The Influence of Culture on Decision Making under Risk and Uncertainty

Submitted by Joanne Laban, to the University of Exeter as a thesis for the degree of Doctor of Philosophy in Economics, August 2014.

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Abstract

I investigate how culture affects decision making under risk and uncertainty through three main strands - social networks, cultural norms and identity, and peer effects.

Firstly, I investigate whether students from collectivist cultures form larger networks at university than students from individualist cultures and to what extent these networks are relied on for risk-sharing. Using an online survey, I find that students from collectivist cultures such as China form larger financial risk-sharing networks at university than students from individualist cultures such as Britain. In the financial context, having a larger network increases the willingness to take risks for collectivists but not individualists. On the other hand, students from collectivist cultures are less willing to take risks with their interpersonal relationships than those from individualist cultures. One likely reason for this is that as networks are relied on more for risk-sharing in collectivist cultures, the value of maintaining relationships is increased.

Secondly, I run experiments with a stag hunt and bargaining coordination game to see whether cultural norms or identity play a part in coordination decisions. Using a between-subjects design, I vary the identity of the opponent between someone of the same culture or a different culture. I compare the responses of British and Asian students 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.

Finally, I investigate cultural differences in conformity in the context of risk attitudes. I expect that people from cultures that value conformity, such as collectivist East Asian cultures, will be more likely to conform to others than

people from cultures that value individuality, such as the United Kingdom. My experiment consists of lottery choice tasks, where some students are given information on the choices from a previous session. Again, comparing Asian and British students, I find no difference in the distribution of Asian choices between treatments. However, the British students are inclined to choose against the majority of their peers. This behaviour is consistent with an individualist culture that places value on uniqueness.

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Chapter One: Introduction

1.1 Motivation

In this thesis I explore how culture affects decision making under risk and uncertainty. As a growing area of research in economics, studying cultural differences helps us to understand whether some phenomena are unique to certain groups or generalizable to the human population (Henrich *et al*, 2010). When a cultural difference exists we can dig deeper to find out why people from certain cultures behave the way they do. We can then provide recommendations for Governments, firms, and individuals who interact with people from different cultures. The question of cultural differences is especially important in the current times of increasing migration and lowering of trade barriers. As interactions with people from different cultures rise, there is an increasing need to understand each other's preferences. This research aims to meet that need.

1.2 Summary of Chapters

In Chapter Two, I begin the thesis with a literature review of cultural differences in economics. I also use this chapter to explain what we mean by culture in an economics context and how the concept can be used meaningfully. I then go on to discuss the previous evidence on cultural differences under the two main headings of individual choice and games. Finally, I end the chapter with a discussion of the proposed explanations for cultural differences and highlight some of the key challenges that arise when trying to compare the behaviour of people from different cultural groups.

In Chapter Three of this thesis, I investigate whether students from collectivist cultures form larger networks at university than students from

individualist cultures and to what extent these networks are relied on for risk sharing. The idea is that people from collectivist cultures are more likely to have access to informal risk sharing networks than people from individualist cultures, which should affect their risk attitudes (Hsee and Weber, 1999). I also test the hypothesis that students from collectivist cultures are more risk averse for social risks than students from individualist cultures. If people from collectivist societies have greater scope to receive financial support from their social network, they may have a stronger incentive to maintain relationships with those they can receive support from.

Moving on from individual choice, Chapter Four looks at how people make decisions when interacting with others from a different culture. In particular, I run a stag hunt and bargaining coordination game where players interact with either players from their own culture or a different culture. The premise is that people from the same culture will share similar social norms and find it easier to predict each other's behaviour, thus improving coordination. On the other hand, when faced with an opponent from a different culture people are less familiar with each other's norms and may rely more on stereotypes to predict behaviour. The results from this project will be relevant for international bargaining where the parties do not know each other's strategies.

Finally, in Chapter Five I investigate how an individual's decisions are shaped by the attitudes of his or her peers. The idea is that people from cultures who value conformity should be more susceptible to peer effects in attitudes towards risk and uncertainty. I test this prediction by running lottery choice experiments where some players are told the percentage of people choosing each option from a previous session.

I believe these chapters flow well from each other. I begin by looking at how culture drives individual decision making, then move on to study interactive scenarios, and end by studying how group norms are projected back onto the individual. In Chapter Six I finish the thesis with some concluding remarks and touch on future research directions for this topic.

1.3 Contribution to Knowledge

While cross-cultural studies in economics have been done before, much of the previous literature focuses on social preferences in ultimatum and public goods games. By focusing on social networks, coordination games, and peer effects, this thesis will fill a gap in literature. The area of cultural differences is relatively new in economics, and as such there is still scope for improvement.

The social networks chapter is unique in that it studies a likely cause of cultural differences in risk attitudes. A lot of previous literature about social networks exists in economics, as well as some literature on cultural differences in risk attitudes. However, previous literature has not covered the link between the two areas in a great level of detail. While we know that cultural differences exist, the challenge now is to explore the causality and pin-point the exact mechanisms through which culture affects risk attitudes.

I deal with the causality issue by looking at how students choose to form networks when they come to study at university, while controlling for external factors. When studying networks at home we are unable to tell why the networks exist. Were people born into their networks or did they acquire them for the purposes of risk sharing? We want to find out to what extent networks are driven by culture compared to economic conditions. If students from collectivist cultures still form larger networks at university after controlling for financial situation and

other demographics, this indicates that culture may be a key driver of network formation.

Studying differences in coordination games also fills a gap in the cross-cultural literature. Some previous literature suggests that group identity (Chen and Chen, 2011) and social norms (Singh, 2009) are important for coordination game outcomes, but few studies have focused on culture. As culture is one aspect of identity, those from similar cultures should find it easier to coordinate on payoff dominant outcomes. Similarly, if the players share some social norm, such as trust, they should find it easier to coordinate. Much of the previous literature on cultural differences in games looks at social preferences, rather than focusing on norms and identity in particular. This chapter aims to fill that gap.

Finally, peer effects have proven to have a very strong influence on behaviour. Usually people prefer to conform to what others in their peer group are doing. This is because people gain utility from belonging to a group and want to act in a way that reinforces their group identity (Geisinger, 2004). However, some cultures value conformity more than others (Bond and Smith, 1996). Collectivist cultures are very group focused and value consistency and harmony in relationships. However, individualist cultures are more concerned with individual freedom and expression. There is a desire to stand out from the crowd in individualist societies. Peer effects in risk attitudes is a relatively new area in economics and yet to be studied cross-culturally. This chapter will link up the evidence of peer effects in economics with the social psychology literature on cultural differences in peer effects.

In general, cross-cultural research improves our understanding of when and where our results and theories can be applied. Many human behaviours are

context-specific and contexts often interact with demographic variables such as culture. The interpretation of any given situation will likely depend on the prior experiences of the decision maker, which can differ vastly by culture. Of course, this can make results difficult to interpret when running experiments as we cannot be sure that people from different cultures interpreted the task in the same way. Abstract experiments that are lacking in context are a particular problem as the participants are free to imagine their own context which will likely differ by culture. Field experiments with a more natural context may therefore be a better route to studying cultural differences. For example, studying insurance arrangements in different groups will give us insight into risk preferences in a real decision environment.

Some of the key theories in behavioural economics, such as prospect theory, were developed based on results from experiments on Westernised college students. There is little reason to believe that people from different backgrounds are subject to the same decision biases. For example, Chinese and Koreans tend to be less loss averse than Americans because they have more scope to seek compensation for a loss from their social networks (Arkes *et al*, 2010). Similarly, Chinese may be more subject to framing effects than Americans because they focus more on the background of a situation than the foreground (Morris and Peng, 1994). We now need to run more experiments in different countries to see whether the theories developed in behavioural economics can be applied across cultures.

As well as improving our understanding, this research has wider implications for public policy and the private sector. Risk attitudes are important in many policy settings such as health and safety and tax compliance. When the

Government introduces a policy change it should consider how the change impacts different cultural groups. Using subtle "nudge" techniques (Thaler and Sunstein, 2008) may be effective for some cultures while having a negative effect on others. Firms will also have an interest in this research as they will better understand the risk attitudes of their customers, competitors, and trading partners. This is especially true when doing business abroad. As the world is rapidly becoming more globalised this research provides a timely response that will be useful now and in the future.

Chapter Two: Literature Review

2.1 Overview and Motivation

There is little doubt that the environment one is raised in can affect behaviour in many economic settings. Culture shapes the social norms of a society and guides people's behaviour and decision making. People from different cultural backgrounds will usually have different beliefs and values, which affect their choices in social interactions and economic decisions. However, the majority of economic experiments to date have been conducted on Western, particularly American, college students. In many cases, results from experiments using such samples are unlikely to generalise to the human population as a whole (Henrich *et al*, 2010).

As the world becomes more globalised and interactions with people from other cultures rise, there is an increasing need to understand the preferences of people from all over the world. For example, firms doing business abroad will benefit from understanding their markets and trading partners. Similarly, Governments will find trade negotiations easier with a greater understanding of each other's culture. Even individuals will benefit from understanding how culture affects the decision making of people they interact with regularly.

Culture has been shown to be an important factor in a wide variety of economic decisions. For example, Henrich *et al* (2001) find vast differences in ultimatum game responses across societies. People who live in societies with a high level of market integration[1] tend to give close to the equal split, while any low offers are rejected. In contrast, those with a high level of economic

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[1] Market integration is a measure of how much people rely on market exchange in their daily lives (Henrich *et al*, 2001, p. 76).

independence tend to make very low offers which are almost always accepted. Similarly, Herrmann *et al* (2008) find differences in antisocial punishment[2] in public goods games across cities. Those in Muscat (Oman) and Athens (Greece) engage in very high levels of antisocial punishment, while those in Boston (USA) and Melbourne (Australia) show the least. Herrmann *et al* (2008) explain their results in terms of differences in societal norms, such as a tendency to punish "do-gooders" in some societies, which leads to antisocial punishment.

Risk attitudes have also been shown to differ by culture. For example, Hsee and Weber (1999) find that Chinese students are significantly more risk seeking than American students, when choosing between risky or safe lottery options. Hsee and Weber (1999) claim that this result is driven by the high level of collectivism[3] in Chinese culture, which promotes risk-sharing behaviour within families. In addition, both American and Chinese participants in Hsee and Weber's (1999) study expected the Americans to be the more risk seeking out of the two cultural groups, which suggests a reliance on cultural stereotypes to try and predict behaviour. Therefore, culture not only affects individual behaviour, but also how we perceive and form judgements of others in society. Finally, culture can also affect how we are influenced by other people, with those from collectivist cultures being more conformist than those from individualist cultures (Bond and Smith, 1996).

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[2] Antisocial punishment is where the person being punished contributed at least as much to the public good as the punisher.

[3] Collectivism is a societal structure which is organised in strong close-knit groups, where group members offer each other mutual protection and support (e.g. China, India). The opposite of collectivism is individualism, where people are expected to take responsibility for themselves and close family only (e.g. United States, United Kingdom). Collectivism and individualism can be seen as a scale, on which countries can be ranked, rather than absolute measures.

2.2 Meaning of Culture

As the word culture has several different meanings, I clarify here what culture refers to in this study. Richerson and Boyd (2005, p. 5) give the following definition of culture:

> *Culture is information capable of affecting individuals' behaviour that they acquire from other members of their species through teaching, imitation, and other forms of social transmission.*

Here, information includes a wide variety of aspects, such as ideas, experiences, skills, norms, and attitudes, to name just a few. Richerson and Boyd (2005) emphasise that such information need not be conscious. Some aspects of culture may be instinctively acquired without conscious thought, such as the habits and mannerisms of people within a society. Culture is acquired over time by absorbing information from one's society. It is important to note that cultural information is *capable* of affecting behaviour, but will not affect behaviour with certainty. Modern psychology views culture as a dynamic process that can be primed in certain situations (Wong and Hong, 2005).

Guiso *et al* (2006) try to identify a causal link between culture and economic outcomes, by narrowing down culture to beliefs and values. They define culture in the following way:

> *Those customary beliefs and values that ethnic, religious, and social groups transmit fairly unchanged from generation to generation.*

Guiso *et al* (2006) give culture economic relevance by interpreting customary beliefs and values as expectations and preferences, respectively. Economic outcomes can then be linked back to beliefs and values, which are partly driven

by culture. Although the main way culture can influence decision making is likely to be through beliefs and values, other factors may also be important, such as societal norms and acquired habits. Therefore, I am more comfortable with Richerson and Boyd's (2005) definition, which defines culture as information, including beliefs and values, as well as other aspects of culture. These other aspects of culture may have a less direct economic interpretation than beliefs and values, but should be included to give a complete definition of culture.

One potential advantage of Guiso's *et al's* (2006) definition is that it suggests that causality runs in only one direction. This is because the definition specifies that culture is fairly unchanged from generation to generation, and is acquired from previous generations, rather than current situational differences between groups. Guiso *et al* (2006) argue that changes in culture due to the economic circumstances of a group are usually very slow, and happen over centuries rather than years. Thus cultural factors are usually quite stable over an individual's lifetime. However, the gradual evolution of culture can also be applied to Richerson and Boyd's (2005) definition. While it is possible for culture to change over a long period of time, any given individual is unlikely to experience substantial cultural change over their life-time.

Although I am primarily concerned with national cultures, different cultures also exist *within* nations. Conventionally, cultures within nations are referred to as subcultures while differences between nations or groups of similar nations are known as cultural differences (Hofstede, 1980). I follow this convention. Examples of subcultures include cultures within workplaces or professions, which are interesting in their own right, and provide useful case studies of the impact of culture on decisions.

Cultural theory is used to explain cultural differences at the individual or subculture level (Douglas, 1982; Douglas and Wildavsky, 1982). This theory characterises people into four groups: Hierarchists, Egalitarians, Fatalists, and Individualists. These categories have different implications for risk attitudes. Hierarchists care about risks that are likely to threaten the social order, Egalitarians are concerned with risks to equality, Fatalists feel unable to control risks, and Individualists care about risks to personal freedom (Langford *et al*, 2000). Subcultures and national cultures can also be associated with these categories. Which cultural identity is important for behaviour (e.g. national or individual) will likely depend on which identity is salient at the time a decision is made (e.g. Wong and Hong, 2005; Shih *et al*, 1999). Thus, when someone is at work, their workplace culture may override individual or national culture.

2.3 Previous Cross-Cultural Research

2.3.1 Individual Choice

Attitudes towards Gambling and Insurance

Kahneman and Tversky (1979) find a reflection effect amongst many subjects, where risk aversion in the domain of gains switches to risk seeking in the domain of losses. One factor that contributes to this result is a bias for certain outcomes in the gain frame, but bias against certain outcomes in the loss domain. This is because the pain of a sure loss is overweighted relative to a probabilistic loss.

However, due to the overweighting of small probabilities (Kahneman and Tversky, 1979), subjects often show an opposite reflection effect under very low probabilities. For example, many people find buying a lottery ticket or betting on

horse races an attractive activity, even though the probabilities of winning are often very low. People tend to become highly risk seeking when there is a small probability of winning a large prize, and the cost of participation in the lottery is not too high. When one gambles on a lottery ticket or horse race, the odds are not designed to be in one's favour, which means that the expected value of the lottery is negative. Voluntary participation in an activity when one is expected to lose money shows risk seeking behaviour. Conversely, in the loss domain, many people prefer to purchase insurance against a low probability disaster, even though their expected wealth would be higher without insurance. Under very low probabilities, people tend to become more risk averse in the loss domain, which is the opposite of the reflection effect typically found under moderate and high probabilities.

Sowinski *et al* (2011) and Laban (2011) find an opposite reflection effect for different cultural groups when looking at behaviour under very low probabilities. Sowinski *et al* (2011) find that while most Americans prefer to take a gamble that pays $5,000 with 0.1% probability rather than have $5 with certainty, most Germans prefer the sure gain. However, when the same problem is framed as a loss, most Americans prefer to insure themselves against the 0.1% chance of a $5,000 loss by taking a $5 loss with certainty, while most Germans prefer to leave themselves open to the large loss. Similarly, using the same parameters as Sowinski *et al* (2011), Laban (2011) finds that British students prefer to take the gamble in the gain frame but the insurance in the loss frame, while Chinese students show the opposite.

Of course, the dominant behaviour of all four cultures in these studies is inconsistent with expected utility theory, which assumes a constant utility function

over both positive and negative domains. The behaviour can be modelled using prospect theory, where subjects attach decision weights to probabilities. Decision weights reflect the impact of a prospect's probability on the overall value of a prospect (Kahneman and Tversky, 1979, p. 275). Americans and British apparently attach higher decision weights to the probability 0.001 than Germans and Chinese. However, it is worth noting that abstract lottery choices such as these may not accurately reflect true attitudes towards gambling and insurance[4]. Usually the exact probabilities are unknown when gambling or purchasing insurance, and need to be estimated by the consumer. Running a study with the same parameters as above but using field context or introducing uncertainty would go some way to generalising the lab results to the real world.

The overweighting of very low probabilities contributes to a four-fold pattern of risk aversion, which is often observed in experiments (Tversky and Kahneman, 1992). Subjects tend to be risk averse for moderate and high probability gains, but risk seeking for very low probability gains. In the loss domain, subjects tend to be risk seeking for moderate and high probability losses, but risk averse for low probability losses. However, results from Sowinski *et al* (2011) and Laban (2011) suggest that the four-fold pattern of risk aversion might not generalise to all cultures, as Germans and Chinese do not seem to overweight small probabilities to the same extent as Americans and Britons.

Attitudes towards Tax Evasion

Evading tax is another kind of risky behaviour. Tax evaders risk getting caught and penalised by the Government in the hope of gaining the benefit of a

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[4] Harrison *et al* (2007) explain some of the difficulties in generalising risk attitudes elicited in the lab to real world behaviour.

reduced tax burden. Cultural differences in attitudes towards tax evasion have been well documented. The differences stem from either differences in tax administration across countries, or the attitudes of citizens towards governments (Cummings *et al*, 2004). Tsakumis *et al* (2007) characterise a country with high levels of tax evasion according to Hofstede's (1980) dimensions of culture as a country with low individualism, high uncertainty avoidance, low masculinity, and high power distance[5]. Empirical evidence supports these hypotheses, with countries such as the United Kingdom and United States found to be more tax compliant compared to countries such as Italy and Spain (Cullis *et al*, 2012; Lewis *et al*, 2009; Alm and Torgler, 2005).

Cullis *et al* (2012) show how cultural differences affect tax evasion through prospect theory. Using a hypothetical survey with student participants, they find that British taxpayers are more compliant than Italians. They attribute this result to differences in social norms between the two countries. People in the UK expect to pay tax and therefore have a lower reference point than the Italians, i.e. income net of any tax payments. As Italians believe tax evasion is more widespread in their society they are more likely to consider a reference point that is closer to gross income. This means that Italians see tax as more of a loss against their reference point than the British. According to prospect theory (Kahneman and Tversky, 1979), people become more risk seeking when they are faced with a loss, and thus more likely to evade taxes. Figure 2.1 below shows the difference in reference points between UK and Italian taxpayers, where Ri is the reference point for Italians and Rb is the reference point for British. As can be seen in the

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[5] Uncertainty avoidance measures the extent to which people in a society try to minimise uncertainty. Masculinity measures the extent a society endorses masculine values such as competitiveness and assertiveness. Power distance shows how much the people with less power in a society view the distribution of power as unequal.

graph, a tax pushes the Italians into the loss domain, which encourages them to become risk seeking.

