Economics Department Discussion Papers Series

ISSN 1473 – 3307

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Paper number 15/05

URL: http://business-school.exeter.ac.uk/economics/papers/
URL Repec page: http://ideas.repec.org/s/exe/wpaper.html

Cultural Norms and Identity in Coordination Games

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9 April 2015

Abstract: We run experiments with a stag hunt and bargaining coordination game. Using a between-subjects design, we vary the identity of the opponent between someone of the same culture or a different culture. The idea is to see whether cultural norms or identity play a part in coordination decisions. We compare the responses of British and Asian students at the University of Exeter and show the cultural identity of the opponent by physical appearance. The players appear to use cultural stereotypes to predict behaviour, especially in the bargaining game which may require more strategic thought than the stag hunt game. In particular, the British act in way that indicates they believe the Asians will behave more cautiously than other British. According to our results, the stereotype of Asians being cautious is misleading.

Acknowledgments: We are grateful to Miguel Fonseca, Brit Grosskopf, Simon Gächter and Jürgen Eichberger for helpful suggestions and comments on this paper. We would also like to thank Iohanna Morozova and Bing Chao for assistance in running the experiments. Finally, we thank the seminar participants at the University of Exeter and the 2014 FUR conference in Rotterdam for valuable suggestions and feedback.

1. Introduction

Coordination is important for many economic decisions, such as firms deciding on output and pricing decisions without knowing the decisions of their competitors, or Governments setting trade policy without knowing the strategies of other countries. People from different backgrounds may use different heuristics when trying to coordinate with others. Knowing how culture affects the ability to coordinate will be useful for those engaging in trade or competition with people from other countries.

People from the same culture are likely to share similar norms and perhaps find it easier to predict the behaviour of their opponent, thus improving coordination. On the other hand, when playing against someone from a different culture, the players may be unfamiliar with each other's norms and need to rely on cultural stereotypes to try and predict the opponent's behaviour. We expect players to experience more ambiguity when playing against someone from a different culture and therefore choose safer strategies in coordination games.

We run two types of coordination games – a stag hunt and a bargaining game. While we do not find Asian students to differentiate very much between a British or Asian opponent, the British students tend to act very differently against an Asian opponent compared to a British opponent. In a stag hunt game, the British students tend to play the safer strategy more often against an Asian opponent, while in a bargaining game they demand more of the pie. The British seem to be basing their behaviour on a cultural stereotype that Asians are cautious. However, our results show that this stereotype is misleading.

2. Background Literature

Although cultural differences in coordination games have not yet been studied extensively, some related literature has demonstrated the importance of social norms (e.g. Singh, 2009) and group identity (e.g. Benjamin *et al*, 2010; Chen and Chen, 2011; Chen *et al*, 2010) for coordination game outcomes. As culture is one aspect of identity, we can expect a group identity to be stronger when players are from the same cultural background. Chen and Chen (2011) show that a salient group identity increases coordination on Pareto superior outcomes in the minimum effort coordination game. As Chen and Chen impose only minimal group identities in the lab[1], we can expect natural group identities such as culture to have an even stronger effect. Similarly, social norms are culture specific, and norms of sharing and cooperation within a community are likely to increase efficiency in coordination games such as the stag hunt (Singh, 2009). Finally, expectations and beliefs are also important in coordination game decisions. When playing against someone from another culture, people may find it harder to predict their opponent's behaviour and need to rely on stereotypes when forming their beliefs.

2.1 Social Norms

Singh (2009) considers how norms of trust within a society will affect behaviour in the stag hunt game. Typical payoffs for a two-player stag hunt game are illustrated below in Figure 1. The story goes as follows. Players must choose whether to hunt a stag or a hare when out hunting. Capturing a stag is more valuable than a hare but requires the help of both players. Therefore, if a player hunts a stag without the assistance of the

[1] Minimal groups are where subjects are randomly allocated to groups and given an arbitrary label such as the "blue" or "yellow" group.

other player, he will receive a payoff of zero. Capturing a hare is easier and guarantees a small but sure payoff. We assume that players are separated and cannot communicate while on the hunt, thus coordination is important for reaching an equilibrium.

Figure 1: Stag Hunt Game

		Player 2: Stag	Player 2: Hare
Player 1	Stag	2, 2	0, 1
	Hare	1, 0	1, 1

There are two pure strategy Nash equilibria in this game. The payoff dominant equilibrium is where all players help in hunting a stag and obtain maximum payoffs. However, there is also a risk dominant equilibrium, where each player guarantees him or herself a sure payoff from hunting a hare. There is also a mixed strategy equilibrium, where each player hunts stag or hare with a certain payoff-dependent probability. According to Singh (2009), people from societies with a norm of high trust are more likely to coordinate on the payoff dominant outcome, whereas people from societies with a norm of low trust will be driven towards the risk dominant equilibrium. This is because in a low trust society, people expect that the other player will be untrusting and prefer to guarantee themself a hare. Therefore, their best response is to also hunt hare to avoid ending up with nothing.

Using data from the World Values Survey, Singh (2009, p. 24) concludes that 64% of countries are characterised by low trust. In particular, countries with the lowest level of trust include African countries such as Uganda and Tanzania, whereas Scandinavian countries such as Denmark and Sweden have the highest levels of trust (Singh, 2009, p. 18). Trust is particularly important in societies that lack formal

contracts and enforcement mechanisms. In such societies, trust provides an incentive to engage in business deals as people can expect to be fairly compensated for their actions.

Singh develops a theory of how people base their expectations of others' behaviour on a sample of past interactions. A society will then converge towards either a low or high trust norm, which respectively correspond to the risk dominant and payoff dominant equilibria in the stag hunt game. We can think of the mixed strategy equilibrium as a society with a norm of medium trust. However, the medium trust society is highly unstable. As people update their expectations of others' behaviour after each interaction, a few successive positive or negative interactions could push the society towards either the high or low trust equilibrium. In such a society, monitoring and enforcement could be used to prevent convergence to the low trust equilibrium.

Singh's theory of how trust norms affect coordination in the stag hunt has not yet been empirically tested. We can expect people from collectivist cultures, such as China and India, to have norms of working together and sharing in the community, which may increase coordination on the payoff dominant outcome.

2.2 Group Identity

Identity was introduced into economic models by Akerlof and Kranton (2000), who theoretically show that people like to behave in a way that reinforces their identity. Extending this idea, Chen and Chen (2011) experimentally find that a common group identity[2] increases coordination on the payoff dominant equilibrium in a minimum effort game (Huyck *et al*, 1990), but only when the group identity is made salient. They make the group identity salient by allowing subjects to communicate in their groups

[2] Using randomly assigned minimal groups, which are labelled according to colour.

when trying to solve a task where they have to match paintings to the respective artists. If subjects help each other in the communication stage, the authors suggest they will be more likely to reciprocate when playing the minimum effort coordination game. Chen and Chen (2011) model this behaviour as an increase in the subjects' group-contingent other-regarding parameter α_i^g when the group identity is made salient. The other-regarding parameter is a weight ∈ [-1, 1] which measures how much a player cares about the payoff of their group members relative to their own payoff, as can be seen in the utility function below.

$$U_i(x) = \alpha_i^g \bar{\pi}_{-i} + (1 - \alpha_i^g)\pi_i(x)$$

Worth nothing, is that an increase in efficiency may also be driven by a shift in beliefs about the underlying probability distribution of the other players' actions, rather than an increase in altruism. Perhaps some subjects in Chen and Chen's (2011) study decided to go for the payoff dominant outcome because they believed the other players were more likely to do the same after the communication stage. Therefore, as well as a potential increase in the other-regarding parameter, the beliefs about probabilities regarding the other players' behaviour is another factor that needs to be considered in explaining Chen and Chen's (2011) results.

