



# Trust game, survey trust, are they correlated? Evidence from China

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Accepted: 21 February 2023 / Published online: 9 March 2023

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## Abstract

Trust Game and survey trust are the two most popular measurements in the field of trust research, but most studies conducted in developing countries have found low or even insignificant correlations between them, we therefore validated this phenomenon in the cultural context of the largest developing country, China. Within-country differences can be of the same magnitude as the between country differences, especially in a culturally diverse China. Thus, we focus on comparing the characteristics of trust in the South and North regions of China. Through zero-order correlation and hierarchical regression analysis, our findings are consistent with those of numerous developing countries: Trust Game is lowly correlated with in-group trust survey and not with out-group trust survey. On the other hand, we found that Chinese individuals exhibit a distinct pattern of in-group trust, and there is no fundamental difference in the characteristics of trust between the South and the North.

**Keywords** Trust Game · Survey · In-group trust · Out-group trust · China

## Introduction

Trust has long been an important research issue in multidisciplinary fields (Acedo-Carmona & Gomila, 2019; Filieri et al., 2015). However, some researchers have found that it is difficult for researchers to accurately and effectively measure individual trust levels, and the validity of the measurement of trust has been seriously questioned (Ermisch & Gambetta, 2006; Karlan, 2005). Among them, the question raised by the low correlation between the Trust Game and survey trust (i.e., survey-based measures of trust) is particularly prominent.

Trust Game was originally a behavior paradigm of indirect measurement of trust developed by Berg et al. (1995), including two roles of trustor and trustee. In the classical Trust Game, the two players of the game are given a certain amount of real or virtual money. The trustor can give any amount of money to the trustee, and the trustee can gain two

or three times the value-added amount. Next, the trustee can return any amount of money in the value-added amount to the trustor. In this context, the amount invested by the trustor to the trustee is trust, and the return amount of the trustee is the trustworthiness of the trustee. Survey trust uses the subjective reporting method, which usually requires participants to directly score a certain object's trust level on the Likert scale. At present, many studies have found that the correlation between the amount sent in the Trust Game and the scores of survey trust is quite low (Carlin et al., 2017; Etang et al., 2012), but there is a higher positive correlation between the amount returned (trustworthiness) and survey trust (Karlan, 2005; McEvily et al., 2012). The Trust Game paradigm and survey trust, as the two most widely used methods in trust measurement, have a significant impact on the credibility of trust research (Attanasi et al., 2019; Rosenberger et al., 2020).

Differences between attitudes and behaviors (Gong et al., 2021), deficiencies of the survey and Trust Game (Ermisch et al., 2009) have been used by several researchers to explain the controversial low correlation between the Trust Game and survey trust. But, not only that, we found another critical reason for a significantly low correlation is the mismatch between the object of trust in the survey and the object in the Trust Game (Etang et al., 2012; Johansson-Stenman et al., 2013; McEvily et al., 2012). The problem is that some researchers do not specify the trusted object (i.e., 'the

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trustee') when using the Trust Game (Corgnet et al., 2016; Drązkowski et al., 2017; Levine & Schweitzer, 2015). In the following sections, the Trust Game refers to that of the unspecified trustee. At this point, researchers have different standpoints about the types of trust represented by the Trust Game (Fehr et al., 2003; Johansson-Stenman et al., 2013; Reeskens, 2013).

According to different trust objects, trust can be divided into in-group trust and out-group trust (Delhey et al., 2011; Welzel, 2010). The former refers to people who have a certain social relationship, while the latter refers to others who lack interpersonal contact (Zhu et al., 2021). From one point of view, researchers believe that the inherent type represented by the Trust Game is out-group trust (especially stranger trust) (Dunning et al., 2014; Naef & Schupp, 2009). In the laboratory situation, whether the trustee is real or virtual, most of the trustee's information is not made known (Bauer & Freitag, 2018; Drązkowski et al., 2017; Wang & Murnighan, 2017), which defaults to the trustee being a 'stranger' of the trustor. Therefore, when the object of trust is not specified, individuals may tend to interpret the Trust Game as a game with strangers, resulting in a closer relationship between the Trust Game and the stranger trust survey. This view is also supported by some empirical studies (Fehr et al., 2003; Glaeser et al., 2000). Naef and Schupp (2009) found that there was a significant correlation between anonymous experimental trust and survey trust for strangers. Combined with the perspective of matching trusted objects, the Trust Game should be significantly positively correlated with out-group trust survey (especially stranger trust survey) (Hypothesis 1).

