.709	-1.873*
	(0.854)	(4.607)	(4.551)	(1.843)	(6.170)	(4.765)	(0.734)	(1.816)	(1.127)
Baseline Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Development Covariates		Yes	Yes		Yes	Yes		Yes	Yes
Land Characteristic Covariates		Yes	Yes		Yes	Yes		Yes	Yes
Cultural Covariates (Questionnaire)		Yes	Yes		Yes	Yes		Yes	Yes
Culture Covariates (Behavioural)									
Risk Attitude		Yes	Yes		Yes	Yes		Yes	Yes
Coordination		Yes	Yes		Yes	Yes		Yes	Yes
UG Offer		Yes	NA		Yes	NA		Yes	NA
DG Offer		Yes	NA		Yes	NA		Yes	NA
UG MAO		NA	Yes		NA	Yes		NA	Yes
DG Belief		NA	Yes		NA	Yes		NA	Yes
Contribution Controls	NA	NA	NA	NA	NA	NA	Yes	Yes	Yes
Period and Period Sq	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared (Overall)	0.0715	0.146	0.110	0.139	0.196	0.164	0.195	0.232	0.225
Observations	4184	2024	2032	4184	2024	2032	3843	1947	1794

Notes: Clustered standard errors at the prefecture city level are reported in parentheses (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

5. Additional Evidence From the Field

In the previous section, we have demonstrated rice cultivation has a profound and consistent influence on subject's cooperative behavior. However, it is not clear whether the finding is a product of artificial situations that subjects encounter in the lab or it can manifest in real life situations. To address this concern, we present two pieces of evidence that rice cultivation is associated with behavior observed in the field.

First, we exploit the natural field experiment offered by Wikipedia and show that the percentage of paddy field in one province is associated with the number of edits contributed the entries related to counties in that province. Second, data from the China Family Panel Studies (CFPS) suggests that percentage of paddy field is a strong predictor of local communities' street tidiness scores.

5.1. Evidence form a Natural Field Experiment

Wikipedia is a global encyclopedia that relies on voluntary contributors to write its entries and provide content that anyone can enjoy. As such it is a prime example of a public good (Chen et al., 2020; Georganas and Li, 2010). Contribution to the Wikipedia articles about Chinese prefecture cities can therefore be considered as a natural field experiment, where the hypothesis is that users from rice dominant areas contribute more to the Wikipedia articles. Research suggests that there exists a community of Wikipedia users who reside in mainland China (Zhang and Zhu, 2011). Moreover, the Chinese entries are also more likely to be edited by human editors instead of automated content editors (for more details see: https://stats.wikimedia.org/EN/Sitemap). We

test our hypothesis in table 8. The dependent variables of interest are the number of edits and the total size in bytes of the Chinese version Wikipedia entries on each prefecture city. Since the encyclopedia does not provide any data to identify the location of its contributors and IP addresses may not be reliable given the widespread use of VPN in mainland China, we focus our attention to contributions made to the entries of prefecture cities. Contributors need to have both knowledge of the topic to the entry of which they contribute and an interest in improving its presentation on Wikipedia. We assume that people who possess both qualities in sufficient levels to contribute to the entries of Chinese prefecture cities live or have lived in the past in those areas, therefore offering us an indirect way to control for location. We used Wikipedia's own list of Chinese prefecture cities in March 2017 to download this data. There were 206 prefecture cities in mainland China, of those 195 are eligible for our purpose. We exclude prefecture cities with large minority populations for the same reason we sought Han Chinese participants for our experiment. The independent variable is the percentage of paddy field of the province in which the prefecture cities are located. We control for population of the urban area of the prefecture cities, GDP per capita of the province in 2005, the growth rate of GDP per capita between 2005 and 2015, the number of 5A tourist attractions in the prefecture cities (prefecture cities that have more 5A attractions might have more edits/bytes simply because there are more pictures showcasing the 5A sites), internet usage rate in 2016, the percentage of college graduates in 2015, distance from Beijing, distance from the coast, and the percentage of GDP owed to the service industry in 2015.

The odd number columns in table 8 present the OLS estimates. Percentage of paddy field is strongly associated with both the number of edits (column 1) and the size of the page (column 3). The coefficient suggests that an 1% increase of the cultivated area devoted to paddy field is associated with a 0.7% increase in both measures. In the even columns, we use rice suitability index at the province level as instrument variables. The results are the same.

TABLE 8. Regressions about the total number of edits on the pages of cities in China on the Chinese Wikipedia

	Number of edits		Size in bytes	
	(1) OLS	(2) IV	(3) OLS	(4) IV
Perc. Paddy Field	0.007***	0.007***	0.009***	0.008**
	(0.002)	(0.002)	(0.003)	(0.003)
5A Tourist attractions	-0.012	-0.011	-0.017	-0.015
	(0.010)	(0.009)	(0.012)	(0.011)
GDP Per cap. growth 2005-15	-0.225	-0.222	-0.353**	-0.348**
	(0.156)	(0.150)	(0.171)	(0.164)
GDP Per cap. 2005	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
log(Population)	0.963***	0.963***	0.762***	0.762***
	(0.095)	(0.091)	(0.115)	(0.109)
Internet usage rate 2016	0.002	0.002	-0.001	-0.001
	(0.006)	(0.006)	(0.007)	(0.007)
Perc. College Graudate 2015	0.018	0.019	0.025	0.027
	(0.026)	(0.025)	(0.026)	(0.025)
Distance from Beijing	0.055	0.079	0.002	0.047
	(0.118)	(0.128)	(0.152)	(0.175)
Service Industry GDP perc. 2015	-0.035**	-0.035**	-0.045**	-0.045***
	(0.015)	(0.014)	(0.018)	(0.017)
Distance from Coast	0.034*	0.034*	0.043*	0.042**
	(0.019)	(0.018)	(0.021)	(0.020)
Constant	-6.455***	-6.474***	1.841	1.805
	(1.206)	(1.163)	(1.390)	(1.335)
Adjusted R-Squared	0.504	0.504	0.295	0.295
Observations	195.000	195.000	195.000	195.000

Notes: Standard errors are reported in brackets and are clustered at the province level. Because of the nature of count data the dependent variable was log transformed for the OLS regressions (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

5.2. Evidence from the CFPS

Our second piece of complementary evidence comes from the China Family Panel Studies (CFPS). What makes this survey suitable for our research is that interviewers were required to rate the tidiness of the streets in the communities where the interviewees live. The tidiness of the street is, arguably, a public good. The neighbors who take care not to litter the street and help maintain its tidiness volunteer their time and effort but they will only receive a reward at least equal to their contribution only if others contribute as well. The independent variable is the percentage of rice paddy fields at the province level. The control variables are GDP per capita at the province level in 2010 and 2014, the number of households in the interviewee's neighborhood, a dummy on whether the community is urban or not, and a 2014 year dummy indicating the second wave of the panel. Due to the privacy policy, the survey only provides data regarding the location of the communities at the province level. We exclude communities that are minority residential areas. The results reported in the table are not restricted to the experimental provinces.

We report random effects OLS without any controls in column 1 of table 9. The percentage of rice paddy field is positively associated with the rating made by the interviewer. The results are the same if we include additional controls (column 2) or use rice suitability as IV (column 3).