2.3 Expectations and Stereotypes

Expectations of other peoples' behaviour may rely on stereotypes, which do not necessarily represent the social norm[3]. For example, Fershtman and Gneezy (2001) find that men of Eastern Jewish origin (Asian or African) in Israel are discriminated against in a trust game because they have an ethnic stereotype of being untrustworthy.

[3] Stereotypes are often correlated with social norms, as people gain utility from belonging to a group and thus often prefer to conform to group stereotypes in order to reinforce their group membership (Geisinger, 2004; Shih *et al*, 1999).

However, the stereotype was found to be unjustified in the trust game as Eastern Jewish participants did not send back significantly lower amounts than men of European or American Jewish origin. They also find men of Eastern Jewish origin to be allocated more money in an ultimatum game because they have a stereotype of reacting harshly to unfairness. Again, this stereotype was unfounded in actual rejection rates.

Similarly, Hsee and Weber (1999) find predictions of risk aversion in Chinese and American subjects to be in contrast to actual behaviour. Subjects apparently rely on a misleading cultural stereotype that Americans are more risk seeking than Chinese, probably because Americans are portrayed as risk seeking in movies. In fact, the results show the opposite – Chinese are more risk seeking than Americans in financial lottery choice tasks when asked to choose between a certain outcome and a gamble. However, the predictions of subjects in Hsee and Weber's (1999) experiment are not made salient by paying subjects for correct predictions.

Participants in Hsee and Weber's (1999) study apparently rely even more on the misleading stereotype when trying to predict behaviour of those from a different culture. The Chinese participants expected Americans to be even more risk seeking than the American participants expected of each other. Similarly, the American participants expected the Chinese to be even more cautious than the Chinese expected of other Chinese. When trying to predict behaviour of people in other countries, participants have less scope to base their prediction on people they know, and thus rely more on stereotypes. This suggests that people will likely face more ambiguity when interacting with those from another culture.

2.4 Ambiguity and Coordination Games

Ambiguity refers to a situation where the relevant probabilities are unknown and cannot be estimated to a reasonable degree. Eichberger *et al* (2008) show that the identity of the opponent matters for ambiguity, with subjects experiencing more ambiguity when playing strategic games against a granny than a game theorist. Most students reported that the game theorist's behaviour was easier to guess than the granny and that they would prefer to play against the game theorist. As such, the students chose more ambiguity-averse strategies against the granny than the game theorist. As people are less familiar with the social norms of other cultures, perhaps they will experience more ambiguity when playing strategic games and therefore choose safer strategies.

A high degree of ambiguity can hinder coordination on the payoff dominant outcome in many coordination games. Eichberger and Kelsey (2002) consider a bargaining game where players can make claims on a total payoff, say 4, but if the claims exceed 4, everyone receives 0. As the players are not allowed to communicate, the game can be interpreted as a coordination game. Any outcome that exhausts the available surplus is a Nash equilibrium. However, with sufficient ambiguity, subjects will prefer to claim lower amounts, leading to inefficient outcomes. The two-player version of this bargaining game where players can claim 1, 2, or 3 is illustrated below in Figure 2.

Figure 2: Bargaining Coordination Game

		Player 2		
		3	2	1
Player 1	3	0 , 0	0 , 0	3, 1
	2	0 , 0	2, 2	2, 1
	1	1, 3	1, 2	1, 1

As people are likely to experience a higher degree of ambiguity when playing against someone from another culture, we can expect such games to result in inefficient equilibria. However, social norms may also govern behaviour. For example, people from societies where fairness or equality is highly valued may select the efficient equilibrium of (2, 2) as a focal point. Similarly, those from trusting cultures may find it easier to coordinate on an efficient outcome, as in the stag hunt game discussed above. In contrast, those from low trust cultures may be driven towards inefficient outcomes such as (1, 1). To allow ambiguity and social norms to have maximum effect, we need to remove any obvious focal points when testing this game experimentally.

2.5 Previous Experimental Results

le Roux and Kelsey (2014) compare the level of ambiguity when playing against a local or a foreign opponent in coordination games with multiple equilibria. Their subject pool consists of students at the University of Exeter in the UK and St. Stephen's College in New Delhi, India. They firstly run the experiment in India and then match the students in Exeter with both another Exeter student and a foreign opponent from the Indian sample. Students in the Exeter experiment are explicitly told that they are playing against students in India and are given some background information on the Indian students, e.g. that they are studying at a prestigious institution.

le Roux and Kelsey (2014) find no difference in the level of ambiguity when playing a local or foreign opponent. They offer the following reasons for this. Firstly, part of the experiment uses a within-subjects design where players face both a local and foreign opponent. Subjects may have simply wanted to appear consistent in their choices against different opponents. In addition, some students were worried about appearing racist if they change their behaviour towards the foreign opponents. We can

get around this first point by using a between-subjects design so that students are faced with *either* an opponent from their own culture or a different culture, but not both.

However, le Roux and Kelsey (2014) also point out that subjects may have found it easy to conceptualise the foreign students and thought they were the same as any other students due to increasing globalisation. As universities in the UK have become very international, students are used to mingling with people from many different cultures and probably see more similarities than differences with their fellow students. This point is difficult to control for and can only be dealt with by extending the sample to non-students who perhaps have less interaction with others from abroad. Such an extension is a promising avenue for future work.

3. Experimental Design

We want to test whether players from the same cultural background will coordinate better when playing strategic games, such as a stag hunt and a bargaining game. As the probabilities of the opponent's decision are unknown in these games, the decision environment is one of ambiguity rather than risk. Players should experience more ambiguity when playing against someone from a different culture as they are less familiar with the social norms of that culture. As such, we predict that players from different cultures will prefer safer strategies and therefore choose less efficient outcomes in coordination games.

We run a between-subjects design where players face either someone from their own culture or a different culture, but not both. This is to remove the confound of subjects wanting to appear consistent against different opponents, as noted by le Roux and Kelsey (2014). All subjects play a one-shot stag hunt game and/or a one-shot

bargaining game. The reason we choose one-shot games is to make the decisions highly salient for the participants. Repeated versions of the games would only be interesting if we revealed the opponent's choice after each round to allow for learning. However, we did not want to reveal payoffs until the end of the experiment to avoid wealth effects. Therefore, both the stag hunt and bargaining game only contain one round each in this experiment.

