

An experimental study of intra- and international cooperation: Chinese and American play in the Prisoner's Dilemma Game

Abstract

We study whether intra- and international groups have different cooperation rates in the Prisoner's Dilemma Game. We report on an experiment in which university students in China and America engage in a single iteration of the game, complete belief elicitation tasks regarding their counterparts' play, and complete a survey including attitudinal measurements regarding their in- and out-group attitudes. We find that Chinese overall cooperation rates are less than American ones. Further, female participants are more cooperative than males. With respect to international cooperation, Chinese participants accurately estimate the likelihood of cooperative behavior of their American counterparts, while Americans overestimate the same likelihood of their Chinese counterparts. Our results further show that Chinese participants cooperate more conditionally than American ones. Finally, we find a more positive attitude toward one's living country is related to less international cooperative behavior, and a more positive attitude towards the other country is related to more international cooperation.

Keywords: International; Intra-national; Prisoner's Dilemma; Cooperation; Experiment

JEL codes: C72, C92, D91

1. Introduction

A rise of global connectivity has spurred investigations of international differences in behavioral norms. A subset of this literature identifies differences in the cooperation norms within countries (etc. Henrich et al. 2005; Gächter et al. 2010; Goerg and Walkowitz, 2010). Less studied are cooperation tendencies when people living in different countries interact. We believe this is a particularly important area of investigation in the case of the United States (US) and China. As the two largest economies in the world, the combined GDP of the United States and China comprises 37% of the world's GDP according to the International Monetary Fund in 2020. Bilateral trade between the two countries accounts for more than 10% of total international trade. Moreover, bilateral cooperation between the US and China, whether at the government or individual level, affects the development prospects of the world economy. However, the US and China have distinct cultures and may bring different norms and beliefs to bilateral cooperation. These differences could affect the success of cooperative efforts, at both the individual and more aggregated levels, between the two countries. This paper uses economic experiments to study international strategic cooperation with the participants residing in these two countries.

Our experimental study investigates the cooperative behavior in the Prisoner's Dilemma Game in a controlled online environment. By conducting the experiment online we avoid the possible confounds of living environment on participants' strategies.¹ We also explore the varying prevalence of conditional cooperation in different cultures using a task that elicits participants' beliefs' regarding their counterpart's strategy. We also assess the impact of in- and out-group biases on cooperative behaviour by surveying attitudes of both in- and out-group nations and measuring the correlation of these to behaviour. Finally, we conduct our experiments with a single iteration of play with participants only being informed of their

¹ We use the terms Chinese and American for those studying full-time at Wuhan and Chapman Universities, respectively, i.e., participants in China and participants in the US. Chinese participants are exclusively Chinese nationals, while we cannot identify the nationalities of the American participants. However, 7.5% of those participants' families originated from China. In unreported results, we verify all of our results are robust to removing the data for these participants.

counterpart's country of residence. This avoids reputational or strategic considerations coming from non-anonymous (Milinski et al., 2002; Rockenbach and Milinski, 2006) and repeated play.

Our four major results are as follows. Three results concern behavior unconditional of whether the interaction is intra- or international. First, American participants exhibit higher proportions of cooperative behavior than Chinese ones, though only marginally so when controlling for multiple factors. Second, females exhibit higher rates of cooperation. This is particularly significant in regression results in which we control for other potential factors. Third, the expected cooperation rate of one's counterpart is a significant factor affecting cooperation. The marginal effect is twice as strong for Chinese participants as it is for American ones. Finally regarding cooperation across countries, in- and out- group attitudes are important in international cooperation. Higher in-group attitude and lower out-group attitude both diminishes international cooperation.

The Prisoner's Dilemma Game is a commonly used instrument which is well suited to analytically and empirically investigate cooperative tendencies. In an experimental study of the Prisoner's Dilemma Game, Hemesath and Pomponio (1998) found that (1) Chinese students cooperated significantly more often than American students who were participating in a study abroad program did and (2) both groups cooperated less often when paired with a foreign counterpart. We revisit the premise of their study and extend it in several dimensions. First, the relationship between the US and China has evolved greatly over the past two decades. Second, we adopt recruitment procedures that do not suffer from the selection bias created by the use of study abroad students. Third, we use an experimental design that increases the power of the study through a larger sample size and the use of a single play of the game.² Fourth, we also elicit participants' beliefs about their counterparts' behavior and participants' attitudes toward in- and out-national groups. Finally, we provide an examination of the

² Hemesath and Pomponio used repeated play of the Prisoner's Dilemma in their study. In addition to this reducing the power of their statistical analysis, it complicates the strategic interpretation of cooperative play in their experiment.

cooperative tendencies of genders in the two countries.

There is an extensive experimental literature investigating differences in cooperation for intra-national strategic interactions. Henrich et al. (2005) conducts a broad study across fifteen different societies and finds the level of prosociality expressed in experimental games is positively correlated with the degree of market integration and the payoffs to cooperation in everyday life. Gächter et al. (2010) researches cooperation differences across fifteen countries with six different cultures and find that cultural differences in cooperation exist in the sense that intra-national variation is smaller than the international variation. Goerg and Walkowitz (2010) runs cooperation game experiments in four different countries. They find cooperation levels differ significantly across participant pools. In the negative externalities treatment, where a transfer creates a negative externality for the opposite player, Chengdu (China) participants have a significantly lower cooperation rate than those in Helsinki (Finland) and Jerusalem. Frey (2019) investigates ten countries and shows that there are minor differences in cooperation rates between countries. Cassar et al. (2014) studies two nations, Italy and Kosovo, and concludes that moral norms of cooperative behavior can follow improvements in formal institutional quality. These studies for the most part investigate the impact of culture by directly comparing the experimental results within different cultures but not international interactions.

