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Development:  
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# Cooperation, Trust, and Economic Development: An Experimental Study in China

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## Abstract

Many previous empirical studies have suggested that cooperation and trust affect economic growth. However, the precise relationship between trust and cooperation (i.e., whether trust leads to cooperation or cooperation leads to trust) remains unclear and it is not known how the level of economic development affects the level of cooperation and trust. Using a combination of public goods experiment, gambling game experiment, and trust game experiment, we investigate the links among cooperation, trust, and economic development in four regions of China. Our results suggest that first, there is a U-shaped or V-shaped relationship between cooperation and economic development; second, on the one hand, cooperation leads to trust, and on the other hand, more cooperative behavior may be created by rewarding trusting behavior; and third, men are more cooperative and trusting than women. Furthermore, we find that the widely used ‘GSS trust’ question from the General Social Survey (GSS) does not predict either cooperation or trust, whereas the questions ‘GSS fair’ and ‘GSS help’ have weak predictive power for trusting behavior but not for cooperative behavior.

**Keywords:** Cooperation; Trust; Economic development; Experiment; China

**JEL classification:** C91, H41, I32

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## 1. INTRODUCTION

Interest in cooperation and trust has dramatically increased in economics, psychology, sociology, and related fields in the last few years. This growing body of research has demonstrated that cooperation, trust and 'social capital' influence a wide range of significant economic phenomena (e.g., Beugelsdijk, Groot, & van Schaik, 2004; Francois & Zabojnik, 2005; Guiso, Sapienza, & Zingales, 2004; Knack & Keefer, 1997; Routledge & Von Amsberg, 2003; Piazza-Georgi, 2002; Woolcock, 1998; Zak & Knack, 2001). Although these studies have used a variety of definitions of social capital, most include trust and cooperation as important elements. However, the precise relationship between trust and cooperation remains elusive, and leading theorists disagree on the causal direction of the relationship (e.g., Hardin, 2002; Macy, 2002; Yamagishi, Kanazawa, Mashima, & Terai, 2005). In our view, this disagreement is largely due to the fact that the two concepts, trust and cooperation, are often treated interchangeably. In this study, we use a combination of four experiments based on the public goods, gambling, and trust games to investigate the links among cooperation, trust, and economic development in four regions of China.

The linear public goods game is often used to capture the inherent tension between cooperative and competitive behaviors in social dilemmas (e.g., Anderson, Mellor, & Milyo, 2004; Carpenter, Daniere, & Takahashi, 2004; Gächter, Herrmann, & Thöni, 2004; Karlan, 2005). The linear public goods game is really an  $n$ -person version of the prisoner's dilemma in which free-riding is the dominant strategy that will achieve the Nash equilibrium in a one-shot version of the game and is also the sub-game perfect outcome in finitely repeated versions of the game. Although zero contribution by all participants is theoretically predicted, in fact, the Nash equilibrium is rarely seen in lab or field experiments. Experiment participants tend to contribute to the public accounts, at least initially if it is a repeated game. Cooperation or cooperative behavior, which is measured by the proportion of the endowment to contribute in public goods games, is an act that increases the welfare of other players (compare to free-riders or those who make less contributions) at some opportunity cost. The forgone opportunity cost is the hallmark of cooperation; without it, an act does not represent genuine cooperation (Yamagishi, Kanazawa, Mashima, & Terai, 2005).

In the best-known version of the trust game or investment game (Berg, Dickhaut, & McCabe, 1995), an agent (called a truster) is asked what portion of a given endowment he or she is willing to entrust to a complete stranger (called a trustee) with the expectation that the latter will reciprocate by returning more money than he or she initially received. The accounting is made viable by the fact that any investment made by the sender is multiplied by a factor of more than one (tripled in our experiment) before reaching the recipient. While the solution predicted by game theory is that both truster and trustee have no incentive to make any positive offers, Pareto efficiency would require the sender to trust and the recipient to be trustworthy (i.e., if the sender makes a positive offer and the receiver returns an amount not lower than the offer received, both parties are better off or at least not

worse off). The typical interpretation of the trust game labels the sender's behavior as "trust" and the receiver's behavior as "trustworthiness". Trust or trusting behavior carries the risk of negative consequences if the trust is misplaced and met by untrustworthy behavior. Therefore, trusting decisions might be influenced by a person's risk attitude. Knowing whether trust can be predicted by risk attitudes is important. If trusting is a risky decision, then policies to promote trust might best focus on creating rules that, for example, promote transparency and encourage peer-to-peer punishment of trust-violations. In contrast, if trust is not about risk, then such policies might be ineffective in promoting economic exchange (Houser, Schunk, & Winter, 2010).