Contrary to the view that the inherent type represented by the Trust Game is out-group trust, cultural value holders argue that the type represented by the Trust Game will vary with individual cultural values (Abascal & Baldassarri, 2015; Bauer & Freitag, 2018; Reeskens, 2013; Van Hoorn, 2015). Individualism/collectivism is a main dimension with which to measure differences in cultural values (Hamamura et al., 2013; Hofstede, 1980). Countries dominated by an individualistic/collectivistic culture will show two distinct trust models (Bomhoff & Gu, 2012; Schwartz, 1994; Van Hoorn, 2015). Specifically, collectivistic countries (such as China and Japan) emphasize in-group trust in all kinds of relatives or other close contacts based on biological relationships and doubt people who are not very close to themselves (Li & Liang, 2002). However, countries where individualistic culture prevails (such as the United States and Sweden) tend to emphasize out-group trust with nonkin and show a wide radius of trust (Delhey et al., 2011). Holm and Danielson (2005) tested the Trust Game and survey trust in Sweden (individualism) and Tanzania (collectivism) simultaneously, but only found a correlation between the stranger trust survey and the Trust Game in Sweden. This potentially confirms the statement that cultural values affect the correlation

between the Trust Game and survey trust by affecting people's trust model. We can speculate that China, as a typical collectivistic country, will show a model of in-group trust, and the Trust Game will have a significant positive correlation with the in-group trust survey, i.e., Hypothesis 2. In summary, combined with the viewpoint of matching trusted objects and the two different viewpoints of the Trust Game representation types, we developed a pair of contradictory hypotheses to test—will the Trust Game be significantly correlated with the out-group trust scale (Hypothesis 1)? or the in-group trust scale (Hypothesis 2)?

The objective environment (i.e., climatic conditions and geographical environment), acts on the local sociocultural system by influencing the production mode and other elements (Georgas & Berry, 1995). As a result, differences in collectivism levels and trust patterns occur between regions within China, especially between the South and the North (Ma et al., 2016). Talhelm et al. (2014) proposed the famous Rice Theory, believing that different planting patterns dominate the differences in the level of collectivism between southern China and northern China (Uskul et al., 2008). Provinces with a high percentage of rice cultivation have a higher degree of collectivism than those with wheat cultivation (Grossmann & Varnum, 2011; Wang et al., 2011). The demand for high-intensity irrigation and planting in the rice region of southern China has generated the demand for communication and cooperation between smallholder families in the same region, which makes it easier to form collectivistic values (Xu et al., 2016), thus forming the in-group trust mode. On the flip side, in the northern wheat region, the small amount of irrigation and labor demand for cooperation is less, and collectivism is difficult to develop, so the in-group trust pattern is not as obvious compared to the South. Although with the acceleration of urbanization and agricultural modernization, the degree of mechanization of rice cultivation in China has increased, the level of mechanization is still not high due to the staggered distribution of plains and basins (Sun et al., 2022), rice cultivation still exerts a significant influence on interpersonal patterns, social structures, etc. (Dong et al., 2019; Talhelm, 2020). Moreover, social traits in rice communities extended to villagers whether they farmed or not (Uchida et al., 2019). Ultimately, the difference in collectivism between the South and the North due to rice cultivation induces differential levels of in-group trust (Southern in-group trust patterns are stronger than Northern) (Bomhoff & Gu, 2012). This is another research issue of interest here: exploring the differences in trust patterns between northern and southern China.

On the other hand, clan cultural theory likewise supports the hypothesis that the level of in-group trust is higher in southern China than in northern China. The clan culture unique to southern China will affect the communication pattern of individuals living there, causing them to have a

small radius of trust centered on blood and family. Clan is a social organization formed by various families centered on paternal blood relationships under the norms of patriarchal concepts (Fei, 1992; Freedman, 1958). Tsai (2007) proposed that iconic clan activities such as worshipping in ancestral temples and inheriting genealogies will form deeper trust among members of the clan. Although the Chinese tradition of clan settlement originated in northern China, after the Wei Jin and the Northern and Southern Dynasties, with the southward shift in economic focus, the trend of clan development was ‘stronger as it goes south, weaker as it goes north’. At present, many clan organizations still exist in southeastern provinces, such as Fujian and Jiangxi (Guo & Yao, 2013; Lin et al., 2016), while they are very rare in northern China, such as Inner Mongolia and Liaoning. Hu and Yuan (2017) found that the level of in-group trust in villages/communities with ancestral temples is significantly higher than that in villages/communities without ancestral temples. Despite the impact of clan culture after the Cultural Revolution, in recent years, China has strengthened its emphasis on rural civilization, and clan culture, which is closely related to rural civilization, has focused on the pursuit of loyalty and filial piety, and the ‘family culture’ in the southern China has been spread (Li & Cai, 2021; Wu & Wang, 2014). It helps maintain a family-centered trust model. Conversely, the trust patterns of northern China are less influenced by clan culture. Combining rice theory and clan cultural theory, we propose hypothesis 3: the level of in-group trust will be significantly higher in southern China than in the northern China.