There is a more limited number of experimental studies in which participants interact with people in an international group. Chuah et al. (2007, 2009) conducts experiments with international ultimatum bargaining between Malaysian and UK participants, and finds Malaysian proposers make higher offers to Malaysian than to UK responders. Matsumoto and Hwang (2011, 2015) run experiments between US-born-and-raised Americans and international students. They find larger cultural differences and related higher contempt emotions are associated with less cooperative and more competitive behavior. Goerg et al. (2013) investigates cooperation in a continuous prisoner's dilemma game of Israelis and Palestinians within a controlled laboratory experiment. Cooperation decreases for pairs of inter-group participants.

There is a vast experimental economics literature providing mixed evidence assessing the impact of gender on cooperation. Some find women cooperate significantly more than men (Gilligan, 1982), especially when they are observed by their peer group (Charness and Rustichini, 2011). Furthermore, Andreas et al. (1999) discovers that women display substantially more cooperative behavior than men in the first several rounds of the Prisoner’s Dilemma Game, but this difference disappears by the last round. They also report that female and male cooperation rates become more similar in single-sex environments. However, Rapoport and Chammah (1965) finds, also in Prisoner’s Dilemma Games, that in single-sex environments substantially more men than women choose to cooperate.

The remainder of this paper is organized as follows. The design of our study is depicted in Section 2. We report the experimental results in Section 3. Finally, we present further discussions in Section 4.

2. Experimental Design

Our experiment consists of a single play of the Prisoner’s Dilemma Game³, the payoffs for the two players given in Table 1, followed by an elicitation task for a participant’s beliefs regarding their counterpart’s likelihood of choosing to cooperate (Option A) and a short survey (Chen et al., 2014) including questions regarding their attitude towards the two countries.

Table 1: Prisoner's Dilemma Game Payoff Matrix

		Other Player	
		A	B
You	A	€8, €8	€2, €12
	B	€12, €2	€4, €4

1 € = USD \$1.00, 1 € = RMB ¥ 1.60

³ We refer to the experimental design of the related literature (Hemesath and Pomponio, 1998). The Prisoner's Dilemma Game is often used to demonstrate the coherence of strategic realism, which holds that in international relations, all nations will act in their rational self-interest given international anarchy. An example is an arms race like the Cold War and similar conflicts (Majeski, 1984). Although the social optimal outcome is for both sides to disarm, the rational course for both sides is to arm, and this is indeed what happened (Kuhn, 2019).

Each participant makes a single choice of either option A (cooperate) or B (defect) in the first stage of the experiment. We do not inform the participants of their game outcomes until all data from their session are collected and processed with a random match with a counterpart for payment.

After the Prisoner's Dilemma Game, participants complete two belief elicitation tasks regarding the likelihood their counterpart chooses to cooperate. First, we ask them to predict whether their counterpart selected option A, while informing them a correct prediction will receive a twenty experimental cents reward. Second, we ask them to guess what percentage of the players from their counterpart's country chose option A, while informing them a guess within ten percent of the true proportion will receive a twenty experimental cents reward.⁴ These two tasks are designed to measure the same belief.⁵

In the post-experiment survey, we ask participants about their general attitudes towards China and the United States, their impressions of Chinese and Americans, their attention to their counterpart's country of residence, and other personal characteristics. We collect the attitudinal measurements of the two countries to assess whether there are in-group or outgroup biases and if these generate differences in cooperative behavior.

We conduct the incentivized experiments within/between Chinese and American to test four main hypotheses.

Hypothesis 1a and 1b (Intra/International Cooperation): Chinese/American choose to cooperate at the same rate in intra-national and international interactions.

Hypothesis 2 (Gender difference): Female and Male participants choose to

⁴ We implement belief elicitation tasks with financial incentives to make their choice in the task payoff salient. However, due to concerns over potential attempts to use the task to hedge the risk in total payoffs for the experiment we make the task payoffs small relative to game payoffs and we do not inform participants there is the elicitation task until after making their game choices.

⁵ A natural question is how should we elicit the belief of cooperation. Croson (2000) finds that when participants are asked in advance for their best (binary) estimation of what their counterpart in the experiment would do, it decreases subsequent cooperation in the one-shot Prisoner's Dilemma Game by about 30% compared with participants who are not asked. Our experimental design fits a branch of literature involving the belief elicitation after the game decision like Charness et al. (2016). Charness et al. (2016) carefully compares the incentivized belief elicitation after the decision and the incentivized belief elicitation without the decision, which finds whether to make a decision does not change the outcome of the incentivized belief elicitation.

cooperate at the same rate in intra-national and international interactions.

Hypothesis 3 (Conditional Cooperation): Conditional upon having the same belief in the likelihood of their counterpart's cooperation, there are no differences in the marginal cooperation rates of Chinese and Americans.