Two related previous studies examining the relationship between trust and cooperation are noteworthy. Gächter, Herrmann and Thöni (2004) reported survey and experimental evidence for trust and voluntary contribution behavior from more than 630 non-student and student participants in rural and urban Russia. They found that socio-economic background affected trust attitudes but not cooperative behavior, and cooperation was significantly positively correlated to trust toward strangers. Yamagishi, Kanazawa, Mashima and Terai (2005) used an experimental game called the Prisoner's Dilemma with Variable Dependence, which allowed players to separate trust in their exchange partners from their cooperation with them in an ongoing relationship. This allowed the researchers to observe the emergence of trust and cooperation separately and ascertain the causal relationship between them. Their results suggested that it was cooperation which led to trust, not the other way around.

A number of researchers have studied social capital in China. Wang and Yamagishi (2005) carried out a comparative study of levels of trust between the sexes in China. They found the stronger degree of mutual trust among Chinese male strangers to be based on higher expectations of reciprocity, and the weaker degree among females to be due to the fear of being taken advantage of. Qin, Shen and Meng (2011) conducted a series of laboratory and artefactual field experiments to evaluate the level of trust, trustworthiness, and cooperation in Shanghai. The groups selected for the study were middle school students, undergraduate university students, and community residents. They found that the level of voluntary cooperation exhibited a U-shaped relationship with age; the overall level of trust was negatively related to age, and trusting behavior was closely linked with risk preference and expectations that trusting behavior would be rewarded. Other Chinese scholars have investigated social capital through surveys in conjunction with macro-economic data. Such studies include explorations of the links between social capital and economic development and social capital and financial decision-making. Zhang and Ke (2002), for example, showed trust to be an important factor in the economic development of various Chinese regions. An empirical study carried out by Zhang and Zeng (2005) also reported social capital to have significant positive effects on regional financial development. Zhang (2006) investigated the relationship between China's level of social capital and its financial development, and Chen and Lu (2007) drew on survey data to explore the

existence of social capital in Chinese society, with social capital defined by behavior at the social communication network level. They examined newly established grass-roots self-governing communities, and found social capital to be quite abundant in Chinese cities and to have long-term implications for local democratic self-governance.

In this study, we conducted laboratory experiments in four regions of China to empirically investigate the link among cooperation, trust, and economic development. Each laboratory session involved four experiments. The first experiment adopted the voluntary cooperation game and employed a public goods experiment to investigate the degree of voluntary cooperation among the subjects. The second employed the gambling game to elicit subjects' risk preferences. The third experiment, which adopts the trust or investment game, explored the degree of trust and trustworthiness among subjects. The fourth experiment again employed the public goods experiment, but this time to examine whether the level of voluntary cooperation changed after the subjects had witnessed trustworthiness or betrayal. Our discussion of the relationships between cooperation/trust and economic development is based on the observed experimental behaviors of subjects from different regions with different economic development levels. Our focus is not on how cooperation and trust affect economic growth but on how the level of economic development influences the level of cooperation and trust. The former question has been thoroughly studied and there is a consensus in the literature that cooperation, trust and 'social capital' stimulate economic growth.

This study makes three contributions to the literature. First, we experimentally explore the levels of cooperation and trust in different regions in China and try to explain how the level of economic development affects cooperative and trusting behaviors. To the best of our knowledge, this has not been documented in the literature. Second, adopting a within-subjects design, our study combines the public goods game with the trust and gambling games. Compared to a between-subject design, a within-subject design is statistically more powerful as it automatically controls for the systematic individual differences that often lead to large variations, therefore allowing us to better examine the relations between trust and cooperation. Third, our study employs both an experimental method and a general survey method, which enables us to combine the subjects' experimental behaviors with their questionnaire answers in our analyses. The two forms of information complement each other, and the result is greatly enhanced.

The remainder of the paper is organized as follows. Section 2 provides a detailed description of the procedures used in the lab experiment, and Section 3 reports the results of these experiments. Concluding remarks and implications for future work are provided in Section 4.

## **2. EXPERIMENTAL ISSUES**

Our experiments were conducted in four regions of China: Chengdu city in Sichuan province,

Yinchuan city in Ningxia province, Shanghai, and Hong Kong.<sup>1</sup> A summary of the experiments conducted in each region is provided in Table 1. In total, 290 subjects participated in the experiments. Subjects were recruited through email announcements sent to subject pools at the selected local university. Most subjects were undergraduate students and a few were postgraduate students.

Each session of the experiment consisted of 10 subjects. Each subject was randomly assigned an ID number and then placed into the ten-person group. There were four experiments in each session. The first experiment was a five-round public goods game. Subjects were provided with written instructions, recording and reporting sheets, and a detailed payoff illustration. Certain words associated with intentions or suggestions, such as “contribution,” “community” and “assist,” were carefully avoided in the instructions to prevent framing effect. The subjects were first asked to read the instruction sheet while one of the experimenters read it aloud to make sure it was understood by all. They were then asked to make investment decisions in five-round public good game.