We recruit East Asian and British students to the Finance and Economics Experimental Laboratory (FEELE) at the University of Exeter in November 2012 and March 2013. Using ORSEE (Greiner, 2004), we recruit subjects based on surnames, with a mixture of East Asian and English surnames invited to sessions[4]. In the November 2012 sessions, all subjects play both a stag hunt and bargaining game, while in the March 2013 sessions the two games are played in separate sessions by different subjects. This is to avoid subjects using the two games played together to hedge risk, which may confound our results.

We run three different treatments, which are summarised below:

Treatment One: The opponent is from the same culture, which is achieved by inviting either all Asian or all British participants to sessions.

Treatment Two: The opponent is from a different culture. Here, we invite a mixture of Asian and British participants and match them against each other.

[4] We verify that all of the participants with East Asian surnames are East Asian by checking their responses to a follow-up questionnaire, and do the same for participants with English surnames. A small number of participants with English surnames come from other individualistic English-speaking countries such as Australia and the United States. All of the participants with East Asian surnames are in fact from East Asian backgrounds. For brevity, East Asians will henceforth be referred to as Asians.

Treatment Three: This is a control treatment, where a mixture of Asian and British participants are invited, but opponent matching is random. The purpose of the control treatment is to use as a benchmark to compare the other treatments to. However, we dropped the control session in the March 2013 sessions as little could be gleaned from the November 2012 results.

Figure 3 shows the number of participants per treatment in each experiment.

Figure 3: Number of Participants per Treatment

November 2012	Asian	British
Treatment One: Same Culture	16	16
Treatment Two: Different Culture	16	16
Treatment Three: Random Opponent Matching	8	8
March 2013		
Treatment One: Same Culture	32	28
Treatment Two: Different Culture	32	32

The main reasons for choosing East Asians and British are that the two cultures have very different social norms and that they have obvious differences in physical appearance. To avoid experimenter demand[5] effects, we use physical appearance to subtly show the cultural identity of the subjects. This is achieved by telling subjects they will be randomly matched with another player who is seated on the other side of the room. However, to preserve anonymity we do not reveal who on the other side of the room they are matched with.

[5] Brislin and Lonner (1973, p. 70) note that experimenter demand effects, or "courtesy bias", are particularly prevalent in Eastern cultures, where participants like to please the experimenter.

Therefore, in the Asian-only and British-only sessions, the subjects are matched with someone from their own culture. In the different-culture treatments, Asians are seated on one side of the room and British on the other so that subjects are matched with someone from a different culture[6]. In the control treatment, seating is randomised. Given the large number of Asian students studying at the university, we do not believe that having only Asian students on one side of the room will feel unusual for the subjects. However, we test for experimenter demand effects by asking subjects what they thought the experiment was about in a follow-up questionnaire, in the spirit of Benjamin *et al* (2010).

The experiment consists of four stages which are each explained in detail below: priming, stag hunt game, bargaining game, and follow-up questionnaire. All of the stages are run on computer terminals using z-Tree (Fischbacher, 2007). Full instructions for the experiment are available in Appendix Four. Participants are given each set of instructions separately for each stage of the experiment.

3.1 Priming

Players are primed before taking part in the games, in order to make their cultural identities salient. We use a questionnaire to subtly get participants thinking about their own culture (Shih *et al*, 1999). This type of priming avoids inducing any particular stereotype which may affect behaviour. For example, showing American subjects the Statue of Liberty may induce a feeling of freedom. Inducing stereotypes is dangerous as stereotypes can sometimes be misleading (Hsee and Weber, 1999). Instead, by completing a questionnaire, subjects think about the people they know and

[6] We run two sessions here to swap which side of the room the Asians and British are seated on, in case this has any effect on their behaviour. There are no significant differences in behaviour between these sessions.

social norms of their culture rather than stereotypes. The questions we use in the priming stage are intended to get participants thinking of their friends and family back home, and are as follows:

What year of study are you in at Exeter?

How many full years have you lived in the UK?

How often do you talk to people from your home country here in Exeter?

Do you live with your family during term time?

If you answered "no" above, how many trips do you make to visit your family each year?

3.2 Stag Hunt Game

The first coordination game faced by the subjects is a simple 2-player stag hunt game, illustrated below in Figure 4. Players have two strategies to choose from, which we label as "1" and "2". We try to keep the labels neutral, rather than calling the strategies "hunt hare" or "hunt stag". This is because the descriptive labels may be interpreted in a very different way by people from different cultures. The payoffs in Figure 4 are given in Experimental Currency Units (ECU), which are converted into pounds after the experiment at an exchange rate of 1 ECU = £0.10.

Figure 4: Stag Hunt Game

		Other Player's Choice	
		2	**1**
Your Choice	**2**	60, 60	0, 40
	1	40, 0	40, 40

3.3 Bargaining Game

The bargaining game involves a surplus of 40 ECU to be shared between each pair of subjects. However, each participant must decide how much of the 40 ECU to demand for themselves before knowing the decision of their opponent. If the total demands exceed 40, both players receive zero. If the total demands are less than or equal to 40, each player receives the amount they demanded. However, participants have only four options in the amount they demand, and there is no obvious focal point. This means that social norms become important in trying to determine what the opponent will choose. The game is illustrated below in Figure 5.

Figure 5: Bargaining Game

		Other Player's Choice			
		30	**25**	**15**	**10**
Your Choice	**30**	0, 0	0, 0	0, 0	30, 10
	25	0, 0	0, 0	25, 15	25, 10
	15	0, 0	15, 25	15, 15	15, 10
	10	10, 30	10, 25	10, 15	10, 10

3.4 Follow-up Questionnaire

Once the bargaining game is complete, the participants are shown the decisions of their opponents in each game and their total payoff from the experiment. After payoffs are revealed, the experiment is concluded with a demographic questionnaire, to control for other factors that could be driving behaviour. The questionnaire includes a few questions about cultural background to verify where the participants were born and raised. We also ask subjects for their predictions about their opponent's behaviour

when playing each game. This is to see whether there is a difference in expectations when playing someone from another culture. The entire set of questions in the follow-up questionnaire can be found in Appendix Four.

4. Results

4.1 Stag Hunt Game

Surprisingly, in the November 2012 experiments, the participants choose stag more frequently when the other player is from a different culture, as can be seen below in Figures 6 and 7. However, the differences between treatments are not statistically significant (p = 0.472 for Asians and p = 0.272 for British)[7]. Results from the mixed culture treatment, with random opponent matching, lie in between the other two treatments. Also of interest, expectations of the other player choosing stag increase dramatically when both cultures are in the room (50% of people expecting the other to choose stag compared to 80% of people). These results hold for both cultures with no apparent cultural difference in behaviour.

We can speculate as to why we obtained these results. Firstly, perhaps having cultural diversity inspired them to take a risk. This is in contrast to some previous literature, which suggests that risk-taking should be lower among a culturally diverse group (Watson and Kumar, 1992). However, in Watson and Kumar's paper the decision making was done in groups rather than privately. Also, the culturally homogeneous groups consisted of white Americans, who may come from very different backgrounds with their own sub-cultures. In addition, the white Americans may have been behaving

[7] Throughout this paper, we use a Mann-Whitney *U*-test to determine whether the samples are statistically different.

according to their stereotype of being risk takers (Hsee and Weber, 1999) simply to reinforce their group membership (Geisinger, 2004; Shih *et al*, 1999).