Figure 2.1: Reference Points of UK and Italian Taxpayers
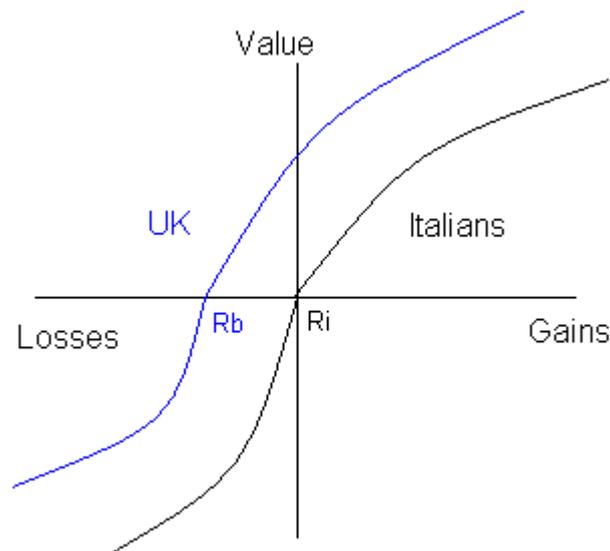
In addition to reference points, Cullis *et al* (2012) also look at the slope of each group's value function. British taxpayers are assumed to experience an intrinsic benefit to paying tax, which is described as a warm glow effect. The warm glow effect comes from the UK having higher tax morale than Italy. This means that British taxpayers see a tax payment as less of a loss and more of gain compared to the Italians, which makes the British value function flatter. The steeper value function for Italians implies they are more risk seeking for losses and more risk averse for gains. This is because they see a tax payment as more of a loss and a tax rebate as more of a gain. The British experience less of a gain from a tax rebate because they miss out on the warm glow effect of paying tax. Conversely, they see tax payments as less of a loss than Italians because they gain a warm glow effect from conforming to their peers. The difference between British and Italians is shown below in Figure 2.2.

Figure 2.2: Value Function of UK and Italian Taxpayers
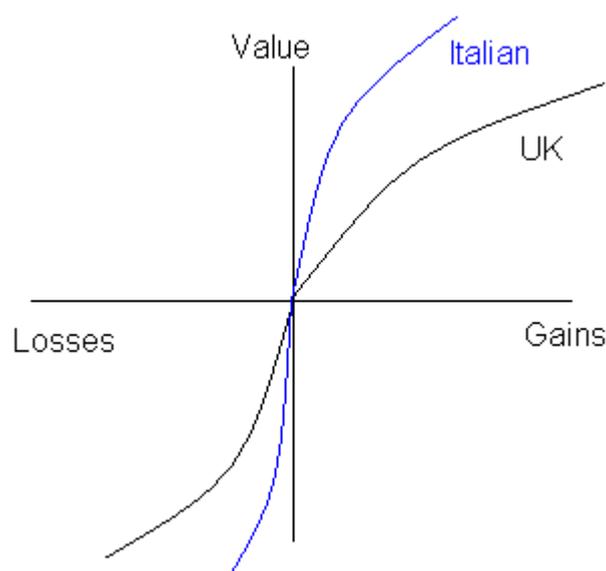
Cullis *et al* (2012) show how cultural differences in tax compliance exist in theory and back this up with empirical results. Social norms are highlighted as one way that culture changes the implications of prospect theory, but there could be many more reasons for cultural differences (e.g. upbringing, social networks, group identity effects, and genetics). More research needs to be done to better understand the exact ways in which culture interacts with prospect theory and individual risk attitudes.

2.3.2 Games

Strategic games are played under some level of uncertainty, in that you cannot be sure which strategies your opponent will choose. Players who are particularly averse to uncertainty will therefore look to play safe options when playing strategic games. Outcomes of interactive games depend to a large degree on social preferences (e.g. Fehr and Schmidt, 1999). As social preferences are shaped by norms within a society, we have reason to expect that people from different cultures will behave differently when playing interactive games. Results from several games have been compared across cultures

directly, such as the ultimatum and public goods games. Other games, such as coordination games, lack empirical cross-cultural data, but some related literature suggests interesting effects. I will explain the key results for each of these games below.

Ultimatum and Dictator Games

This section would not be complete without mentioning the ultimatum and dictator games run by Henrich *et al* (2001), which were among the first economic experiments conducted in small-scale societies[6] such as tribes in the Amazonian rainforest. The ultimatum game involves a proposer and a recipient. The proposer chooses how to split an amount of money[7] ("the pie", typically $10) between themselves and the recipient. The recipient then decides whether to accept the proposal, in which case the split chosen by the proposer is implemented, or reject the proposal, in which case both players receive nothing. The dictator game is the same as the ultimatum game, except that the recipient does not get to make a decision and has to accept whatever is offered to them. Thus, the dictator game measures how much people are willing to give for altruistic motives alone.

The subgame perfect Nash equilibrium for these games involves the proposer never offering anything (or offering the smallest possible amount in the case of the ultimatum game with discrete strategy choices) and the recipient never rejecting (they are better off with a small amount than nothing at all). However, when these games are played with real subjects, the proposers often send positive amounts and the recipients tend to reject low offers. This behaviour

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[6] A small-scale society contains a few dozen to several thousand individuals who live by foraging, herding animals, or horticulture. Such societies lack complicated economies or Governments and kinship relationships tend to be very important.

[7] Although most of Henrich *et al's* (2001) experiments use money, a few use other valuable goods such as tobacco.

can be explained by social preferences, i.e. caring about the payoffs of other people, which are likely to be culture-dependent.

Henrich *et al* (2001) find vast differences when these games are played by different subject pools. For example, the Machiguenga tribe in Peru only offer around 25% of the pie on average, but hardly ever reject offers. This is in contrast to standard student samples, who tend to offer around 40% in the ultimatum game and reject lower offers. At the other extreme, the Lamelara tribe in Indonesia make very generous offers with a mean of 58%. Some societies even reject offers above the 50% mark. For example, the Au and Gnau of Papua New Guinea reject both very low and very high offers with nearly equal frequency.

Henrich *et al's* (2001) dictator game results also vary widely, with the Orma in Kenya showing a model offer of 50% while the Hadza of Tanzania's mode is only 10%. Student samples tend to give around 25% in dictator games (Andreoni *et al*, 2007). These results suggest that how people play the ultimatum and dictator games is dependent on the society in which they live. Henrich *et al's* (2001) results are consistent with the norms of the societies they studied. For example, societies with more interaction and a norm of sharing tend to give more than societies where families live independently of each other.

Dictator games have also been used to examine norm enforcement in Papua New Guinea (Bernhard *et al*, 2006). This study introduces uncertainty to the dictator game by including the option of punishment of the dictator by an independent third-party. The third-party observes the amount the dictator transfers to the recipient and can decide to punish the dictator. Punishment lowers the dictator's payoff but is costly to the third-party. Therefore, the subgame perfect Nash equilibrium of this game involves no punishment. However, the

third-party may choose to inflict punishment on the dictator to enforce a social norm that the dictator may have violated.

Bernhard *et al* (2006) play the dictator game with third-party punishment with two tribes in Papua New Guinea. Their treatments vary by the tribal identity of each player. The tribes in Papua New Guinea hold very egalitarian values, and thus are likely to select the equal split as the social norm. Any deviation from the equal split is therefore likely to attract punishment by the third-party. The authors find that punishment occurs significantly more when the punisher and recipient belong to the same tribe, or when the dictator belongs to a different tribe than the punisher. This shows evidence of in-group altruism, as the punishers show more aversion to a member of their own group being treated unfairly, and dictators are forgiven more if they are from the punisher's own tribe.

The above study shows that how players behave in a game depends on the norms of their society and the identity of their opponents. Differences in norms and identity have interesting implications for how strategic games are played cross-culturally. How will the cultural identity of the opponent matter when a player is selecting strategies, and how will the social norms of each player drive their behaviour? I address these questions in Chapter Four of this thesis.

Prisoners' Dilemma

A few studies have looked at cross-cultural differences in prisoners' dilemma game responses but the evidence is inconclusive. An example of a typical prisoners' dilemma game is given below in Figure 2.3. The prisoners' dilemma game has a payoff structure such that both players have a dominant strategy to defect, even though both players would do better if they both cooperate rather than defect. Cultures that place more emphasis on maximising

social welfare than individual gain may do a better job of coordinating on the cooperative outcome.

Figure 2.3: Prisoners' Dilemma

		Player 2	
		Cooperate	Defect
Player 1	Cooperate	3, 3	0, 5
	Defect	5, 0	1, 1

Wong and Hong (2005) show that priming bicultural Hong-Kong Chinese participants with Chinese icons (e.g. a Chinese dragon) increases cooperation when playing a prisoners' dilemma against a friend, compared to a control group (primed with geometric shapes) and those primed with American[8] icons (i.e. the American flag). However, no differences are found when playing against a stranger. The results for friends are consistent with the Chinese notion of collectivism that places great importance on the well-being of the group as opposed to the individual. However, the identity of the group also matters, such as whether the group consists of friends or strangers.

Goerg and Walkowitz (2009) show a cultural difference in framing effects when playing the prisoners' dilemma, with Chinese and Palestinians subject to a framing effect but Finns and Israelis showing no such effect. The prisoners' dilemma game they use is framed with either positive or negative externalities, although both frames are logically and strategically identical. They find that Chinese and Palestinian participants cooperate more when the game is framed in terms of positive externalities compared to negative externalities. As noted by the authors, the difference could stem from higher collectivism among Chinese

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[8] The authors choose to use American primes as American influence is strong in Hong-Kong.

and Palestinians which makes them more likely to cooperate and perhaps makes the frame more salient. Israeli and Finnish societies are more individualistic and therefore more competitive and less likely to cooperate.

Chen *et al* (2010) investigate the effect of priming different identities when playing a prisoners' dilemma game. Specifically, they prime either an ethnic identity (to capture fragmentation) or a school identity (to capture a common identity). They find that compared to Caucasians, Asians are more responsive to priming and show significantly more in-group favouritism and out-group discrimination when playing the prisoner's dilemma. Again, this could be due to the high level of collectivism in Asian cultures, where a strong group identity is important.

Cross-cultural results for the prisoners' dilemma game are not yet extensive enough to draw robust conclusions. However, the evidence above suggests that collectivist cultures are more group-focused and therefore more likely to cooperate in the prisoners' dilemma game, but only when the opponent is from the same group and cultural identities are made salient.

Public Goods

The public goods game involves players deciding how much to contribute to a public good (c_i), according to the following payoffs, where $1/n < \alpha < 1$. This game is similar to the prisoners' dilemma in that the individual incentives are to free-ride (i.e. contribute nothing), even though players would receive a higher payoff when everyone contributes the maximum amount.

$$\pi_i = (z - c_i) + \alpha \sum_{j=1}^{n} c_j$$

Herrmann *et al* (2008) play the public goods game with punishment across a variety of cities. Here, players can punish (with some cost to themselves) other group members after observing their contributions. They find differences in contributions and punishment across the different subject pools, but the most striking difference is in the level of antisocial punishment. Antisocial punishment, which is where the punisher contributed the same or less to the public good as the person they are punishing, is particularly strong in Athens (Greece) and Muscat (Oman). On the other hand, players in Boston (USA) and Melbourne (Australia) punished very little antisocially, but punished free-riders extensively. Herrmann *et al* (2008) suggest that the difference is due to variations in norms within each society. Some societies have a tendency to punish people who out-perform or "show-off", while others will only punish those who free-ride. The highest contributions are sustained in Boston (USA) and Copenhagen (Denmark), both of which engage in high levels of free-riding punishment.

As is becoming a recurring theme, Herrmann *et al* (2008, p. 1366) mention individualism/collectivism as a possible explanation for their results. Those in collectivist societies may be more driven towards antisocial punishment if they see the other players as out-group members. This is because the other players are strangers rather than members of the collectivist players' close-knit social networks. Herrmann *et al's* (2008) results are indeed consistent with collectivist cultures engaging in higher levels of antisocial punishment than individualist cultures. Regressions show a highly significant correlation between antisocial punishment and a widely used measure of individualism/collectivism (Hofstede, 1980).

Public goods games also yield interesting results when played inter-culturally, i.e. when the players are from different cultures. Cultural diversity tends to hinder the ability of players to coordinate on the payoff dominant equilibrium (Banerjee *et al*, 2005). Reasons that have been put forward for this include in-group altruism towards members of the same culture, that members of the same culture have more scope to punish defectors in the future, and that members of the same culture can use social norms to coordinate on outcomes (i.e. a strategy selection mechanism). Habyarimana *et al* (2007) investigate why ethnic diversity hinders the provision of public goods. They find the strategy selection reason to be the most important, with members of the same ethnic group tending to play cooperative equilibria while members of different ethnic groups do not. However, they also find evidence that the threat of punishment is important, as members of the same culture are more likely to be connected through social networks and thus have greater scope to punish each other.

Coordination Games

Cross-cultural differences in coordination games have not yet been widely studied. Singh (2009) gives some theoretical predictions of how a society with a norm of high trust will be more likely to coordinate on the payoff dominant outcome in games with multiple Pareto-ranked equilibria. According to the World Values Survey (Wave 4: 1999-2004), Singh concludes that 64% of countries are characterised by low trust, and thus will converge to inefficient equilibria in coordination games. The Scandinavian countries such as Denmark and Sweden tend to have the highest levels of trust, whereas African countries such as Uganda and Tanzania have low levels of trust (Singh, 2009, p. 18).

Similarly, Chen and Chen (2011) show the importance of a common group identity in achieving coordination. They find that subjects are more likely to coordinate on a payoff dominant outcome when the players share a common group identity, but only when the identity is made salient. As Chen and Chen study minimal group identities[9], their results are likely to be a lower bound on the effect of cultural identities.

Hsee and Weber (1999) find that people tend to rely on stereotypes when forming expectations about the behaviour of people from both one's own and another culture, but more so for another culture. In particular, Hsee and Weber (1999) find that both Chinese and Americans expected Americans to be the more risk seeking of the two cultures. In addition, the Chinese expected Americans to be even more risk seeking than the Americans predicted of each other.

Hsee and Weber (1999) use the "risk stereotypes" hypothesis to explain this result: Americans are often portrayed as aggressive and risk seeking in popular media (such as movies), whereas Chinese are not usually portrayed in this way. Interestingly, this stereotype turns out to be misleading, as Chinese participants are more risk seeking than Americans in Hsee and Weber's (1999) study. People from another culture tend to rely more heavily on stereotypes as there is less scope to base their prediction on people they know. This suggests that subjects will probably experience more ambiguity when their opponent is from another culture than their own culture, and may rely on cultural stereotypes to predict behaviour.

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

Trust Game

Identity is also important when playing the trust game. The trust game (Berg *et al*, 1995), involves one player (A) deciding how much money out of an initial endowment to send to another player (B). Any money that is sent to player B gets multiplied by some positive constant > 1. Player B then decides how much money to send back to player A. Therefore, in order for Player A to send any money to Player B, Player A must trust Player B to send at least some money back. Player B would not send any money back in a subgame perfect Nash equilibrium, and realising this Player A would not send any money to begin with. However, often players do trust each other in experiments and players in the role of Player B do send money back.

Some papers have documented cultural differences in the trust game. Walkowitz *et al* (2004) design an inter-cultural trust game, where participants from Argentina, China, and Germany play the game against each other. Subjects are told the surname and university of their opponent to signal their cultural background. Significant amounts of trust are observed even across borders. Argentinians show the highest level of trust, followed by Chinese, and Germans show the lowest. Germans show significantly less reciprocity than Chinese or Argentinians. Participants do not discriminate between countries in reciprocity, however Chinese tend to discriminate against Argentinians in trust.

Bornhorst *et al* (2004) study differences in trust game responses between northern and southern Europeans. Examples of northern countries include Austria, Germany, and the United Kingdom, whereas southern countries include Greece, Portugal, and France. An important feature of Bornhorst *et al's* (2004) trust game, is that players are allowed to choose the receivers to which they make

transfers. They find that people from southern European countries are discriminated against in the number of transfers they receive, particularly from northerners. However, this discrimination can be explained by the behaviour of southerners in early rounds of the game as they transfer less money back than northerners.

Bornhorst *et al* (2004) offer two explanations for their result. The first is an income effect: southern Europeans tend to be poorer and feel that reciprocity is a luxury good that they cannot afford. The other explanation is that because the family plays a stronger role in economic interactions in southern Europe, northerners have to rely more on trusting people outside the family to achieve economic success. Different family and social structures are one of the key explanations of cultural differences in economic behaviour, and are discussed in detail throughout this thesis.

2.4 Proposed Explanations for Cultural Differences

2.4.1 The Cushion Hypothesis

Hsee and Weber (1999) introduce the "cushion hypothesis" to explain their result that Chinese are more risk seeking than Americans. The Chinese culture is more collectivist than the American culture (Hofstede, 1980). This means that Chinese tend to define themselves as members of a close-knit group of family and friends, whereas most Americans consider themselves as individuals. Individualistic societies promote freedom and responsibility for one's own decisions, whereas collectivist societies are more likely to make decisions as part of a group and share the responsibility if something goes wrong. This means that Chinese people can generally seek financial support from their social networks more readily than Americans can, i.e. the Chinese are cushioned if they fall. Hsee

and Weber (1999) claim that the ability to seek compensation from a social network contributes to their result that Chinese are more willing to take financial risks than Americans.

Hsee and Weber (1999) find support for the cushion hypothesis by running a second study, where they ask subjects how many people they can receive financial support from. Chinese subjects give significantly higher responses to this question than American subjects. When including social network factors as explanatory variables, Hsee and Weber (1999) find that differences in risk attitudes between the two cultures disappear. In a further test of the cushion hypothesis, Hsee and Weber (1999) ask subjects to choose between safe or risky options in medical (drug options) and academic (essay topics) contexts. In these contexts, a social network will be unable to rectify a problem, and can only offer moral support. Chinese and American subjects show no significant difference in risk aversion when making medical or academic decisions. In addition, subjects from the two cultures give similar responses when asked for the number of people they could seek support from for medical or academic problems.

In a separate study, Weber *et al* (1998) consider an alternative explanation for their finding that Chinese are more risk seeking than Americans. China's rapid growth over recent decades may have inspired riskier financial decisions by its citizens. At the time Hsee and Weber's (1999) experiment was run, people living in China may have been more likely to benefit from taking financial risks than Americans, due to the prosperous environment in China. Weber *et al* (1998) compare Chinese, American, and German proverbs using a content analysis. They find that long-standing Chinese and German proverbs promote significantly more risk taking advice in financial situations than American proverbs. Examples

of Chinese proverbs used in Weber *et al's* (1998) analysis include "Failure is the mother of success" and "If someone has never left his home, he cannot be a great person". American proverbs include "The highest branch is not the safest roost" and "He who plays with a cat must expect to get scratched". As the proverbs have been around since long before China's spell of rapid economic growth, Weber *et al* (1998) conclude that the cushion hypothesis is a valid explanation.

The cushion hypothesis can help explain cultural differences in several risky choice behaviours. For example, Arkes *et al* (2010) find Chinese and Koreans to be less loss averse than Americans, which can be explained by the higher ability to seek compensation for a loss from one's social network among the Chinese and Korean cultures. This means that people from collectivist cultures are less likely to need to purchase formal insurance than individualists. Studies by Sowinski *et al* (2011) and Laban (2011) provide empirical evidence for this, with Germans and Chinese more likely to leave themselves open to a small chance of a large loss than Americans or British, who mostly prefer a small sure loss (an insurance premium).

Although the cushion hypothesis suggests greater financial risk taking behaviour among collectivist cultures, some studies find that people from individualist cultures tend to make riskier financial decisions when the probabilities of winning are very low. For example, Sowinski *et al* (2011) (and Laban, 2011) find that Americans (British) prefer to take a low probability gamble on a large prize, than accept a small sure gain. However, Germans (Chinese) prefer to take the small sure gain.

These results may be partly driven by the motivation to stand out in individualist cultures. As the British and American cultures are more individualistic

than both the Chinese and German cultures (Hofstede, 1980), the desire to get ahead of others by winning a large sum of money may be stronger among the British and Americans. Another potential explanation is that stigma associated with gambling in some cultures may discourage people from taking risks when the odds of winning are very low. Lau and Ranyard (2005, p. 626) note that heavy gambling is stigmatised in Hong Kong and raise doubts over whether a social network would provide financial support to cushion a reckless gambling loss.

2.4.2 Social Norms

Although the cushion hypothesis can explain a variety of observed cultural differences, it is important to determine how norms such as network structures are formed in the first place. For example, if social networks are formed in response to economic conditions, there could be a simultaneous causality problem when studying the effects of culture on economic decisions. On the other hand, if social networks are formed due to long-standing cultural norms, economic circumstances are unlikely to drive the cushion hypothesis. How people form networks in society can be thought of as a social norm. Examining how social norms arise gives us insight into why some cultures form larger networks than others. Previous literature suggests several explanations of norm formation. Some theories describe norm formation as a result of rational choice (e.g. McAdams, 1997), whereas another theory claims that norms arise from the self-categorisation of individuals into groups, which largely happens sub-consciously (Geisinger, 2004).