Each subject was given 10 tokens as an endowment and had to decide how much to contribute to the public account and to save in the private account. A subject could either keep 10 tokens for himself or herself, or chose  $q_i$  ( $0 \leq q_i \leq 10$ ) tokens to contribute while keeping the remaining  $10 - q_i$  tokens. For each round, the payoff for each subject  $i$  in the group of  $n$  subjects was calculated as

$$\pi_i = 10 - q_i + a \sum_{j=1}^n q_j, \quad 0 < a < 1 < na, \quad (1)$$

where  $a$  was the marginal per subject return from one token of investment. In this study,  $a$  was taken as 0.7. The total payoff from the first experiment for each subject was the sum of the round-payoffs, as given in Eq. (1), over all five rounds. Note that Eq. (1) indicates that full free-riding or  $q_i = 0$  would be the dominant strategy in the stage decision. This is because  $\partial \pi_i / \partial q_i = -1 + a < 0$ . However, the aggregate payoff  $\sum_{i=1}^n \pi_i$  would be maximized if each subject in the group fully cooperated by investing all 10 tokens because  $\partial \sum_{i=1}^n \pi_i / \partial q_i = -1 + na > 0$ .

The subjects jotted down their decisions on the reporting sheets and recorded their investment and savings amounts on the recording sheets. The experimenters summed up the total investment amount and announced it to all of the subjects, who then calculated their individual earnings. Two rounds of the exercise were carried out before the real game to familiarize the subjects with the procedure.

The second experiment involved a gambling game. Each subject had 10 tokens as an endowment and decided how much to invest. The experimenter then rolled the dice, and the number

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<sup>1</sup> These four regions have different levels of economic development. According to the Chinese Statistical Yearbook 2011, the per capita GDP of Sichuan, Ningxia, Shanghai, and Hong Kong in 2010 were USD3,129, USD3,968, USD11,238, and USD31,709, respectively.

shown determined the return on that investment. The number 1, for example, meant that the investment amount would be multiplied by 0, the number 2 that it would be multiplied by 0.5, and the numbers 3, 4, 5, and 6 that it would be multiplied by 1, 1.5, 2, and 2.5, respectively.

The third experiment was a trust game. The ten subjects were assigned to either role A or role B, with an equal probability of either assignment, and then paired up randomly. Each was given 10 tokens as an endowment. Those assigned role A had to decide on the amount to transfer to their role B counterparts. That amount was then multiplied by 3 and transferred. Those assigned to role B were asked to write down in advance the amount they would give back to their role A counterparts based on the receipt of different possible amounts. The actual amount returned to the role A participants depended on the amount their B counterparts had written down in advance.

The fourth experiment involved a one-shot public goods game, which was the same as the first experiment except that the number of rounds was reduced from five to one.

Communication was prohibited during the experiments, with subjects given to understand that the experiment would be terminated immediately if they communicated with one another. Each experimental session lasted approximately 90 minutes. The average payment made to each subject by region was approximately RMB51 (about USD7.85 if USD1 = RMB6.5) in Shanghai, RMB24 (about USD3.69) in Ningxia, RMB32 (about USD4.92) in Sichuan, and HKD66.2 (about USD8.83 if USD1 = HKD7.5) in Hong Kong. The exchange rates between experiment tokens and real money varied a little bit to reflect the idiosyncratic earning powers of subjects in different regions. Following the experiments, all of the participants were asked to fill out a questionnaire including their demographic characteristics (e.g., gender, age, and monthly consumption level) and factors deemed relevant to social capital (e.g., number of close friends, whether he or she had participated in group activities in last year, and those questions from the general social survey (GSS) that related to trust, fairness, and helpfulness).

### **3. RESULTS AND DISCUSSION**

#### *(a) Data overview and statistical test*

Table 2 summarizes the descriptive statistics of three aspects of our subjects: their demographics, factors relevant to social capital, and their behavior in our experiment. As most of our subjects are undergraduate students, there is no significant difference in average age among the regions according to the ANOVA test ( $F(3, 286) = 1.44, p = 0.231$ ). However, there are significant differences among regions in the male-female ratio ( $F(3, 286) = 3.78, p = 0.011$ ) and in monthly consumption level ( $F(3, 286) = 15.60, p < 0.01$ ). Most Chinese universities have a higher ratio of male students. Also, students from Hong Kong and Shanghai are generally from affluent families.