In this study, we tested the correlation between the Trust Game and survey trust in 31 provinces, cities and autonomous regions of China. Previous studies have validated the correlation between the Trust Game and the survey in countries with different levels of economic development and cultural backgrounds, such as UK and Tanzania (Banerjee et al., 2021; Danielson & Holm, 2007), but the results are clearly heterogeneous. China is the second-largest economy in the world and the birthplace of Confucianism, a culture prevalent in East Asia, thus, it can be said that China has a strong geographical specificity and research value. In addition, the repeated validation study of the correlation between the Trust Game and survey trust in the distinctive cultural context of China replicates and extends the concept of the current similar studies and has an important role in helping to clarify the reliability and validity of the Trust Game. Our research aims to solve two main problems: on the one hand, whether the Trust Game is correlated with survey trust and whether the correlation appears in the in-group trust survey or the out-group trust survey; on the other hand, whether there are differences in trust characteristics between southern and northern regions of China. By using the Trust Game and trust survey without financial incentives, we find that there is a positive correlation between Trust Game and in-group trust

survey, but not with out-group survey. Additionally, Chinese individuals show obvious in-group trust patterns, and there is no fundamental difference in trust patterns between the South and the North. It should be noted that in this study, we completed the experiment with no financial incentives, mainly for the following reasons. Firstly, we draw on numerous previous studies that use the Trust Game without financial incentives (Derks et al., 2014; Fulmer & Gelfand, 2015; Xin et al., 2016). Besides, most previous studies examining the correlation between Trust Game and survey mostly taken the form of financial incentives (Fehr et al., 2003; McEvily et al., 2012), and there is a relative lack of discussion of the correlation between them in the absence of financial incentives, which may lead to some bias in such studies. As far as we know, only the research of Holm and Nystedt (2008) examined the relationship between the Trust Game and survey trust without financial incentives. Interestingly, they found that the correlation between trust behavior and survey trust was only significant when there was no financial incentive, which suggested that financial incentive might moderate the correlation between them (for example, economic stimulus induced other motives). Therefore, we adopt the way of non-financial incentives, and provide reference for finding out the occurrence situation of the correlation between the Trust Game and survey.

The second section will introduce the implementation process of this study. The third section presents the descriptive statistics from the Trust Game and the survey, with more results in the fourth section. Finally, the results of this study are summarized and discussed.

## Research methodology

We recruited participants via Wenjuanxing (<https://www.wjx.cn/>), which is an online crowdsourcing platform in mainland China that provides functions equivalent to Amazon Mechanical Turk. There are two main reasons supporting our adoption of an online survey to conduct it: first, Buchan and Croson (2004) argued that the data collected by questionnaire and laboratory methods are highly consistent; then, limited to the COVID-19 outbreak, the online survey approach was able to avoid its impact on the research process. The survey was conducted from March to September 2021, and we recruited 1622 participants from 31 provinces and cities across the country, and 1110 ( $n = 1110$ ) valid data were obtained after eliminating invalid data. The main reasons for excluding the data are wrong answers to the Trust Game exercise questions and investment amount exceeding the initial amount of 10 RMB (i.e., not understanding the rules of the Trust Game), lacking of response content for some questions, and response times more than or less than 2.5 Standard Deviation from the mean response time. All participants completed the

questionnaire version of the Trust Game, the World Values Survey (WVS, <https://www.worldvaluessurvey.org>), part of risk preference scale and prosocial preference scale. The experimental instructions used in this experiment have been listed in the [Appendix](#).

**Trust Game** The classic version of the Trust Game developed by Berg et al. (1995) is presented in the form of a questionnaire. And the participants are only required to act as trustors to choose the amount sent. In the instructions, we required the subjects to assume that they have an initial amount of RMB 10. The participants can choose to send any amount to the trustee, and the amount sent will be tripled after being received by the trustee. The participants were allowed to imagine freely without specifying the identity of the trustee. To check whether the participants understood the rules of the Trust Game, we sent a text question: ‘You now have a principal of 10 yuan. Suppose you sent 2 yuan to the trustee, and the trustee gets 3 times of 2 yuan, that is, 6 yuan. Then, the trustee decides to return you 4 yuan. How much do you finally have?’ The participants who answer the exercise question incorrectly will be eliminated to improve the data effectiveness.