Hypothesis 4 (National Attitude Bias): In international interactions, the attitude towards their living countries and the country of their counterpart does not affect cooperation rates.

2.1 Treatments

Our first primary treatments are international interaction, which generates two sub-treatments: Chinese students playing against American students (CA) and American students playing against Chinese students (AC). The second primary treatment is intra-national interaction, which generates two more sub-treatments: Chinese students playing against Chinese students (CC) and American students playing against American students (AA).⁶ In each treatment, we only inform participants of whether their counterpart is from their living or the other country at the beginning of the session.⁷

2.2 Participants

American participants were students from Chapman University recruited through ORSEE (Greiner, 2015), and Chinese participants were recruited from Wuhan University through ancademy.org. To account for the odd participant number in the CC and AA treatments and the different sum of participants for the CA and AC treatments, which prevents full one-to-one matching, we randomly chose a matched participant for any odd participant⁸ for the purpose of determining their game payoff and to provide feedback.

We conducted the experiment in two waves. We conducted the first wave in

⁶ Abbreviation derived from country names' initial letters.

⁷ The subject pool treatment effect is likely a joint effect of culture, environment and national identity. Our attitudinal assessments provide some control for identity effects.

⁸ The matching should not affect participants' decisions. This matching is randomly conducted after participants finished the experiment. All decisions and survey responses are completed before the matching procedure. Matching is used solely to determine payoffs and feedback.

December 2020 with 322 participants, and the second wave in March 2022 with 305 participants. In total, there are 321 participants from the United States and 306 from China. We conducted the second wave in response to the gender in-balance of the first wave; although the first wave sample is in line with the student gender balance of the respective universities. Table 2 reports, by waves and treatments, some descriptive statistics of the participants' demographics and survey responses.

With respect to attitudinal measurements, participants prefer their nation to the other nation ($p\text{-value} < 0.001$, all tests reported within the text are Wilcoxon rank-sum tests). We also see in the second wave a statistically significant degradation in the Chinese attitude towards the US, which we conjecture reflects geopolitical events unfolding between the waves. Regarding the concern of the counterpart's nationality, we ask the participants "how much did you pay attention to your partner's nationality?" Participants can respond with a value of 1 to 3 corresponding respectively to "paid no attention", "paid little attention", and "paid much attention." In both the Chinese and American samples, participants in international treatments are significantly more concerned about their partner's nationality than participants are in the intra-national treatments ($p\text{-value} < 0.001$ and $p\text{-value} < 0.001$). This suggests participation in the Prisoner's Dilemma game primes sensitivity to nationality of one's counterpart in international interactions.

Table 2: Descriptive statistics of participant attributes by wave and treatments

Mean	CC	CA	AA	AC	p-value ^a
Sample Size					
First Wave	85	75	84	78	-
Second Wave	76	70	79	80	-
Female					
First Wave	57.6%	62.7%	71.4%	73.1%	0.118
Second Wave	53.9%	54.3%	63.3%	63.7%	0.425
p-value ^b	0.64	0.31	0.27	0.21	-
Age					
First Wave	19.98	19.65	20.27	20.45	<0.001
Second Wave	20.45	20.43	20.19	20.2	0.744
p-value ^c	0.03 ⁹	0.05	0.42	0.91	-
Economics major (0 = non-economics, 1 = economics)					
First Wave	27.1%	24%	10.7%	7.7%	0.001
Second Wave	15.8%	15.7%	15.2%	16.3%	0.998
p-value ^b	0.08	0.21	0.39	0.10	-
Attitude towards China (response range: 1-5)					
First Wave	4.87	4.87	2.82	2.94	<0.001
Second Wave	4.76	4.87	2.62	2.74	<0.001
p-value ^c	0.15	0.90	0.16	0.19	-
Attitude towards the US (response range: 1-5)					
First Wave	2.89	3.2	3.42	3.36	0.010
Second Wave	2.37	2.84	3.47	3.5	<0.001
p-value ^c	<0.001	0.01	0.70	0.36	-
Attention paid to the Partner's Nationality (response range: 1-3)					
First Wave	1.28	1.71	1.24	1.54	<0.001

⁹ At Wuhan University, they only conduct a large-scale update of the participant pool every two years, which may be the reason why the participants are slightly older in the second wave.

Second Wave	1.29	1.81	1.28	1.54	<0.001
p-value ^c	0.96	0.28	0.76	0.83	-
Income¹⁰ (response range: 1-3)					
First Wave	1.61	1.72	2.49	2.35	<0.001
Second Wave	1.76	1.83	2.28	2.43	<0.001
p-value ^c	0.04	0.30	0.05	0.43	-

^a P-value of the hypothesis test the mean response is the same in all four treatments. We use Kruskal-Wallis rank-sum tests for mean comparisons of Age, Attitude towards China, Attitude towards the US, Attention paid to the Partner's Nationality, and Income. We use binomial tests for ratio comparisons of Female, and Economics major.

^b P-value of the hypothesis test the mean response is the same in two waves. We use binomial tests for ratio comparisons.

^c P-value of the hypothesis test the mean response is the same in two waves. We use Wilcoxon rank-sum tests for mean comparisons.