With regards to the factors relevant to social capital that were answered in the post experiment questionnaire by subjects, we find significant regional differences in *Number of close friends* ( $F(3,$

286) = 7.71,  $p < 0.01$ ), *Participated in group activities* ( $F(3, 286) = 24.92, p < 0.01$ ), *Most people can be trusted* ( $F(3, 286) = 6.48, p < 0.01$ ), *Most people try to be fair* ( $F(3, 286) = 4.43, p < 0.01$ ), and *Most people try to be helpful* ( $F(3, 286) = 24.61, p < 0.01$ ). However, except for *Number of close friends*, we find that if we exclude Hong Kong, there are no significant differences among regions in other factors (*Participated in group activities*:  $F(2, 217) = 0.14, p = 0.874$ ), *Most people can be trusted*:  $F(2, 217) = 1.44, p = 0.240$ ), *Most people try to be fair*:  $F(2, 217) = 1.55, p = 0.216$ ), and *Most people try to be helpful*:  $F(2, 217) = 0.30, p = 0.741$ ). Figure 1 provides a graphical illustration of the results. We find that compared to other regions, the values of these factors drop dramatically in Hong Kong.

To analyze the subjects' behavior in the experiments, we first create a correlation coefficient matrix, shown in Table 3. We find that (i) cooperative behavior (i.e., mean contribution in the first public goods game) is significantly correlated with gambling behavior and trusting behavior; (ii) gambling is significantly correlated with trustworthy behavior, but not trusting behavior; and (iii) the correlation between trustful and trustworthy behaviors is significant, as expected. On the other hand, for the sake of easy comparison, we plot subjects' experimental behaviors in Figure 2. From the figure, we see that there is (i) a U-shaped or V-shaped relationship between cooperative behavior and economic development level; (ii) a U-shaped or V-shaped relationship between gambling behavior and economic development level; and (iii) an inverse U-shaped or V-shaped relationship between trusting behavior and economic development level. Note that the order of regions on the horizontal axis represents the ranking of regional economic development level from low to high. Statistical test results for these visual evidences are provided in Table 4. Using the interregional pairwise Wilcoxon rank sum tests to examine the relationship between cooperation and economic development level, we find that Sichuan (the lowest per capita GDP) > Ningxia (the second lowest per capita GDP) = Shanghai (the second highest per capita GDP) < Hong Kong (the highest per capita GDP), and Sichuan = Hong Kong, which implies a possible U-shaped or V-shaped curve among our studied regions.<sup>2</sup> However, for the other two visual analyses, we cannot obtain conclusive results as there are several contradictory results in the statistical tests.<sup>3</sup>

(b) *Tobit regression on factors affecting cooperation, trust, and trustworthiness*

Table 5 presents the results of our analyses of cooperation, trust, and trustworthiness. The

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<sup>2</sup> We use the word “possible” here is to stress that our results should be interpreted with caution due to the limited number of regions in this study. The U-shaped or V-shaped curve could exist; however, without further data from other regions with different economic development levels, we cannot reach a definite conclusion.

<sup>3</sup> An example of the contradictory results can be found in the results of the gambling experiment. Although Sichuan > Ningxia < Shanghai = Hong Kong did suggest a U-shaped or V-shaped curve, the results that Sichuan = Shanghai, Sichuan < Hong Kong, and Shanghai = Hong Kong are obviously contradictory.

dependent variables in these three models are each subject's mean contribution in the first public goods game, each truster's transfer in the trust game, and each trustee's transfer in the trust game, respectively. Because the mean public goods contribution and truster's transfer are bounded by 0 from below and by 10 (the token endowment) from above, and the trustee's transfer are bounded by 0 from below and by 40 from above, we choose a Tobit model for the regression. Common independent variables in the three regressions include the following: (i) three demographical variables – male dummy, age, and monthly consumption level; (ii) five variables related to social capital – number of close friends, participated in group activities, GSS\_trust dummy (equaling 1 if “most people can be trusted” was chosen as the answer to the survey question “Generally speaking, would you say that most people can be trusted or that you cannot be too careful in dealing with people?”), GSS\_fair dummy (equaling 1 if “most of the time people try to be helpful” was chosen as the answer to the survey question “Would you say that most of the time people try to be helpful, or that they are mostly just looking out for themselves?”), and GSS\_help (equaling 1 if “most people would try to be fair” was chosen as the answer to the survey question “Do you think most people would try to take advantage of you if they got a chance, or would they try to be fair?”); and (iii) three region dummies—Ningxia, Shanghai, and Hong Kong. In addition, the gambling amount and predicted value obtained from the cooperation behavior regression are included in both trust and trustworthy regressions, and the predicted value of trust is included in the trustworthy regression.