6. Conclusion

In this paper we show that the cultivation of wetland rice in China is associated with increased levels of cooperativeness in public goods games and

TABLE 9. Rice Farming and Tidiness of Streets

	(1)	(2)	(3)
Perc. Paddy Field	0.794***	0.383**	0.583***
	(0.264)	(0.186)	(0.172)
GDP per Captia		0.0733***	0.0537**
		(0.0228)	(0.0258)
Urban (Dummy)		0.464***	0.486***
		(0.110)	(0.103)
No. of Households		0.129***	0.122***
		(0.0261)	(0.0248)
Year 2014 (Dummy)=14		0.170	0.219**
		(0.117)	(0.0956)
Constant	4.484***	3.811***	3.798***
	(0.146)	(0.170)	(0.115)
R-Squared (Overall)	0.0363	0.128	0.126
Observations	1058	1049	1025

Notes: Random Effects Linear regressions. The dependent variable is the street tidiness index at the community level. The third column reports the second stage IV regression results. Clustered standard errors at the prefecture cities level are reported in parentheses (* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$).

increased punishment of free-riders. We recruited Han Chinese, first year, university students. We administered public goods games, with and without cooperation, which are our measures of cooperativeness. We find that students from traditionally rice prefecture cities contribute and punish more compared to students from traditionally non-rice prefecture cities. Our results survive a series of robustness checks, including IV regressions with soil suitability as an instrument, which suggests that the influence of wetland rice cultivation on cooperation may go beyond mere correlation. Given that our subjects are not farmers themselves and they do not have extensive (if at all), direct exposure to rice farming, we attribute those differences to a cultural norm that emerged in historical rice cultivating areas and has been transmitted through generations over the years. We also offer evidence of increased cooperation in the field, suggesting that our results are likely to go beyond the laboratory environment. It is important to note that we do not claim wetland rice farming is the

only origin of preference for cooperation, rather, we show it is likely one of the potentially many other factors that contribute to the formation of such preferences.

Moreover, Ray (1998) summarized certain conditions under which punishment behavior is likely to emerge, namely, positive individual gain from successful cooperation, member's action must be observable by others, and sanctions must be enforceable. Wetland rice cultivation satisfies all these conditions. First, it is not possible for farmers to cultivate wetland rice without cooperation, therefore, there are substantial gains from successful cooperation. Second, paddy fields are usually plain lands without any shelter, therefore, each farmer's effort is easily observable. Lastly, the names of the free-riders might spread relatively fast within the village, since rural villages are usually small and closed communities. Our results are also in line with the finding of Gavrilets and Richerson (2017) that norm internalization is promoted much more easily in groups that foster punishment.

One caveat of our results is that we only offer indirect evidence regarding the existence of the norm. Future research could provide more direct evidence. An interesting avenue for this is the use of text analysis of folk stories and songs, following Michalopoulos and Xue (2019) to pin down the values and norms that one generation attempted to pass on to another. Another caveat is that although we have invested a large amount of effort in trying to establish a causal link between historical wetland rice farming and contemporary cooperation, it is possible we have not controlled for every confounding factor. Further research could utilize natural experiments to narrow down the list of confounding factors and offer stronger identification.

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Appendix A: English Instructions

The followings are the instructions. The first set are English Instructions followed by the Chinese Instructions. The only difference is that we used input boxes instead of sliders for the Chinese instructions.

Thank you for participating.

Please note that communication with other participants is prohibited during the study. If you have a question once the study has begun, please raise your hand and an assistant will come to your desk to answer it. Violation of this rule can lead to immediate exclusion from the study and from all payments.

Today we will do 5 studies. The instructions for the first study are attached. Once a study is completed, you will receive instructions for the next study.

During the study we will not speak in terms of GBP, but in points. Your entire earnings will be calculated in points. At the end of the study the total amount of points you have earned will be converted to RMB at the following rate:

1 point = 0.4 GBP

At the end of today's study, one out of 5 study will be randomly selected for payment. After you completed all the studies, a card will be drawn from a bag, containing cards numbered from 1 to 5. The number on the card determines which study is for payment.

You will receive GBP 4 as a show-up fee for participating. Therefore, your total earning is:

Total Earning = Show-up fee + money you earned in the randomly chosen study

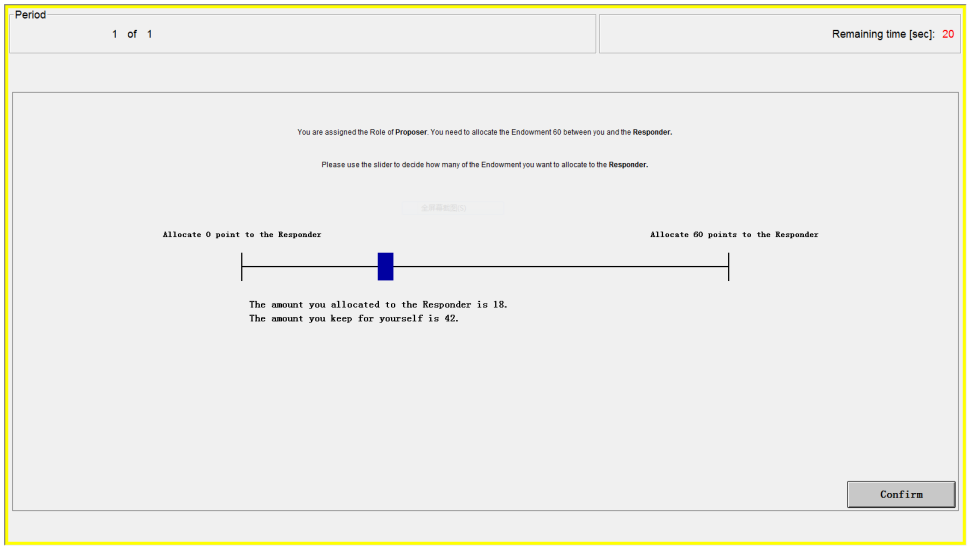
Please read the instructions carefully, because your earnings in each study depends on how well you understand the instructions.

Instructions for the First Study

In this study, first you will be assigned a role. You will be either a Proposer or a Responder. If you are a Proposer, you will be randomly and anonymously paired with a Responder. If you are a Responder, you will be randomly and anonymously paired with a Proposer. This way, half of the people in the room will be Proposers and half of them will be Responders.

DECISION OF PROPOSER

The Proposer's role is to allocate **a total of 60 points** between the Proposer and Responder. The input screen for the Proposer is presented below:



The Proposer needs to use the slider to allocate points between him or her and the Responder. The more points the Proposer allocates to the Responder the less points he or she keeps. The amount of points allocated to the Responder as well as the points remaining for the Proposer are both shown on the screen.

DECISION OF RESPONDER

In the current study the responder can only accept the allocation made by the Proposer. In other words, the allocation made by the Proposer is implemented regardless of whether the Responder agrees or disagrees.

EARNINGS

The Proposer and the Responder receive the amount according to the allocation made by the Proposer.

Control questions

1. Suppose the Proposer allocated 20 points to the responder.

What are the earnings for the Proposer?.....

What are the earnings for the Responder?.....

What can the Responder do if he/she is not satisfied with the allocation? ……..

……

2. Suppose the Proposer allocated 40 points to the responder.

What is the earnings for the Proposer?.....

What is the earnings for the Responder?.....

What can the Responder do if he/she is not satisfied with the allocation? ……..

……

Instructions for the Second Study

This study is very similar to the previous one.

Your role in this study remains the same as in the previous study. If you were a Proposer, you will also be a Proposer in this one. If you were a Responder, you will also be a Responder in this one.

Again . If you are a Proposer, you will be randomly and anonymously paired with a Responder. If you are a Responder, you will be randomly and anonymously paired with a Proposer. This way, half of the people in the room will be Proposers and half of them will be Responders. Your pair in this study **need not be** the same as in the previous study.

DECISION OF PROPOSER

The decision of the Proposer is exactly the same as in the previous study. The Proposer needs to allocate a total of 60 points between the Proposer and the Responder. In this study, the Responder can accept or reject the offer.

NEW IN STUDY 2: DECISION OF RESPONDER

Responders need to enter the **minimum acceptance amount** while the Proposers are making their decisions. The minimum acceptance amount is a number such that if the Proposer allocates a number **less** than the minimum acceptance amount, the allocation will be **automatically rejected**. On the other hand, if the Proposer allocates a number **more or equal** to the minimum acceptance amount, the allocation will be **automatically accepted**. For example, if a Responder stated 20 as the minimum acceptance amount and the Proposer allocates 19 or less to the Responder, then the allocation is automatically rejected. If the Proposer allocates 20 or more points to the Responder, then the allocation is automatically accepted. Important, Responders and Proposers are making decisions simultaneously. Therefore, Proposers will **NOT** know Responders' minimum acceptance amount while making the allocation. Similarly, Responders will **NOT** know Proposers' allocation while entering minimum acceptance amount.