2.3 Procedures

We constructed an online survey to elicit all responses using the website www.wjx.cn. We produced a version of the survey in English for the Chapman University participants and in Mandarin for the Wuhan University participants. We provide the English version of the instructions in the appendix, and the Mandarin version is available upon request from the corresponding author. We controlled the release of the survey such that participants in the same experimental session participated at the same time of the day.¹¹

Participants are paid within 24 hours of the conclusion of their participation to avoid unnecessary variation in the time zone difference and the delay of payments. Those who completed the experiment are paid in their respective currency based on their performance throughout the experiment. Due to the nature of purchasing power parity between China and the US, we used different conversion rates between the experimental token and the US Dollar and between the experimental token and the

¹⁰ This variable is the place participants feel their family income would be among other families, not the level of family income.

¹¹ Each session consisted of participants of the same nationality in order to control the environment (avoid morning vs. afternoon, etc.) as much as possible. All participants answered the survey in the afternoon in their time zones. We control this to avoid the case of cognitive limitations from fatigue.

RMB.

Chinese and American participants earned ¥21.98¹² and \$13.67 on average, respectively, including 7 experimental tokens as a show-up fee, namely, ¥11.2 for Chinese participants and \$7 for American participants. Each session took approximately half an hour or less in total to complete.

3. Experimental Results

3.1 International cooperation rates

Table 3 shows the descriptive statistics for the Prisoner's Dilemma Game, as well as binomial tests comparing cooperation rates. The overall cooperation rate for American participants is 55.8 percent (321 participants) versus 47.1 percent (306 participants) for Chinese participants (p-value = 0.03). We also observe more cooperative behavior from American than Chinese participants in both the intra- and international treatments (p-value = 0.08 and = 0.19, respectively). One of our main questions is whether people exhibit different rates of cooperative behavior in intra- and international in the Prisoner's Dilemma Game. Although nominal cooperation rates are larger in intra-national treatments than in international treatments, we find no statistically significant difference for either the Chinese (p-value = 0.96) or American groups (p-value = 0.64). However, when controlling for other factors, see the regression results of Table 7, participants in the international treatments have a statistically greater cooperation rate.¹³

Result 1: *American participants exhibit greater proportions of cooperative behavior when pooling the intra- and international treatments. Each nationality exhibits nominal, but not statistically, higher rates of cooperation in each of the intra- and international*

¹² Chinese participants earned ¥21.98 on average, i.e., approximately \$3.45.

¹³ Our experimental design provides more statistical power relative to other close studies. With respect to the measure of minimal detectable effect size, we consider the cooperation rates of Chinese versus Americans in Table 2 in Hemesath and Pomponio (1998) as an example. The minimal detectable effect size is 0.25. Since most participants in their study played the game with people from another country, we take the cooperation rates of CA versus AC in Table 3 in our study as an example. The minimal detectable effect size of this test is 0.16. This is a best case scenario as this analysis treats each play of the game as independent, a dubious assumption for the repeated play adopted by Hemesath and Pomponio.

treatments.

Table 3: Cooperation in the Prisoner's Dilemma Game

	Chinese	American	CC	CA	AA	AC
Cooperation Rate (%)	47.1	55.8	47.2	46.9	57.1	54.4
Sample Size	306	321	161	145	163	158
Chinese versus American	p-value = 0.03					
CC versus CA	p-value = 0.96					
AA versus AC	p-value = 0.64					
CC versus AA	p-value = 0.08					
CA versus AC	p-value = 0.19					

Note: CC means “Chinese students in the intra-national treatment”, CA means “Chinese students in the international treatment”, AA means “American students in the intra-national treatment”, and AC means “American students in the international treatment”. All ratio comparisons are performed via a two-sided binomial test.

In Table 4, we disaggregate the data in Table 3 by gender. In all treatments, the cooperation rates of female participants exceed those of male ones. Even with reduced numbers of observations, resulting in lower power for the binomial tests, we still find a highly significant difference for the Chinese females versus Chinese males in the international treatment, and marginally significant differences for the other treatments. These marginally significant results become highly significant in the regression results of Table 7. The conclusion that female participants are significantly more likely to cooperate than male participants is consistent with the findings of Andreas et al. (1999).

Result 2: (Gender difference) *Females exhibit greater cooperative behavior than Males.*

Table 4: Cooperation by Gender in the Prisoner's Dilemma Game

	Female	Male	CCF	CCM	CAF	CAM	AAF	AAM	ACF	ACM
Cooperation Rate (%)	57.0	42.3	52.2	40.8	55.3	35	60.9	49.1	58.3	46
Sample Size	393	234	90	71	85	60	110	53	108	50
Female versus Male	p-value < 0.001									
CCF versus CCM	p-value = 0.15									
CAF versus CAM	p-value = 0.02									
AAF versus AAM	p-value = 0.15									
ACF versus ACM	p-value = 0.15									

Note: CCF means “female in CC”, CCM means “male in CC”, CAF means “female in CA”, and CAM means “male in CA”. AAF means “female in AA”, AAM means “male in AA”, ACF means “female in AC”, and ACM means “male in AC”. All ratio comparisons are performed via a two sided binomial test.