Rational Choice Theories of Norm Formation

McAdams (1997) suggests that norms result from individual preferences for esteem. People will tend to behave in a way consistent with the norms of the

group they seek approval from. This is because other members of the group may punish people who violate norms by withholding esteem. Norms can arise by this method, provided the group has reached agreement on which behaviours are honourable or dishonourable, and there is a known reasonable probability of the other group members observing the honourable or dishonourable behaviour. Another theory of norm formation (Posner, 2000) that is based on rational choice is that norms result from signalling behaviour. People behave according to norms in order to signal to other group members that they are a cooperative person, which may be beneficial in future interactions, such as in a prisoners' dilemma scenario.

Group Identity Theory of Norm Formation

Geisinger (2004) introduces a group identity theory of norm formation, which suggests that norms are the result of individuals self-categorising themselves into groups. People identify themselves and each other as members of categories in order to simplify and make sense of the complex social world around them. The act of categorisation tends to exaggerate similarities among group members while exaggerating differences between groups. Therefore, the group stereotype becomes the norm, and group members tend to conform to the stereotype as they receive self-esteem from belonging to the group (Shih *et al*, 1999).

This raises the question of whether cultural differences in behaviour are partly due to people behaving according to their cultural stereotype. Shih *et al* (1999) find a difference in behaviour in Asian women when they are primed[10] with

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[10] The participants were primed by completing a questionnaire with either gender or ethnicity related questions. The control group answered questions about university telephone and cable TV services.

a gender stereotype compared to a cultural stereotype. The women performed significantly better than a control group on a mathematics test when primed with their Asian identity, and significantly worse when primed with their female identity. As well as affecting individual behaviour, stereotypes can affect how we perceive others. For example, participants in Hsee and Weber's (1999) study apparently rely on cultural stereotypes to set their expectations about the behaviour of others, i.e. that Americans are risk seeking and Chinese are cautious. However, the participants in Hsee and Weber's (1999) study behave in contrast to their stereotype, with Chinese taking greater financial risks than Americans. These studies suggest that stereotypes are important for shaping both individual behaviour and expectations, especially when made salient.

Akerlof and Kranton (2000) formalise the notion of group identity by incorporating identity and self-image (I_j) into a utility function for individual j, which also includes the individual's actions (a_j) and the actions of others (a_{-j}), as follows:

$$U_j = U_j(a_j, a_{-j}, I_j)$$

Identity depends on an individual's assigned categories (c_j), prescriptions of how people in those categories should behave (P), and how closely the individual's actions match the prescriptions (ε_j). Violation of the prescriptions by either the individual or others is assumed to cause anxiety and loss of identity to the individual. The identity function is represented as below. The function $I_j(.)$ also measures the social status of a category and thus captures the individual's self-image as well as identity.

$$I_j = I_j(a_j, a_{-j}; c_j, \varepsilon_j, P)$$

Although the set of prescriptions is not indexed by *j*, the authors note that there may be no universal agreement about social categories and prescriptions (Akerlof and Kranton, 2000, p. 720). They also note that in some cases, individuals may have limited choice in the categories they belong to. Some categories, such as race and psychical appearance, can be difficult or impossible for the individual to alter.

Persistence of Norms

Norms may persist for several reasons, such as threat of social disapproval, emotions of shame or guilt when departing from a norm that is considered morally right, or the norm's ability to solve a coordination problem. For example, people may fear ostracism for cutting in line at a bank, or they may abstain from littering even if nobody is around simply because they feel a moral obligation. A norm that solves a coordination problem is also likely to persist because it is in everyone's interest to follow the norm. For example, it is better for all if everyone drives on the same side of the road, and there are strong reasons against driving on a different side from the norm. Axelrod and Hamilton (1981) investigate how the norm of cooperation may become evolutionary stable in a prisoners' dilemma game. In particular, they find that the tit-for-tat strategy can become evolutionary stable in a population, if the probability of playing against a tit-for-tat type player in the future is sufficiently high.

2.4.3 Overconfidence Bias

Yates *et al* (1997) find that Asians are more overconfident in their general knowledge judgements than Americans. This may contribute to more risk seeking behaviour when the probabilities are unknown, or more optimistic decision weights (Kahneman and Tversky, 1979) under known probabilities. However, Lau

and Ranyard (1999) find that Chinese speakers generate a lesser variety of probability related expressions than English speakers when responding to a View of Uncertainty Questionnaire. This questionnaire asks subjects either general knowledge questions or predictions about the future. Subjects can respond verbally however they wish (e.g. a straight yes or no, or probabilistic statement). The number of different probability related terms that subjects mention is taken as a measure of how probabilistically they think. Straight "yes" or "no" answers are taken to show a lack of probabilistic thinking. Lau and Ranyard's (1999; 2005) results suggest that Chinese think less probabilistically than English.

Therefore, apparent overconfidence among Chinese may be partly driven by thinking less probabilistically rather than confidence attitudes. An experiment that distinguishes overconfidence from probabilistic thinking would allow us to measure the respective strength of the two effects. Lau and Ranyard (2005, p. 625) find differences in probabilistic thinking to explain a small but significant portion of the variance in gambling decisions among Chinese and English, which leads them to conclude that social and cultural influences are also likely to be important.

Distinguishing both overconfidence and probabilistic thinking from the cushion hypothesis explanation of risky behaviour among Chinese, would allow us to assess the importance of the three separate factors in explaining cultural differences. Hsee and Weber (1999, p. 175) reject differences in probabilistic thinking or overconfidence bias as possible explanations for their result that Chinese are more risk seeking than Americans when making financial decisions. This is because they find differences in risk aversion only in financial contexts, not academic or medical contexts. If their results are driven by differences in

probabilistic thinking or overconfidence, the differences should persist in the academic and medical contexts.

2.4.4 Genetic Factors

Zong *et al* (2009) investigate the heritability of risk attitudes by comparing the behaviour of identical twins (who share the same DNA) with non-identical twins (who have different DNA but a presumably similar upbringing). Using a Chinese population, they find that 57% of the variation in risk attitudes is accounted for by genetic factors. However, using Swedish twins, Cesarini *et al* (2009) find only around 20% of risk attitude is inherited. Therefore, culture appears to play a smaller role in the development of risk attitudes in China compared to Sweden. Along a similar line, research in neuroeconomics (Hsu *et al*, 2005; Tom *et al*, 2007) suggests that chemical or anatomical differences in the prefrontal cortex may play a role in determining risk attitudes. These physiological and biological factors should be considered as potential explanations for cultural differences in behaviour, as people from a particular cultural group are highly likely to share a similar gene distribution and similar physiological conditions. However, according to the twins studies, genes alone do not fully explain risk attitudes, and the environment one is raised in is likely to play an important role.

2.4.5 Confounding Effects

Interpretation Differences

Although cultural differences in behaviour are likely to be at least partly driven by differences in attitudes, one potential confound is differences in interpretation of the experimental situation. For example, framing effects have

been shown to differ across cultures. Levinson and Peng (2007) find that Chinese are more susceptible to framing effects than Americans, which is because they concentrate on the background of a situation, whereas Americans focus more on the foreground. Goerg and Walkowitz (2010) also find cultural differences in framing effects, with Chinese and Palestinians sensitive to the framing of a prisoners' dilemma game, but Finns and Israelis showing no such effects. Again, people from the more collectivist cultures seem to read into the background more than people from the individualistic cultures.

In addition, Keysar *et al* (2012) find that people are less subject to biases such as framing effects when making decisions in a foreign language, as opposed to their native language. This is probably because people are less emotionally attached when thinking in a foreign language, and therefore make decisions more systematically and less intuitively. Therefore, cross-cultural experiments that use a single language may be biased if the language used is native for some subject pools but foreign for others.

Numerous cultural differences in perception and interpretation of images have been documented (e.g. Brislin and Lonner, 1973, pp. 116-117, 126). Therefore, any experimental situation is open to systematic interpretation differences between cultures. Brislin and Lonner (1973) recommend careful pre-testing of questionnaires used in cross-cultural research, to ensure that the same thing is being tested in each culture. For example, a random sample of respondents may be asked probing questions about their responses, such as "What do you mean?" to see how well the respondents understand the question (Schuman, 1966). Another technique used is to ask subjects for a clarity rating of

each question (Mitchell, 1966). Any questions rated as unclear should be re-worded and pre-tested again before being used in the final questionnaire.

External Influences

Harrison *et al* (2009) note several concerns when comparing data collected from developing countries. In particular, Harrison *et al* (2009) visit drought-stricken areas in India and Ethiopia, and note that their subjects may behave pessimistically due to the droughts. They point to a large body of evidence (Harrison *et al*, 2007) that suggests that background risk (such as extreme weather conditions or corruption within a country), can influence subjects' behaviour over foreground risk (the experimental task at hand). This makes it difficult to explain whether any apparent differences in risk attitudes are due to long-standing cultural values or the current political, economic, or environmental conditions within a country. Harrison *et al* (2007) find that adding background risk to an experiment decreases the reliability of abstract lottery choices over monetary outcomes. In the same study, Harrison *et al* (2007) also find that subjects make fewer errors when the lottery prizes are something natural and familiar to the subjects[11] than when choosing over abstract monetary lotteries.

As mentioned above, Weber *et al* (1998) try to alleviate the problem of competing explanations for cultural differences by examining long-standing proverbs in different cultures to see what risk attitudes are promoted. Although not a perfect measure, a content analysis can give us insight into long-standing cultural values, and compare these to attitudes suggested by the current

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[11] Harrison *et al* (2004) conduct their field study as a coin collectors' show, where the lottery prizes are graded coins. They introduce background risk by adding another treatment where the grade of the coins is uncertified.

conditions. Another way some researchers (e.g. Hennig-Schmidt and Yan, 2009; Hennig-Schmidt *et al*, 2008) have attempted to deal with the causality problem is to use video experiments, where subjects make group decisions involving discussion. This allows us to assess the reasons and arguments used in reaching a decision. However, video experiments are not without their problems, such as the potential for subjects behaving differently than they would normally, just because they are being filmed.

Henrich and Boyd (1998) give examples of empirical evidence that suggests that differences in environmental conditions (either physical, ecological, or economic) are not sufficient to explain behavioural differences between groups. This is due to the widespread emergence of different behavioural patterns between groups who share very similar environmental conditions. For example, the Machiguenga and Yora tribes of the Amazon live in almost identical regions, with the same climate and level of technology. However, the two tribes speak entirely different languages and have very different familial and social structures. If environmental conditions are the primary determinant of behaviour, we should see similar behavioural patterns in the Machiguenga and Yora. Rather, culture appears to evolve independently of external environmental factors, which reduces the risk of simultaneous causality in the influence of culture on economic variables.

2.5 Conclusions

While we have observed cultural differences in several previous experiments, one of the key challenges we now face is to isolate *how* culture affects behaviour. As there are many competing explanations, we cannot immediately attribute an observed cultural difference to be due to cultural values.

Therefore, in this thesis I focus cultural values that are likely to affect behaviour under risk and uncertainly, while controlling for other factors that could also be driving behaviour, such as demographics.

In particular, I focus on the key areas of social networks, cultural norms and identity, and peer effects. Research by Hsee and Weber (1999) indicates that social networks are likely to be a key driver of cultural differences in risk attitudes. Similarly, Chen and Chen (2011) show that group identity is likely to come into play when making interactive decisions under uncertainty. I use coordination games to investigate how cultural norms and identity affect behaviour as coordination games seem under-represented in the cross-cultural literature. Finally, I study cultural differences in the way risk attitudes are transmitted within peer groups to see whether conformist values are more manifest in the tight-knit collectivist cultures.

Chapter Three: Culture and Risk-Sharing Networks

3.1 Introduction

Social networks are an important source of financial risk-sharing, especially in developing countries where formal insurance markets may be underdeveloped. Collectivist societies tend to place more emphasis on informal risk-sharing than individualist societies. This may be because collectivists are concerned more with group prosperity than individual wealth. If a member of a collectivist group loses money through bad luck, the other group members are likely to bail them out. On the other hand, in an individualist society there is more emphasis on taking responsibility for one's own losses. This is exactly how Hsee and Weber (1999) explain their result that Chinese students are more willing to take financial risks than American students. The Chinese students, who are part of a collectivist society (Hofstede, 1980), are more likely to receive financial help from their family members, and thus take more risks with money than the individualistic Americans. Hsee and Weber (1999) call this explanation the "cushion hypothesis", as the social network can be thought of as a cushion to protect someone who falls (i.e. suffers a financial loss).

The importance of social networks in collectivist countries suggests that social risks (i.e. risks to interpersonal relationships) may be of greater concern than financial risks. While people from collectivist societies may receive financial support from their social network, any support received is usually conditional on the benefactor being on good terms with their network members. Therefore, people from collectivist cultures have a greater incentive to maintain good relationships than those from individualist cultures, who do not tend to rely on

others for financial support. Indeed, Weber *et al* (1998) find more proverbs applicable to social risks in Chinese culture than American or German culture.

We run an online survey to elicit the social networks of students at the University of Exeter in the United Kingdom and the University of Canterbury in New Zealand. The survey is followed up with a laboratory experiment where we saliently elicit students' risk attitudes and present them with a hypothetical social risks problem. Asian students are found to form significantly larger financial risk-sharing networks, and also show a greater preference for taking financial risks compared to British and New Zealand Europeans. However, fewer Asians are prepared to take risks in social situations compared to people from the other cultures. These findings support Hsee and Weber's (1999) cushion hypothesis. While a larger social network may decrease risk aversion over financial outcomes, people from collectivist cultures have a greater incentive to maintain good relationships and thus take fewer risks with their social life.

3.2 Background Literature

3.2.1 The Cushion Hypothesis

Using hypothetical choices between a certain outcome and a gamble, Hsee and Weber (1999) document a cultural difference in financial risk preferences, with Chinese taking more risks than Americans. In contrast to this result, the majority of subjects from both cultures expected Americans to be more risk seeking than Chinese. However, the result makes sense in terms of social networks, as the collectivist Chinese are more likely to receive financial support from their network, thus inspiring more risk taking behaviour. In the event of a loss, Chinese are "cushioned" by their social network. People from individualist

cultures are less likely to receive such support and are therefore more cautious with their money.

As explained in Chapter Two (pp. 37-38), Hsee and Weber (1999) find support for their cushion hypothesis by asking subjects how many people they could receive financial support from. The Chinese participants give a significantly larger number of people they could ask for financial support compared to the Americans. However, there are no significant cultural differences when asking participants how many people they could approach for emotional or psychological support. In addition, Hsee and Weber (1999) find no significant differences in risk attitudes between Chinese and Americans in the academic or medical context. They claim this is because while the social network can provide immediate support for financial problems, the network can only provide limited support for academic or medical problems.

3.2.2 Context-Specific Risks

Dohmen *et al* (2011) find risk attitudes to be highly context-specific in a large representative sample. Their data consists of 22,000 individuals from the German Socio-Economic Panel Survey. Using an 11-point scale, subjects are asked to rate their willingness to take risks in general, and in several different contexts (car driving, financial matters, sports and leisure, career, and health). The measure of general risk aversion is verified by a field experiment on a representative sample of 450 individuals, where the coefficient of risk aversion is estimated for each subject using a salient lottery choice task for money. Data is also collected on behavioural outcomes for the 450 individuals, including traffic offenses, portfolio choice, smoking, occupational choice, participation in sports,

and migration. In each case, the behavioural outcome is best predicted by the corresponding context-specific risk measure.

In a separate study that uses the same data as Dohmen *et al* (2011), Dohmen *et al* (2012) look at the transmission of risk attitudes from parents to children. Using the risk attitude questions from the German Socioeconomic Panel, they find a strong correlation between the attitudes of parents and their children. These correlations are context-specific, with the attitudes of parents and children being highly correlated within each context. In addition to risk attitudes, they also attempt to measure preferences, by presenting subjects with a hypothetical lottery choice task. Again, they find a strong correlation between the choices of parents and their children. The authors note that the study does not distinguish how attitudes are transmitted. There are several possibilities including genetics, imitation, or deliberate efforts by parents. If attitudes are transmitted from generation to generation, any cultural differences in risk attitudes could persist for many years. Attitudes may also be transmitted through networks, which means cultural differences in network structures could affect how risk attitudes are transmitted.

3.2.3 Models of Network Formation

Models of network formation assume that individuals gain benefit from being connected to others, but that maintaining direct links is costly. Therefore, links are only formed when the benefits of membership outweigh the costs. Typically, networks are represented as a set of n agents, $N = \{1,…,n\}$, where N_i is agent $i's$ set of neighbours, or agents i is linked with. A link between agents i and j is represented as $g_{ij} = 1$, whereas if agents i and j are not linked we have $g_{ij} = 0$. The set of links that makes up a network can then be represented on a graph.

Some of the most common network structures studied in the literature are illustrated below in Figure 3.1.

Figure 3.1: Common Network Structures
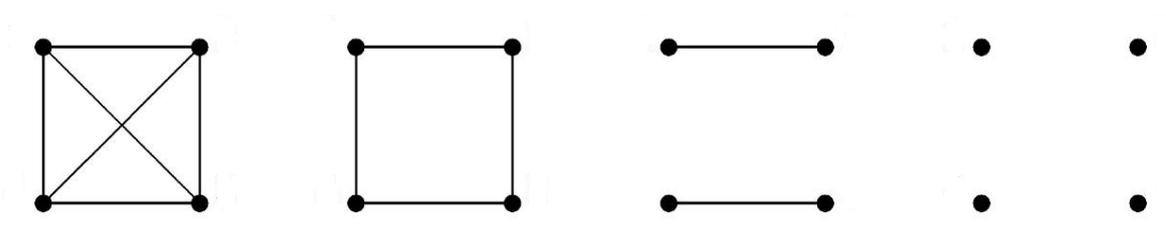
The image on the far left of Figure 3.1 represents a unilateral matching network, where every member of the population (indicated by the nodes) is connected to every other member (indicated by the lines between nodes). The second image shows a local interaction network, where agents only interact with their nearest neighbours. The third image shows two marriage networks, where each agent is only connected to one other agent. Finally, the image on the far right corresponds to a situation of autarky, where no agents interact. These are the network structures considered by Corbae and Duffy (2008).

There are several reasons why network membership may be more or less beneficial or costly in some cultures. For example, greater geographic distance between members may make network maintenance more costly, or poor financial institutions in some areas may mean there is more benefit in forming social networks to obtain credit. This raises the question of whether social networks are formed in response to external factors such as poor financial institutions, or whether they reflect cultural values such as sharing and cooperation. There is a possibility that causality runs in the other direction, with financial institutions being underdeveloped in collectivist societies because there is less need for them.

3.2.4 *Network Formation in the Lab*

Kosfeld (2004) provides a survey of network experiments in the lab, focusing on cooperation, coordination, and network formation. Although cooperation can theoretically be sustained in networks through imitation of successful strategies, some experimental evidence is to the contrary. For example, Kirchkamp and Nagel (2001) find that cooperation rates decline in the prisoners' dilemma when moving to more isolated network structures. Kosfeld (2004) suggests that subjects may not learn from their neighbours in the way assumed by theoretical models of imitation. Rather, learning may be driven by positive reinforcement of one's own successful strategies.

Both cooperation and coordination rates are higher in networks if people are allowed to choose their own partners (Kosfeld, 2004). In addition, a lower group size leads to greater convergence on payoff dominant outcomes. As for network formation, Kosfeld (2004) notes that the cost of maintaining networks is important and that fairness mechanisms may be needed to keep networks in place. For example, rotation of inferior roles or compensation given to those in inferior roles may help sustain the network.

Lab experiments are useful when studying cultural differences in risk-sharing networks because we can eliminate competing reasons for network formation that are present in real-life networks such as friendship and emotional support. If people from collectivist cultures form more extensive networks in real life, we can check the robustness of this result by looking at network formation in the lab. We can also see if there are any cultural differences in the ability to use networks to cooperate or coordinate.

Corbae and Duffy (2008) experimentally test the effect of endogenous network formation on behaviour in a multi-player stag hunt game. Players are also subject to a random shock which limits the actions available to them in the stag hunt game. The idea is to see how network structure affects the possibility of contagion, i.e. the spread of a random shock from an individual to the network.