While Proposers are making decisions, Responders need to enter a number between 0 and 60. This number is called the "**Minimum Acceptance Amount.**" If the points that Proposer allocated to Responder are **less** than this "Minimum Acceptance Amount", Proposer's allocation will be **automatically rejected**. On the other hand, if the points that Proposer allocated to Responder are **more or equal** to this "Minimum Acceptance Amount", Proposer's allocation will be **automatically accepted**. For example, if a Responder stated 20 as the minimum acceptance amount and the Proposer allocates 19 or less to the Responder, then

the allocation is automatically rejected. If the Proposer allocates 20 or more points to the Responder, then the allocation is automatically accepted. Important, Responders and Proposers are making decisions simultaneously. Therefore, Proposers will **NOT** know Responders' minimum acceptance amount while making the allocation. Similarly, Responders will **NOT** know Proposers' allocation while entering minimum acceptance amount.

The input screen for the Responder is presented below.

EARNINGS

If the allocation made by Proposer is **accepted**, both receives the points allocated to them.

If the allocation made by Proposer is **rejected**, both receive **zero points**.

Please answer the questions in the next page. They serve as a test for you understanding of the task.

Control questions

1. Suppose the Proposer allocated 20 points to the Responder.

If Responder enter the minimal acceptance amount 15, what is the earnings for the Proposer?.....

What are the earnings for the Responder?.....

If Responder enter the minimal acceptance amount 45, what is the earnings for the Proposer?.....

What are the earnings for the Responder?.....

2. Suppose the Proposer allocated 40 points to the responder.

If Responder enter the minimal acceptance amount 15, what is the earnings for the Proposer?.....

What are the earnings for the Responder?.....

If Responder enter the minimal acceptance amount 45, what is the earnings for the Proposer?.....

What are the earnings for the Responder?.....

Instructions for the Third Study

In this study, participants are randomly divided into groups of two. You will therefore be in a group with another participant.

DECISIONS

You and the other participant in your group need to pick one out of two possible choices simultaneously. The choices are labelled @ and #. When you make your choice you will not know what the other participant will choose. The other participant will not know your choice either. In other words, no participant will know what action the other player chose when making a decision.

EARNINGS

The following table shows earning for all possible combination of choices made by you and the other participant in your group.

		Other's Choice	
		@	#
Your Choice	@	(**30**, 30)	(**10**, 22)
	#	(**22**, 10)	(**22**, 22)

Note that, the numbers that are **Bolded** in each cell are **earnings for you**. The other number in each cell indicates the earning for the other participant.

For example, suppose your choice is "@" and the other's choice is "#", then the earning are (**10**, 22). Therefore, you earn **10** points and the other participant earns 22 points. If you choose "#" and the other's choice is "#", then the earning are (**22**, 22). Therefore, you earn **22** points and the other participant earns 22 points too.

Keep in mind: You and the other participant make your choices simultaneously without knowing what the other participant chooses.

Control questions:

1. Suppose you choose @ and the other participant choose @.

What is the earning for you?.....

What is the earning for the other participant?.....

2. Will you know what the other participant chose when you chose? ….

Will the other participant know what you chose once he or she choses? …

3. Suppose you earn 22 and the other participant earn 10.

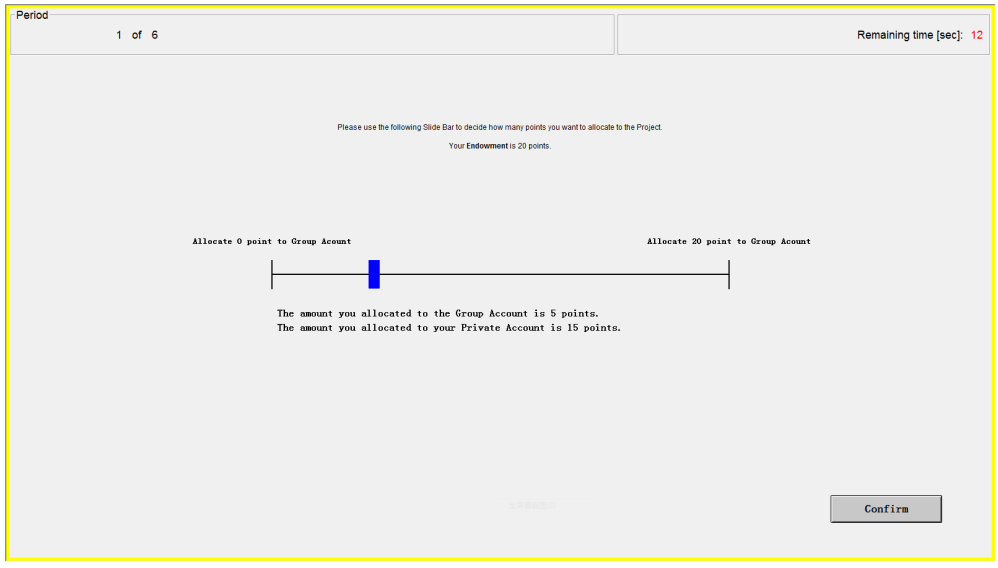
What was your choice?.....

What was the other participant's choice?.....

Instructions for the Fourth Study

In this study, participants are randomly divided into groups of four. You will therefore be in a group with 3 other participants. You will remain in the same group for the duration of this study. There will be a total of 6 periods, each participant will face the same decision in each period.

At the beginning of each period, each participant receives 20 points. We call this your endowment. In each period you will be asked to decide how many points of your endowment you want to allocate to a **Group Account.** You may allocate any integer number of points between 0 and 20. The remainder of your endowment will be automatically allocated to your **Individual Account**. The input screen is presented below:



You can use the slide bar to decide how many points of your endowment you want to allocate to the **Group Account**. The amount allocated to your **Private Account** is also shown on the screen.

EARNINGS

After all the participants have made their decisions, your earnings for the period are calculated. Your earnings consist of two parts:

(1) Your earnings from the **Individual Account**.

(2) Your earnings from the **Group Account.**

Your earnings from the Individual Account equal the points that you keep for yourself, and are thus independent of others' decisions. For every point you keep for yourself in your Individual Account, you earn 1 point.

Your earnings from the Group Account depend on the total number of points allocated to the Group Account by the 4 group members (including yourself). This total amount is multiplied by 1.6 and then distributed equally amongst the four group members – each member receives a quarter of it (25%). In other words, each point that you allocate to the Group Account turns into 1.6 points, which are distributed equally to four members i.e. 0.4 points each.

So, for each point that you or any of your group members allocate to the Group Account, you and the other three group members receive 0.4 points each.

In summary, your earnings in each period are calculated as follows:

Your earnings =

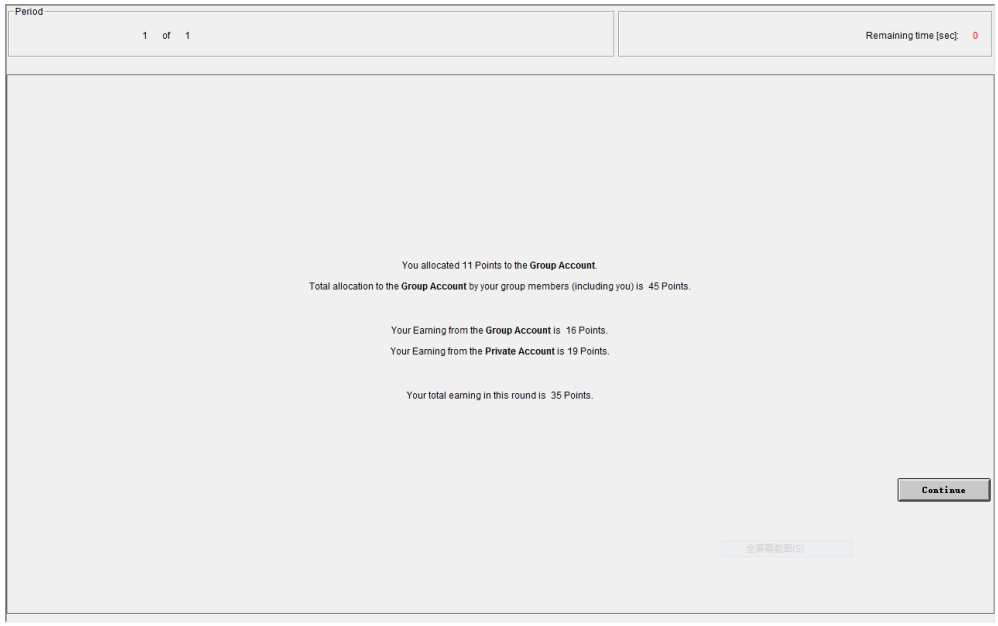
Earnings from Individual Account + Earnings from the Group Account =