Among the common variables mentioned above, a significant gender effect can be seen in the prediction of cooperation and trust behaviors. Compared to female subjects, male subjects seem to act more cooperatively in the public goods game and to trust their counterparts more in the trust game. In addition, subjects who have previously participated in group activities were expected to be more cooperative; however, in our results this factor does not affect subjects' trustful and trustworthy behaviors. Furthermore, it is noteworthy that GSS\_trust, which is normally used in the General Social Survey as a measure of trust, predicts neither contribution nor trust and trustworthiness. On the other hand, in this study, GSS\_fair and GSS\_help are estimated with significantly positive signs in the regression of trusting behavior, indicating that subjects who are more likely to feel that most people try to be fair and helpful, behave more trustfully. Finally, the results of the three region dummies in all regressions replicate the results obtained by the Wilcoxon rank sum test, especially the possible U-shaped or V-shaped relationship between cooperation and economic development level.

With respect to the additional variables in the trust and trustworthiness regressions, we find that cooperative behavior could significantly affect trusting behavior in a positive way. A surprising result is that the amount of investment in the gambling game, which was expected to elicit the subjects' risk preferences, has an impact on trustworthiness but not trust. Finally, we find that a truster's behavior significantly affects a trustee's behavior. The more trusters transfer to their

counterparts, the more their counterparts return.

*(c) Comparison between cooperative behavior before and after trust game*

The fourth experiment is a variation of the public goods game. As shown in Figure 3, we find that after playing the gambling and trust games, subjects' level of voluntary cooperation does not diminish too much in any region and the possible U-shaped or V-shaped relationship between the levels of voluntary cooperation and economic development remains similar to that seen in the first experiment. Although the mean contribution decreases in the second public goods game compared to the first public goods game, the corresponding standard deviations in each region increases in this experiment (see Table 2). This suggests that on the one hand some of the subjects may reduce their voluntary contributions because they feel disappointed about the results of the trust game, but on the other hand, subjects who feel satisfied with the result of the trust game may increase their voluntary contributions. To investigate this issue a little further, we perform a number of Chi-squared tests to examine what factors correlate with an increase in public goods contribution. Omitting all insignificant results, we find that for trusters, receiving a transfer from trustees that is more than their own transfer, has a significantly positive correlation with the decision to increase the level of voluntary contribution ( $\chi^2(1) = 8.24, p = 0.004$ ).

*(d) Discussion*

A couple of interesting observations can be derived from our results. First, it is noteworthy that the level of economic development seems act as a determinant of cooperative behavior with a U-shaped or V-shaped way. Kranton (1996) attributed the prevalence of cooperative behavior to the lack of well-developed market networks. It is to say that a society that lacks well-developed markets would tend to conduct most of its economic transactions through primordial or non-market channels, which to some extent may explain the left part of our U-shaped or V-shaped curve. However, as Onyeiwu and Jones (2003) mentioned, this argument appears to be tautological and vacuous, in the sense that all cooperative behaviors would be attributed to the lack of markets, while the non-existence of cooperation would be explained by the pervasiveness of market institutions. Moreover, if individuals regard cooperatively motivated transactions as more valuable or beneficial, their preference for cooperation will not disappear as the economy becomes more market oriented.

Second, the result of a gender effect suggests that compared to females, males tend to cooperate and trust more. This result partly supports the finding of Wang and Yamagishi (2005) that male participants in their experiments were significantly more trusting of unknown partners than female participants. In addition, one's general trust belief, as it is measured by the GSS trust question, influences neither voluntary contribution to a public good nor trusting and trustworthy behaviors in the trust game. This result is consistent with previous evidences reported in the literature (e.g.,

Glaeser, Laibson, Scheinkman, & Soutter, 2000; Gächter, Herrmann, & Thöni, 2004). In addition, we find that fairness and helpfulness beliefs (i.e., GSS\_fair and GSS\_help) influence trusting behavior in a positive way. Remember that GSS\_fair asks whether people believe that others mostly try to take advantage of one or would try to be fair. Likewise, GSS\_help asks for the belief that others are mostly helpful instead of just thinking for themselves. In the presence of incentives that trusters would be beneficial if they met with trustworthy trustees, both beliefs are directly relevant for trusters who want to avoid being the sucker.

Third, similar to the results obtained by Yamagishi, Kanazawa, Mashima and Terai (2005), Gächter, Herrmann and Thöni (2004), and Qin, Shen and Meng (2011), we find that cooperative behavior positively affects trusting behavior. Separating trust from cooperation like in our experiment is especially useful in the stage of trust building. Gächter, Herrmann and Thöni (2004) argued that most people are only willing to cooperate if they expect others to cooperate as well, because they do not want to be the suckers. Therefore, conditional cooperators who make a contribution decision can gain from cooperation but face the risk of being exploited by the free riders. Consequently, people who contribute apparently trust the others.