**Survey trust** The measurement of trust mainly includes in-group trust and out-group trust, with a total of 6 questions appeared in the 5th wave of the WVS to measure. The WVS, which started in 1981 and consists of nationally representative surveys conducted in almost 100 countries, is the largest noncommercial, cross-national, time series investigation of human beliefs and values ever executed. In this study, the *Cronbach’s alpha* of the in-group trust survey is 0.535, and the out-group trust survey’s *Cronbach’s alpha* is 0.827. Specifically, the content of the trust survey is as follows: ‘please rate the trust degree of the following people, whether you Trust completely, Trust somewhat, Do not trust very much, or Do not trust at all. (1 ~ 4 points)’ The scoring objects are ‘your family’, ‘your neighbors’, ‘people you know personally’, ‘people you meet for the first time’, ‘people of another religion’, and ‘people of another nationality’. The trust scores of the first three subdimensions are equally divided to represent the in-group trust, and the trust scores of the last three subdimensions are equally divided to represent the out-group trust.

**Control variable** Previous studies have found that the trust level in the Trust Game is closely related to social preference (Aksoy et al., 2018; Derks et al., 2014; Sapienza et al., 2013) and risk preference (Chetty et al., 2021; Thielmann & Hilbig, 2015). Therefore, to control the possible interference of prosocial preference and risk preference in the Trust Game, we measured these two preference motivations

and use statistical means to control them. Specifically, we randomly selected three items in the risk preference scale prepared by Hsee and Weber (1999) to measure the risk preference index (RPI). The questionnaire shows two investment schemes: one is the benefit level under certain conditions (conservative), and the other is the benefit level under different risk levels (risk). In this study, the risk preference scale had *Cronbach’s alpha* = 0.611. For the measurement of prosocial preference, three items in the locally revised prosocial tendency measure (PTM) (Carlo & Randall, 2002) by Kou et al. (2007) were randomly selected. The higher the scale score, the higher the prosocial level. In this study, the PTM *Cronbach’s alpha* equaled 0.608.

## Preliminary results

The Harman single-factor test was used to test common method bias. Unrotated exploratory factor analysis of all measurement items showed that a total of 7 common factors with eigenvalues greater than 1 were proposed, and the first common factor accounted for 12.64% of the total variation, which was less than 40% of the judgment criteria (Podsakoff et al., 2003). Therefore, there was no serious common method bias in this study.

As shown below, Table 1 presents the descriptive statistical results of the demographic variables. The most commonly used method of regional division in China is the division of agricultural regions. China is divided into the North and the South by the Qinling Mountains-Huaihe River

**Table 1** Summary statistics for the sample

	Mean	SD	Range
Male(%)	39.4(437)		
Age(years)	26.96	6.78	[12, 53]
Lived in a village(%)	16.9(188)		
Lived in a town(%)	33.3(370)		
Lived in a city(%)	49.7(552)		
Married(%)	42.8(475)		
Income(\$)	744.83	877.65	[0, 14055.47]
Southern area(%)	55.7(618)		
Northern area(%)	44.3(492)		
Students(%)	36.2(402)		
Non students(%)	63.8(708)		

The numbers in brackets represent the number of people. We divided the participants’ occupations into students and nonstudents. The southern region includes Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Hubei, Hunan, Guangdong, Guangxi Zhuang Autonomous Region, Hainan, Chongqing, Sichuan, Guizhou, Yunnan and Tibet Autonomous Region. The northern region includes Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia Autonomous Region, Liaoning, Jilin, Heilongjiang, Shandong, Henan, Shaanxi, Gansu, Qinghai, Ningxia Hui Autonomous Region and Xinjiang Uygur Autonomous Region

Line, which is a division of culture, politics and economy (Tawney, 1964).

Then, we analyzed the basic situation of the Trust Game and the survey. In general, the mean amount sent by the 1110 participants in the Trust Game was 5.10 yuan ( $SD=2.79$ ), accounting for 51% of the initial endowment of 10 yuan. This result is consistent with the findings of previous studies; that is, people tend to choose a ‘moderate’ amount to invest (Bellucci et al., 2019; McAuliffe et al., 2019). Among the 1110 respondents, 20 (1.8%) chose not to invest, while 144 chose to send the whole endowment, accounting for 13%. Regarding survey trust, the score of the in-group trust survey ( $M=3.20$ ,  $SD=0.48$ ) was significantly higher than that of the out-group trust survey ( $M=1.83$ ,  $SD=0.65$ ),  $t=-51.80$ ,  $p<0.000$ ,  $Cohen's\ d=2.39$ , suggesting that Chinese individuals have significant in-group trust characteristics.

### Analysis

In Table 2, we report the correlations of behavior in the Trust Game with the survey and demographic characteristics. The amount sent in the Trust Game is significantly correlated with the scores of in-group trust,  $r=0.066$ ,  $p=0.028$ , and the correlation is very low, less than 0.1. We did not find a statistical correlation between the Trust Game and out-group trust survey ( $p=0.153$ ). Inconsistent with the studies of Glaeser et al. (2000), Camerer (2003) and McEvily et al. (2012), we did not find a significant correlation between the Trust Game and the attitudinal question about trusting strangers ( $p=0.221$ ).