20 - (Your allocation to the Group account) + 0.4 x (Total points allocated to Group Account by all group members)

Example: Suppose in one period that you allocated 8 points to the Group Account and that the other three members of your group allocated a total of 22 points. This makes a total of 30 points in the Group Account. In this case each member of the group receives earnings from the Group Account of 0.4×30 = 12 points. In addition, you also receive 12 points from your Individual Account. Therefore, your earning in this period is: (20 – 8) + 0.4 x 30 = 24 points.

RESULTS SCREEN

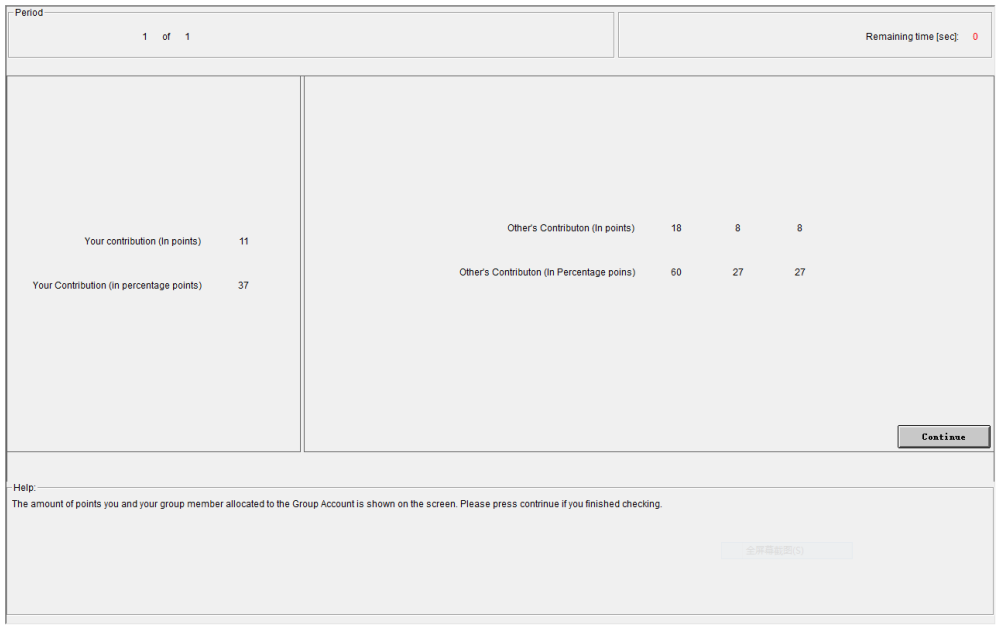
After all your group members have made their decision, your allocation and the sum of all allocations in your group are reported on the Result Screen as shown below. To aid you in your calculation, your earnings from your individual account and your earnings from the group account are both presented on the screen.



Please press the Continue button after you have read all the information.

INFORMATION SCREEN

Next the information screen appears, which reveals the contributions of the other group members.



This screen shows how many points each group member allocated to the Group Account. Your allocation is displayed in the first column, while the allocations made by the other group members are shown in the remaining three columns. Please note that **the order in which other group member's allocations are displayed changes randomly in every period.** The allocation in the second column, for example, generally represents a different group member each time. The same holds true for the allocations in the other columns. **That way you are informed about the contributions but not about the identities of the other group members.**

A new period will start shortly after pressing the Continue button. You will again receive 20 points as endowment and you will be asked again to decide how many points of your endowment you want to allocate to a Group Account.

If this study is randomly chosen for payment, we will randomly pick 1 period out of the 6 periods and your payments will be calculated by your decisions in that period

Please answer the questions in the next page. They serve as a test for your understanding of the task.

Control questions

1. Each group member has an endowment of 20 points. Suppose nobody (including you) contributes any points to the Group Account. What is:

Your earnings from the Group Account?.....

Your earnings from the Individual Account?.....

Your total earnings?.....

Other group members earnings from the Group Account?.....

Other group members earnings from the Individual Account?.....

Other group members total earnings?.....

2. Each group member has an endowment of 20 points. Suppose you contribute 8 points to the Group Account. All other group members each contribute 12 points to the Group Account. What are:

Your earnings from the Group Account?.....

Your earnings from the Individual Account?.....

Your total earnings?.....

Other group members earnings from the Group Account?.....

Other group members earnings from the Individual Account?.....

Other group members total earnings?.....

3. Each group member has an endowment of 20 points. Suppose the other three group members contribute **a total of 30** points to the Group Account.

a) If you contribute 5 points to the Group Account.

Your earnings from the Group Account?.....

Your earnings from the Individual Account?.....

Your total earnings?.....

Other group members earnings from the Group Account?.....

b) What are your earning if you contribute 15 points to the Group Account?

Your earnings from the Group Account?.....

Your earnings from the Individual Account?.....

Your total earnings?.....

Instructions for the Fifth (Last) Study

This study is similar to the previous study. First you will be randomly divided into a new group of four. The **new** group composition will **not** change throughout this study.

Each participant receives a lump sum payment of **10 Points** at the beginning of this study. This one-off payment can be used to pay for eventual losses during this study**. However, you can always evade losses with certainty through your own decisions**.

This study consists of 10 periods and there are **2 stages in each period**. The first stage is identical to the previous study. At the beginning of each period each participant receives 20 points as his or her endowment. You need to decide how many points of your endowment you want to allocate to a **Group Account** (and hence the remainder of your endowment will be automatically allocated to your **Individual Account**). Your earnings from the first stage will be calculated exactly in the same way as in the previous part.

Your earnings from the **First Stage** =

Earnings from Individual Account + Earnings from the Group Account =

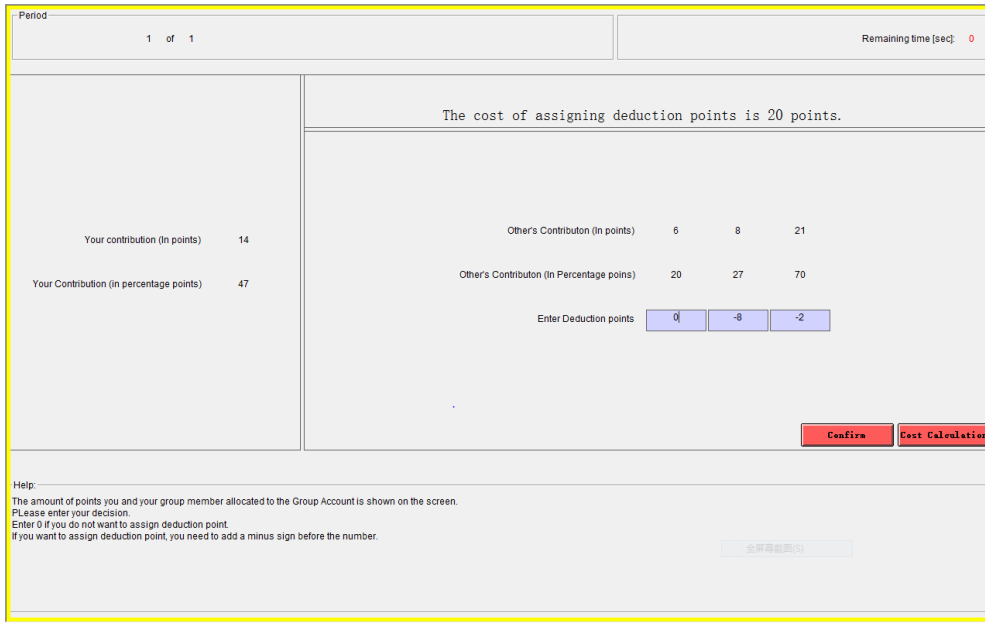
20 - (Your allocation to the Group account) + 0.4 x (Total points allocated to Group Account by all group members)

THE SECOND STAGE

There will be a new **second stage** introduced after all participants have made their decisions in the first stage.