Figure 6: Proportion of British and Asian students choosing stag or hare when faced with an opponent from the same culture

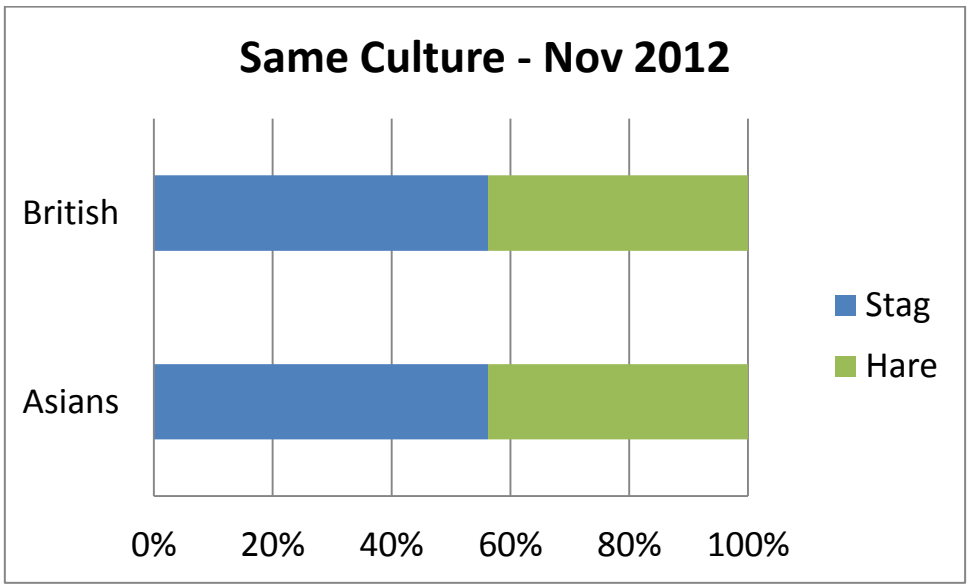
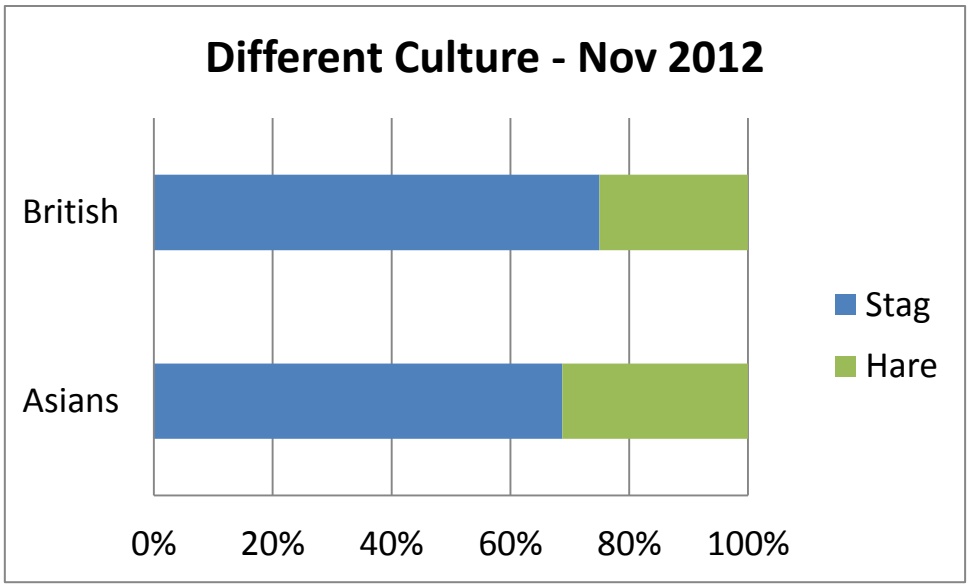


Figure 7: Proportion of British and Asian students choosing stag or hare when faced with an opponent from a different culture



Another reason for our results could be that the participants thought for longer when faced with an opponent from another culture. In contrast, when faced by someone from their own culture, the thinking may have been more automatic and they went for the option that first came to mind. However, it is unclear which option should be the first to come to mind. Also, we checked the response times from the z-Tree output and there are no significant differences in average response times between the mixed and same culture treatments.

Finally, the participants may have simply been too scared to rip someone off from another culture as they were unsure of the other player's reaction. However, given that players were anonymously matched and there were no opportunities for retribution, this does not seem a likely reason. Interestingly, the players coordinated quite well, with both cultures more willing to hunt stag when playing someone from another culture. This led to overall higher payoffs than in the same culture treatments.

One potential confound with the November 2012 experiments is that more Asians are studying business or economics compared to the British. All of the Asians are taking a business or economics major, expect for one Asian student who is studying law. This compares with only 16 of the 40 British students, who are majoring in business or economics (40%). Therefore, we may be picking up more of a subject-major difference than a cultural difference.

On average, business majors are more likely to choose the safe option in the stag hunt game, but demand more of the pie in the bargaining game. However, in the case of the bargaining game, the difference is entirely driven by the Asian business majors, with British business majors demanding slightly less than the non-business majors. The high

numbers of Asian business majors compared to the British is one reason we decide to run another round of experiments in March 2013.

Another reason we choose to run another round of experiments is that some subjects appear to use the two games to hedge risk. For example, one subject mentioned in their follow-up questionnaire that "*I'd taken a risk in Game One so in Game Two I played it more safe.*" On average, those who choose the payoff dominant option in the stag hunt do demand less of the pie in the bargaining game. There also appears to be a cultural difference in hedging risk with British switching from risky to safe strategies more than Asians. Perhaps there is a cultural difference in the interpretation of the games, with British treating the two games as one large game and the Asians considering the two games in isolation. To investigate further, we run another round of experiments where the two games are played separately.

The results from the March 2013 stag hunt experiments are reported below in Figures 8 and 9. Here we not only see a difference between the same culture and mixed culture treatments, but we find a striking cultural difference in behaviour. When the British students are faced with an Asian opponent, they are less likely to go for the payoff dominant outcome than when faced with a British opponent (p = 0.079 using a Mann-Whitney U-test). However, the Asian students are no less likely to choose the payoff dominant outcome when faced with a British opponent compared to an Asian opponent. In fact, the proportion of Asians choosing each option is exactly the same in each treatment.

We also check the expectations data from our follow-up questionnaire. While the Asian students do not differentiate between the same culture and mixed culture treatments, the British students are less likely to expect Asian students to choose the

payoff dominant outcome compared to other British. This result is in contrast to the November 2012 experiments, where expectations of the other player choosing stag went up dramatically with both cultures in the room.