Fourth, the result that risk preference has a positive impact on trustworthiness but not trust is the opposite of the findings reported in Schechter (2007) and Qin, Shen and Meng (2011) that risk attitudes were highly predictive of trusting behavior in the trust game. In our view, the benefit of running both the trust game and a gambling game with similar payoff structure is that, in theory, the only difference between the players' moves in the two games should be due to differences in their assessments of payoffs from the random gamble and from trusting their counterparts. On the other hand, as the two games are similar and the players played the gambling game first, they may then frame the trust game as a gamble as well. Therefore, investments in the gambling game should be positively related to trusters' transfer in the trust game. However, our results did not support our prediction. Meanwhile, trustworthiness should not be correlated with risk preference since trustworthiness decision is not made under any uncertainty. Again, our results exhibited an opposite evidence. While one possible explanation for gambling behavior not affecting trusting behavior is that subjects are not primed to view the trust game as a gamble, the reason why gambling behavior influences trustworthiness behavior is unknown and further investigation on this issue is necessary.

Finally, we find that trusters who received a transfer from trustees that was more than their own transfer increased their voluntary contribution in the second public goods experiment. This evidence suggests that individuals may engage in more cooperative behavior when they feel their own trusting behavior is duly recognized. Therefore, as Qin, Shen, and Meng (2011) noted, to boost voluntary investments in public goods, it is important that policymakers create an atmosphere in which trustful individuals can obtain reasonable rewards and recognition.

#### **4. CONCLUSION**

The results of our laboratory experiments in four regions of China suggest that (i) there is a U-shaped or V-shaped relationship between voluntary cooperation and economic development; (ii) on the one hand, cooperation leads to trust, and on the other hand, more cooperative behavior may be created by rewarding trusting behavior; (iii) men are more cooperative and trusting than women; and (iv) the widely used GSS trust question does not predict either cooperation or trust, while the questions of GSS fair and GSS help have weak predictive power for trusting behavior but not for cooperative behavior.

The earlier comment about the limited number of regions in this study naturally leads to a major implication for future research. To confirm the U-shaped or V-shaped relationship between cooperation and economic development, the combination of experiments used in this study should be carried out in more regions representing a greater variety of economic development levels. Experimental data from other regions with different levels of economic development will also allow us to reexamine the findings reported above, and may expand our understanding of the links among cooperation, trust, and economic development.

Finally, we end with one more future implication of our research. In our experiments, we studied a sample of student subjects. However, in the experiments aiming to fully understand the relationships among cooperation, trust, and economic development, non-student subjects with different socio-economic backgrounds should be given more consideration. Going beyond student subject pools is important since students are not representative of the population in many socio-economic dimensions. Research with non-student pools suggests that students might not be very representative for the larger society (e.g., Carpenter, Daniere, & Takahashi, 2004). Therefore, future studies could be conducted by recruiting members from other sections of the society.

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Figure 1. Associational social capital by region