At the second stage you can observe how many points each group member allocated to the Group Account. In addition, in this stage you can **decrease** the earning of each group member by assigning **deduction tokens** to him/her. If you do not want to decrease the other's earning, you simply do not assign any deduction tokens to him/her. Note that other group members can also decrease your earnings if they wish to do so.

The input screen for the second stage is presented below:



The screen shows how many points each group member allocated to the Group Account at the first stage. Your allocation is displayed in the first column, while the allocations made by the others are shown in the remaining three columns. Please note that **the order in which allocations are displayed changes randomly in every period**. The allocation in the second column, for example, generally represents a different group member each time. The same holds true for the other columns. This way you are informed about the contributions but not about the identities of the other group members.

You now have to decide whether, and if so how many, deduction tokens to assign to each of the other three group members. If you do not wish to change the income of a specific group member then you must enter 0. If you want to distribute deduction tokens, you must put a negative sign in front of the number (without spaces between them).

You can assign between 0 and 10 deduction tokens to each group member. However, each deduction token **costs you 1 point**. Therefore, the larger the amount of deduction tokens that you assign to other group members, the larger your costs. The total cost of assigning deduction tokens is calculated as follows:

Total cost of assigning deduction tokens = Sum of assigned deduction tokens x 1

You can move from one input field to the other using the mouse.

Example: If you assign 2 deduction tokens to one member (enter -2), assign 8 deduction tokens to another member (enter -8), and you assign 0 deduction token to the last group member (enter 0), the sum of assigned deduction tokens is 2 + 9 + 0 = 11 and the total cost is 11 x 1 = 11 points.

Each deduction token assigned to a participant reduces his/her earnings by 3 points. A participant's total received deduction tokens equal the sum of deduction tokens other group members assigned to him/her. Consequently, the amount of earnings decreased by the received deduction tokens is calculated as follows:

Total amount of earnings decreased by received deduction tokens = Sum of received deduction tokens x 3

Important: By receiving deduction tokens, each participant's earning can only be reduced to **ZERO**.

Example: If a participant received 2 deduction token from one group member, 9 deduction tokens from another group member, and 0 deduction token from the last group member, then the participant received a total of 2 + 9 + 0 = 11 deduction tokens. Consequently, his/her earnings will be decreased by 11 * 3 = 33 points. If this participant earned 40 points in the **First Stage**, then his/her earnings will be 40 – 33 = 7 points**. If this participant earned less than 33 in the First Stage, his/her earning will only be reduced to 0 point.** It is possible that one can earn a negative amount: if your earnings were reduced to ZERO by receiving deduction tokens **and you distributed 5 deduction tokens to others**, your final earnings will be 0 – 5 = -5 points. **However, you can always evade losses with certainty through your own decisions**.

EARNINGS

After all participants have made their decisions in the second stage, your earnings for the period are calculated.

The earnings from the First Stage are the same as in the previous part. These are the earnings from your Individual Account and the earnings from the Group Account.

The earnings from the **Second Stage** depend on the total deduction tokens you assigned to other group members as well as the total deduction tokens you received from other group members.

In sum, your earnings in each period are calculated as follows:

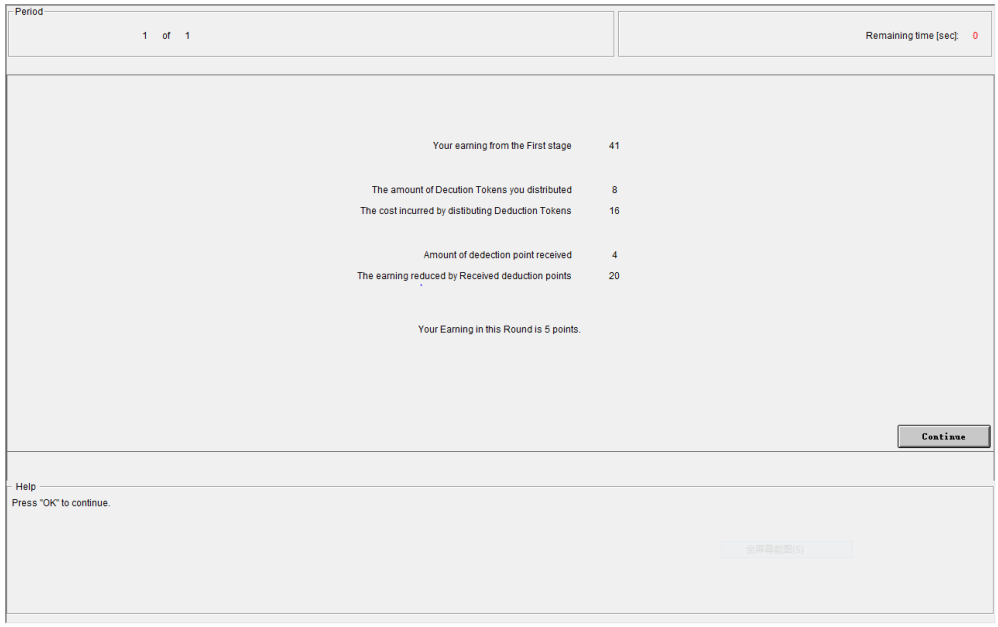
Your earnings at the end of the second stage = income per period

= **Earnings in the First stage**
- (Sum of deduction tokens received from other participants x 3)
- (Sum of deduction tokens assigned to other participants)

Please remember that your earnings at the end of the second stage can be negative, if the cost of your points used to distribute deduction tokens exceeds your (possibly reduced) income from the first stage. You can however avoid such losses with certainty through your own decisions!

RESULTS SCREEN

At the end of the second stage, your allocation and the sum of all allocations in your group are reported on the outcome screen as shown below. The sum of deduction tokens you assigned to others as well as the sum of deduction tokens you received are also presented on the screen.



Please press the Continue button after you have read all the information. A new period will start shortly.

If this study is randomly chosen for payment, we will randomly pick 1 period out of the 10 periods and your payments will be calculated by your decisions in that period

Please answer the questions in the next page. They serve as a test for you understanding of the task.

Control questions

1. Suppose at the second stage you assign the following deduction tokens to your three other group members: -9, -5, and 0. What is the total cost of your assigned deduction tokens?.....

2. What is your cost if you assign a total of 0 points?.....

3. Suppose you earn 10 points in the First stage. By how many points will your income from the first stage be reduced if you receive a total of 1 deduction tokens from the other group members?.....

4. Suppose you earn 20 points in the First stage. By how many points will your income from the first stage be reduced if you receive a total of 5 deduction tokens from the other group members?.....

5. Suppose you earn 30 points in the First stage. If you received 1 deduction token and assigned a total of 5 deduction tokens. What are your final earnings?.....

6. Suppose you earn 20 points in the First stage. If you received 7 deduction tokens and assigned a total of 5 deduction tokens. What are your final earnings?.....

7. Suppose you earn 10 points in the First stage. If you received 2 deduction tokens and assigned a total of 8 deduction tokens. What are your final earnings?.....