Figure 8: Proportion of British and Asian students choosing stag or hare when faced with an opponent from the same culture

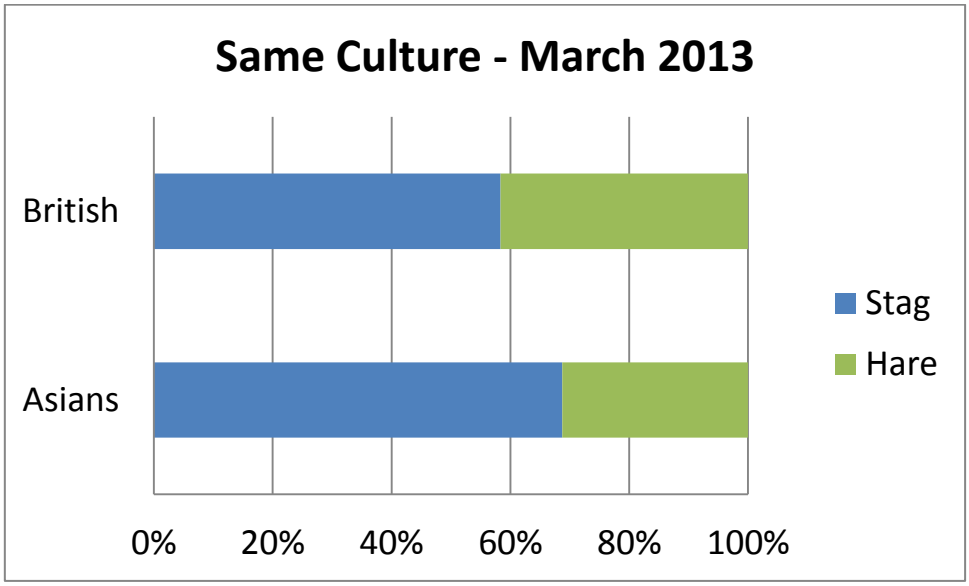
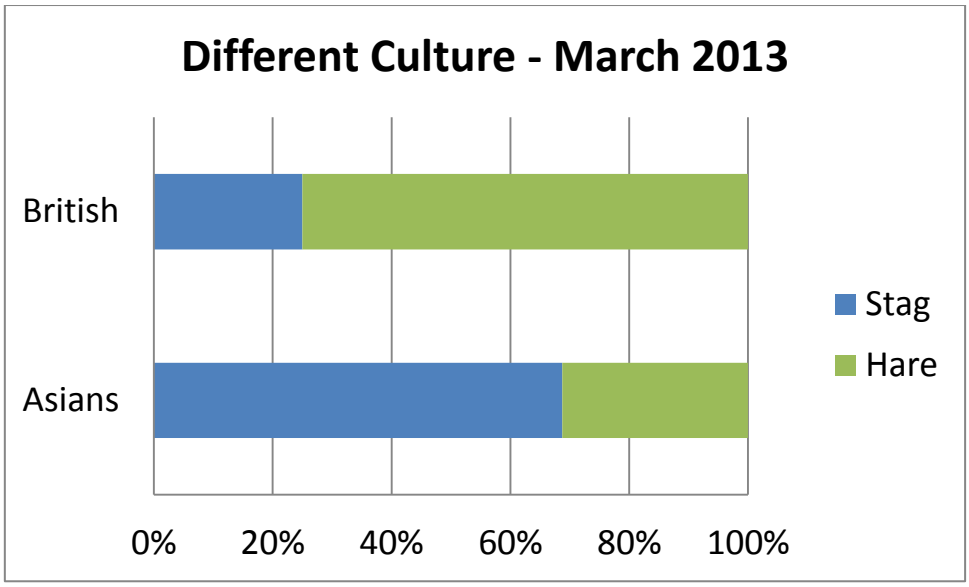


Figure 9: Proportion of British and Asian students choosing stag or hare when faced with an opponent from a different culture



The only obvious difference to the participants between the November and March experiments would have been that the March experiments were booked in for a shorter length of time. Perhaps the students were more careful of their choices in the March experiments as they figured they would have fewer opportunities to earn money during the experiment.

We also need to consider other demographic variables that could be driving the results. Firstly, more British business school students were invited to the March sessions to balance the high number of Asian business school students. Therefore the British students in March may have acted differently to the British students in November simply because they are business students. On the other hand, the Asian students, who are almost all business majors, behave similarly across sessions. The March results are possibly more reliable due to the similar numbers of business majors across cultures.

Secondly, we invited a similar number of males and females of each culture to each session to try and minimise gender effects. Our results show that males are more likely to go for the safe option in the stag hunt but demand more of the pie in the bargaining game. However, the gender differences do not appear to interact with culture and are therefore not a major confound to our results.

4.2 Bargaining Game

In the November 2012 experiments, we find a contrasting result between the stag hunt and bargaining game. The results are presented below in Figures 10 and 11. While in the stag hunt players are more likely to take a risk when both cultures are in the room, in the bargaining game players tend to be more cautious when faced with an

Figure 10: Proportion of British and Asian students choosing each bargaining game option when faced with an opponent from the same culture

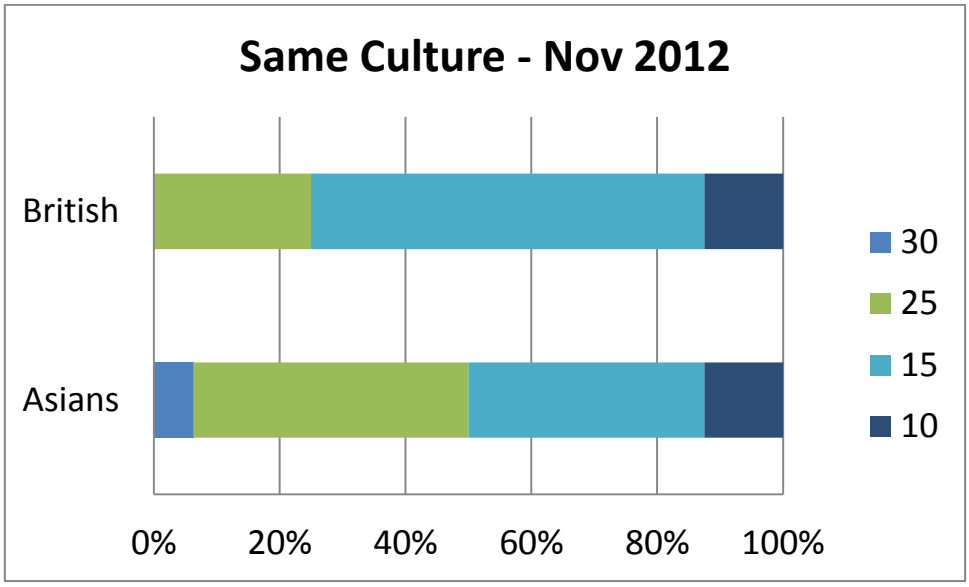
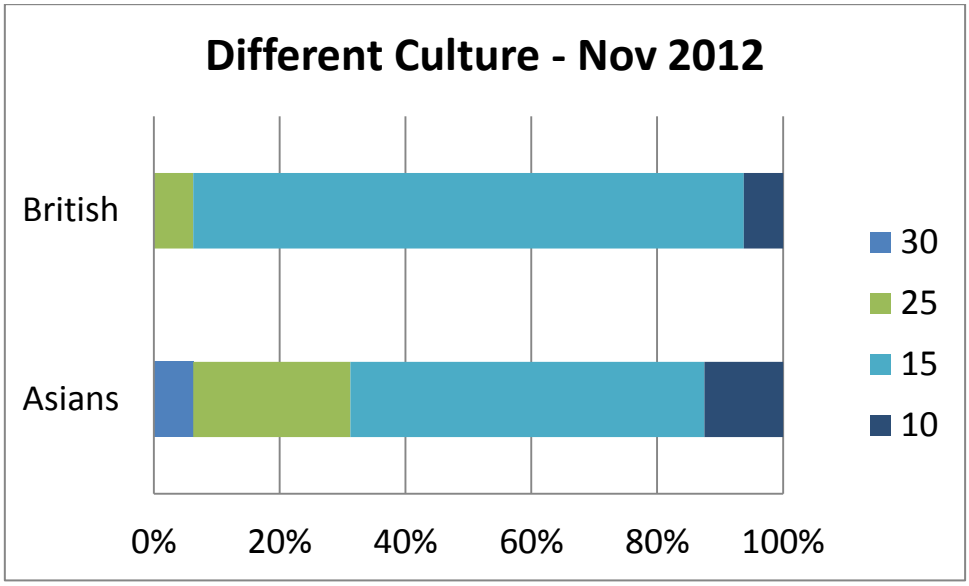