In order to give players something to base their network formation on, three different types of network structures are imposed in the first set of games: marriage, local interaction, and uniform matching. Marriage networks are where only two people interact, local interaction has every player interacting with their two nearest neighbours, and uniform matching is where every player interacts with all other players in a group. Players are organised in groups of four, within which these networks structures are imposed. Therefore, players play either a two, three, or four player stag hunt game.

After playing five rounds under an initially imposed network structure, players are free to propose links to other players within their group of four. Any players who mutually propose links to each other are then linked and play the stag hunt together for another five rounds. The process is then repeated three more times.

Corbae and Duffy (2008) find that the marriage (i.e. two player) network is the most stable structure, and that regardless of the initial network imposed, most players end up with only one link. While the marriage and uniform matching networks are robust to contagion, they find some evidence of contagion in local interaction networks. They also find a high rate of efficiency, with around 90% of strategies played being payoff dominant.

3.2.5 Network Formation in the Field

Fafchamps and Gubert (2007) study the formation of risk-sharing networks in the rural Philippines. Using survey data, they find that one of the main determinants of network formation is geographical proximity (which is possibly correlated with kinship), with a smaller geographic distance indicating higher likelihood of network links. The authors find this surprising, as subjects do not maximise the potential for risk-sharing by forming networks with those in different occupations or regions. Apparently the participants prefer to form networks with people they can easily monitor, or perhaps have some kinship altruism towards.

In contrast, Grimard (1997) finds that risk-sharing groups in Cote d'Ivorie can form across regions where households share the same ethnicity. Anthropological evidence from Cote d'Ivorie suggests that links with extended family members are particularly important economically and that these links persist across regions (Grimard, 1997, pp. 399 – 401). Using panel data, Grimard (1997) finds evidence of partial risk-sharing among ethnic groups in Cote d'Ivorie, but admits that the data is subject to measurement error and unobserved common factors. Nonetheless, evidence from both Fafchamps and Gubert (2007) and Grimard (1997) suggests that risk-sharing networks are incomplete and related to kinship ties rather than income or occupation differences.

3.3 Methods

There are three main hypotheses we attempt to test with this research. We address the hypotheses with an online survey to elicit social networks among students, which is followed up by a lab experiment to replicate network formation and introduce a salient measure of risk attitude. The hypotheses and research methods are detailed below.

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Hypothesis One: Students from collectivist cultures will form larger networks than students from individualist cultures when they come to study at university, when all other factors are accounted for. In addition, collectivist students will also attempt to form more network connections in a lab environment than individualist students.

Hypothesis Two: Having a larger network will decrease aversion to financial risk, as students can rely on their network for support if they need to borrow money. Note that this effect may be stronger for collectivist cultures than individualist cultures, as collectivists are more likely to consider their network in decision making.

Hypothesis Three: Students from collectivist cultures will be more risk averse for social risks. This could be because they have a greater incentive to maintain harmonious relationships, in order to receive support from their network when in need. We also expect there to be cultural differences in risk attitudes in other contexts, such as health and career, due to differences in values and beliefs.

3.3.1 Initial Online Survey

Using SurveyMonkey, we run an initial online survey to identify social network connections of students at the University of Exeter in the United Kingdom (UK) and the University of Canterbury in New Zealand (NZ), before inviting respondents to the lab for experiments. We choose the UK and NZ because both are English-speaking individualistic countries but have high numbers of Asian students. The entire set of questions from the surveys can be found in Appendix One.

The survey was run at the University of Exeter in the UK in February 2012 and the University of Canterbury in NZ in June 2012. We received 465 responses from students at Exeter and 87 responses from students at Canterbury. The low response rate from Canterbury students may have been because the survey was run during the last week of winter holidays and first week of term. For both surveys, the main method of advertising was emailing students who were registered to take part in experiments and inviting them to complete the survey. The invitation specified that responses were strictly confidential and would only be seen by the researchers. The surveys included a prize draw in both countries in order to incentivise participation. In Exeter one respondent was randomly selected to receive £100 and in Canterbury five randomly selected respondents received NZ$20 each. We had more prizes in Canterbury because the registered students were usually all paid when they attended experiments and the department wanted to pay as many as possible.

One of the shortcomings of this survey was that the respondents' earnings were not contingent on their decisions in the survey, and therefore they were not given an incentive to answer truthfully. Leider *et al* (2009, p. 8) use a clever method to saliently elicit network connections, by paying subjects for naming people who also name them. While such a method is ideal for truthfully eliciting network connections, we were unaware how many people would complete the online surveys and thus faced a budget limitation.

Students provide a good subject pool when studying the formation of social networks, as students must decide with whom to form links when they come to study at university. In the UK and NZ students do not usually know any of their classmates before arriving at university. Studying network formation in people's

home towns is complicated by the fact that many people are born into networks, rather than choosing who to form links with. By studying how networks are formed at university we can see how networks are consciously formed. We can therefore tell whether networks are formed due to cultural values or external conditions. While controlling for external conditions, if students from collectivist backgrounds still choose to form larger networks, this provides an indication that cultural values such as risk-sharing are important in determining networks.

The online survey contains three questions where respondents are asked to name fellow students who they could turn to for various problems. The first question asks respondents to give the full names of any people who they could ask to borrow £100 (or $100 in NZ) from for an accommodation deposit that they need urgently. The second question asks them to name classmates they could ask to borrow lecture notes from, and the final question asks them to name people who they could ask for personal advice. The survey questions are designed to identify the size of people's social networks at university and to identify network connections between people. The three different network contexts are used to ensure robustness and to see whether certain cultures have larger networks in some areas of their lives than others.

For all three questions, respondents are told that they can only list people from the university and cannot receive help from their friends or family back home. They are also told they can list any number of people. To make the data collection simpler we provide ten boxes for the participants to list their friends in, and an eleventh box to type the names of any other friends. Therefore, there may have been some anchoring effects driving the participants to list around ten

people. However, many people listed less than five friends so anchoring effects appear to be minor.

As part of the online survey, we include Dohmen *et al's* (2011) context-specific risk questions, in order to look for cultural differences in context-specific risk attitudes. We also ask subjects to rate their willingness to take risks in general. The questions are framed as follows:

Please estimate your willingness to take risks with regard to the following areas, with 0 being not at all willing to take risks, and 10 being very willing to take risks:

Driving, Financial Investment, Leisure and Sport, Career, Health, Social Approval[12]

We ask several behavioural questions to follow-up the context-specific risk questions. We ask these questions before the context-specific risk measures, with another question in-between. This is to prevent respondents from trying to be consistent with their self-reported risk measures when answering the behavioural questions. The behavioural questions are as follows:

Please answer the following questions:

Do you smoke?

Have you ever been charged with a traffic offence?

Do you plan to become self-employed?

Do you (or will you) invest in the stock market?

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[12] We add a question about social risks, i.e. risks to interpersonal relationships, which we describe as "social approval".

Do you play any active sports?

Do you plan to work in the public sector?

Although Dohmen *et al* (2011) collect data on actual behaviour, we hope the above questions will provide some indication of how useful our context-specific risk measures are at predicting behaviour. We are interested in any cultural differences in context-specific risk attitudes and related behaviour. In particular, we expect students of Asian origin to be less risk averse for financial investment risks but more risk averse for social approval risks. This is because collectivist values promote the sharing of financial risks, while emphasising the importance of relationships.

The survey also collects information on demographics, which allows us to know the cultural background of subjects before they turn up for experiments. This minimises experimenter demand effects[13] as we do not need to ask participants for their cultural information during the experiment. Knowing the cultural background of respondents before inviting them to experiments also allowed us to invite higher numbers of people from the cultures of most interest (such as Chinese and British).

3.3.2 Network Formation Experiment

In May 2012 we run a follow-up experiment to the online survey in Exeter, and in July 2012 we run the same experiment in Canterbury. A total of 120 students attended the experiment in Exeter, and 68 students attended the experiment in Canterbury, leading to a total of 188 participants. The experiment involves a stag hunt game with endogenous network formation, based on Corbae

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[13] 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.

and Duffy (2008). The idea is to see whether people from collectivist cultures try to form more links when given the opportunity to do so. The experiments are run using pen and paper in purpose-built experimental laboratories: FEELE (Finance and Economics Experimental Laboratory) at the University of Exeter and NZEEL (New Zealand Experimental Economics Laboratory) at the University of Canterbury. The experiment consists of four parts, each explained in detail below. Full instructions are available in Appendix Two.

As part of the follow-up experiment we include a salient measure of risk aversion, where subjects choose between risky or safe lottery options (Holt and Laury, 2002) and are paid accordingly. We also include a social risks question, where participants need to decide whether or not to give advice to a roommate that will either enhance or hurt the relationship (based on Weber *et al*, 1998). Responses from these questions can be compared to the subjects' self-reported measures of risk attitudes from the online survey.

To avoid inducing any cultural stereotypes, we do not prime the identity of participants. People from a variety of cultural backgrounds are invited to each session, and we do not mention anything about culture until the follow-up questionnaire. Hsee and Weber (1999) find cultural stereotypes of risk attitudes to be highly misleading. In their experiment, both Chinese and American participants expected Americans to be more risk seeking. The results were in fact the opposite, with Chinese being the more risk seeking. Previous literature shows that subjects have a tendency to behave according to stereotypes in experiments when primed with their identity (Shih *et al*, 1999). As we are interested in identifying norms rather than stereotypes, we do not prime the identity of participants before they take part in the experiment.

Part One – Stag Hunt with Exogenous Network

Each participant is assigned to a group of four players, where each player is identified with a player ID but their identity is kept secret from each other. In part one of the experiment, each participant plays three different versions of a stag hunt game with other players in their group of four. The three different versions of the game correspond to a two, three, and four player version. We allow players to play each version of the game so that they gain familiarity with all three versions and have experience with playing the game with different numbers of players. This prevents us from needing to control for different part one experiences in later stages, such as when players are allowed to form links with each other.

Payoff tables for the three different versions of the stag hunt game are illustrated below. We use the same payoff structure as Corbae and Duffy (2008). The payoffs are given in Experimental Currency Units (ECU), which are converted into pounds or dollars at the end of the experiment. Using ECU allows us to run the experiment in different countries with ease. Players are told to choose between X and Y without knowing the choice(s) of other players. In the tables, the other players' choices are given by how many players choose each option. For example, in the 4-player game, 2X1Y means that two of the other players choose X and one chooses Y.

The payoff dominant equilibrium in each version of the game has all players choosing X, whereas the risk dominant equilibrium has each player choosing Y. This is a game of aggregate externalities, i.e. players only care about the total benefit they receive from the decisions of other players rather than who chooses what. In each version of the game, the participants are matched with

other players within their four-player group by the experimenter. These matches determine who plays the game with who and the subsequent payoffs from part one. Each player's payoff and the decisions of all other players within their group of four are revealed to them before moving on to part two. Players can then use this information to decide who they will propose links to. One of the three versions of the game is randomly selected for payment at the end of the experiment.

2-player Game

		Other Player's Choice	
		X	Y
Your	X	60	0
Choice	Y	35	35

3-player Game

		Other Players' Choices		
		2X	1X1Y	2Y
Your	X	60	30	0
Choice	Y	35	35	35

4-player Game

		Other Players' Choices			
		3X	2X1Y	1X2Y	3Y
Your	X	60	40	20	0
Choice	Y	35	35	35	35

Part Two – Stag Hunt with Endogenous Network Formation

In part two of the experiment, players are given the opportunity to form links with other players within their group of four. They do this by completing a link proposal form where they tick the player ID(s) of any other players within their four-player group with whom they wish to form a link. A link can only be formed if two players mutually propose a link to each other. Forming a link means that the players who are linked will play another round of the stag hunt game with each

other. The number of links each player forms therefore determines which version of the game they play. Following on from Corbae and Duffy (2008), players who form no links receive an automatic payoff of 35 ECU. This is to prevent players from sending out extra link proposals solely as insurance that they will be linked. After the link formation stage, players are told the player IDs of any players they are linked with and asked to play one more round of the stag hunt game.

Part Three – Risk Aversion Elicitation

Part three of the experiment is a lottery choice task, designed to saliently elicit the subjects' risk attitudes. Participants are asked to make ten decisions, where each decision involves a choice between two lotteries. One lottery is relatively riskier and the other relatively safer. The ten lottery choices are given in a table, and as you move down the table the expected value of the relatively riskier lottery increases, so that the risk attitude of a person can be measured by the point they switch from preferring the safer lottery to the riskier lottery. One of the ten choices is then randomly selected and played out to determine the payoffs from this part of the experiment. The probabilities and payoffs used in this task are based on Holt and Laury (2002).

Part Four – Follow-up Questionnaire

Part four is the final part of the experiment and involves a follow-up questionnaire. Subjects are asked a social risks question, questions about their family income and number of siblings, and questions designed to control for background risk. The social risks question is designed to test whether people from collectivist cultures are more risk averse for social risks than people from individualist cultures, as maintaining relationships is likely to be more important for collectivists. The question is framed as follows:

Imagine you have a good relationship with your roommate, and that your roommate is currently facing an important decision. You have a strong opinion about the decision your roommate should make, and need to decide whether or not to give your roommate advice. If you give advice that your roommate appreciates, this will greatly enhance your relationship. However, if your roommate dislikes your advice, this will seriously harm your relationship. If you give no advice, this will have no effect on your relationship. Will you give advice or remain silent?

This question is based on an example of a social risks problem given by Weber *et al* (1998). Individualists are expected to take more risks with their interpersonal relationships as they probably do not rely as heavily on their social network for financial support as collectivists do. It is likely to be more important for an individualist to get their opinion across than to minimise the risk of harming a relationship.

We control for family income in case students from a particular culture are wealthier than students from other cultures, which could be driving any differences in risk attitudes. We also ask for the number of siblings to see how many people the family wealth is distributed amongst.

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). This is a large problem for cross-cultural research as students from a particular country may be feeling risk averse because of financial or environmental conditions in their home country, rather than their cultural values. To control for background risk, we ask students to rate

the current financial stability of their home country, as well as their current mood, on a scale from one to five.

3.4 Results

3.*4.1 Online Survey*

There are four main research questions we can attempt to answer with the online survey. Firstly, do students from collectivist cultures form larger networks when they come to study at university? Secondly, how does network size affect attitudes to risk in the financial context? Thirdly, do students from collectivist cultures claim to be less willing to take risks with social approval? Fourthly, are the context-specific risk attitudes measures correlated with behaviour and are there any cultural differences? I will discuss the results for each of these questions below.

In the UK dataset, the cultural group each participant is allocated to depends on their nationality. In cases where a respondent lists more than one nationality, the first nationality they give is used to determine their cultural group. In NZ, cultural groups are based on ethnicity, rather than nationality. This is to distinguish between ethnic groups with the same nationality, i.e. Maori and European New Zealanders are two distinct ethnic groups who are both considered "New Zealanders". Any responses with mixed Asian and European backgrounds are thrown out. Out of the 552 respondents who completed the online survey, 340 are British, 82 are East Asian, 53 are European, 48 are NZ European, and 29 belong to other cultures. The majority of respondents in the Other category are students who completed the survey in NZ but did not specify whether they are from a Maori or European background.

Network Size

If network formation is driven by cultural values, we expect students from collectivist cultures to form larger networks when they come to study at university, when controlling for external conditions. Table 3.1 shows the average network sizes in each context by cultural group. These values correspond to the average number of network connections listed in response to the three questions: who would you ask to borrow money from? (Financial Network), who would you ask to borrow lecture notes from? (Academic Network), and who would you ask for advice when faced with an important decision? (Social Network).

Table 3.1: Average Network Size by Nationality/Ethnicity

	Average Network Size[14]				
	Overall $n = 552$	British[15] $n = 340$	Asian[16] $n = 82$	European[17] $n = 53$	NZ Euro $n = 48$
Financial Network	4.93 (0.13)	5.14 (0.16)	5.66 (0.33)	4.60 (0.40)	3.60 (0.42)
Academic Network	4.71 (0.12)	5.07 (0.15)	4.65 (0.32)	4.26 (0.36)	3.77 (0.36)
Social Network	5.15 (0.13)	5.76 (0.17)	4.35 (0.30)	4.51 (0.34)	3.96 (0.43)

We can see from Table 3.1 that the Asian students have a higher average network size for financial risks than any of the other cultures. Using a Mann-Whitney *U*-test, the Asian network size variable is significantly different to the other cultures for financial risks ($p = 0.011$). NZ Europeans have an even smaller average financial network, which is also significantly different to the other cultures

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[14] Standard deviations are given in parentheses.

[15] Includes other English-speaking individualist nationalities such as American, Canadian, Australian, and Irish.

[16] Includes Chinese, Japanese, Indonesian, Malaysian, Vietnamese, Indian, Hong Kong, and Singaporean.

[17] Includes German, French, Spanish, Italian, Greek, Lithuanian, Bulgarian, Romanian, Belgian, Polish, Czech Republic, Slovakian, Cypriot, Chechen, Swedish, and Russian.

(p < 0.001). While the average size of academic networks are fairly similar between the cultures, the British have a larger and statistically different social network size compared to the other cultures (p < 0.001). NZ Europeans have smaller networks sizes than the other cultures in all three contexts. As the online survey in NZ was conducted during a term break, network connections may have been less salient to the NZ participants.

European cultures are a mixture of individualist and collectivist societies, and as such we do not have clear predictions about the size of Europeans' social networks in different contexts. Categories containing other nationalities are omitted from this analysis due to low sample sizes or cultural ambiguity. For example, some students listed their ethnicity as "New Zealander", which could include Maori or NZ European. As we cannot distinguish culture among these students, the results are not particularly insightful.

A two-sample Kolmogorov-Smirnov test of equality of distributions shows that Asians have a significantly different distribution of financial network size compared to the rest of the sample (p = 0.015). The British also have a different distribution to the rest of the sample but the result is less significant (p = 0.050), while the difference for NZ Europeans is highly significant (p < 0.001).

Table 3.2 shows some demographic characteristics of the online survey respondents. On average, Asian students are slightly older and in more advanced years of study than the British students. In addition, the sample of Asian students has a higher proportion of females than the British sample. Worth noting, is that females may form networks in a different way to males. For example, Lindenlaub and Prummer (2013) find that male high school students in the US form larger networks than their female counterparts. On the other hand, female students form

more clustered networks, where their friends tend to know each other (Lindenlaub and Prummer, 2013). In our survey, females form fewer links associated with financial risk-sharing, but have larger networks in the academic and social contexts. Testing for cultural and gender differences in the depth of networks, e.g. how much money could be borrowed from each friend, would be an interesting follow-up study to this work. For now, we control for the age and gender of participants when running regressions to see how network size influences risk attitude.

Table 3.2: Average Demographic Characteristics

	Average Demographics			
	British	Asian	European	NZ Euro
Age in Years	19.78	21.21	20.32	21.29
Percent Female	55.59	71.60	58.49	47.92
Percent Business Major	27.35	81.71	50.94	43.75
Year of Study	1.66	2.01	1.75	2.83

The most striking demographic difference between British and Asian students is the proportion of students majoring in business or economics. The vast majority of Asian students in the sample, over 80%, major in business, whereas only 27% of British students take a business or economics major. A two-sided two-sample Z-test of proportions shows that this is a highly significant difference ($p < 0.001$). This highlights the importance of controlling for demographic factors, as students who study business may have systematically different preferences to non-business majors, which could bias the results. For all variables, Europeans lie somewhere between the British students and the Asian students. NZ Europeans are in more advanced years of study on average, compared to the other cultures, and have a slightly lower percent female than the

British sample. Similarly to Europeans, they lie between the British and Asians in the percent who are taking a business major.

To investigate whether any cultural differences in network size are driven by the high portion of business majors among Asian students, Table 3.3 looks at cultural differences in network size for business majors only. Analysis is restricted to the extreme cases of British students and Asian students, who have a very low and very high proportion of business majors, respectively. When looking at the results for British students who major in business compared to the overall British sample, there is little difference in the size of financial networks, but both the academic and social networks become smaller when restricting the sample to business majors. Even with these smaller values, the social network size of British business majors is still higher than the Asian business majors. Differences in the size of academic networks are still small when looking at only business majors. These results are in-line with the results discussed above for the entire sample. Asian business majors have similar network sizes to the overall Asian sample.