Appendix B: Chinese Instructions

首先，感谢你的参与！

在整个参与过程中请保持安静，不要与其他人交谈。如果有任何疑问，请举手，我们会前去为你解答。如果违反这个规定，你将会失去参加今天研究的机会， 也不会得到任何报酬。

今天你一共会参与 5 项研究。

请注意，每项研究都是相互独立的。你在某一项研究中的决策不会对其它研究产生任何影响。此外，你在每项研究中的决策都是匿名的。也就是说，其他人不会知道你在每项研究中做出的决策。

在今天的研究中，我们将使用点数作为计算报酬的单位，而不是人民币。也就是说，你今天的收入将会以点数计算，然后，我们会将你所得的点数以一定的兑换率兑换成人民币，兑换率如下：

1 点数 = 0.5 人民币（5 毛钱）

在最后，我们会从 5 项研究中随机抽取一项研究。你的收入会根据随机抽取的那一项研究中所得来的点数决定。你还会得到 15 元的“ 签到费用”。所以，你今天所得的报酬是：

总收入 = 15 元（签到费用）+ 随机抽取的研究中的收入

请仔细阅读每个研究的说明，因为你的收入将取决于你对每项研究的理解程度。

在第一项研究开始之前，请填写即将显示在屏幕上的调查问卷。问卷的结果对我们的研究有重要的意义，请你如实填写。请注意，调查问卷没有正确答案。调查问卷的结果也不会作为计算你报酬的依据。

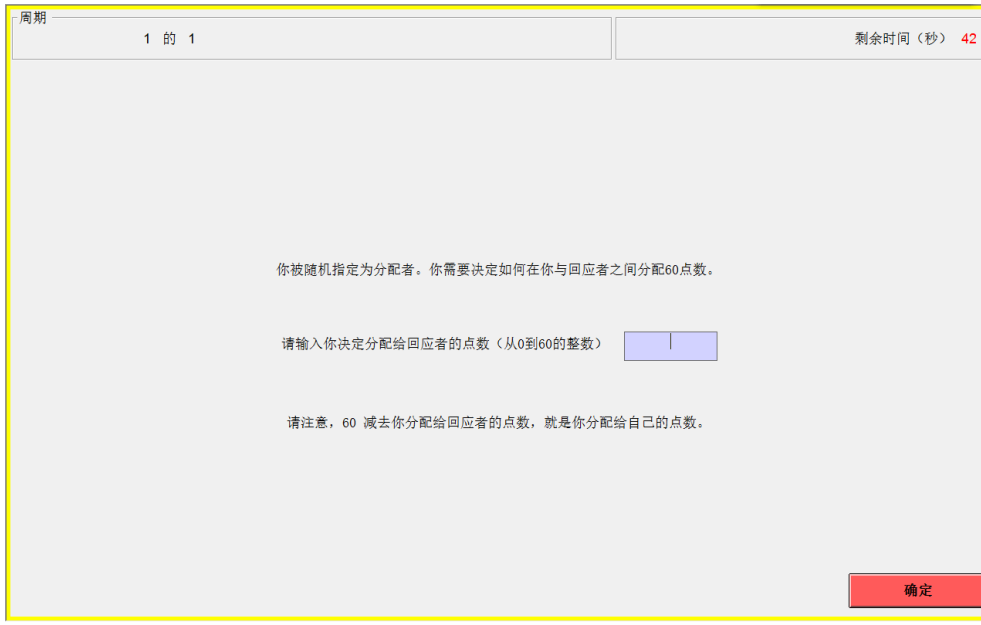
在你填写完调查问卷后，我们会发给你第一项研究的说明。每当你完成一项研究后，我们会发下一项研究的说明。

第一项研究的说明

在本项研究中，每个参与者都会被随机指定一个角色。这里一共有两种角色，**分配者**和**回应者**。如果你被随机指定为分配者，那么你会和另一名回应者随机的组成一组。同样的，如果你被随机指定为回应者，那么你会和另一名分配者随机的组成一组。也就是说，在所有的参与者中，有一半会被指定为分配者，另一半被指定为回应者。

分配者的任务

分配者需要决定如何在其与回应者之间分配 60 点数。分配者做决定的屏幕如下图所示：



分配者需要输入其决定分配给回应者的点数，这个数字必须是从 0 到 60 的整数。分配者分配给回应者的点数越多，留给自己的点数就越少。

回应者的任务

回应者只能被动接受分配者的分配方案。换句话说，无论回应者是否愿意接受这个分配方案，这个分配方案都会被执行。

收入

分配者和回应者所得到的点数收入，是依据分配者做出的分配方案决定的。

请注意，你在本项研究的决策是匿名的。也就是说，其他人不会知道你被随机分配了哪种角色，也不会知道你在本研究中所做出的决策。

请回答下面的检测问卷。它可以检验你是否理解了本项研究的说明。

检测问卷

1. 假设分配者分配了 20 点数给回应者，那么：

分配者得到的点数是多少？_____

回应者得到的点数是多少？_____

如果回应者对这个分配方案不满意，他/她该怎么办？

_____

_____

_

2. 假设分配者分配了 40 点数给回应者，那么：

分配者得到的点数是多少？_____

回应者得到的点数是多少？_____

如果回应者对这个分配方案不满意，他/她该怎么办？

_____

_____

_

第二项研究的说明

第二项研究与第一项研究相似。

在本项研究中，你要扮演和第一项研究中一样的角色。也就是说，如果刚才你是分配者，现在你还是分配者。同样，如果刚才你是回应者，那么现在你依然是回应者。跟之前一样，分配者和另外一个回应者会随机地组成一组。但是请注意，在本项研究中和你配对的组员，和第一项研究中的不会相同。

分配者的任务

分配者在本项研究中的任务与第一项研究中的任务相同。分配者需要决定如何在其与回应者之间分配 60 点数。但是请注意，与第一项研究不同的是，在分配者做出分配方案之后，回应者在本项研究中**有权决定接受，或者拒绝，分配者提出的分配方案**。

与第一项研究不同之处：回应者的任务

在本项研究中，回应者有权接受或者拒绝分配者提出的分配方案。回应者做决定的屏幕如下图所示。

回应者需要做的是：输入一个你能接受的分配给你的最低点数。这个数字必须是介于 0 和 60 之间的整数。如果分配者分配给回应者的点数**少于**这个最低点数，那么**系统会自动地拒绝这个分配方案**。如果分配者分配给回应者的点数**大于或等于**这个最低点数，那么**系统会自动地接受这个分配方案**。

请注意，分配者和回应者是同时进行决策。所以，分配者在做分配方案时，不会知道回应者输入的最低接受点数。同理，回应者在输入最低接受点数时，也不会知道分配者的分配方案。

收入

如果分配方案被接受，也就是说分配者分配给回应者的点数大于或等于回应者的最低接受点数，那么分配者和回应者的点数收入会依据分配者的分配方案决定。

如果分配方案被拒绝，也就是说分配者分配给回应者的点数少于回应者的最低接受点数，那么分配者和回应者的点数收入都将为零。

例子 1：假设回应者输入的最低接受点数是 20。同时，分配者分配了 25 点给回应者。这个分配方案会被自动的接受。因此，那么回应者得到 25 点，分配者得到 35 点。

例子 2：假设回应者输入的最低接受点数是 20。同时，分配者分配了 15 点给回应者。这个分配方案会被自动的拒绝。因此，回应者和分配者都得到 0 点。

请注意，你在本项研究的决策是匿名的。也就是说，其他人不会知道你被随机分配了哪种角色，也不会知道你在本研究中所做出的决策。

请回答下面的检测问卷。它可以检验你是否理解了本项研究的说明。

检测问卷

1. 假设分配者分配了 20 点数给回应者。

如果回应者输入的最低接受点数是 15 点，那么，

分配者得到的点数是多少？_____

回应者得到的点数是多少？_____

如果回应者输入的最低接受点数是 45 点，那么，

分配者得到的点数是多少？_____

回应者得到的点数是多少？_____

2. 假设分配者分配了 40 点数给回应者。

如果回应者输入的最低接受点数是 15 点，那么，

分配者得到的点数是多少？_____

回应者得到的点数是多少？_____

如果回应者输入的最低接受点数是 45 点，那么，

分配者得到的点数是多少？_____

回应者得到的点数是多少？_____

第三项研究的说明

在本项研究中，两个参与者会被随机地组成一个小组。也就是说，你会和另外一个人，随机地组成一组 。

你在本研究中的任务

你和你的组员需要同时从两个选项中做一个选择，这两个选项分别被标注为“ @”和“ #”。请注意，你和你的组员是**同时进行选择**。所以，在你做选择时，你不会知道你的组员选择了什么。同样的，在你的组员做选择时，他/她也不知道你做了什么选择。