3.2 Determinants of cooperation

In the following analysis, we examine the effects of one's expectation of their counterpart's play, and one's in- and out-group attitudes have on their cooperative behavior. We first report group differences on the expectation of their counterpart's cooperation conditional upon their counterpart's country. Then we report group differences with respect to in- and out-group attitudes. We then report the correlations between the expectation of participants' counterpart's cooperation and their in-group attitudes. We then present regression analyses on how these factors effect individuals' cooperative behavior.

Conditional cooperation has long been an identified decision rule in dilemmas such as Public Good games (Fischbacher et al., 2001) and later in the Prisoner's Dilemma Game (List, 2006). A conditional cooperator, in our single play setting, is more likely to cooperate the stronger their belief that their counterpart is going to cooperate. We use the response to the question, “guess what percentage of the players from China/US chose option A in today's experiment” as our measurement of that belief.¹⁴ As shown

¹⁴ We collect two measures of expectations, one elicits a judgement on the cooperation rate of their counterpart's country, the other elicits a judgement on their counterpart's action. As shown in Table

in Table 5, Chinese and American participants do not have different expectations of counterparts' cooperation rate ($p\text{-value} = 0.94$). However, with the different cooperation rates by country, at least one of these average beliefs is inaccurate.

Let's consider the accuracy and biases found in the beliefs in the rate of counterpart cooperation by player and interaction type. In the international treatment, Chinese participants correctly estimate the cooperation rate of their American counterpart (expected 53.5%, actually 54.4%, $p\text{-value} = 0.877$), but American participants overestimate the cooperation rate of their Chinese counterpart (expected 57.3%, actually 46.9%, $p\text{-value} = 0.069$). A similar pattern does not occur in the intra-national treatment. Chinese participants overestimate their Chinese counterpart's cooperation rate (expected 56.9%, actually 47.2%, $p\text{-value} = 0.081$); American participants correctly estimate their American counterpart's cooperation rate (expected 54.8%, actually 57.1%, $p\text{-value} = 0.686$). This is also to say, American participants' cooperation rate are nominally correctly estimated or slightly underestimated by their counterpart, while that of Chinese participants are nominally overestimated.

Table 5: Cooperation Expectation in the Prisoner's Dilemma Game

	Chinese	American	CC	CA	AA	AC
Expected cooperation of population (%)	55.3	56.1	56.9	53.5	54.8	57.3
Standard Deviation	24.97	21.02	25.64	24.16	21.25	20.77
Sample Size	306	321	161	145	163	158
Chinese versus American	$p\text{-value} = 0.94$					
CC versus CA	$p\text{-value} = 0.22$					
AA versus AC	$p\text{-value} = 0.32$					
CC versus AA	$p\text{-value} = 0.32$					
CA versus AC	$p\text{-value} = 0.24$					

Note: All mean comparisons are performed via a Wilcoxon rank-sum test.

In- and out-group biases reflect the differential attitudes one has towards those they consider as part of their identity group versus those not considered part of their identity

C.1 in the appendix, these two measurements are highly and positively correlated. Due to this high correlation we only use the former elicitation in our regressions, to avoid issues of multicollinearity.

group. Behavioral economists, for example (Chen and Li, 2009), argue group biases moderate the tendency to cooperate through individuals' social preferences – in effect transforming the payoffs of the Prisoner's Dilemma Game. We use the responses to the attitudinal questions, “What are your views on the China/United States? On a scale of 1 to 5. Please indicate your level of feelings. 1 = Unfavorable, 2 = a little Unfavorable, 3 = Neutral, 4 = a little favorable, 5 = Favorable,” as proxy measurements for in- and out-group bias.

With respect to the view of one's country of residence, in-group preference, Chinese have a higher view than Americans, but there is no difference between international and intra-national treatments, as shown in Table 6. On the other hand, views of the other country differ. When participants participate in an international interaction, their view of their counterpart's country becomes much higher. Particularly striking, Chinese participants' view of the US (3.03) in the international setting is almost as high as their American partner's view of the US (3.43) in an international game. This suggests the frame of our experimental task is priming a more positive attitude towards the other country in the international treatments.

Table 6: Summary of Responses to Attitude towards Countries

International treatment	Mean	SD	Intra-national treatment	Mean	SD	p-value
Chinese						
CA, View of China (n=145)	4.87	0.41	CC, View of China (n=161)	4.82	0.50	0.442
CA, View of US (n=145)	3.03	0.85	CC, View of US (n=161)	2.65	0.98	< 0.001
American						
AC, View of China (n=158)	2.84	0.92	AA, View of China (n=163)	2.72	0.92	0.308
AC, View of US (n=158)	3.43	1.15	AA, View of US (n=163)	3.44	1.18	0.920

Note: All mean comparisons are performed via a Wilcoxon rank-sum test.

We now assess the impact conditional cooperation and group biases have on cooperative behavior via multivariate logistic regressions. Table 7 reports estimated coefficients and the marginal effects for the Chinese, American, and pooled samples. First, we find strong evidence of conditional cooperation in both national groups. The

first set of evidence is the highly significant estimated coefficients and marginal effects for the Expected cooperation of population (elicited belief) for the two groups. Further, this effect size is twice as large for the Chinese participants. Namely, a one-percent increase in one's expected cooperation results in an estimated 1.2% and 0.6% increase in cooperation for Chinese and American participants, respectively. This is confirmed by the marginally significant estimated coefficient and marginal effect size for the interaction variable Expected cooperation of population * Chinese in the pooled sample.