Table 3.3: Average Network Size for Business Majors

Average Network Size		
	British $n = 93$	Asian $n = 60$
Financial Network	5.19 (0.32)	6.02 (0.36)
Academic Network	4.48 (0.26)	4.90 (0.37)
Social Network	5.27 (0.30)	4.48 (0.36)

Financial Risk Attitudes

As part of the online survey, we ask subjects to rate their willingness to take risks in different contexts, by giving a rating between 0 and 10 (higher numbers correspond to greater willingness to take risks). Although not a salient measure of risk attitudes, Dohmen *et al* (2011) find these measures to give an accurate prediction of related behaviour. For example, willingness to take risks in the health context is an accurate predictor of smoking behaviour. We ask subjects to rate their willingness to take risks in the context of financial investment, to see whether network size or culture affect attitudes to financial risk. On average, willingness to take risks with financial investment is higher for Asian students than British or NZ European students, with a mean of 5.4 for Asians, compared to 4.4 for British and 4.9 for NZ Europeans. A Mann-Whitney *U*-test shows that Asians have a significantly different willingness to take financial risks than the other cultures ($p < 0.001$). However, to control for demographics of the sample, I use regressions to get a better idea of how culture and network size affect attitudes to financial risk.

We use an ordered probit regression to assess whether having a larger financial support network lowers risk aversion over financial outcomes. An ordered probit model accounts for the ordinal nature of the data, whereas ordinary least squares treats the data as though it has precise quantitative meaning (Greene, 2003, p. 736). For example, ordinary least squares treats the difference between a risk rating of five and six the same as the difference between a rating of nine and ten. However, the risk aversion measure used here is only a ranking, where the order of outcomes is important rather than precise values. Although an ordered probit model provides a more appropriate fit to the data, interpretation of

the coefficients is less straightforward. While sign and significance of coefficients from an ordered probit model are meaningful, the magnitude of coefficients does not have a direct interpretation. The magnitudes differ depending on values of the independent variables.

However, we can calculate expected values of the dependent variable (risk attitude) by plugging in values of the independent variables (such as the sample means) and comparing changes in the independent variable of interest. For example, we can compare the expected value of financial risk attitude when network size is one compared to a network size of five, while plugging in sample means for the rest of the independent variables.

Our regression equation is as follows:

$$Risk\ Attitude_i$$
$$= \beta_1 Network\ Size_i + \beta_2 Age_i + \beta_3 Female_i + \beta_4 Culture_i$$
$$+ \beta_5 (Asian_i \times NZ\ Study_i) + u_i$$

Risk attitude is measured as the respondent's self-reported willingness to take risks in the financial context. Network size is the number of friends listed in the online survey, in three different contexts (financial, academic, and social). Age is the respondent's age in years. Year of study and a dummy variable for business major were initially included, but dropped due to insignificance. Female is a dummy variable, equal to one if the respondent is female, and zero if they are male. I include three cultural dummy variables to look for differences in the cultures of interest: Asian, British, and NZ European. The omitted categories are Europeans and Other. I also include a dummy variable for Asian students who are studying in NZ, in case they have different preferences to Asian students

studying in the UK. I use robust standard errors to account for heterogeneity in the sample.

Results from the ordered probit regressions are presented in Table 3.4 below. When looking at the entire sample of 552 students, we can see that the size of one's financial network has a positive and significant (p = 0.020) effect on the willingness to takes risks in financial investment, as expected. Social network size is also significant at the 5% level of confidence, but has a negative effect on the willingness to take risks with money. It is unclear why a larger social network should have a *negative* effect on willingness to take risks. Perhaps the students with more friends are more concerned with their reputation and do not want to face the shame of asking to borrow money from others, incentivising them to be more careful with money. Academic network size has no effect on risk attitudes in the financial context. Age and gender are also significant. Consistent with previous studies (e.g. Dohmen *et al*, 2011), being female and older both reduce the willingness to take financial risks.

The only significant cultural dummy variable is the Asian variable, which is significant at the 1% level of confidence (p < 0.001). As predicted, being Asian increases the willingness to take risks in the financial context, relative to the omitted categories of European and Other. A chi-squared test shows that the coefficient on the Asian dummy variable is significantly different to the coefficients on the British dummy variable (p < 0.001) and NZ European dummy variable (p = 0.039). There is no significant difference between the coefficients on the British and NZ European dummy variables (p = 0.220).

Table 3.4: Results from Ordered Probit Regression on Financial Risk Attitudes

	Coefficients from Ordered Probit Model[18] Dependent Variable: Willingness to Take Financial Risks			
	Entire Sample $n = 552$	British Sample $n = 340$	Asian Sample $n = 82$	NZ Euro $n = 48$
Financial Network Size	0.045** (0.019)	0.036 (0.022)	0.105** (0.051)	0.004 (0.106)
Academic Network Size	-0.000 (0.023)	-0.001 (0.029)	-0.092* (0.053)	0.101 (0.138)
Social Network Size	-0.048** (0.020)	-0.039 (0.024)	0.015 (0.062)	-0.046 (0.092)
Age	-0.022* (0.012)	-0.008 (0.018)	-0.083** (0.042)	0.041 (0.053)
Female	-0.589*** (0.091)	-0.453*** 0.110	-0.900*** (0.285)	-1.054*** (0.310)
British	0.042 (0.134)	N/A	N/A	N/A
Asian	0.642*** (0.165)	N/A	N/A	N/A
NZ Euro	0.244 (0.190)	N/A	N/A	N/A
Asian * NZ Study	-0.325 (0.296)	N/A	-0.181 (0.349)	N/A
Cut 1	-2.594 (0.327)	-2.329 (0.416)	-5.035 (0.895)	-1.223 (1.338)
Cut 2	-2.072 (0.326)	-1.835 (0.415)	-4.232 (0.876)	-0.889 (1.298)
Cut 3	-1.469 (0.320)	-1.126 (0.402)	-3.738 (0.881)	-0.458 (1.248)
Cut 4	-1.081 (0.317)	-0.750 (0.402)	-3.165 (0.878)	-0.072 (1.223)
Cut 5	-0.806 (0.317)	-0.454 (0.401)	-2.978 (0.887)	0.206 (1.213)
Cut 6	-0.394 (0.315)	-0.049 (0.400)	-2.258 (0.865)	0.536 (1.218)
Cut 7	0.131 (0.313)	0.424 (0.398)	-1.550 (0.842)	1.178 (1.191)
Cut 8	0.783 (0.316)	1.038 (0.403)	-1.069 (0.842)	2.127 (1.204)
Cut 9	1.472 (0.332)	1.650 (0.415)	-0.334 (0.912)	N/A
Cut 10	2.185 (0.384)	2.391 (0.497)	0.350 (0.930)	N/A

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[18] Robust standard errors are given in parentheses, rounded to three decimal places. Significance at the 10%, 5%, and 1% level of confidence is indicated with *, **, and ***, respectively. In ordered probit models, the probability of the dependant variable taking on any particular value is given by the probability a latent variable lies between each cut point.

To see whether any of the effects are culture-specific, we stratify the sample into British, Asian, and NZ European responses. Here we can see that the effect of financial network size comes entirely through the Asian sample. This makes sense, as the collectivist Asians are more likely to consider their network when making risky decisions. On the other hand, the individualist British and NZ Europeans probably make risky decisions based on their own personality. The negative effect of age on financial risk taking also comes entirely through the Asian sample, whereas the gender effect holds for all three cultural groups. Interestingly, having a larger network in the academic context reduces the willingness to takes risks with money for the Asian sample. It is unclear why this should be the case.

In addition to the stratifications, we run regressions that interact the cultural dummy variables with financial network size, age, and gender. This is to see whether the cultural effects differ with other characteristics. None of these interaction terms are significant. However, the results are available in Appendix Three for the Asian dummy variable interactions. We also check for an interaction between network size and gender, but this is also insignificant.

Social Risk Attitudes

We now turn to see whether there are any cultural differences in the willingness to take risks with social approval. We can expect those from collectivist cultures to be wearier of harming relationships than those from individualist cultures. We ask respondents to rate their willingness to take risks with social approval on a scale from 0 to 10, with higher numbers indicating greater willingness to take risks. When looking at sample averages, the average willingness to takes risks with social approval among British students is 5.4,

whereas Asians have an average of 4.7. NZ Europeans are also more willing to take social risks than Asians, with an average willingness to take social risks of 5.1. A Mann-Whitney *U*-test shows that Asians have a significantly different willingness to take social risks compared to the other cultures ($p = 0.008$). These results are indicative that students from collectivist cultures, such as most Asian countries, are indeed more risk averse for social risks than students from individualist cultures.

To account for demographic variables and any effects from network size, I run the same ordered probit regression as above, but with social risk attitudes as the dependent variable. Results from this regression are presented below in Table 3.5.

All of the cultural dummy variables are significant in this regression, but all have a negative effect on social risk attitudes, compared to the omitted categories of European and Other. The effect of being Asian is particularly large and significant. Using a chi-squared test, the coefficient on the Asian dummy variable is significantly different to the British coefficient ($p = 0.007$) but not the NZ European coefficient ($p = 0.191$). Similarly to financial risk attitudes, being female has a significantly negative effect on social risk attitudes. However, the gender effect works entirely through the NZ European sample. Age is not significant in determining social risk attitudes, accept for Asians where age has a negative effect. The only network size variable to show significance is the financial network size (and the academic network size for NZ Europeans only), which increases the willingness to take social risks, especially for British and NZ Europeans. It is unclear why having a larger financial risk-sharing network increases the willingness to take social risks.

Table 3.5: Results from Ordered Probit Regression on Social Risk Attitudes

	Coefficients from Ordered Probit Model[19] Dependent Variable: Willingness to Take Social Risks			
	Entire Sample *n* = 552	British Sample *n* = 340	Asian Sample *n* = 82	NZ Euro *n* = 48
Financial Network Size	0.035* (0.018)	0.055*** (0.021)	0.016 (0.053)	0.154* (0.088)
Academic Network Size	-0.027 (0.021)	-0.008 (0.025)	-0.056 (0.053)	-0.277*** (0.095)
Social Network Size	-0.008 (0.019)	-0.027 (0.023)	0.004 (0.050)	0.025 (0.088)
Age	0.010 (0.017)	-0.001 (0.022)	-0.107* (0.056)	0.084 (0.053)
Female	-0.178** (0.088)	-0.141 (0.112)	0.167 (0.271)	-0.755** (0.329)
British	-0.244* (0.145)	N/A	N/A	N/A
Asian	-0.631*** (0.184)	N/A	N/A	N/A
NZ Euro	-0.398** (0.171)	N/A	N/A	N/A
Asian * NZ Study	0.315 (0.345)	N/A	0.732** (0.369)	N/A
Cut 1	-2.194 (0.415)	-2.228 (0.506)	-3.792 (1.117)	-1.274 (1.202)
Cut 2	-1.819 (0.412)	-1.845 (0.499)	-3.370 (1.116)	-0.932 (1.193)
Cut 3	-1.328 (0.411)	-1.191 (0.501)	-3.088 (1.108)	-0.397 (1.184)
Cut 4	-0.933 (0.406)	-0.820 (0.492)	-2.600 (1.115)	0.092 (1.165)
Cut 5	-0.610 (0.404)	-0.417 (0.492)	-2.401 (1.117)	0.393 (1.121)
Cut 6	-0.061 (0.402)	0.082 (0.490)	-1.725 (1.106)	1.247 (1.113)
Cut 7	0.305 (0.402)	0.415 (0.490)	-1.421 (1.106)	1.856 (1.119)
Cut 8	0.686 (0.404)	0.844 (0.491)	-1.136 (1.093)	2.523 (1.131)
Cut 9	1.206 (0.408)	1.409 (0.492)	-0.652 (1.057)	3.521 (1.330)
Cut 10	1.675 (0.420)	1.905 (0.491)	0.252 (1.169)	N/A

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[19] Robust standard errors are given in parentheses, rounded to three decimal places. Significance at the 10%, 5%, and 1% level of confidence is indicated with *, **, and ***, respectively. In ordered probit models, the probability of the dependant variable taking on any particular value is given by the probability a latent variable lies between each cut point.

Context-Specific Risks

The average willingness to take risks in each context for each culture is presented below in Table 3.6. The average willingness to take risks in general is very close, with an average score of around 6 in all four cultures. Most people are very risk averse when driving, with averages of around 3 in each culture. Results for financial investment risks are discussed above, and show us that Asians tend to be more risk seeking with their money compared to British, Europeans, and NZ Europeans. All cultures are quite keen on taking risks with leisure and sport, although the Asians less so than the others. Asians are also less inclined to take risks with their careers, with an average willingness of 5.48 compared to over 6 for British and Europeans, and 5.58 for NZ Europeans. There is quite a large cultural difference in the health context, with Asians scoring an average willingness to take risks of only 2.17, compared to 4.33 for the British and 4.65 for NZ Europeans. This result may be due to Confucian values such as patience and self-control, that place less emphasis on immediate rewards than Westerners might. Therefore, Asians may be less inclined to engage in unhealthy behaviour such as over-eating. Risks with social approval are discussed above and show that Asians are less willing to take risks with their relationships than other cultures.

Following on from Dohmen *et al* (2011), we can check how well these context-specific risk measures predict actual behaviour using simple correlations. As the behavioural measures involve only "yes" or "no" outcomes, we use probit regressions to check the correlation between each behavioural measure and each context-specific risk attitude measure. The results from these regressions are presented below in Table 3.7. In-line with Dohmen *et al's* (2011) results, all

Table 3.6: Average Willingness to Take Risks by Nationality/Ethnicity

Average Willingness to Take Risks[20]				
	British n = 340	Asian n = 82	European n = 53	NZ Euro n = 48
General	6.10 (0.10)	5.88 (0.19)	6.02 (0.24)	6.04 (0.25)
Driving	3.37 (0.14)	2.66 (0.31)	2.89 (0.33)	3.83 (0.28)
Financial Investment	4.35 (0.12)	5.38 (0.23)	4.28 (0.34)	4.90 (0.34)
Leisure and Sport	6.89 (0.11)	5.63 (0.25)	6.60 (0.30)	6.13 (0.31)
Career	6.03 (0.11)	5.48 (0.24)	6.13 (0.30)	5.58 (0.29)
Health	4.33 (0.15)	2.17 (0.26)	3.94 (0.39)	4.65 (0.34)
Social Approval	5.41 (0.12)	4.67 (0.28)	5.45 (0.36)	5.10 (0.28)

Table 3.7: Correlations between Context-Specific Risk Measures and Self-Reported Behaviour

Probit Regression of Behavioural Outcomes on Risk Attitudes [21] Dependant Variable: Behavioural Outcome						
Risk Attitudes	**Behavioural Outcomes**					
	Smoking	Traffic Offence	Self-Employed	Stock Market	Active Sports	Public Sector
General	0.172*** (0.046)	0.167*** (0.053)	0.087*** (0.031)	0.010*** (0.030)	0.084*** (0.031)	0.004 (0.030)
Driving	0.011 (0.029)	0.087*** (0.032)	0.035 (0.021)	0.070*** (0.021)	0.051** (0.021)	-0.040* (0.021)
Financial Investment	0.041 (0.032)	0.095** (0.039)	0.111*** (0.025)	0.201*** (0.025)	0.054** (0.024)	-0.017 (0.024)
Leisure and Sport	0.100*** (0.038)	0.007 (0.039)	0.050* (0.027)	0.035 (0.025)	0.221*** (0.028)	-0.048* (0.025)
Career	0.131*** (0.041)	0.090** (0.044)	0.093*** (0.028)	0.049* (0.027)	0.054** (0.027)	-0.012 (0.027)
Health	0.170*** (0.030)	0.046 (0.030)	-0.026 (0.020)	-0.000 (0.020)	0.010 (0.020)	-0.004 (0.020)
Social Approval	0.112*** (0.033)	0.087** (0.037)	0.066*** (0.024)	0.036 (0.023)	-0.005 (0.023)	0.022 (0.023)

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[20] Standard deviations are given in parentheses.
[21] Standard errors are given in parentheses, rounded to three decimal places. Significance at the 10%, 5%, and 1% level of confidence is indicated with *, **, and ***, respectively.

of the context-specific measures are strongly correlated with related behavioural outcomes, except for the question on public sector employment. For example, self-reported willingness to take risks in the financial investment context is a strong predictor of whether or not someone intends to invest in the stock market. Similarly, whether or not someone smokes is highly correlated with their willingness to take risks in the health context. As such, these context-specific measures of risk attitudes seem to give a realistic insight into behaviour.

3.4.2 Network Formation in the Lab

In total, 188 students took part in the lab experiment, 120 in Exeter and 68 in Canterbury. Of these, 74 students are British, 42 are Asian (21 of which are studying in NZ and 21 in the UK), 33 are NZ European, and the others are European or from other cultures (mostly New Zealanders who did not specify whether they are Maori or NZ European). We can now ask whether students from collectivist cultures are more inclined to form networks when given the opportunity to do so in the lab.

When looking at the descriptive statistics[22], we can note differences in the extreme ends of the link proposals distribution, with no Asians proposing zero links in the UK data, compared to 18% of British students. At the other extreme, 42% of Asians propose the maximum number of links (three), compared to only 20% of British participants. The NZ data tells a different story, with 18% of Asians sending zero link proposals, compared to 15% of NZ Europeans. There is also

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[22] Responses from three sessions in the UK are removed from the analysis of link proposals due to a difference in the payoff structure. As almost all students were sending the maximum number of link proposals in the first three sessions, we decided to change the payoffs to make forming links less of a focal point. The payoff tables in all other sessions follow from Corbae and Duffy (2008).

little cultural variance in the proportions sending three link proposals, with 27% of Asians compared to 24% of NZ Europeans.

The overall data from both countries is illustrated below in Figure 3.2, which shows the percentage of people from each culture sending each number of link proposals. Here, NZ Europeans stand out while Asians and British are fairly similar. Proportionately more NZ Europeans send one link proposal and less send two compared to Asians and British. Using a two-sample Kolmogorov-Smirnov test of equality of distributions, Asians and British do not have significantly different distributions in the number of link proposals sent. However, NZ Europeans have a significantly different distribution compared to both the Asians and the British ($p = 0.034$ and $p = 0.013$, respectively).

Figure 3.2: Link Proposals by Culture as a Percentage
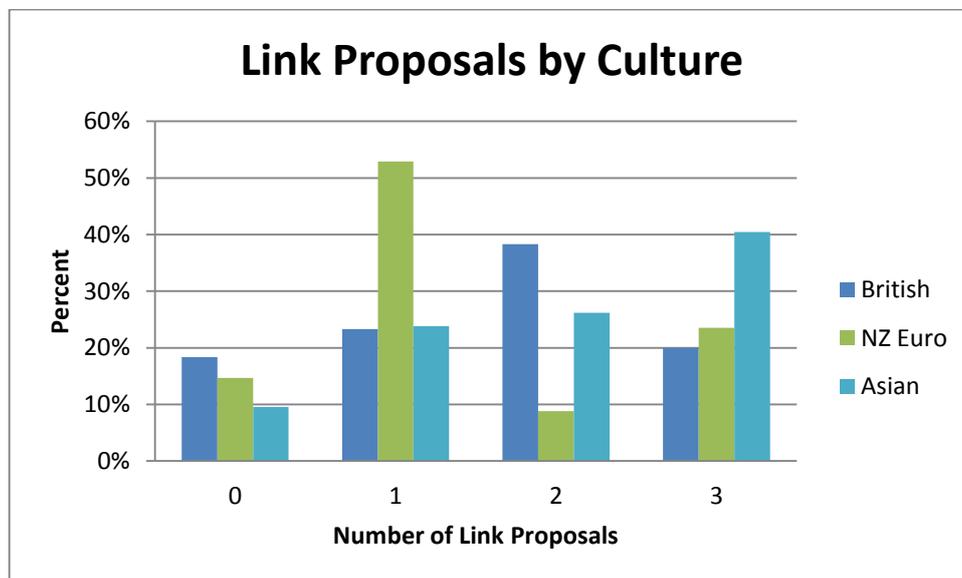
To control for demographic factors affecting behaviour in the number of link proposals, we run an ordered probit regression. The results from this regression are presented below in Table 3.8. Only two variables have a significant effect on the number of link proposals sent: the cultural dummy variables for Asians and NZ Europeans. Asians send significantly more link proposals and NZ

Europeans send significantly less, relative to the omitted categories of European and other.