收入

下面的表格显示了你和你的组员可能得到的点数。你们得到的点数由你和你的组员共同决定。请注意，在每个单元括号里的数字，加粗的数字是你得到的点数。另外一个数字就是另一个组员得到的点数。

		另一人的选择	
		@	#
你的选择	@	(30, 30)	(12, 22)
	#	(22, 12)	(22, 22)

例如：假设你选择了“ @”，另一个组员选择了“ #”，那么你们的收入是（12, 22）。你得到的点数是 12，另一个组员得到的点数是 22。假设你选择了“ #”，另一个组员也选择了“ #”，那么你们的收入是（22, 22）。你得到的点数是 22，另一个组员也得到 22 点数。

请注意，你在本研究中的决策是匿名的。小组是随机组成，任何人都不会知道他/她的组员是谁。此外，其他人也不会知道你在本研究中的决策。

请回答下面的检测问卷。它可以检验你是否理解了本项研究的说明。

检测问卷

1. 假设你选择了“@”，另一个组员也选择了“@”，那么，

你得到的点数是？_____

另一个组员得到的点数是？_____

2. 在你做选择的时候，你会不会知道另一个组员选择了什么？_____

在另一个组员做选择的时候，他/她会不会知道你选择了什么？_____

3. 假设你得到了 22 点，另一个组员得到了 12 点，那么，

你的选择是？_____

另一个组员的选择是？_____

第四项研究的说明

在本项研究中，参与者会被随机组成 4 人一组的小组。所以你这一组除你本人之外还会有其他 3 个成员。小组成员的构成在本项研究中不会改变，你们 4 人会一起完成这个研究项目，中途不会换人。本项研究一共有 8 轮，每一轮你们所面临的决策是相似的。

在每一轮的开始，每人会获得 20 点数供自己支配。在后文中我们把它叫做分配给你的**初始点数**。每一轮你都要决定从初始点数中分配多少点数给**小组账户**。你可以选择从 0 到 20 的任何**整数**。余下的部分会自动划分到你的**个人账户**。下图显示的是如何分配点数到小组账户：

你需要输入你决定分配给小组账户的点数，这个数字必须是从 0 到 20 的整数。

收入点数的计算

在所有人都做出决定以后，系统将会计算你在本轮收入的点数。你收入的点数将由两部分组成：

(1) **个人账户**的点数收入。
(2) **小组账户**的点数收入。

来自个人账户的点数收入，等于你从初始点数中分配给小组账户后，**余下的点数**，所以个人账户的点数收入**不会**受到其他人的影响。你分配给个人账户的每 1 点数，都会为你增加 1 点数的收入。

而来自小组账户的点数收入，则取决于所有小组成员（也包括你）分配到小组账户中点数的总和。小组账户中的点数总和会被乘以 1.6，然后再平均分配给每个组员。也就是说，每个组员将得到点数总和乘以 1.6 后的四分之一（25%）。换句话说，每分配 1 点到小组账户，总数就会变成 1.6，然后平均分配给每个组员，也就是每个组员都将得到 0.4 个点数。

所以，不论是你或者其他三位组员中的任何一人分配 1 个点数到小组账户中，每个小组成员（包括你）的收入都会增加 0.4 个点数。

总体来说，你在每轮收入的计算方式如下：

你收入的点数 =
来自个人帐户的收入+ 来自小组帐户的收入 =
(20 - 分配到小组账户的点数) + (0.4 x 所有组员分配到小组账户的点数总和)

例如：假设在某一轮中你分配了 18 个点数到小组账户，其他三个组员一共分配了 12 个点数到小组账户。小组账户的总额是 30 点。所以，每个小组成员会从小组账户中获得 0.4 x 30 = 12 点。此外，你从个人帐户得到的收入是 2 点。所以，你在这一轮的总收入是：(20 – 18) + 0.4 x 30 = 14 点数。

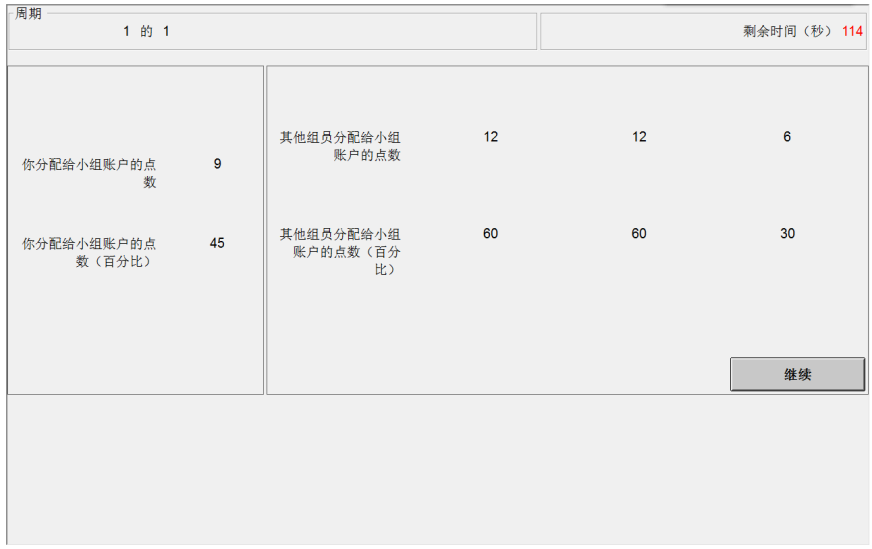
显示结果

在本组所有成员都做出分配的决定后，屏幕上会显示本轮的分配结果。显示的信息包括：你分配给小组账户的点数，以及本组所有人分配给小组账户点数的总和。我们还分别显示了你的个人账户的点数，以及来自小组账户的点数收入，这样做是为了方便你计算自己的总点数收入。

在浏览完信息后，请点击“继续”键。

信息屏幕

在显示你的点数收入之后,下一页屏幕将向你显示有关每个组员如何分配点数的信息。



在屏幕上，你可以看到每个组员分配了多少点数到小组账户中。第一列显示的是你的分配数额。余下的三列显示的是其他三位组员的分配数额。需要注意的是，其他组员的分配信息，是按**随机的顺序**显示在另外三列中的。例如，第二列中显示的分配数额，每轮都来自不同的组员。其他各列显示的分配数额也同样如此。**这么做是为了在你了解分配数额的同时，避免你得知其他组员的身份。**最后，我们还列出了分配数额在初始点数中所占的百分比。

在点击“ 继续”键之后，新一轮的分配即将开始。你会再次收到20点的初始点数。同样的，你需要再次决定将多少初始点数分配到小组账户中。请注意，你在本轮得到的点数，**不会**累计到下一轮。

如果最后随机抽到了本项研究作为支付你报酬的依据，我们会从8轮研究中再随机抽取1轮。而被抽到的这一轮里你所得的点数，将用来决定你最终的报酬。

请注意，你在本研究中的决策是匿名的。小组是随机组成，任何人都不会知道他/她的组员是谁。此外，其他人也不会知道你在本研究中的决策。

请回答下页的检测问卷。它可以检验你是否理解了本项研究的说明。

.