We found a significant correlation between the Trust Game and in-group trust survey in zero-order correlation analysis. Therefore, we used hierarchical regression analysis to test the net correlation between in-group trust and control variables and the Trust Game. Based on the research

of Glaeser et al. (2000), researchers used the survey to predict the behavior of the Trust Game. We did what Glaeser et al. did. The results are shown in Table 3. In Model 1, we include demographic variables, including gender, age, occupation and income, because we found that they are significantly correlated with the results of the Trust Game. Since gender and occupation (students/nonstudents) are classified variables, they are first coded into two dummy variables and then entered into regression analysis. Gender variable codes: males = 1, females = 0, occupation variable (students/nonstudents) codes: students = 1, nonstudents = 0. We also found that risk preference and prosocial preference have a close relationship with behavior in the Trust Game and the survey. Therefore, we put risk preference and prosocial preference into Model 2 for control in the regression analysis to better capture the stable correlation between in-group trust and the Trust Game. In Model 3, we put in the in-group trust scores to further verify its correlation with the results of the Trust Game. Model 2 in Table 3 shows that after controlling, prosocial preference can significantly predict the amount sent in the Trust Game, prosocial preference affects the amount sent, and the explained variation increases by 1%. After controlling for the demographic variables, risk preference and prosocial preference, the in-group trust score cannot significantly predict the amount sent in the Trust Game (Model 3). Nevertheless, in the zero-order correlation analysis, we found that there was a significant correlation between the subdimensions of in-group trust (family, neighbor and acquaintance) and the Trust Game. Therefore, in the regression analysis, we try to determine whether these three subdimensions can significantly predict the amount sent of the Trust Game. Hierarchical regression analysis found that the family and acquaintance dimensions of in-group trust can statistically significantly predict the amount sent. After controlling for the demographic variables, prosocial and risk preference, the variance explanation

**Table 2** Correlation between the Trust Game and survey

	1	2	3	4	5	6	7	8	9	10	11
1 Risk preference	-										
2 Prosocial preference	0.099***	-									
3 Family	0.081**	-0.042	-								
4 Neighbor	0.025	0.234***	0.171***	-							
5 Acquaintance	0.063*	0.164***	0.262***	0.403***	-						
6 Stranger	0.102***	0.066*	-0.336***	0.086**	-0.088**	-					
7 Other religion	0.100***	0.067*	-0.312***	-0.022	-0.077*	0.611***	-				
8 Other nationality	0.088**	0.095**	-0.305***	0.063*	-0.024	0.595***	0.638***	-			
9 In-group trust	0.075*	0.177***	0.624***	0.773***	0.758***	-0.134***	-0.176***	-0.106***	-		
10 Out-group trust	0.112***	0.088**	-0.369***	0.048	-0.073*	0.853***	0.872***	0.861***	-0.162***	-	
11 Amount sent	0.060*	0.119***	-0.070*	0.098***	0.100***	0.037	0.054	0.019	0.066*	0.043	-

The characteristic index of Trust Game is the amount sent, \*\*\*  $p<0.001$ , \*\*  $p<0.01$ , \*  $p<0.05$



**Table 3** Regression results for Trust Game transfers conditional on survey trust [B(SE)]

Predict variables	Amount sent			Predict variables	Amount sent		
	Model 1	Model 2	Model 3		Model 1	Model 2	Model 3
Gender	0.51(0.17)**	0.46(0.17)**	0.46(0.17)**	Gender	0.51(0.17)**	0.46(0.17)**	0.46(0.17)**
Age	0.03(0.01)	0.02(0.01)	0.02(0.01)	Age	0.03(0.01)	0.02(0.01)	0.02(0.01)
Occupation	0.04(0.24)	0.11(0.24)	0.11(0.24)	Occupation	0.04(0.24)	0.11(0.24)	0.11(0.24)
Log income	0.29(0.18)	0.29(0.18)	0.29(0.18)	Log income	0.29(0.18)	0.29(0.18)	0.29(0.18)
Risk preference		0.10(0.08)	0.09(0.08)	Risk preference		0.10(0.08)	0.09(0.08)
Prosocial preference		0.29(0.10)**	0.28(0.10)**	Prosocial preference		0.29(0.10)**	0.28(0.10)**
In-group trust			0.21(0.17)	Family			-0.43(0.14)**
				Neighbor			0.14(0.12)
				Acquaintance			0.40(0.14)**
$\Delta F$	6.485***	5.669**	1.451		6.485***	5.669**	5.681***
$R^2$	0.019	0.028	0.028		0.019	0.028	0.040
$\Delta R^2$		0.010	0.001			0.010	0.015

The dependent variable is the amount sent. Convert income to logarithm

of the three subdimensions of in-group trust (family, neighbor and acquaintance) on the amount sent in the Trust Game increased by 1.5%.