Figure 11: Proportion of British and Asian students choosing each bargaining game option when faced with an opponent from a different culture



opponent from a different culture. This result is in-line with our hypothesis that people experience more ambiguity when interacting with someone from another culture and as such should choose safer strategies. In the different-culture treatments, both groups

demand less of the pie than in the same-culture treatments, but the results are not significant (p = 0.427 for Asians and p = 0.456 for British). Again, the results from the mixed culture treatment represent an intermediate case, between the other two treatments.

Similarly to the stag hunt results from March 2013, we also obtain a cultural difference in the bargaining game. The results are presented below in Figures 12 and 13. Asians demand slightly less of the pie when faced with a British opponent compared to the all-Asian treatment, although this difference is not significant (p = 0.389). On the other hand, British demand *more* when faced with an Asian opponent compared to the all-British treatment, which is a significant result (p = 0.010). This is in contrast to the November 2012 results, where both cultures demand less of the pie when faced with a foreign opponent. The British also contrast the theoretical prediction that people will choose safer options when faced with an opponent from a different culture. However, the coordination works well, with the British demanding more and Asians demanding less when faced with an opponent from a different culture.

The cultural difference in the March bargaining game could be driven by social norms. Perhaps the Asian students feel the need to be more polite towards the British students than the other Asian students, as they consider themselves guests in the UK. The British students may expect Asians to be polite towards them, based on their personal experiences, and therefore expect to be able to claim more of the pie. Indeed, according to our expectations data from the follow-up questionnaire, the British students expect Asian students to claim less of the pie than other British students.

Figure 12: Proportion of British and Asian students choosing each bargaining game option when faced with an opponent from the same culture

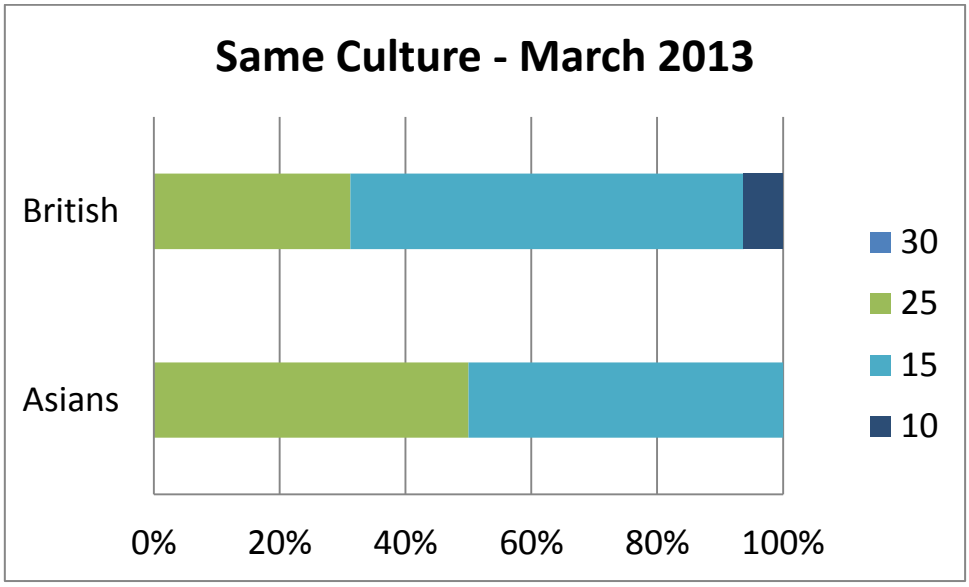
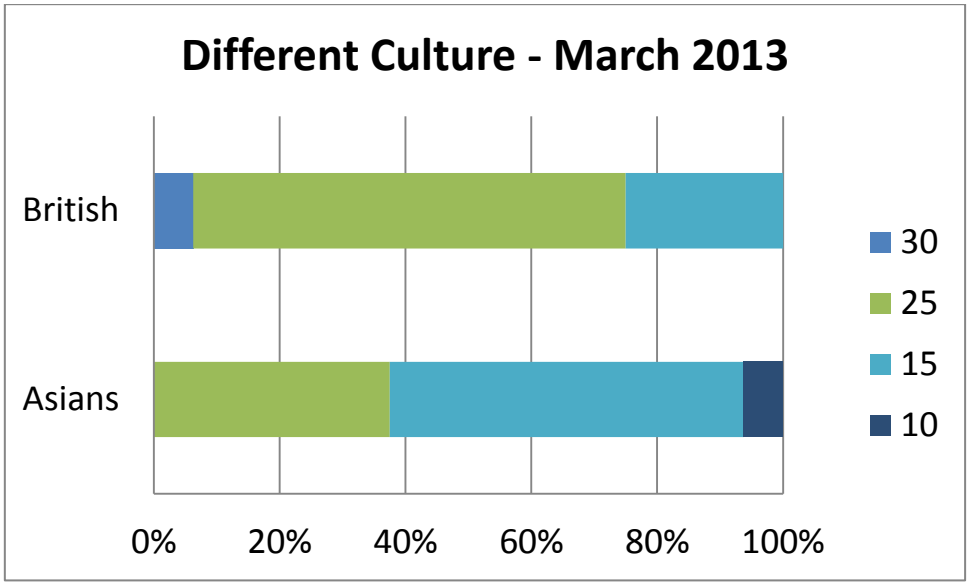


Figure 13: Proportion of British and Asian students choosing each bargaining game option when faced with an opponent from a different culture



5. Discussion

Why, then, do the Asians differentiate based on the identity of the opponent in the bargaining game but not the stag hunt? The stag hunt game is more straightforward

and has an obvious focal point of both going for the payoff dominant outcome. Perhaps the Asians thought this choice was obvious regardless of the opponent, whereas the bargaining game requires more thought. However, we cannot glean any evidence of longer response time in the bargaining game compared to the stag hunt in our z-Tree output. Similarly, Asians may interpret the two games in different ways, with the stag hunt being focused on efficiency while the bargaining game is about fairness. Identity may then play a greater role when making decisions about fairness as opposed to efficiency. We now turn to consider both social preferences and expectations of the opponent's behaviour as potential explanations for our results.