Table 3.8: Results from Ordered Probit Regression on Link Proposals

Coefficients from Ordered Probit Model[23] **Dependent Variable: Number of Link Proposals**	
Financial Network Size	0.014 (0.040)
Academic Network Size	0.021 (0.044)
Social Network Size	-0.005 (0.040)
Age	-0.027 (0.024)
Female	-0.038 (0.193)
British	-0.098 (0.240)
Asian	0.709** (0.339)
NZ Euro	-0.659** (0.313)
Asian * NZ Study	-0.055 (0.662)
Cut 1	-1.731 (0.635)
Cut 2	-0.675 (0.621)
Cut 3	0.104 (0.619)

We can also ask, how do link proposals relate to the size of one's outside network? The network size variables are insignificant when adding them to the above regression on link proposals. However, financial network size has a

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[23] Robust standard errors are given in parentheses, rounded to three decimal places. Significance at the 10%, 5%, and 1% level of confidence is indicated with *, **, and ***, respectively. In ordered probit models, the probability of the dependant variable taking on any particular value is given by the probability a latent variable lies between each cut point.

positive and significant effect on the number of proposals sent when the cultural dummy variables are removed from the regression. This means that the effect of financial network size is entirely captured by the cultural dummy variables, as Asians have a significantly larger financial network compared to the other cultures, while NZ Europeans have a significantly smaller network.

Corbae and Duffy (2008) find a high degree of efficiency in their stag hunt experiment, with around 90% of players choosing payoff dominant strategies. In our experiment, 71% of players choose the payoff dominant outcome in the 2-player game under the exogenous network, compared to 66% in the 3-player game, and 68% in the 4-player game. In total, 60% of players choose the payoff dominant outcome after link formation. The 40% of players "choosing" the risk dominant equilibrium includes players who did not form any links and were forced to accept the risk dominant payoff. As there is little cultural difference in the level of efficiency, I do not give a detailed analysis of efficiency here.

3.4.3 Risk Attitudes in the Lab

Financial Risks

Subjects are asked to make ten different lottery choices, and the point they switch from preferring the safer lottery to the risker lottery is taken as a measure of risk attitude (Holt and Laury, 2002). Subjects who switch later in the table are more risk averse than subjects who switch earlier. In my analysis, the measure of risk aversion is taken as the number of the row they switch at, such that higher numbers correspond to greater risk aversion. Nine inconsistent responses are dropped from the dataset. Figure 3.3 shows the percentage of subjects from each culture who choose each switch point in the lottery choice task. We can see that larger proportions of Asians and NZ Europeans switch to preferring the riskier

lottery later on the table (rows 9 or 10), compared to British students. There also appears to be a focal point, with the majority of subjects from all cultures choosing to switch at row 7 or 8.

Figure 3.3: Percent of Subjects from each Culture Choosing each Switch Point
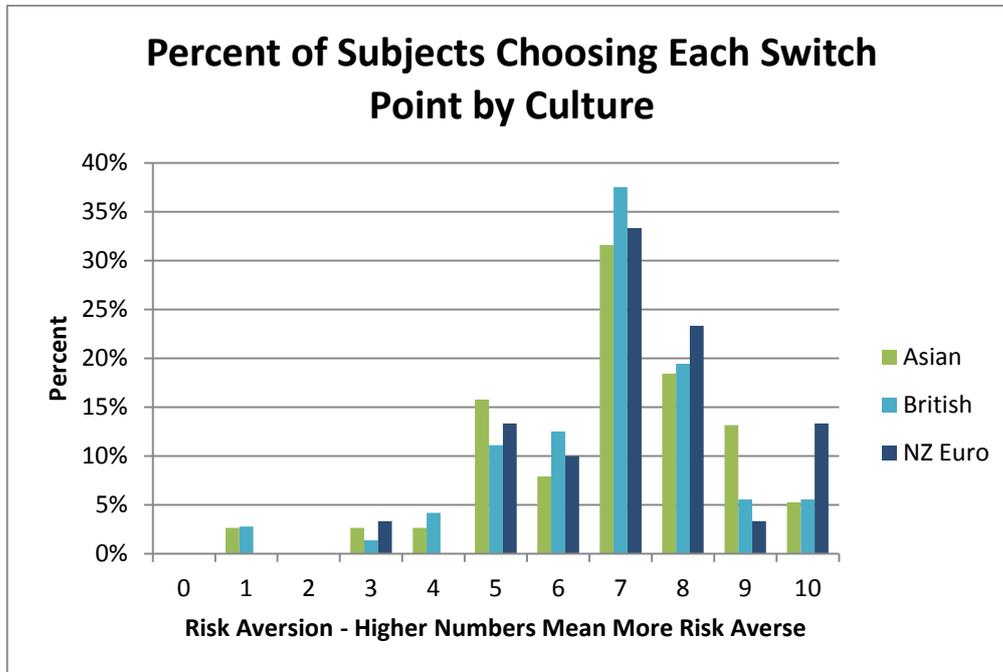
Again, we use an ordered probit model to assess the effects of culture and network size on the salient measure of financial risk aversion[24]. From the regression, reported below in Table 3.9, we can see that age and gender significantly affect salient financial risk attitudes, in the usual way (e.g. Dohmen *et al*, 2011). Being older and female increases the level of risk aversion among subjects. Also significant, is the interaction of the two dummy variables, being Asian and studying in NZ. Being both Asian and studying in NZ reduces risk aversion, so that these subjects take more risks with money. None of the cultural

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[24] We also run this regression including family income, number of siblings, and an interaction term for these two variables, but drop all three variables due to insignificance. The family income variable is problematic as many students reported that they did not know their parents' income and took a wild guess.

Table 3.9: Results from Ordered Probit Regression on Lottery Choice Task Switch Points

| | Coefficients from Ordered Probit Model[25] | | | |
| | Dependent Variable: Lottery Choice Task Switch Point | | | |
	Entire Sample n = 188	British Sample n = 74	Asian Sample n = 42	NZ Euro n = 33
Financial Network Size	-0.019 (0.047)	-0.001 (0.057)	0.283* (0.162)	-0.422* (0.245)
Academic Network Size	0.006 (0.044)	0.023 (0.058)	-0.070 (0.113)	0.259 (0.198)
Social Network Size	-0.034 (0.040)	-0.028 (0.048)	-0.230 (0.140)	-0.041 (0.125)
Age	0.064*** (0.020)	0.201** (0.097)	0.045 (0.093)	0.080** (0.038)
Female	0.624*** (0.193)	0.235 (0.243)	2.070** (0.981)	1.48** (0.585)
British	0.112 (0.211)	N/A	N/A	N/A
Asian	-0.220 (0.396)	N/A	N/A	N/A
NZ Euro	-0.040 (0.302)	N/A	N/A	N/A
Asian * NZ Study	-1.31*** (0.358)	N/A	-2.019 (1.255)	N/A
Cut 1	-0.858 (0.588)	2.000 (1.922)	0.939 (2.302)	-0.070 (1.056)
Cut 2	-0.465 (0.586)	2.193 (1.943)	1.404 (2.095)	0.652 (1.018)
Cut 3	-0.133 (0.568)	2.454 (1.894)	2.027 (2.252)	1.140 (1.063)
Cut 4	0.541 (0.561)	2.995 (1.908)	2.320 (2.237)	3.037 (1.179)
Cut 5	0.925 (0.560)	3.402 (1.895)	3.154 (2.257)	3.775 (1.250)
Cut 6	1.869 (0.569)	4.447 (1.891)	3.874 (2.257)	4.080 (1.312)
Cut 7	2.511 (0.564)	5.176 (1.914)	4.773 (2.339)	N/A
Cut 8	2.974 (0.580)	5.576 (1.992)	N/A	N/A

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[25] Robust standard errors are given in parentheses, rounded to three decimal places. Significance at the 10%, 5%, and 1% level of confidence is indicated with *, **, and ***, respectively. In ordered probit models, the probability of the dependant variable taking on any particular value is given by the probability a latent variable lies between each cut point.

dummy variables are alone significant, but the coefficient on the Asian dummy variable has the expected sign, i.e. being Asian reduces risk aversion over financial outcomes.

We observe some interesting results when stratifying the sample by culture for this regression. The effect of age works through the British and NZ European sample, but not the Asians, whereas the effect of gender works through the Asian and NZ European sample, but not the British. Also, when restricting the sample to Asians or NZ Europeans, the coefficient on financial network size becomes significant. Strangely, financial network size has a positive effect on risk aversion for the Asians. This is in contrast to our result obtained from the online survey, where having a larger financial risk-sharing network *increases* the willingness to take risks for the Asian sample.

The main problem with using Holt and Laury's lottery choice task is that we lack variation in the data. Most people in the experiment switch at around row 7 or 8, which is somewhat of a focal point. Because subjects are given exact probabilities and payoffs they are able to make decisions fairly systematically. We observe a lot more variation in the self-reported willingness to take risks measures from the online survey. The survey measures may be more related to personal preferences as there is no need to try and calculate a "right" answer.

Social Risk Problem

Participants are given a hypothetical social risk problem as part of the follow-up questionnaire. The problem involves a choice of whether or not to give advice to a roommate who is currently facing a major personal decision. Giving advice involves a social risk as the advice may turn out to be bad or the roommate may believe you are being pushy, which would harm the relationship. On the

other hand, if the roommate appreciates the advice, the relationship is improved. Remaining silent avoids the risk as it has no effect on the relationship. Participants can choose either to give advice or remain silent. Overall, 88% of British and 82% of NZ European participants indicate they would give advice, compared to only 54% of Asian participants. Using a two-sided two-sample Z-test of proportions, both the British and NZ European results are statistically different to the Asian results ($p < 0.001$ for both).

As there are only two outcomes in the social risks question, a standard probit regression can be used to analyse the results. A dummy dependent variable is created to indicate whether the subject would take the risk (1) or remain silent (0). Results from the probit regression on the social risks question are presented below in Table 3.10. As the cultural dummy variables are the most interesting here, I do not stratify the regression by culture.

We can see here that being Asian or older significantly reduces the tendency to take social risks in the roommate problem. The large effect of age is surprising considering the small variety of ages in the sample. However, when removing those older than 25 the effect of age becomes insignificant ($p = 0.143$). The effect of culture backs up my hypothesis that Asians are less willing to take risks with their interpersonal relationships. Without maintaining good relationships, collectivists do not have access to the benefits of belonging to a close-knit social network, such as receiving financial support in times of need.

Although this result supports the idea that Asians are more risk averse for social risks, only one hypothetical problem is considered. More social risks questions in different contexts need to be added as a robustness check to the above result. Alternative explanations also need to be considered. Perhaps the

Asians prefer to remain silent due to other cultural values, such as being polite, rather than wanting to maintain the risk-sharing network. Similarly, individualists may be concerned with other aspects of their culture, such as a greater emphasis on opinion sharing to show their individual values, rather than risks to relationships. In addition, we cannot be sure whether the participants even interpreted the problem as a risky situation. Perhaps they imagined a good friend whom they felt they could be honest with without risk of harming the relationship.

Table 3.10: Results from Probit Regression on Social Risk Question

Coefficients from Probit Model[26] Dependent Variable: Social Risk Attitude	
Constant	4.411***
	(1.054)
Financial Network Size	0.022
	(0.051)
Academic Network Size	-0.033
	(0.069)
Social Network Size	-0.034
	(0.064)
Age	-0.129***
	(0.037)
Female	0.066
	(0.285)
British	-0.555
	(0.455)
Asian	-2.010***
	(0.534)
NZ Euro	-0.423
	(0.540)
Asian * NZ Study	1.019
	(0.636)

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[26] Robust standard errors are given in parentheses, rounded to three decimal places. Significance at the 10%, 5%, and 1% level of confidence is indicated with *, **, and ***, respectively.

3.5 Discussion

This paper provides some indicative results that students from collectivist cultures do form larger networks at university, and do consider their networks more when making risky decisions. These results may show a lower bound on the effects of social networks on risk attitudes, as only networks within the university are considered. However, there are several important problems that need to be addressed with this research. Four of the key problems, which are common to cross-cultural research, are sample bias, background risk, interpretation bias, and heterogeneity within cultures with respect to values.

3.5.1 Sample Bias

The aim of this study is to provide some insights on how culture affects risk attitudes through social networks. However, it is important to note that any conclusions reached here only apply to a particular sample of students. The results are not representative of any cultural population, such as Asians in general. Asians who study abroad could be more or less risk seeking than the average population. Perhaps international students are particularly risk seeking as they are prepared to move countries to study, which is somewhat risky as students do not know how much they will like a place before they arrive.

On the other hand, students who are living in a foreign country may feel and act more risk averse as they are without the support of their close friends and family. Similarly, international students may conform to the local culture when studying abroad and act less collectivist as they perceive less collectivism in society (Zou *et al*, 2009). Extending this study to representative samples would be an interesting exercise for the future, to get an idea of how culture affects risk attitudes at the macro-level.

3.5.2 Background Risk

Comparing samples of students from different countries is subject to the problem of background risk (Harrison *et al*, 2007). The risk attitudes measured in this study could be influenced by different risky conditions that the students face in their daily lives. Perhaps some of the students come from a country that is experiencing harsher economic downturn than other countries. The students from the University of Canterbury were facing on-going earthquakes at the time the online survey and experiment were run. Could this have affected their risk attitudes? If so then comparison with students studying at Exeter will be biased. We try to control for background risk by asking subjects to rate their current mood and financial stability in their home country when completing the experiment's follow-up questionnaire. Neither of these variables turn out to be significant in regressions on risk attitudes. However, the problem of background still needs to be considered in our results.

One possible way to alleviate the problem of background risk is to compare cultures who are born and raised in the same environment, subject to the same background risks. For example, the Maori and European cultures in New Zealand represent two distinct cultural groups that are integrated and share the same environment. While the Maori culture is very collectivist, the NZ European culture is similar in individualism to the UK. While a few responses from Maori students were gathered in this study, more data needs to be collected to make a comparison between Maoris and NZ Europeans.

3.5.3 Interpretation Bias

Any experiment or survey is subject to interpretation differences between cultures. Interpretation bias is where people from a particular culture interpret the

experimental situation in a systematically different way to people from another culture. This may happen because cultural values dictate what the focus of the situation should be. For example, Morris and Peng (1994) use a computer simulation of a group of fish swimming, with some fish appearing in the foreground and others in the background. They find that Chinese participants tend to focus on the entire group of fish, while American participants focus on just one individual fish in the foreground. Therefore, Asians tend to consider background and context more in making decisions. How do Asian students interpret questions about their social networks and risk attitudes, or sending link proposals in the lab? Will this differ from the British/NZ European interpretation? The lab experiment with endogenous network formation seems quite abstract and difficult to interpret in terms of individualist and collectivist values.

3.5.4 Heterogeneity Within Cultures

One limitation with this research is heterogeneity within cultures with respect to values, such as collectivism and individualism (Bond and Smith, 1996, p. 125). While overall, East Asia can be characterised as a collectivist culture, and the United Kingdom can be characterised as an individualist culture, how individuals within these cultures take on the values of individualism and collectivism can differ widely. Students who attend economic experiments may be particularly individualist or collectivist individuals, regardless of their country of origin. How closely each individual identifies with being individualist or collectivist will determine whether or not these values are manifested in their behaviour.

Jetten *et al* (2002) look at how the strength of identification with national identity can affect behaviour among North Americans and Indonesians. In North

America, those who identify strongly with their national identity are more individualistic, while in Indonesia those who identify strongly are *less* individualist. These results reflect the national identities of North America being very individualist and Indonesia being very collectivist. Future experiments regarding cultural differences at the individual level should contain a measure of how strongly each individual identifies with their culture.

3.6 Conclusions

The main research questions of this study are whether students from collectivist cultures form larger networks when they come to study at university, and whether network size affects risk attitudes. We find that on average, students from collectivist Asian countries do form larger networks in the financial risk-sharing context, but not in the academic or social contexts. Having a larger financial risk-sharing network does increase the willingness to take risks with money, but only for Asian students. Risk attitudes for individualists are likely to be driven more by personality than relationships with others.

A couple of secondary research questions are whether collectivists are more risk averse for social risks, and are there any other cultural differences in context-specific risk attitudes? We find that Asian students are significantly less likely to take risks with their social relationships than British or NZ European students. This makes sense as Asian students are more likely to receive financial support from their social network and thus have a greater incentive to maintain relationships to ensure the support. Individualists are less likely to receive support to begin with and thus have less need to maintain relationships. In addition to social risks, Asians are also less inclined to take risks with their health compared

to the other cultures. This may be due to other cultural values such as self-control and not over-indulging.

The results of this project may be useful for policymakers, especially in countries that have a mixture of individualist and collectivist citizens. For example, policies that encourage risk-sharing networks to promote entrepreneurial activities may have a stronger impact on collectivists than individualists. These results are particularly relevant for developing countries which may lack formal insurance markets and also often tend to be collectivist in nature.

While the cushion hypothesis is likely to hold for university students, we need to ask how the effect may change with age. University students tend to be in a young age group, who have not yet accumulated their own wealth, which means they need to rely on financial support from older family members. But what effect does belonging to a collectivist culture have on the risk attitudes of older generations? The older generations are likely to make net transfers to the younger generations, as they have accumulated more wealth. Will the older generations therefore be more risk averse as they are responsible for supporting the young? Collectivism may have an opposite effect on risk attitudes as age increases. Does this mean the effect of risk-sharing networks cancels out when averaged over a representative sample? All of these questions are promising avenues for future research.

Chapter Four: Cultural Norms and Identity in Coordination Games

4.1 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 discriminate 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.

4.2 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[27], 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.

4.2.1 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 4.1. 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

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

player hunts a stag without the assistance of the 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 4.1: Stag Hunt Game

Player 2

		Stag	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.

4.2.2 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[28] increases coordination on the payoff dominant

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

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 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^g when the group identity is made salient. The other-regarding parameter is a weight $\in$ [-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.

The Pareto optimal equilibrium of the minimum effort game is for all players to contribute maximum effort, as payoffs are given by the equation below, where c < 1. However, it is only in a player's best interest to give the maximum effort if every other player also gives the maximum effort. A player should never give

more effort than the minimum chosen by any other player, as this effort would be wasted. Neither should they give less than the minimum as this would lower the payoff. This game is thus a coordination game, with Pareto-ranked Nash equilibria that have all players choosing the same effort level.

$$U_i(x) = min\{x_1, \dots, x_n\} - c[\alpha_i^g \bar{x}_{-i} + (1 - \alpha_i^g)x_i]$$

Chen *et al* (2010) investigate the impact of salient ethnic identities on coordination and cooperation. They find that Asians are more responsive to ethnic priming than Caucasians, and show more in-group favouritism and out-group discrimination. They use the participants' surnames to convey ethnic identity of the other players in each game, but they combine the surname with the participant's year of study and student ID to avoid experimenter demand effects[29]. Chuah *et al* (2007) also find more in-group favouritism and out-group discrimination by Malaysian Chinese than UK subjects when playing the ultimatum game. This suggests that people from collectivist cultures may distinguish more between in-groups and out-groups than people from individualist cultures.

Similarly, Benjamin *et al* (2010) investigate the effects of making ethnic identity salient on both financial risk attitudes and patience. They find no effect of priming[30] on risk aversion for Asian Americans, whites, or blacks. Priming ethnicity could have a dual effect on risk aversion for Asians. They could be more risk seeking when thinking about their collectivist values and knowing they have a social network who can bail them out financially. On the other hand, they could

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[29] Experimenter demand effects (i.e. subjects giving results that they believe will be helpful for the experimenter, rather than making the choice they want) have been shown to be of particular concern in Asian cultures (Brislin and Lonner, 1973, p. 70).
[30] Using a questionnaire developed by Shih *et al* (1999).

become more risk averse when thinking about the stereotype of Asians being cautious. Therefore, the overall effect of priming on risk attitudes may be negligible.