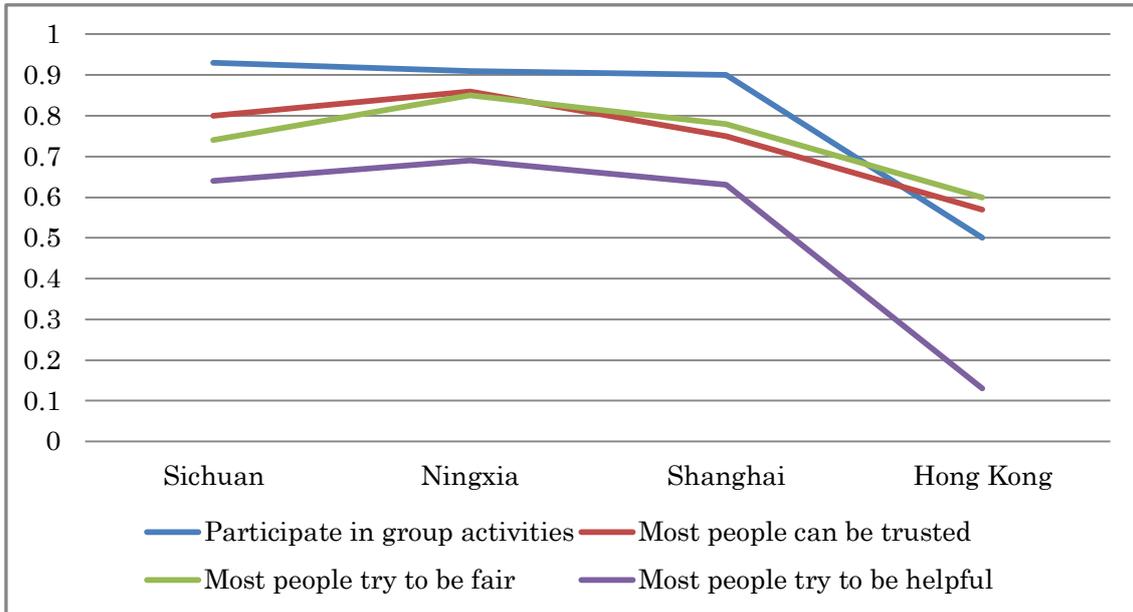


Figure 2. Experimental behavior by region

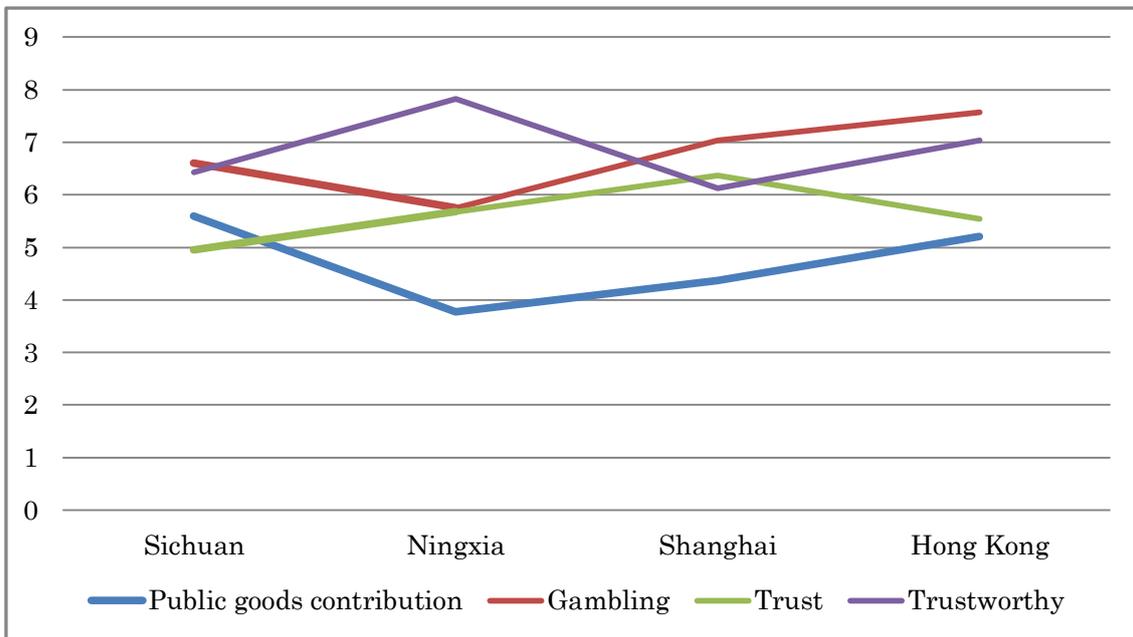


Figure 3. Contribution in the fourth experiment

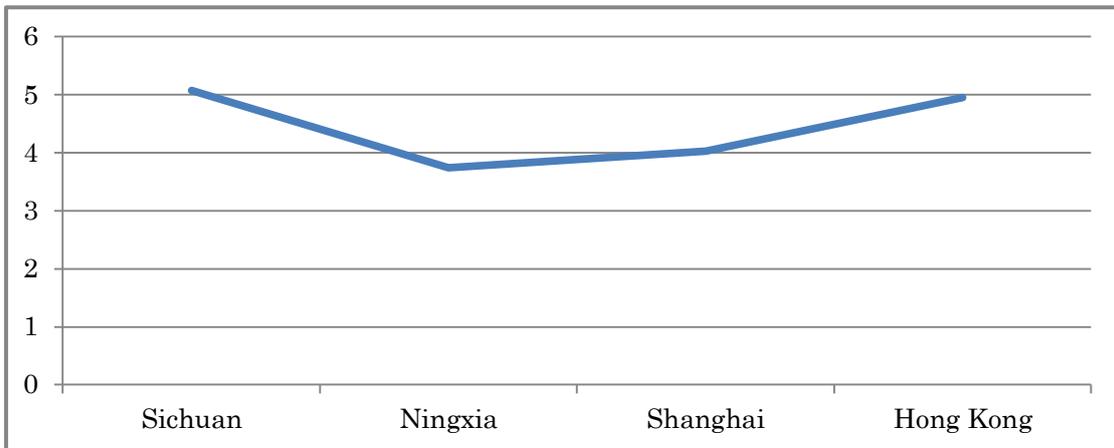


Table 1. Summary of experiments by region

Region	Sessions	Subjects	Location of Experiments	Date of Experiments
Shanghai	6	60	Shanghai Jiao Tong University	December 2008
Ningxia	8	80	Ningxia University	May 2010
Sichuan	8	80	Chengdu Sport University	November 2011
Hong Kong	7	70	Chinese University of Hong Kong	February 2012