To address another major issue of concern in this study: the differences in trust levels between the southern and northern regions of China, we distinguished the participants into southern and northern participants based on the regional division basis mentioned in the previous section, and conducted a trust difference analysis between the South and the North (see Table 4). The results of the Trust Game showed that the average amount sent from the southern group is 5.04 yuan ( $SD=2.76$ ), while the average amount sent from northern group is 5.17 yuan ( $SD=2.83$ ), which is slightly higher than that of the participants from the southern region. This difference was not significant at the statistical level,  $p=0.462$ ,  $t=-0.73$ , *Cohen's d*=0.04. In the test of the significance of the difference between in-group trust and out-group trust between the South and the North, we did not find that the two regions showed statistical differences. To understand whether the difference in trust characteristics between the South and the North will lead to different correlation results between the Trust Game and survey trust, we analyzed the correlation between these two measurements in the South and the North. Only in southern China, did the Trust Game have a significant positive correlation

with the three subdimensions of in-group trust - family ( $r=-0.125$ ,  $p=0.002$ ), neighbor ( $r=0.139$ ,  $p=0.001$ ) and acquaintance ( $r=0.097$ ,  $p=0.016$ ). In northern China, we only found a correlation between the Trust Game and survey trust in acquaintances ( $r=0.107$ ,  $p=0.018$ ). Furthermore, we conducted hierarchical regression analysis of South China and North China. Only in the southern area, after controlling for demographic variables, prosocial preference and risk preference, can the scores of the family dimension ( $B=-0.71$ ,  $SE=0.20$ ,  $p=0.001$ ) and the neighbor dimension ( $B=0.34$ ,  $SE=0.16$ ,  $p=0.039$ ) still predict the amount sent in the Trust Game.

## Discussion

One of the main purpose of this study was to explore whether there is a correlation between the Trust Game and survey trust in China. We found that the Trust Game is only significantly correlated with the in-group trust survey, but this correlation is very low, with a correlation coefficient of less than 0.1. We have not found a significant correlation between the Trust Game and out-group trust survey. The perspective of matching trusted objects holds that when the Trust Game and the survey measure for the same object,

**Table 4** Statistical description and T-test of trust in southern and northern China ( $M \pm SD$ )

	Amount sent	In-group trust	Out-group trust	Family	Neighbor	Acquaintance	Stranger	Other religion	Other nationality
South	5.17 ± 2.86	3.28 ± 0.52	1.82 ± 0.57	3.75 ± 0.56	2.75 ± 0.76	3.15 ± 0.59	1.80 ± 0.71	1.88 ± 0.73	1.83 ± 0.72
North	4.91 ± 2.87	3.21 ± 0.53	1.93 ± 0.76	3.68 ± 0.67	2.78 ± 0.77	3.09 ± 0.68	1.80 ± 0.82	1.90 ± 0.84	1.79 ± 0.78
<i>t</i>	-1.18	-1.48	2.09*	1.83	-0.63	1.75	-0.15	-0.35	0.89
<i>p</i>	0.24	0.14	0.04	0.068	0.53	0.08	0.88	0.72	0.37

they will have a significant correlation. On the one hand, when the identity of the trustee is unspecified, the type of trust represented by the Trust Game is similar to measuring trust in strangers. On the other hand, due to the different cultural values of the region where people live, the Trust Game has different representation modes of in-group trust and out-group trust. The results of this study support the hypothesis of cultural values theory.

In this study, we tested both views mentioned above and found interesting results. The Trust Game is significantly correlated with the in-group trust survey, especially with that of family and acquaintance. However, it should be noted that the direction of the correlation is not consistent - the Trust Game is significantly negatively correlated with the survey trust of family, but positively correlated with the survey trust of acquaintance. The significant positive correlation between the Trust Game and acquaintance trust dimension confirms the guanxi-trust model proposed by Chinese scholar Peng (1999); that is, Chinese people's trust is relationship-based trust. Peng (1999) believed that guanxi is the main mechanism for the generation of trust among Chinese people. Guanxi is the existence of direct particularistic ties between an individual and others (Tsui & Farh, 1997). In Chinese literature, guanxi ties have three qualities: (1) familiarity, intimacy (2) trust, and (3) mutual obligation (Bian 2018; Burt et al., 2018). Through the means of guanxi operation (such as gift giving and communication, etc.), individuals outside the family can increase their trustworthiness and form mutual trust with outsiders. Such trust based on guanxi is the most common trust mode in Chinese society (Huang & Rau, 2019) and may lead to Chinese individuals' tendency to show the characteristics of trust based on guanxi (acquaintance trust) when playing the Trust Game, thus, presenting a different result from other countries. In contrast, we did not find a significant correlation between the Trust Game and out-group trust, indicating that in China, the Trust Game of unspecified trustee does not represent out-group trust.