Result 3: (Conditional cooperation) *Conditional cooperation is a strong factor in determining the choice to cooperate. This influence is twice as strong for the Chinese compared to the Americans.*

Next, we consider the impact of group attitude on the tendency to cooperate. First, we find evidence that one's attitude towards their living country is correlated with their likelihood of cooperation. The in-group bias exercised in the international treatments is measured by the estimated coefficients for the interaction terms of International and View of Living Country. We find significantly negative impacts of this interaction term on the cooperative behaviors for both Chinese and American participants. This indicates that participants who view their country of residence more positively are less inclined to cooperate in international treatments. Out-group bias in international interactions is captured by the interaction terms of International and View of Other Country. We find participants who view the other country more positively are more inclined to cooperate in international treatments. The in-group and out-group biases are similar for both Chinese and American participants.

Result 4: (In- and out-group biases) *In the international treatments, participants who view their living country more positive are less likely to cooperate, while participants who more positively view the other country more are more likely to cooperate.*

Although females cooperate more than males, Chinese and American females behave differently in international treatments. Chinese females have highly significant positive coefficients and marginal effects in both international and intra-national

treatments. The positive effect is higher in the international treatment. American females also have highly significant positive coefficients and marginal effects in both international and intra-national treatments, but this positive effect is higher in the intra-national treatment.

Table 7: Logit Regressions for the Determinants of Cooperation

Factor	Dependent variable: Choice to cooperate (option A)					
	Chinese		Americans		Pooled	
	Coefficient	Marginal effect	Coefficient	Marginal effect	Coefficient	Marginal effect
Chinese					-1.147*	-0.279*
					(0.639)	(0.147)
International	1.855**	0.431**	0.998***	0.241****	0.269	0.067
	(0.929)	(0.189)	(0.161)	(0.038)	(0.248)	(0.062)
Female	0.279***	0.069****	0.795***	0.196****	0.494**	0.123**
	(0.051)	(0.013)	(0.029)	(0.007)	(0.220)	(0.054)
International* Female	0.694***	0.172****	-0.359**	-0.089**	0.132	0.033
	(0.020)	(0.005)	(0.144)	(0.036)	(0.273)	(0.068)
Expected cooperation of population	0.049***	0.012****	0.025***	0.006****	0.025***	0.006****
	(0.005)	(0.001)	(0.001)	(<0.001)	(0.002)	(<0.001)
Expected cooperation of population*					0.022***	0.006****
Chinese					(0.005)	(0.001)
International* View of Living Country	-0.499***	-0.124***	-0.526***	-0.129****	-0.216*	-0.054*
	(0.167)	(0.041)	(0.042)	(0.010)	(0.126)	(0.031)
International* View of Other Country	0.095**	0.024**	0.324***	0.080****	0.177	-0.044
	(0.042)	(0.011)	(0.027)	(0.007)	(0.119)	(0.030)
Control variables	Wave, Age, Economic major, Income, View to Countries					
Observations	306		321		627	

Note: *p<0.1; **p<0.05; ***p<0.01; ****p<0.001. Robust clustered standard errors are in brackets.

4. Discussion and Conclusion

Technological advances, globalization, and increasing worldwide prosperity all contribute to growing incidences of international interactions and joint participation in projects. The success of multi-person efforts often rely upon individuals' abilities to engage cooperatively without formal institutional enforcements. With China's unique culture and recent ascension to the world's second-largest economy and the United States' long-standing hegemony, there will be an ever-growing incidence of such multi-person efforts between individuals from these two cultures.

In contrast to the state of the world when Hemesath and Pomponio (1998) collected data, we now have a more competitive China-US relationship and more direct communication. This makes understanding how people in these two countries interact strategically online a pressing concern. We find Chinese are generally less cooperative than Americans, perhaps resulting from China becoming more market-oriented the last two decades. This is the reason Hemesath and Pomponio (1998) conjectured for their result that Americans were less cooperative than Chinese in their study. Furthermore, our paper considers more carefully the comparison between intra- and international cooperation and uses national attitudes as control variables.

Financially incentivized Prisoner's Dilemma Game experiments are simple and effective instruments to measure this cooperation and to study what factors influence cooperation. Our results suggest some important policy initiatives and nudges that could increase cooperation rates. First, our results surprisingly suggest that increasing female roles in intra- and international affairs should yield higher cooperation rates. Second, the high incidence of conditional cooperation suggests cooperation begets cooperation. This suggests actions like pre-play interactions or scaling up the decision sizes could be effective with only moderately bureaucratic interventions. Finally, both in- and out-group biases are significant. This suggests strengthening narrow nationalism and scapegoating other countries can harm international cooperation.

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Appendix A: Experimental Instructions

Example for AC treatment.

Welcome to today's experiment. You are about to participate in an experiment on decision-making. During this experiment, we ask you and the other participants to make decisions and to fill out a questionnaire. Your decisions in the experiment and the data from the questionnaire will be used for scientific purposes only.

Participants in this experiment are from 2 universities in different countries: Students of the University of Chapman in the United States and Wuhan University in China will play the experiment on the same day over the internet. Those who are in China will see these instructions in Mandarin. Those who are in America will see these instructions in English. And no participants at any university will see any decisions by the other participants. As an American participant, you will be paired up with an anonymous and random participant from the Chinese university.