Table 2. Demographics, social capital indices, and experimental behavior

	Sichuan		Ningxia		Shanghai		Hong Kong		
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	
<i>Demographics</i>									
Subject sex (1=male)	0.50	0.50	0.50	0.50	0.63	0.49	0.34	0.48	
Subject age	21.75	1.74	20.71	1.30	22.49	2.03	21.49	1.39	
Consumption level (1(low) to 6(high))	3.18	0.88	2.36	0.84	3.02	0.83	3.81	2.11	
<i>Factors relevant to social capital</i>									
Number of close friends	5.03	2.70	7.49	6.62	4.75	3.68	4.38	2.70	
Participated in group activities (1=yes)	0.93	0.27	0.91	0.28	0.90	0.30	0.50	0.50	
Most people can be trusted (1=yes)	0.80	0.40	0.86	0.35	0.75	0.44	0.57	0.50	
Most people try to be fair (1=yes)	0.74	0.44	0.85	0.36	0.78	0.42	0.60	0.49	
Most people try to be helpful (1=yes)	0.64	0.48	0.69	0.47	0.63	0.49	0.13	0.34	
<i>Experimental behavior</i>									
Mean contribution in the first PG game	5.59	2.01	3.77	1.78	4.37	2.65	5.21	3.05	
Investment in gambling game	6.60	2.47	5.75	2.05	7.03	2.41	7.57	2.52	
Truster's transfer in trust game	4.95	3.12	5.68	2.90	6.37	4.00	5.54	3.71	
Trustee's transfer in trust game	6.43	5.67	7.83	6.34	6.13	6.67	7.03	8.42	
Mean contribution in the second PG game	5.08	3.15	3.74	3.39	4.02	3.63	4.98	4.07	
Observations	80		80		60		70		

Table 3. Correlation coefficient matrix of experimental behaviors

	Public goods contribution	Gambling	Trust	Trustworthiness
Public goods contribution	1			
Gambling	0.148**	1		
Trust	0.178**	0.071	1	
Trustworthiness	0.108	0.285***	0.599***	1

Note: \*, \*\*, and \*\*\* denote significant at 10%, 5%, and 1%, respectively.

Table 4. Interregional pairwise tests on experimental behaviors

	Cooperative behavior	Gambling behavior	Trust game	
			Trust	Trustworthiness
Sichuan vs. Ningxia	5.686***	2.335**	-1.081	-0.970
Sichuan vs. Shanghai	3.201***	-1.176	-1.675*	0.788
Sichuan vs. Hong Kong	0.528	-2.447**	-0.691	0.512
Ningxia vs. Shanghai	-1.287	-3.454***	-1.078	1.430
Ningxia vs. Hong Kong	-3.296***	-4.554**	0.124	1.127
Shanghai vs. Hong Kong	-1.759*	-1.357	0.810	-0.307

Note: \*, \*\*, and \*\*\* denote significant at 10%, 5%, and 1%, respectively.

Table 5. Determinants of cooperation, trust, and trustworthy behaviors

	Cooperation		Trust		Trustworthiness	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Constant	6.598***	2.212	3.909	6.495	-8.766	7.953
Male	0.668**	0.309	2.346***	0.830	0.726	1.113
Age	0.003	0.095	-0.182	0.268	-0.010	0.317
Monthly consumption level	-0.162	0.125	-0.358	0.364	-0.250	0.442
Number of close friends	-0.001	0.035	0.040	0.122	-0.095	0.105
Participated in group activities	1.171**	0.472	1.057	1.145	-0.437	1.746
GSS_trust	-0.545	0.387	-0.929	0.975	0.457	1.594
GSS_fair	0.549	0.388	1.898*	1.004	1.440	1.428
GSS_help	0.366	0.357	1.803*	0.981	0.160	1.263
Ningxia	-2.061***	0.437	0.783	1.227	1.476	1.588
Shanghai	-1.472***	0.436	1.819*	1.005	-2.745	2.640
Hong Kong	-0.765	0.499	1.611	1.396	-1.260	1.701
Predicted_cooperation			0.821***	0.182	0.344	0.242
Gambling			0.182	0.182	0.827***	0.238
Predicted_trust					1.399***	0.166
Prob > chi2	0.000		0.000		0.000	
Observations	290		145		145	

Note: \*, \*\*, and \*\*\* denote significant at 10%, 5%, and 1%, respectively. Results are obtained from the Tobit estimation.