However, Benjamin *et al* (2010) do find an effect of priming on patience among Asian Americans, who become more patient when their race is primed. This may be due to Confucian values, which emphasize perseverance and are still prominent in several Asian countries. Interestingly, Benjamin *et al* (2010) find minimal evidence of experimenter demand effects, with a follow-up questionnaire showing 90% of participants claimed they were not thinking about what the experimenter wanted them to choose when making their decision. Of the remaining 10% of participants, no one guessed the experiment was about race (Benjamin *et al*, 2010, p. 18).

4.2.3 Expectations and Stereotypes

In addition, coordination games may be used to identify social norms. In Krupka and Weber (2013), subjects are asked to rate the social appropriateness of possible decisions in two variants of a dictator game. One variant is the standard dictator game, where the dictator is given an endowment of $10 and asked how much they want to transfer to the recipient. The other variant is a "bully" dictator game, where both subjects are endowed with $5, and the dictator is asked how much they want to give to or take from the other person. In both variants, the dictator can transfer amounts in increments of $1. Subjects earn extra money for each appropriateness rating that matches the modal response of all of the subjects' ratings. Therefore, subjects have an incentive to try and coordinate on the appropriateness rating that they believe other people will

choose. The most popular ratings may identify a social norm, or at least people's perceptions of the social norm.

However, expectations of other peoples' behaviour may rely on stereotypes, which do not necessarily represent the social norm[31]. 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. 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

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[31] 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).

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.

4.2.4 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 4.2.

Figure 4.2: Bargaining Coordination Game

Player 2

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

The bargaining game discussed above differs from the stag hunt in that the bargaining game is a situation of strategic substitutes, whereas the stag hunt is a game with strategic complements. Eichberger and Kelsey (2002) show that the implications of ambiguity differ depending on whether a game has strategic substitutes or strategic complements. Strategic substitutes are where an increase in the opponent's action will decrease the marginal benefit of one's own action. For example, in the bargaining game above, a larger claim of the opponent decreases the marginal benefit of one's own claim. Strategic complements are

the opposite: an increase in the opponent's action makes one's own action more beneficial, as in the stag hunt game. If the opponent switches from hunting hare to hunting stag, this increases the benefit of putting in the extra effort to hunt stag.

Eichberger and Kelsey (2002) show that an increase in ambiguity will have opposite effects in games with strategic complements and substitutes, but this depends on whether there are positive or negative externalities. In the bargaining game we have negative aggregate externalities, because an increase in demand of the opponent lowers payoffs. Under negative externalities, in a game with strategic substitutes (e.g. the bargaining game), an increase in ambiguity will lower equilibrium actions. However, the opposite result holds under positive externalities. With strategic complements, an increase in ambiguity will increase equilibrium actions under negative externalities, but decrease equilibrium actions under positive externalities. The stag hunt game has positive externalities, i.e. a higher action by the opponent is beneficial, which means that ambiguity should lower equilibrium actions in the game, leading to the inefficient equilibrium where all players hunt hare. Therefore, an increase in ambiguity, perhaps by playing someone from a different culture, has undesirable implications for both the stag hunt and bargaining coordination games.

4.2.5 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.

4.3 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 both a one-shot stag hunt game and 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. 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 effects, we use physical appearance to subtly show the cultural identity of the subjects. We recruit subjects based on surnames, with a mixture of East Asian and English surnames invited to sessions[32].

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[32] 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-

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. Across both sessions, we have a total of 64 Asian observations and 60 British observations for the stag hunt. For the bargaining game we have a total of 64 Asian observations and 64 British observations.

We run four different treatments: one with all Asian participants, one with all British participants, one with a mixture of Asians and British where the opponent is from the other culture, and one control treatment with a mixture of Asians and British and random opponent matching. The purpose of the control treatment is to use as a benchmark to compare the other treatments to.

To indicate to the subjects who they are matched with, they are told that they will be randomly matched with another player who is seated on the other side of the room. Therefore, in the Asian-only and British-only treatments, 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[33]. 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

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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.

[33] 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.

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.

4.3.1 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 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?

4.3.2 Stag Hunt Game

The first coordination game faced by the subjects is a simple 2-player stag hunt game, illustrated below in Figure 4.3. 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 4.3 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 4.3: Stag Hunt Game

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

4.3.3 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 4.4.

Figure 4.4: Bargaining Game

Other Player's Choice

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

4.3.4 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.

4.4 Results

4.4.1 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 4.5 and 4.6. However, the differences between treatments

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Figure 4.5: Proportion of British and Asian students choosing stag or hare when faced with an opponent from the same culture
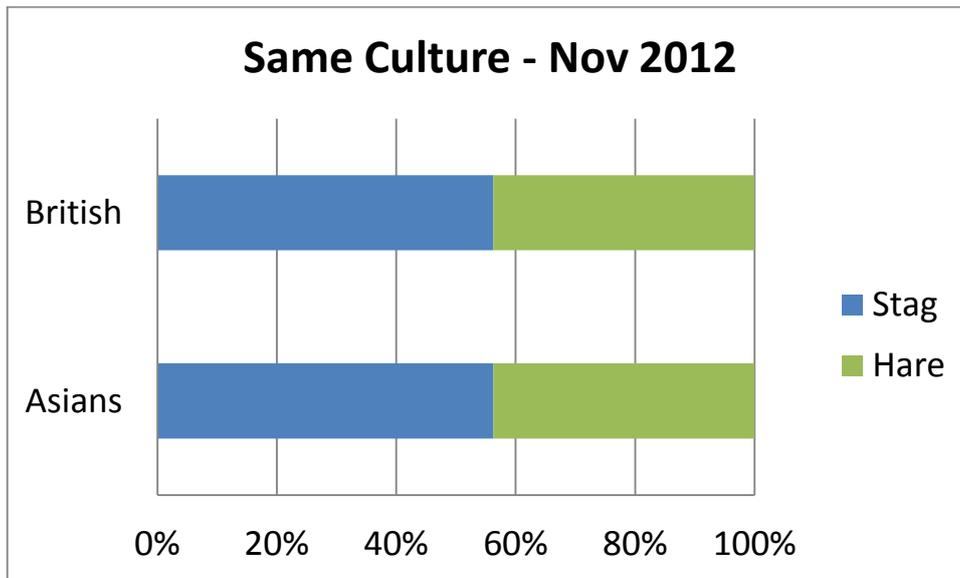
Figure 4.6: Proportion of British and Asian students choosing stag or hare when faced with an opponent from a different culture
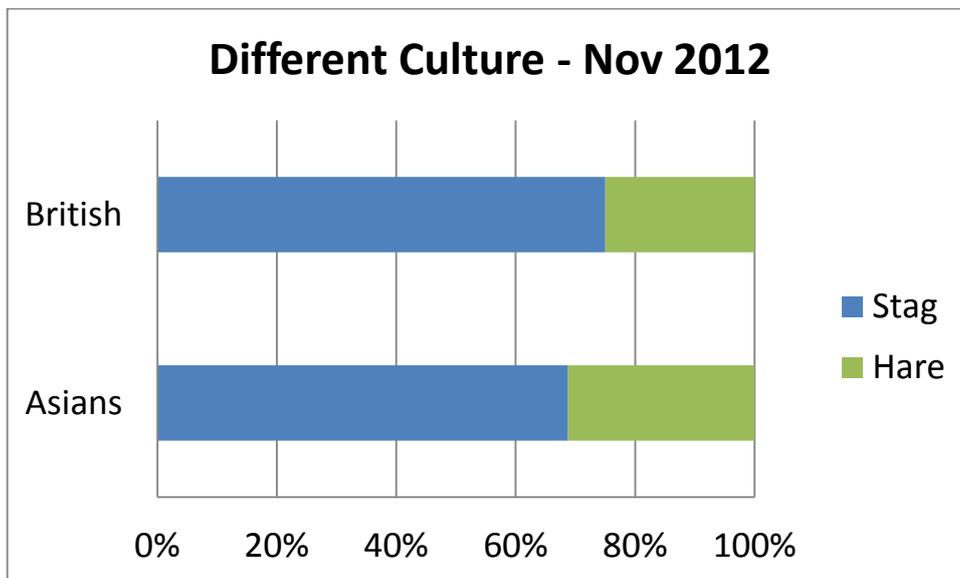
not statistically significant ($p = 0.472$ for Asians and $p = 0.272$ for British)[34].

Results from the mixed culture treatment, with random opponent matching, lie in between the other two treatments. Also of interest, expectations of the other

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

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

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 4.7 and 4.8. 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 discriminate 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.

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.

Figure 4.7: Proportion of British and Asian students choosing stag or hare when faced with an opponent from the same culture

Same Culture - March 2013

British — Stag ~60%, Hare ~40%
Asians — Stag ~68%, Hare ~32%

Legend: Stag (blue), Hare (green)

X-axis: 0%, 20%, 40%, 60%, 80%, 100%
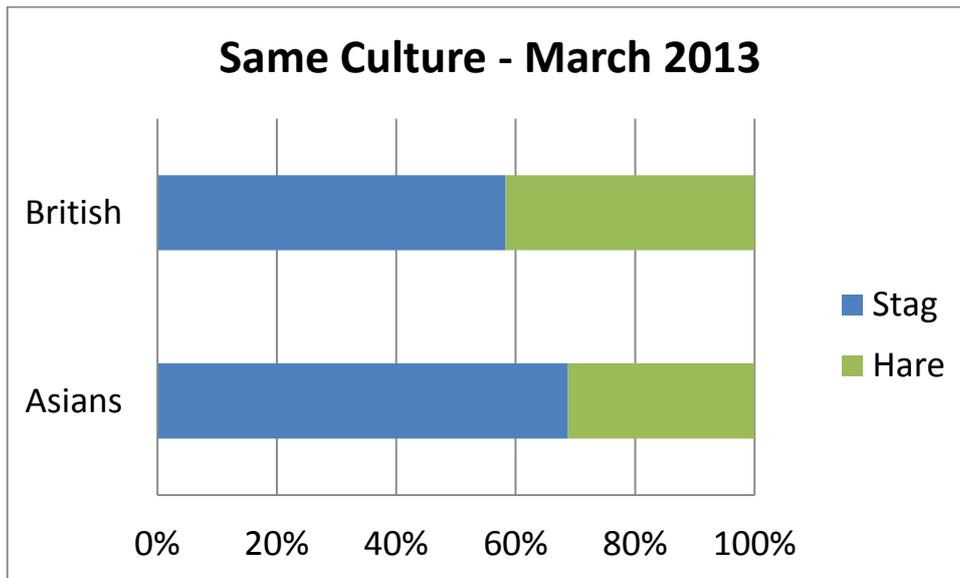
Figure 4.8: Proportion of British and Asian students choosing stag or hare when faced with an opponent from a different culture

Different Culture - March 2013

British — Stag ~25%, Hare ~75%
Asians — Stag ~68%, Hare ~32%

Legend: Stag (blue), Hare (green)

X-axis: 0%, 20%, 40%, 60%, 80%, 100%
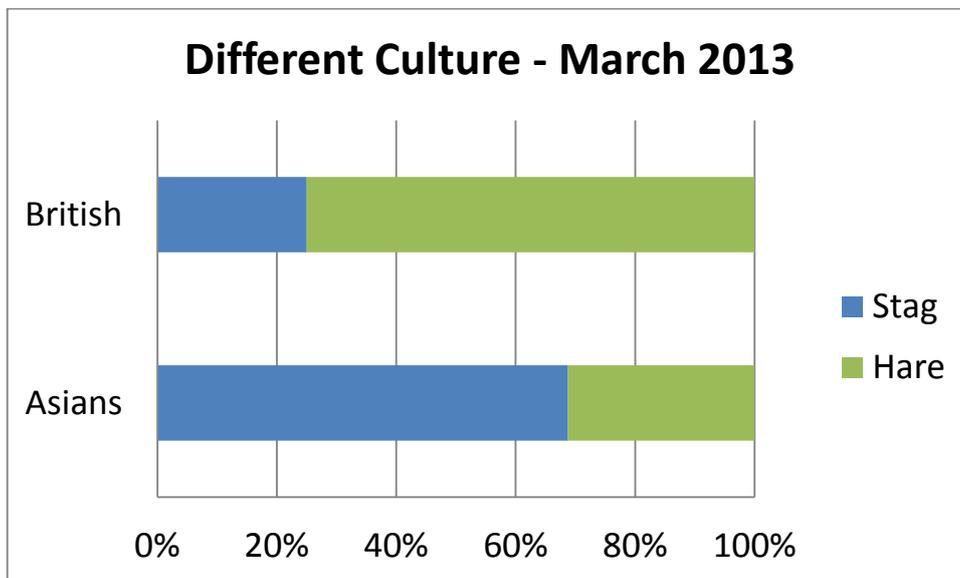
We also need to consider other demographic variables that could be driving the results. Firstly, more British business school students were invited to the March sessions to balance the high number of Asian business school students. Therefore the British students in March may have acted differently to

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.

4.4.2 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 4.9 and 4.10. 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 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.

Figure 4.9: Proportion of British and Asian students choosing each bargaining game option when faced with an opponent from the same culture

Same Culture - Nov 2012

British
Asians

30
25
15
10

0% 20% 40% 60% 80% 100%
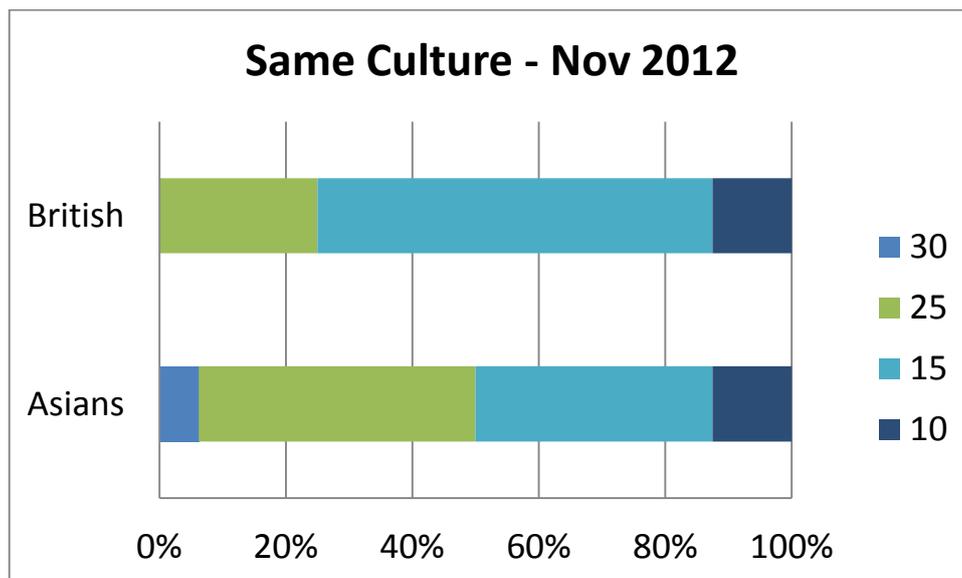
Figure 4.10: Proportion of British and Asian students choosing each bargaining game option when faced with an opponent from a different culture

Different Culture - Nov 2012

British
Asians

30
25
15
10

0% 20% 40% 60% 80% 100%
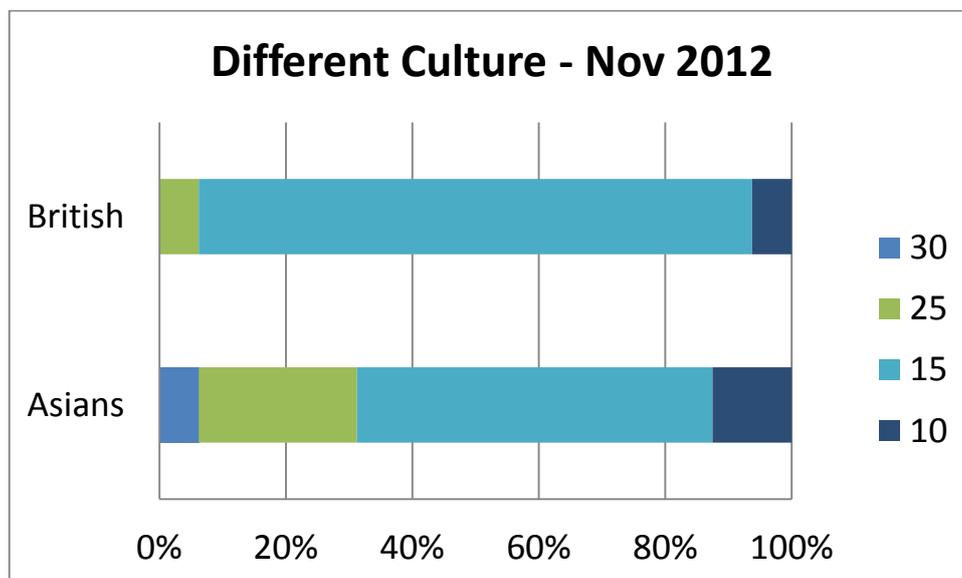
Similarly to the stag hunt results from March 2013, we also obtain a cultural difference in the bargaining game. The results are presented below in Figures 4.11 and 4.12. Asians demand slightly less of the pie when faced with a British

Figure 4.11: Proportion of British and Asian students choosing each bargaining game option when faced with an opponent from the same culture
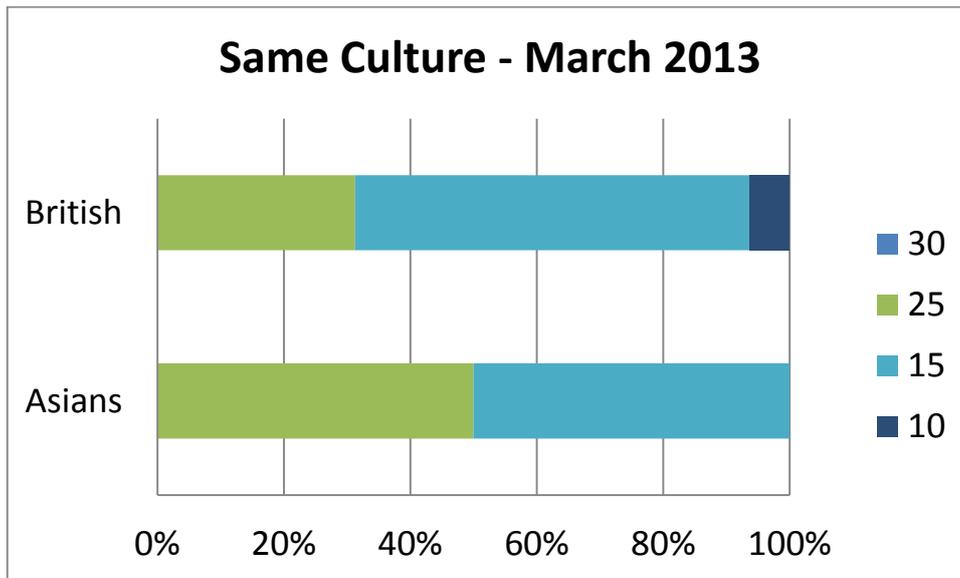
Figure 4.12: Proportion of British and Asian students choosing each bargaining game option when faced with an opponent from a different culture
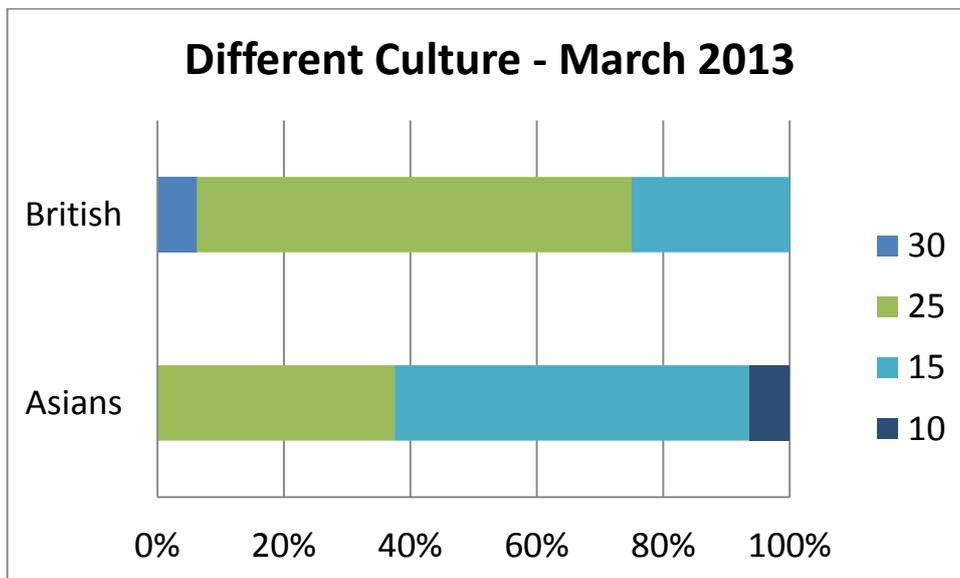
opponent compared to the all-Asian treatment, although this difference is not significant ($p = 0.389$). On the other hand, British demand *more* when faced with an Asian opponent compared to the all-British treatment, which is a significant result ($p = 0.010$). This is in contrast to the November 2012 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.