检测问卷

1.假设所有组员（包括你）都没有分配点数到小组账户。那么：

你来自小组账户的收入是多少?_____

你来自个人账户的收入是多少？_____

你的总收入是多少？_____

其他组员来自小组账户的收入是多少?_____

其他组员来自个人账户的收入是多少？_____

其他组员每个人的总收入是多少？_____

2.假设你分配了 8 点到小组账户。其他三个组员每个人分配 12 点到小组账户。那么：

你来自小组账户的收入是多少?_____

你来自个人账户的收入是多少？_____

你的总收入是多少？_____

其他组员来自小组账户的收入是多少?_____

其他组员来自个人账户的收入是多少？_____

其他组员每个人的总收入是多少？_____

3.假设其他三个组员**总共**分配了 30 点到小组账户，

3a.假设你分配了 5 点到小组账户，

你来自小组账户的收入是多少?_____

你来自个人账户的收入是多少？_____

你的总收入是多少？_____

其他组员每个人来自小组账户的收入是多少?_____

3b.假设你分配了 15 点到小组账户，

你来自小组账户的收入是多少?_____

你来自个人账户的收入是多少？_____

你的总收入是多少？_____其他组员每个人来自小组账户的收入是多少?_____

第五项也是最后一项研究的说明

本项研究与前一个研究相似。首先，参与者会被随机组成 4 人一组的小组。但是请注意，在本项研究中，与你组成一组的 3 个小组成员，和前一项研究的小组成员**不会相同**。新的小组成员的构成在本项研究中不会改变，你们 4 人会一起完成这个项目，中途不会换人。

在研究开始之前，每个人会得到 10 点数的报酬。这个报酬是**一次性的**，并且它是为了弥补你在本研究中可能会遭受的损失。但是，你完全可以通过深思熟虑的决策来避免损失。

本项研究一共有 8 轮，每轮包含 2 个阶段。第一个阶段与前一个研究一样：在每一轮的开始，每人会获得 20 点的初始点数。每一轮你都要决定从初始点数中分配多少点数给小组账户。你可以选择从 0 到 20 的任何整数。余下的部分会自动划分到你的个人账户。你在

第一阶段你得到的点数 =
来自个人帐户的收入 + 来自小组帐户的收入 =
(20 - 你分配到小组账户的点数) + (0.4 x 所有组员分配到小组账户的点数总和)

第一阶段的点数收入，与前一项研究的计算方式一样：

第二阶段

在所有组员做完第一个阶段的决定后，第二个阶段就会开始。

在第二阶段中，你可以看到其他组员分别分配了多少点数给小组账户。除此之外，你还可以给其他任何一个组员“减分”，用来**减少**他们在第一阶段所得的点数。当然，如果你不希望减少某一位组员在第一阶段所得的点数，你可以不给其“减分”。请注意，其他组员也有权力给你“减分”，如果他们希望减少你在第一阶段得到的点数。

第二阶段做决策的屏幕如下图所示

屏幕上显示了第一阶段每个组员分配了多少点数到小组账户中。第一列显示的是你分配的数额。余下的三列显示的是其他三位组员的分配数额。需要注意的是，其他组员的分配信息，是按**随机的顺序**显示在另外三列中的。例如，第二列中显示的分配数额，每轮都来自不同的组员。其他各栏显示的分配数额也同样如此。这么做是为了避免你在了解分配数额的同时，得知其他组员的身份。

现在，你必须对除你以外的其他组员分别作出决定。你要决定是否给他们“减分”，并且要决定给的数量。如果你不希望减少某一个组员的点数，那么你需要在他/她那一列中输入 0。如果你想给某一个组员“减分”，那么你必须在给予数量的前面加上一个负号“-”（负号和数字之间不能有空格）。

你可以选择-10 到 0 之间的任何整数，给其他组员“减分”。但是请注意，每一个“减分”的成本是你在第一阶段收入的 1 个点数。也就是说，你给其他组员减的分越多，你损失的成本也就越大。使用“减分”的成本计算公式如下：

使用“减分”的总成本= 你给其他组员“减分”的总和 x 1

例如：如果你给某一个组员减 2 分（输入-2），给另外一个组员减 8 分（输入-8），给最后一个组员不减分（输入 0）。那么，你给别人减分的总和是 2 + 8 + 0 = 10，你使用减分的总成本是 10 个点数，也就是说，你在第一阶段的收入会减少 10 个点数。

如果某一个组员得到 1 个“减分”，那么其在第一阶段所得到的点数会减少 3 点。如果某一个组员得到了 2 个减分，那么其在第一阶段所得到的点数会减少 6 点。以此类推。你被“减分”的总数，是其他三个组员分别给你减分的总和。所以，你由于被减分而损失的点数计算方式如下：

你被减分而减少的点数 = 得到减分的总数 x 3

请注意：无论你从其他组员那里得到多少“减分”，你在第一阶段所得到的点数**最多会被减少到 0，不会减到负数**。但是，如果你在第一阶段收入的点数，由于得到过多的“减分”而减少到 0 以后，你还给其他人“减分”，在这个情况下，你的得到的点数可能为负数。

例子 1：假设你在第一阶段的收入是 40 点。如果某一位组员给你 2 个“减分”，另一个组员给你 8 个“减分”，最后一个组员给你 0 个“减分”。那么你收到“减分”的总数是 10 个。那么你第一阶段的收入会被减少**到** 10。如果你又给其他人总共 5 个“减分”。那么你最后的点数是 5 点。

例子 2：假设你在第一阶段的收入是 28 点。如果某一位组员给你 2 个“减分”，另一个组员给你 8 个“减分”，最后一个组员给你 0 个“减分”。那么你收到“减分”的总数是 10 个。你在第一阶段的收入会被**减少** 30 点。**但是如前文所说：无论你从其他组员那里得到了多少“减分”，你在第一阶段所得到的点数最多会被减少到 0。所以你在第一阶段得到的点数被减少到 0。但是，如果你又给其他人总共 5 个“减分”，那么你最后的点数是“-5”点。**

收入

在本组所有人都做出第二阶段分配的决定后，系统会计算出你在本轮收入的点数。

在第一阶段，你的点数收入与前一项研究的计算方法相同，是来自小组账户和个人账户的总和。

在第二阶段，你的点数收入由你给其他组员多少“减分”和其他组员给你多少“减分”共同决定。

总的来说，你在每一轮的收入计算方式如下：

你在每一轮收入的点数
= 第一阶段收入的点数
　　－(得到“减分”的总和 x 3)
　　－(给其他组员“减分”的总和 x 1)

或者（如果第一阶段的收入由于得到的“减分”过多而被减到 0)
你在每一轮收入的点数
= 0 －(给其他组员“减分”的总和 x 1)

显示结果

在第二阶段结束后，屏幕上会显示你在第一阶段收入的点数、你收到的“减分”的总和，你给其他组员的“减分”的总和，以及你在本轮的最后点数收入。

在浏览完信息后，请点击“继续”键。新一轮的分配即将开始。请注意，你在本轮的收入不会累计到下一轮。

如果最后随机抽到了本项研究作为支付你报酬的依据，我们会从8轮中再随机抽取1轮。而被抽到的这一轮里你所得的点数，将用来决定你最终的报酬。

请注意，你在本研究中的决策是匿名的。小组是随机组成，任何人都不会知道他/她的组员是谁。此外，其他人也不会知道你在本研究中的决策。

请回答下面的检测问卷。它可以检验你是否理解了本项研究的说明。

检测问卷

1. 假设你分别给其他三位组员－9、－5以及0个减分。你的总成本是多少点数？_____

2. 如果你一共给其他组员0个减分，总成本是多少？_____

3. 假设你在第一阶段的收入是10点数。如果你总共收到了1个减分，那么你在第一阶段的收入会被减到多少？_____

4. 假设你在第一阶段的收入是10点数。如果你总共收到了5个减分，那么你在第一阶段的收入会被减到多少？_____

5. 假设你在第一阶段的收入是10点。如果你总共收到了1个减分，并且一共给其他组员5个减分。那么你最后得到的点数是？_____

6. 假设你在第一阶段的收入是10点。如果你总共收到了6个减分，并且一共给其他组员5个减分。那么你最后得到的点数是？_____

7. 假设你在第一阶段的收入是10点。如果你总共收到了2个减分，并且一共给其他组员5个减分。那么你最后得到的点数是？_____