The experiment consists of one task and a questionnaire. You will receive the earnings from the task of the experiment. You are required to finish the experiment in one hour. **If it is not completed in one hour then no money is paid.**

During the experiment, we will speak in terms of experimental tokens (€) instead of dollars. Your payoffs will be calculated in terms of tokens and then translated into dollars at the end of the experiment at the following rate:

1 experimental token (€) = 1.0 US Dollar

For your participation, we will pay you with **7 experimental tokens as a show-up fee**. You will be awarded *additional* experimental tokens based on your performance in this experiment. As you and your partner are in different time zones, we will give you the results of both of your choices following your partner's completion of this experiment tomorrow morning.

Task

In this task, you will be anonymously paired with a player from Wuhan University (China). During and after the game you will not be told with which player you have been paired and the other player will not be told that he or she has been matched with you.

In this task, both you and your partner have two choices in this game: A or B. For this game, your payoff will depend on your choice as well as your partner's choice. Both you and your partner will make your choice on the same day, meaning neither of you will find out which choice the other has made, and the game will not be repeated.

The payoff matrix corresponding to your decision and that of the other participant is as follows. In each cell, the first number (**in bold**) is your payoff, and the second number is the payoff of the other participant. That is,

If you both choose A, you will earn €8, and your partner will earn €8.

If you choose A, and your partner chooses B, you will earn €2, and your partner will earn €12.

If you choose B, and your partner chooses A, you will earn €12, and your partner will earn €2.

If you both choose B, you will earn €4, and your partner will earn €4.

		The other player from Wuhan University (China)	
		A	B
You	A	€8 , €8	€2, €12
	B	€12 , €2	€4, €4

In this task, according to the payoff matrix, what's your choice?

(a) A

(b) B

Appendix B: Post-experiment Questionnaire

Example for AC treatment.

Page 1

Recall that, the payoff matrix in the task is:

		The other player from Wuhan University (China)	
		A	B
You	A	€8, €8	€2, €12
	B	€12, €2	€4, €4

Please answer the following questions.

1. In the last task, what do you expect your partner has chosen? You will receive €0.20 for a correct result.

(a) A

(b) B

2. In the last task, guess what percentage of the players from China chose option A in today's experiment. If your guess comes as close as 10% to the actual ratio, you receive an additional €0.20.

The unit is %. Please enter an integer number (from 0 to 100). If you guess the percentage is XX%, just enter XX.

Page 2

Now, please answer the following questions.

1. What are your views on the People's Republic of China? On a scale of 1 to 5, please indicate your level of feelings.

1 = Unfavorable, 2 = a little Unfavorable, 3 = Neutral, 4 = a little favorable, 5 = Favorable:

- (a) Unfavorable
- (b) A little unfavorable
- (c) Neutral
- (d) A little favorable
- (e) Favorable

2. What are your views on the United States of America? On a scale of 1 to 5, please indicate your level of feelings.

1 = Unfavorable, 2 = a little Unfavorable, 3 = Neutral, 4 = a little favorable, 5 = Favorable:

- (a) Unfavorable
- (b) A little unfavorable
- (c) Neutral
- (d) A little favorable
- (e) Favorable

Page 3

Please answer the following questions about yourself.

1. What is your age?

2. What is your gender?

(a) Male

(b) Female

3. Which category of the following includes your major, please?

(a) Philosophy

(b) Economics

(c) Law

(d) Pedagogy

(e) Literature

(f) History

(g) Natural Science

(h) Engineering

(i) Agronomy

(j) Medicine

(k) Management

(l) Art

(m) Other (please specify) _____

4. Please tell us your ethnicity?

(a) African (*American*: 2.8%)

(b) Asian (*American: 31.7%*)

(c) European (*American: 36.4%*)

(d) Hispanic (*American: 14%*)

(e) Native (*American: 0.6%*)

(f) Other (please specify) _____

5. Have you ever been to China?

(a) Yes (*American: 14.3%*)

(a) No (*American: 85.7%*)

Page 4

The following questions concern your family.

1. How many generations has your family lived here?

(a) First Generation (*Chinese: 6.2%; American: 25.2%*)

(b) Second Generation (*Chinese: 8.8%; American: 19.3%*)

(c) More than two Generations (*Chinese: 85.0%; American: 55.5%*)

2. From which countries did your family originate?

(a) United States (*Chinese: 0.3%; American: 23.7%*)

(b) China (*Chinese: 99%; American: 7.5%*)

(c) African (*Chinese: 0%; American: 2.5%*)

(d) Asian (*Chinese: 0.7%; American: 20.9%*)

(e) European (*Chinese: 0%; American: 29.9%*)

(f) Americas (*Chinese: 0%; American: 5.6%*)

(g) Other (please specify) _____

3. Thinking about your family income, compared with other American families in general, would you say your family income was roughly:

(a) Below average (*Chinese: 34.6%; American: 12.1%*)

(b) Average (*Chinese: 58.2%; American: 37.1%*)

(c) Above average (*Chinese: 7.2%; American: 50.8%*)

Page 5

There are 12 items below. Please read each item and determine the extent to which you agree or disagree. Please select the option that fits your true opinion.