5.1 Stereotypes

In March 2013, the British appear to be more careful in the stag hunt but more risk taking in the bargaining game, when faced with a foreign opponent. While this behaviour may seem odd, we can make sense of this by thinking about stereotypes. The British may expect Asians to choose the safer options in both games, which would mean that the British should also play it safe in the stag hunt but take a risk in the bargaining game. When looking at the expectations data, Asian participants do not show much difference between treatments. However, the British expect the Asians to demand much less of the pie than other British. The British also expect Asians to be more likely to choose the safe option in the stag hunt compared to other British.

According to the follow-up questionnaires, a few people in the March experiments had an inkling that the experiment was about ethnicity. For example, when asked for aspects of the opponent's identity they considered in making their decision, one participant commented "*Their gender, their race/ethnicity, their nationality.*" Although only a few people (four in total) guessed that the experiment was about

ethnicity, others may have subconsciously picked up on cultural stereotypes. This is especially true given our priming questionnaire at the beginning of the experiment. While the questionnaire was intended to induce social norms, rather than stereotypes, there is a possibility that the questionnaire heightened students' susceptibility to stereotypes. A good robustness check for this result would be to run sessions where a different aspect of identity is primed and then match people with an opponent of the corresponding identity. For example, people may expect females to be more cautious and finance majors to be more risk seeking due to the stereotypes.

The most likely explanation for the March 2013 results seems to be that the British students expected the Asians to behave cautiously in both games. In other words, British students expected that Asian students would take the safe option in the stag hunt and demand less of the pie in the bargaining game. Is this stereotype true? To investigate this, we restrict ourselves to the same culture treatments, where the decisions are less complicated by trying to figure out the cultural norms of the opponents.

When looking at the same culture treatments, Asians are more likely to hunt stag than British and also demand more of the pie in the bargaining game. This means that a stereotype of Asians being cautious is not only misleading, but has real effects on behaviour. Even the Asian students appear to be affected by their stereotype in the bargaining game, where they demand less of the pie against British students than in the same culture treatment. Asian students may lower their demands against the British students because they expect the British students to demand more, based on the stereotype that Asians are cautious. These results are in-line with Hsee and Weber's

(1999) study that finds Chinese to be more risk seeking than Americans, even though both groups predicted the opposite.

5.2 Norms vs. Identity

We can now consider whether cultural norms or the opponent's identity had the greatest influence on behaviour. As we observe a difference in behaviour between British and Asians in many of the same culture treatments, we can speculate that cultural norms play a part in the decision making process. However, the difference in behaviour between the same culture and different culture treatments shows that identity also comes into play. Chuah *et al* (2007) also find cultural differences both when interacting within national groups and with those from another group, when looking at ultimatum game responses of Malaysian Chinese and UK subjects. This suggests that both cultural norms and the opponent's identity play a part in interactive decision making.

5.3 Efficiency

We can also consider whether playing someone from a different culture improves or hinders efficiency. Across all sessions and games, the payments are higher in the same culture treatments than the different culture treatments. However, for the bargaining game we notice fairly good coordination between Asians and British in the different culture treatments in March 2013. British increase their demands when facing an Asian opponent compared to another British opponent, while Asians lower their demands against the British. The players seem to be using cultural stereotypes to predict each other's behaviour and choose their action accordingly. Interestingly,

players perform better by behaving according to the stereotype, even if the stereotype is untrue.

On the other hand, coordination is hindered in the different culture treatments for the March stag hunt game. While Asians tend to go for the payoff dominant choice, British get the wrong impression by believing Asians will be cautious and choose the certain outcome. Therefore, British tend to choose the certain outcome, based on a misleading stereotype, when they could do better by choosing the payoff dominant outcome. Therefore, stereotypes may sometimes be a useful guide to behaviour when there is little else to base decisions on, but can also harm efficiency if the opponents do not behave according to their stereotypes.

5.4 Social Preferences

While we have considered expectations of the opponent's behaviour based on their identity, we have yet to mention how social preferences may differ by culture. Perhaps the players care more about each other's payoffs when they are from the same culture. Chen and Chen (2011) consider an other-regarding parameter that increases when players share a common group identity. While Chen and Chen (2011) find an improvement in coordination when players share a group identity, it is unclear whether this is because they care more about each other's payoff, or because they believe the other player is more likely to choose the payoff dominant outcome when they come from the same group. Reciprocity is likely to feature in Chen and Chen's (2011) experiment as the participants helped each other in a task before taking part in the game. Therefore, expectations of reciprocity may have improved the coordination, rather than altruistic feelings towards those from the same group.

Separating beliefs from social preferences is also difficult in our experiment. However, when reading through responses to our follow-up questionnaire, the players appear to be trying to maximise their own payoff, with little regard for the other player. For example, many players mention something along the lines of "*I wanted to guarantee a payment regardless of the other player*", when asked "*how did you decide what option to choose?*"

Worth noting, is that motivations for behaviour are likely to be different in the stag hunt than the bargaining game. The stag hunt is a game of cooperation while the bargaining game is one of competition. In the stag hunt, the option that maximises the player's payoff also maximises the opponent's payoff. Therefore, decisions are more likely to be driven by expectations of the other's behaviour than social preferences. In contrast, the bargaining game introduces a conflict between the player's payoff and the opponent's payoff. Here social preferences are more likely to play a role, as the player must decide how much they care about their own payoff relative to the opponent's payoff.

Cultural differences in the way in-groups and out-groups are formed and defined may also impact the level of altruism players feel towards each other. Forming a group takes longer in collectivist cultures as bonding is necessary, whereas individualists have many superficial interactions and perhaps in-groups are formed more readily (Triandis, 1989). This means that students from collectivist cultures, such as many Asian countries, may perceive all others as out-groups as their in-groups only include close friends and family and are not extended to nationality. For this reason, the students from collectivist cultures could be less susceptible to group identity effects. This is a

research question for the future, along with experiments to isolate the effects of altruism versus expectations of the opponent's behaviour.

5.5 Design Limitations

Another possibility is that participants did not consider the cultural identity of their opponent in decision making and treated the opponent simply as "another student". In Eichberger *et al's* (2008) experiment, the subjects are given descriptions of the granny and game theorist, which make them more believable and easier to imagine. Perhaps having students of a different culture on the other side of the room was not enough to distinguish a cultural identity. However, le Roux and Kelsey (2014) give their subjects background information about the Indian students but still find no difference in the level of ambiguity against a foreign or home opponent. Eichberger *et al* (2008) find that other students are also a source of ambiguity, with other students being perceived as more ambiguous than the game theorist and just as ambiguous as the granny. An interesting idea for future research would be to combine the cultural identity of the opponent with further information, such as "the opponent is studying game theory" to see how the two components of identity interact.