Many of the earlier empirical studies conducted to date have studied the evidence of the correlation between the Trust Game and survey trust, but the results are inconsistent in developed and developing countries (Carlin et al., 2017; Safra et al., 2022). Studies in developed countries such as the Italy, Uruguay and UK have found that survey trust is significantly positively correlated with the Trust Game (Banerjee et al., 2021; Murtin et al., 2018; Safra et al., 2022). However, in developing countries such as Ethiopia, South Africa, Tanzania, the correlation between them is very low or even irrelevant (Carlin et al., 2017; Carlsson et al., 2018; Danielson & Holm, 2007). The results of this study are consistent with the results obtained by studies in developing countries. The correlation between the Trust Game and survey trust is very low. After controlling for other variables, there are

only two subdimensions of in-group trust correlated to the Trust Game. Perhaps this is because the different cultural norms between countries have different effects on the internal validity of the Trust Game, which makes the correlation between the Trust Game and survey different. Given the lack of formal means to adjudicate disputes in many developing communities, at this time, social norms will intervene as informal means and affect the economic performance of the community (Cardenas & Carpenter, 2008). When extended to larger regional and national levels, developing regions and countries that emphasize the importance of teamwork for production tend to have more social norms requiring cooperation and sharing (Johansson-Stenman et al., 2013). Greig and Bohnet (2008) found that the basic norm of slums in Nairobi, Kenya was equality and reciprocity, and under the 'constraint' of this norm, they thought they were obligated to invest in others. However, consideration based on equality under cultural norms may lead to a decrease in the internal validity of the Trust Game in relatively backward developing countries, showing a low correlation between the Trust Game and survey trust. In contrast, developed countries mostly support the norm of conditional reciprocity; that is, the two parties see the relationship more as a partnership in which both players accrue profit (Cardenas & Carpenter, 2008). At this point, investing behavior represents a willingness to trust in order to gain profits, and this behavior can better represent the individual trust level, thus showing a significant correlation between the Trust Game and survey trust. In the Chinese context, the investment behavior of the trustor is likely to be influenced by the norms of equality in the traditional culture, and they tend to associate the investment behavior with the responsibility and obligation to promote the realization of equity required by the Chinese society of "Li". Therefore, investment is made for the consideration of "equality of wealth and poverty", which weakens the trust component in investment behavior and makes the Trust Game and survey trust show irrelevant results.

In terms of trust characteristics in China, we find that Chinese individuals show a strong in-group trust pattern, whereas there is no significant difference in trust characteristics between subjects in southern and northern China, the hypothesis of this study was not confirmed. This may suggest that differences in rice cultivation and clan culture in northern and southern China do not fundamentally affect trust patterns. On the one hand, in describing the applicability of rice theory, they created three separate regression equations using three indicators: percentage of rice cultivation, GDP per capita, and incidence of infectious diseases (Talhelm et al., 2014), but strictly speaking, the authors should have put the three indicators into the same regression equation to test the effect of the three indicators on individualism/collectivism and their relative importance. Ruan et al. (2015) found that the percentage of rice cultivation

was not a significant predictor of individualism/collectivism after controlling for GDP per capita and the incidence of infectious diseases. So, the rice theory did not support the explanation of individualism/collectivism differences among Chinese. On the other hand, the influence of clan organizations has gradually declined with social and political movements since 1949 (Tang, 2017), and the influence of clan culture on trust differences between the South and the North has weakened. In addition, the disruption of social networks by the urbanization process has weakened trust differences between regions (Zeng & Liu, 2021). Chinese social networks are personal relationships established along blood and geographic boundaries (Fei, 1992), and the cross-regional mobility of individuals during urbanization will disrupt the original social networks and promote communication and cultural integration, leading to a gradual convergence of trust patterns between the South and North, while exhibiting in-group trust patterns.