1 = Strongly disagree, 2 = disagree, 3 = In general, 4 = agree, 5 = Strongly agree

For each item, please select the option that fits your true opinion by choosing the appropriate number from numbers 1-5.

1. I think that Chinese people are strategic is a common stereotype in my society. (*Mean: Chinese: 3.42; American: 3.69*)

2. I think that Chinese people are trustworthy is a common stereotype in my society. (*Mean: Chinese: 3.29; American: 2.68*)

3. I think that Chinese people are naive is a common stereotype in my society. (*Mean: Chinese: 2.52; American: 2.34*)

4. I think that Chinese people are sneaky is a common stereotype in my society. (*Mean: Chinese: 2.52; American: 2.92*)

5. I think that Chinese people are cooperative is a common stereotype in my society.
(Mean: Chinese: 3.74; American: 3.01)

6. I think that Chinese people are competitive is a common stereotype in my society.
(Mean: Chinese: 3.19; American: 4.23)

7. I think that American people are strategic is a common stereotype in my society.
(Mean: Chinese: 3.22; American: 3.12)

8. I think that American people are trustworthy is a common stereotype in my society.
(Mean: Chinese: 2.31; American: 2.63)

9. I think that American people are naive is a common stereotype in my society. (Mean:
Chinese: 2.29; American: 3.47)

10. I think that American people are sneaky is a common stereotype in my society.
(Mean: Chinese: 3.36; American: 3.09)

11. I think that American people are cooperative is a common stereotype in my society.
(Mean: Chinese: 2.81; American: 2.74)

12. I think that American people are competitive is a common stereotype in my society.
(Mean: Chinese: 3.69; American: 4.07)

Page 6

Please answer the following questions.

1. Generally speaking, would you say that people can be trusted or that you can't be too careful in dealing with people?

(a) Always trusted (Chinese: 1.3%; American: 0.6%)

(b) Usually trusted (Chinese: 59.5%; American: 39.3%)

- (c) Neutral (*Chinese: 31.4%; American: 28.7%*)
- (d) Usually not trusted (*Chinese: 7.2%; American: 29.9%*)
- (e) Always not trusted (*Chinese: 0.7%; American: 1.6%*)

2. How trusting are you?

- (a) Always trusting (*Chinese: 2.9%; American: 5.0%*)
- (b) Usually trusting (*Chinese: 48.4%; American: 52.3%*)
- (c) Neutral (*Chinese: 40.5%; American: 18.1%*)
- (d) Usually not trusting (*Chinese: 7.2%; American: 24.6%*)
- (e) Always not trusting (*Chinese: 1.0%; American: 0%*)

3. During the Experiment you tried to:

- (a) Maximize my own payoffs (*Chinese: 52.3%; American: 40.2%*)
- (b) Maximize joint payoffs (*Chinese: 47.4%; American: 59.2%*)
- (c) Maximize player B's payoffs (*Chinese: 0.3%; American: 0.6%*)

4. During the experiment, how much did you pay attention to your partner's nationality?

- (a) Paid a lot of attention (*Chinese: 6.2%; American: 4%*)
- (b) Paid little attention (*Chinese: 38.6%; American: 31.5%*)
- (c) Paid no attention (*Chinese: 55.2%; American: 64.5%*)

Thank you!

You have finished today's experiment! As you and your partner are in different time zones, you will receive your payment 24 hours after the experiment, the amount of your payment is derived from both your and your partner's choice.

Please enter your school email, so that we can pay you the payment!

Appendix C: Two measures of expected cooperation

The gap between attitudes towards participants' living country and their counterpart's country does not impact their expectation of their counterpart's cooperation decision (expected cooperation of counterpart, abbreviated as ECC), nor the cooperation rate of their counterpart's country (expected cooperation of population, abbreviated as ECP). As shown in Table C.1, the ECP does not have a significant correlation with participants' attitudes towards their counterpart's country in all treatments. It is only related to their ECC. Note that there exists the case that their counterpart's country is the same as their living country when participants are in the CC and the AA treatments.

Table C.1: Correlation Analyses by Treatments

CC	ECP ¹⁵	ECC ¹⁶	CA	View of Counterpart's Country	ECP	ECC
View of Living/ Counterpart's Country	0.125 [0.113]	0.104 [0.189]	View of Living Country	0.035 [0.674]	0.082 [0.325]	0.077 [0.359]
ECP	-	0.614 [<0.001]	View of Counterpart's Country	-	0.080 [0.338]	0.014 [0.869]
			ECP		-	0.581 [<0.001]
AA	ECP	ECC	AC	View of Counterpart's Country	ECP	ECC
View of Living/ Counterpart's Country	0.098 [0.215]	-0.016 [0.839]	View of Living Country	0.199 [0.012]	-0.156 [0.050]	-0.073 [0.362]
ECP	-	0.168 [0.032]	View of Counterpart's Country	-	-0.003 [0.969]	-0.063 [0.429]
			ECP		-	0.269 [<0.001]

All correlation comparisons are performed via a Spearman test.

¹⁵ We use ECP to represent "expected cooperation of population" to make the table easier to read.

¹⁶ We use ECC to represent "expected cooperation of counterpart" to make the table easier to read.