As part of the follow-up questionnaire we ask participants whether they considered the identity of their opponent when making their decision. Asians are slightly more likely to answer this question with "yes" but there appears to be some misunderstanding about what the question was asking. For example, when asked what aspects of the opponent's identity they considered, several students talk about mutual benefit or what choice they thought the opponent would take. According to our questionnaire responses, identity is actually considered more in the same-culture

treatments than the different-culture treatments. However, very few students mention culture as an aspect of identity they considered.

We also need to consider whether our priming questionnaire had a differential impact on British students compared to Asian students. The questionnaire probably felt quite normal for international students, with questions about how long you have lived in the UK and how often you speak to people from your home country. However, this questionnaire may have felt quite strange, or had little or no impact, for the British students. In addition, the questionnaire may have primed aspects of identity other than culture, such as a sense of family. Priming a sense of family could change the mood of Asian students in a different way to British students. For example, Asian students may feel sad when family is primed as they are probably very far away from their families, while British students are a lot closer.

These concerns highlight a key problem with our data, sample bias. The sample bias comes from comparing the behaviour of home students with international students, who may be inherently different in personality. Our results may be driven by differences between home and international students, rather than cultural differences. There are several ways to get around the problem of sample bias. Firstly, we could run the same experiment in an Asian country such as China, where the roles are reserved and compare the results to the British experiment. Secondly, we could run the experiment between two countries, where the British home students face Chinese home students.

However, one problem with these two methods is that the players would face different levels of background risk[8] in each country, making the samples not entirely comparable. A preferred method may be to run the experiment between two cultures that are native to a particular country, thus facing the same level of background risk. For example, the Aboriginal Australians or Maori of New Zealand have distinct cultural identities but share their environment with Europeans. Running experiments in these cultures will be the next step in understanding cultural differences under uncertainty.

6. Conclusions

We expected that players would experience more ambiguity when faced with an opponent from a different culture and therefore choose safer options in coordination games. This is because players should find it harder to predict each other's behaviour when they do not share similar social norms. We find contrasting results between two rounds of experiments run in November 2012 and March 2013. The March 2013 experiments are possibly more reliable as we have similar numbers of business school students in each cultural group, thus removing the confound of more Asian business school majors than British.

In November, cultural diversity appeared to improve coordination on the payoff dominant stag hunt outcome. However, in March the British students tended to go for the safe, risk dominant, outcome against the Asians, even though most Asians still tried to achieve the payoff dominant outcome. In the November bargaining games, students from both cultures lowered their demands of the pie when matched with someone from a different culture. On the other hand, in March the British students increased their

[8] Background risk is where subjects are affected by risky situations outside the laboratory (Harrison *et al*, 2007), such as weather conditions, violence, and corruption (Harrison *et al*, 2009, p. 100).

demands against the Asians while Asians lowered their demands against the British. One likely reason for this is a cultural stereotype of Asians being cautious. Based on our results, this stereotype was proven to be misleading.

Appendix One: Experiment Instructions

Instructions

You are about to take part in an experiment. Your payoff from this experiment will depend on the decisions you make during the experiment. Therefore it is important that you carefully read and understand these instructions.

Please do not communicate with the other participants at any stage during the experiment. If you have a question, please raise your hand and the experimenter will assist you.

Your earnings from the experiment will be in Experimental Currency Units (ECU). Each ECU is worth £0.10. After the experiment, your earnings will be converted into pounds, and you will be paid anonymously in cash before you leave the room. You will also receive a £5 show-up fee, in addition to any money earned during the experiment.

The experiment will start with a questionnaire which will shortly appear on the computer screen. Please complete the questions and then click the "OK" button at the bottom of the screen.

After everyone has completed the questionnaire, instructions will be handed out for the next stage of the experiment.

In the next stage of the experiment, you will play the game described below. You will be randomly matched with another player who is sitting on the other side of the room to you.

Game One

Game One consists of a choice between 1 and 2. Your payoff depends on both your own choice and the choice of the player you are matched with, who is sitting on the other side of the room.

The payoff table for this game is illustrated below. The numbers in the table correspond to your payoffs in ECU, for every possible combination of choices by you and the other player. The first number in each cell is your payoff and the second number is the other player's payoff.

If both you and the other player choose 2, you each receive a payoff of 60 ECU. If both players choose 1, you each receive a payoff of 40. If one player chooses 2 while the other chooses 1, the player choosing 2 receives 0 while the player choosing 1 receives 40.

Please input your choice of 1 or 2 into the computer when asked to do so. You will not know the choice of the other player until after you have made a decision.

If you have a question, please raise your hand and the experimenter will assist you.

		Other Player's Choice	
		2	**1**
Your Choice	**2**	60, 60	0, 40
	1	40, 0	40, 40

In the next stage of the experiment, you will play the game described below. You will be randomly matched with another player who is sitting on the other side of the room to you. The person you are matched with in Game Two will not necessarily be the same person you were matched with in Game One.

Game Two

In Game Two, you and another player are allocated 40 ECU to share between you. You need to decide how much of the 40 ECU you will demand for yourself and the other player will do the same. If the total demands from you and the other player exceed 40 ECU, you will both receive 0. If the total demands are less than or equal to 40, each of you will receive the amount you demanded.

The payoff table for this game is illustrated below. The numbers in the table correspond to your payoffs in ECU, for every possible combination of choices by you and the other player. The first number in each cell is your payoff and the second number is the other player's payoff.

As an example, if you choose 25 and the other player chooses 15, the total demands are 40. In this case, you will receive 25 and the other player will receive 15. However if you choose 25 and the other player also chooses 25, the total demands are 50. In this case, you will both receive 0.

As another example, if you choose 10 and the other player chooses 15, the total demands are 25, which is less than 40. In this case, you will receive 10 and the other player will receive 15.

Please input your choice of 10, 15, 25, or 30 into the computer when asked to do so. You will not know the choice of the other player until after you have made a decision.

If you have a question, please raise your hand and the experimenter will assist you.

Other Player's Choice

Your Choice	**30**	**25**	**15**	**10**
30	0, 0	0, 0	0, 0	30, 10
25	0, 0	0, 0	25, 15	25, 10
15	0, 0	15, 25	15, 15	15, 10
10	10, 30	10, 25	10, 15	10, 10

Appendix Two: Follow-up Questionnaire

Please answer the following questions and click the "OK" button when complete.

In Game One, how did you decide what option to choose?

In Game Two, how did you decide what option to choose?

In Game One, what did you think the other player would choose?

In Game Two, what did you think the other player would choose?

Did you consider the identity of the other player when making your decisions?

If you answered "yes" above, what aspects of the other player's identity did you consider?

What do you think this experiment was about? (Optional)

- OK Button -

Please answer the following questions and click the "OK" button when complete.

Age (in years):

Gender:

Subject major:

Nationality:

Nationality(ies) of your parents:

Country of birth:

Native language:

Second languages:

- OK Button -

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