## Limitations and prospects

There are some limitations in operation and research content in this study. We completed survey trust and the Trust Game in the form of a questionnaire, which we believe is appropriate and necessary given the limitations of the current outbreak of COVID-19 on the conduct of the experiment and the similar measures taken by previous authors (Buchan & Croson, 2004), but which at the same time poses some limitations to the study. First, the participants' answers to the survey may be affected by social expectations or demand characteristics (McCambridge et al., 2012), so that the trust level measured by the questionnaire may be higher or lower than the actual level (Krumpal, 2013; Paulhus, 1991). Second, we adopted the online network survey, which lacks economic incentives compared with a laboratory situation, and individuals may lack strong motivation to express real ideas (Fehr et al., 2003). At the same time, it is difficult for us to control many irrelevant variables, such as the response environment and the seriousness of the subjects, which may be the source of error in our results. Finally, although the convenience sampling method adopted by our participants reduces the difficulty of data collection, there may indeed be some deviations in our sampling. For example, the age distribution is positively skewed, and there is fewer data for the younger subjects (under 12 years old) as well as older subjects. These nonnormally distributed data may lead to biased results.

We provide some important perspectives for future research. On the one hand, at present, researchers have not formed a consistent result of the correlation between the Trust Game and survey trust. In the future, researchers can expand the regional scope, verify them in countries with different degrees of development, and try to find the internal

reasons for the different results in different countries. For example, there is an inseparable relationship between culture and trust (Klein et al., 2019). Delhey et al. (2011) found that there is a significant negative correlation between Confucian cultural tradition and trust radius. Whether East Asia, which is jointly affected by Confucian culture, will have trust results similar to those in China requires future researchers to conduct a broader comparative study among countries.

## Conclusion

This study mainly discusses the correlation between the Trust Game and survey trust (in-group trust / out-group trust) in the context of China. At the same time, by comparing the trust characteristics in northern and southern China, we can draw the following conclusions:

- (1) In China, the Trust Game has a significantly low correlation with the in-group trust survey and no significant correlation with the out-group trust survey.
- (2) Chinese individuals exhibit distinct in-group trust characteristics, but there are no obvious differences in trust characteristics between South and North China.

## Appendix

### Instructions in Chinese

#### 量表信任

请您对以下这些群体的信任程度进行打分, 1 表示“非常不信任”, 2 表示“不太信任”, 3 表示“有点信任”, 4 表示“非常信任”。

#### 信任博弈

您与被投资者现在都拥有10元人民币, 您可以向被投资者投资0到10元之间的任何金额的钱。之后您发送的金额在被投资者收到之前会翻三倍。然后, 被投资者将选择任意金额返还给你。你作为投资者, 现在请决定投资多少元给对方。

#### 风险偏好量表

假设你一周前买了一张彩票。你现在被告知, 你已经赢了, 并已经得到了两个选择, 如何接受的钱。请您选出您认为最好的一种方案, 并在5点量表中标出您对两种投资方案的喜好程度。(其中, 1 为“非常喜欢方案A”, 2 表示“比较喜欢方案A”, 3 表示“对两种方案的喜好程度相同”, 4 = 表示“比较喜欢方案B”, 5 表示“非常喜欢方案B”。)

#### 社会偏好量表

请根据自身情况, 对以下描述进行打分。1 为完全不符合, 2 表示有点不符合, 3 表示不太确定, 4 表示有点符合, 5 表示完全符合。



## Instructions in English

### Survey Trust

I'd like to ask you how much you trust people from various groups. Could you tell me for each whether you trust people from this group completely, somewhat, not very much or not at all?

### Trust Game

In this game, both you (the sender) and Player B (the receiver) were initially endowed with 10 yuan. You could send any amount of money between 0 and 10 yuan to Player B. The amount sent was then tripled by the experimenter before it was received by Player B. Player B then chose any fraction of this amount to return to you. Finally, you earn the amount you did not send, plus the amount returned to you by Player B. You, as the sender, now please decide how many yuan to send to Player B.

### Risk Preference Index

Suppose that you bought a lottery ticket a week ago. You are now informed that you have won and have been given two options of how to receive the money. Please choose the one you think is the best and indicate your preference for the two options on a 5-point scale. (where 1 = 'strongly prefer option A', 2 = 'prefer option A', 3 = 'equal preference for both options', 4 = 'prefer option B', and 5 = 'strongly prefer option B').

### Prosocial Tendency Measure

Please rate the following descriptions according to your own situation. 1 means completely disagree, 2 means somewhat disagree, 3 means not sure, 4 means somewhat agree, 5 means completely agree.

**Data availability** The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

## Declarations

**Ethics approval** All procedures involving human participants in this study were performed in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Ethical commission at Sichuan Normal University, College of Psychology, March 2021.

**Patient consent statement** Participants were informed that their participation were voluntary and that they are free to withdraw at any time, without giving a reason and without cost. They voluntarily agreed to take part in this study.

**Competing interests** The authors did not receive support from any organization for the submitted work. The authors have no relevant financial or non-financial interests to disclose.

**Conflict of interest** We have no conflicts of interests to disclose.

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