4.4.3 Differences between Games and Treatments

Why, then, do the Asians discriminate 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.

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.

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.

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.

Although the March 2013 experiments are conceptually different to the November 2012 experiments, we add the two datasets together to see whether we can glean any general conclusions about British or Asian behaviour. When looking at the overall sample, the results are roughly in-line with the March 2013 experiments. The British students are more likely to go for the safe option in the stag hunt but demand more in the bargaining game when faced with an Asian opponent compared to another British opponent. For the Asian students we see the opposite – they are more likely to go for the payoff dominant outcome in the

stag hunt while demanding less in the bargaining game against a British opponent compared to another Asian. We do need to keep in mind however that the overall results may be biased by the high proportion of Asian business majors compared to British business majors in the November 2012 set of experiments.

We also check the overall expectations data. For the stag hunt, results are in-line with the November 2012 experiments, with both cultures more likely to expect the opponent to choose stag in the mixed culture treatments. In the bargaining game, the overall results support the March 2013 results for the British but not the Asians. Overall, British expect Asians to demand less of the pie than other British, while Asians expect the British to demand less than other Asians. This second result implies that people from both groups should demand more against an opponent from the other culture. We observe this behaviour for the British but not the Asians.

4.5 Discussion

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.

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[35] 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.

4.6 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

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[35] 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).

the British students increased their 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.

Chapter Five: Culture, Conformity, and Risk Attitudes

Social influence can be powerful in a society where everyone claims to be independent and autonomous. – Jetton, Postmes, and McAuliffe (2002, p. 204)

5.1 Introduction

How people behave depends not only on individual preferences, but is often shaped by the attitudes of those we interact with. As people gain utility from belonging to a peer group, we sometimes take on the norms and characteristics of the groups we belong to, in order to increase our attachment to those groups (Geisinger, 2004). How the attitudes of one's peers shapes individual behaviour is known as "peer effects". As group attachment is stronger in collectivist cultures, it is conceivable that peer effects are stronger in collectivist cultures than individualist cultures. In collectivist cultures, conformity brings positive feelings of harmony and connectedness, whereas in individualist cultures people enjoy the feelings of freedom and independence from being unique (Kim and Markus, 1999). My main focus for this chapter is to see whether people from collectivist cultures are more conformist in risk attitudes than people from individualist cultures.

In Chapter Three of this thesis, I find that Asian students form larger financial risk-sharing networks at university compared to British students. I also find that the number of network connections affects the risk attitudes of Asian students but not British students. This makes sense, as those from collectivist cultures probably consider their networks more in decision making than those from individualist cultures. However, I now want to test if collectivists are influenced more by the attitudes of their peers compared to individualists. Peer effects in risk attitudes have been documented among a sample of MBA students

(Ahern *et al*, 2013), where after one year on the programme, individual risk attitudes converged to the average risk attitudes of the group. Similarly to Ahern *et al* (2013), I also want to test for peer effects in risk attitudes, but this time testing for any cultural differences. I choose East Asian students to represent a collectivist culture and British students to represent an individualist culture. These choices are consistent with Hofstede's (1980) measures of individualism and collectivism in each country.

I run an experiment with lottery choice tasks, where I present some participants with the majority choices from previous sessions. While the distribution of choices among Asian students is unaffected by the presence of peer choices, the British students tend to choose against the majority of their peers. This makes sense, as people from individualist cultures gain utility from being different to others. The results from this research will be useful for policy-makers, who want an idea of how different cultural groups react to the decisions of their peers. Messages about the behaviour of others are increasingly being used by Government to influence behaviour (Wenzel, 2002). Knowing whether people from different cultural groups will prefer to conform or to go against the majority will help the Government to know which types of information will be useful to make public, and to whom.

5.2 Background Literature

5.2.1 Peer Effects in Risk Attitudes

Ahern *et al* (2013) study peer effects in risk attitudes and trust among a sample of MBA students at the University of Michigan. They measure pre-determined risk attitudes using a Holt and Laury (2002) lottery choice task, and they measure trust attitudes using questions from the World Values Survey. They

then re-elicit risk and trust attitudes after one year on the MBA programme to test for any convergence. Ahern *et al* (2013) decide to focus on attitudes rather than outcomes in order to fill a gap in the literature and better understand whether peers influence underlying attitudes as well as outcomes (Ahern *et al*, 2013, p. 1). Observing outcomes only, such as betting decisions among a group of friends at the horse races, does not tell us why we might see convergence. People may conform for social reasons or conform automatically without putting much thought into their decision, rather than a change in risk attitudes.

The reason Ahern *et al* (2013) use pre-determined attitudes is to avoid simultaneity between the influences of peers on attitudes and attitudes on peers. As individuals may influence the attitudes of their peers, as well as being influenced by their peers, looking at how the individual's attitudes change shows a causal relationship of the peer attitudes on the individual's attitudes. In addition, people may select peers with similar attitudes to themselves, leading to observed peer similarity that is not necessarily driven by peer influence. Ahern *et al* (2013) overcome this problem by using random assignment of peer groups in their experiment. Finally, they include a survey to verify that the peers have meaningful social relationships.

After one year on the MBA programme, Ahern *et al* (2013) find that risk attitudes of individuals *do* converge to the average risk attitudes of the group. In particular, a one standard deviation increase in average risk aversion of a randomly assigned peer group increases an individual's risk aversion by 0.2 standard deviations. On the other hand, no effects are found for the influence of peer attitudes on individual trust attitudes, suggesting that trust may be a more stable attitude, related to factors other than risk taking. This finding supports

recent evidence that trust is not just a special case of risk taking (Bohnet and Zeckhauser, 2009). I expect Ahern *et al's* (2013) finding of positive peer effects in risk attitudes would be stronger among people of collectivist cultures.

Delfino *et al* (2013) also look at conformity in attitudes under risk and uncertainty. Participants are given an investment choice task, where they choose how many tokens to invest in a risky or uncertain prospect. The risky prospect is represented by known probabilities of loss and the uncertain prospect is represented by unknown probabilities. They use a within-subjects design where participants first make a series of investment choices, with varying probabilities of loss. Next, the participants repeat the series of choices, but are given some information about the choices of an earlier group of subjects. The information about past choices is given as either a group average or one individual's choice.

Delfino *et al* (2013) find evidence of conformity in choices, which is stronger when the decision-makers are more cautious, when they are given a group average rather than an individual's choice, and when they are under time pressure. Interestingly, the authors find stronger conformity for risky prospects than for uncertain prospects. They initially expected this to be the other way around, as with less information to base their decisions on people may be more likely to copy others. However, the result could be because under uncertainty the participants may have thought the others were just choosing randomly, whereas for known probabilities the choices are a better indication of preferences. People are probably more likely to conform when they believe others' choices reflect their true preferences, rather than a random choice.

5.2.2 Peer Effects and Culture

Although peer effects in risk attitudes are yet to be explored cross-culturally, there are several studies in the field of social psychology that document cultural differences in conformity in other areas. For example, Bond and Smith (1996) conduct a meta-analysis of studies using Asch's (1952, 1956) line judgement task to investigate cultural and temporal differences in conformity.

In Asch's line judgement task, subjects are presented with a group of three lines of varying lengths and asked to select the line that is equal in length to a standard line, as shown below in Figure 5.1. The task is designed such that the answer is fairly obvious. Subjects are in groups of seven to ten people and each individual is required to announce his or her choice to the group. However, in each group, all but one of the subjects is previously instructed by the experimenter to choose the wrong line and announce this to the group. Therefore, one subject is faced with information from the group that contradicts their private observation. The idea is to see whether this individual conforms by choosing the same line as the majority of their group.

Bond and Smith (1996) compare data collected for the line judgement task in 17 countries. Using three different measures of individualism and collectivism (Hofstede, 1980; Schwartz, 1994; Trompenaars, 1993), they find a positive and significant relationship between collectivism and conformity. In addition, when looking at the U.S. data, they find that conformity has declined since the 1950s. The authors also point out that the identity of the peers matters for conformity, with studies showing higher levels of conformity among friends than strangers (Bond and Smith, 1996, p. 112). This raises the question over whether

collectivists will only conform more than individualists when dealing with members of their in-groups.

Figure 5.1: Asch's Line Judgement Task (1952, 1956)
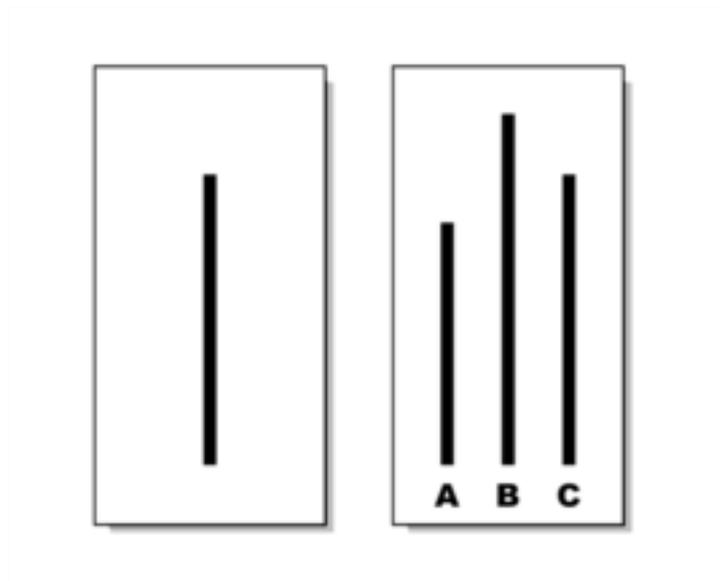
More recently, Kim and Markus (1999) investigate conformity preferences among East Asian and European Americans, by asking subjects to choose between items that represent either conformity or uniqueness. In their first set of studies, subjects choose from sets of abstract shapes where the majority of shapes look the same but there are a minority of shapes that look different. Overall, more European Americans than Chinese Americans choose the shapes that are in the minority, indicating a preference for uniqueness. They also replicate this study in Korea and once again find the European Americans to select the minority shapes more often than the Koreans.

In order to see whether this cultural difference in preference is also manifested through choice, Kim and Markus (1999) run another study where subjects are asked to choose a pen from a group of five pens, that are coloured either green or orange. As there are five pens, the majority of pens are the same

colour, while the minority of pens are the other colour. Overall, most Americans (74%) choose the less common colour while most East Asians go for the majority colour (76%). One reason Kim and Markus (1999) choose to present their subjects with trivial choice tasks is to remove social pressure from their experiments. This is to show that the tendency to conform can be a preference, which is based on cultural values rather than a response to group pressure (Kim and Markus, 1999, p. 787).

5.2.3 Motivations for Conformity

Similarly to Kim and Markus (1999), I am interested in conformity as a cultural value. To isolate this value, we need to remove other peer influence forces that drive risk taking behaviour. For example, Gamba and Manzoni (2014) show that the simple act of comparing oneself to others can prompt risk seeking behaviour. In addition, interacting with others from the same cultural group may bring about stereotypes, which can affect behaviour but sometimes be misleading (Shih *et al*, 1999). Therefore, I focus on simple individual choice tasks in this chapter, where each participant's decisions are kept private.

This is especially important when looking at cultural differences, as the varying drivers of behaviour could affect people from different cultures in different ways. For example, the tendency to become more risk seeking when making decisions in a group could work in a culturally-specific way (Kim and Park, 2010). Collectivists may focus on a norm of interdependent relationships that leads to a diffusion of responsibility. On the other hand, individualists may be more focused on individual goals such as showing-off to other group members. By focusing on one aspect of peer influence, such as the preference of being similar to other people, we can gain a better understanding of how culture affects conformity.

In addition, I control for the beliefs of players by giving everyone the same precise information regarding probabilities. In environments of uncertainty, players may copy each other simply because they believe others have made a good choice. Without knowing the probabilities involved, players have little else to base their decisions on. How people's beliefs are shaped by others may also differ culturally, leading to a confounding situation where cultural differences could be driven by different beliefs as well as different preferences. To isolate conformity due to preferences, the only benefit players should receive from conforming is to know they have behaved similarly to others, rather than any informational or social gains. This motivation should be stronger in cultures that value conformity.

5.2.4 Applications

Focusing on conformity as a cultural value may also be useful for public policy. Although the Government cannot control peer influence due to social pressure or comparison, they can attempt to influence behaviour through messages about social norms. For example, in a field trial with the Australian Tax Office, Wenzel (2002) finds that people tend to overestimate a negative attitude towards tax compliance in others, and believe that tax evasion is more widespread than it actually is. When sharing this information with taxpayers, Wenzel finds an increase in compliance relative to a control group. This effect works through changing the perceived social norm, which people prefer to conform to. Knowing how different cultural groups are affected by such messages will help the Government to target policy in areas that would be most effective.

Another area cultural differences in conformity can be applied is herding in financial markets. Herding is where people choose to invest in a stock because

they have observed others investing in the stock (Bikhchandani and Sharma, 2000). Park and Sgroi (2009) distinguish between rational and irrational herding. Rational herding is where people use information gained from observing others' actions in order to make better decisions. Irrational herding represents a decision to follow others even though no useful information is gained from observing the others' actions. Park and Sgroi (2009) also point out the existence of contrarian behaviour, which is where people go against the majority action e.g. investing in a stock that others are avoiding. Similarly to herding, contrarianism can be either rational, i.e. using valuable information, or irrational, i.e. doing something different for the sake of it.

Herding can lead to irregularities in the stock market, such as over-priced stocks and bubbles that eventually burst. Looking at cultural differences in conformity raises the question of whether certain cultures are more susceptible to herding. If cultural values are indeed an important driver of conformity, the tendency to herd may be even stronger among collectivist cultures. However, the goal of participating in the stock market is to make money, and financial concerns may outweigh any cultural inclinations.

5.3 Experimental Design

5.3.1 Hypotheses

My main hypothesis to be tested is that students from collectivist cultures will be more susceptible to peer effects than students from individualist cultures. Previous research shows that Asian students are more risk seeking with money than American students (Hsee and Weber, 1999). One key reason for this appears to be the ability to rely on social networks for support in collectivist

cultures, known as the "cushion hypothesis" (Hsee and Weber, 1999). Therefore, I have three hypotheses for this research:

Hypothesis One: Students from collectivist Asian cultures will be more financially risk seeking than students from individualist cultures. Therefore, when measuring a preference for risk, a sample of Asian students will have a higher mean preference than students from an individualist culture such as Britain.

Hypothesis Two: When presented with the decisions of their peers, the distribution of choices among collectivist Asian students will become more clustered than the students from individualist cultures, with less extreme choices. This means that choices will converge to the mean as people prefer to make similar choices to their peers.

Hypothesis Three: When presented with the decisions of their peers, Asian students will be more likely to conform to the majority than students from individualist cultures. Students from individualist cultures may not be affected at all by the decisions of others, or they may be affected by choosing differently to their peers to express their individuality.

5.3.2 Experiment

I run a 2 X 2 between-subjects design, where I compare individualist and collectivist cultures in treatments with or without peer effects. Although a within-subjects design is more economical, subjects would need to complete two different risk attitude elicitations, i.e. before and after peer effects are induced. This would be subject to possible consistency bias, as the players may choose the same options in the second task simply to appear consistent with the first

task, thereby ignoring the peer effects. I choose a between-subjects design to avoid this bias.

To represent an individualist culture, I invite students of British or Irish nationality. For students of collectivist culture, I invite students from China or other East Asian countries such as Taiwan and Vietnam. I avoid inviting Japanese students, as in Japan collectivism is focused on the work group rather than the family (Bond and Smith, 1996, p. 126). This experiment was run at the Finance and Economics Experimental Laboratory (FEELE) at the University of Exeter in March 2014. I run four sessions, with 20 participants in each. However, one session only contains 19 participants due to no-shows.

I run separate sessions for British and Asian students. Each cultural group has both a control session without peer effects and a treatment session with peer effects. In the treatment sessions, peer effects are induced by revealing the results from the respective culture's control session. For example, Asian students in the treatment session are given the results of Asian students in the control session, and vice versa for the British students. One advantage of running separate sessions is that social norms of individualism and collectivism may be enhanced in each cultural group. However, the main reason I run separate sessions is to induce peer effects in a culturally specific way.

This is because I expect the Asian and British students to choose different options in the control sessions, with Asian students going for more risk seeking options. I want to present the students in the treatment sessions with a culturally specific social norm, which they can then decide whether or not to conform to. Also, as identity of the peers is likely to be important (Bond and Smith, 1996, p. 112), I want each group in the treatment sessions to imagine a session being run

previously with similar participants to themselves. Running sessions with all-Asian or all-British students is an effective way to induce this image. However, to avoid experimenter demand effects[36], the students are not explicitly told that the previous sessions contained participants of the same culture.

Participants complete a lottery choice task in the experiment, very similar to Hsee and Weber's (1999) hypothetical task. I choose this task because Hsee and Weber find very promising cultural differences but do not pay subjects according to their decisions. Therefore, I thought this task would be interesting to run saliently. The exact lottery choices subjects make are shown below in Table 5.1. Each question appears in order on a computer screen, which is programmed using z-Tree (Fischbacher, 2007). The reason I choose to present the questions in order is to prevent confusion and inconsistent responses. Hsee and Weber (1999) vary the order of their questions and find no significant order effects (Hsee and Weber, 1999, p. 169).

Table 5.1: Lottery Choice Task

Question	Safe Option	Risky Option
1	Receive £4 ECU for sure	Flip a coin; Receive £20 if heads or £0 if tails
2	Receive £6 ECU for sure	Flip a coin; Receive £20 if heads or £0 if tails
3	Receive £8 ECU for sure	Flip a coin; Receive £20 if heads or £0 if tails
4	Receive £10 ECU for sure	Flip a coin; Receive £20 if heads or £0 if tails
5	Receive £12 ECU for sure	Flip a coin; Receive £20 if heads or £0 if tails
6	Receive £14 ECU for sure	Flip a coin; Receive £20 if heads or £0 if tails

After the lottery choice task, each participant is asked to roll a die to determine which question we will pay them for. If they have chosen the coin flip

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[36] Brislin and Lonner (1973, p. 70) note the possibility of cultural differences in experimenter demand effects, with "courtesy bias" being particularly prevalent in Eastern cultures, where participants like to please the experimenter.

for the selected question, they then flip a coin to determine their payoff. In addition, everyone receives a £5 show-up fee to avoid people leaving with nothing. The payment method is explained to participants at the beginning of the experiment. I decide to pay each participant for only one decision, in order to avoid wealth effects and participants hedging risk between the questions. Subjects earn £14.89 on average for this experiment, with a maximum of £25 and a minimum of £5.

The only difference between the control sessions and the treatment sessions is that in the treatment sessions, participants are presented with a sentence for each question detailing the results from the corresponding control session. This sentence is a true statement based on actual results. For example, for the first question, participants in the Asian treatment session are given the following sentence:

> *Yesterday we ran the same experiment and 30% of participants chose £4 for sure while 70% of participants chose the coin flip.*

I then compare the numbers of Asian and British students choosing in-line with the majority, expecting Asian students to be more likely to follow the majority than the British. Instructions for this experiment are given below in Appendix Five.

5.3.3 Follow-up Questionnaire

Once payoffs are determined, the subjects complete a follow-up questionnaire, also programmed in z-Tree (Fischbacher, 2007). This questionnaire contains a survey measure of risk attitudes in different contexts (Dohmen *et al*, 2011), as well as demographic questions and a hypothetical social risks problem. One key reason I include an additional measure of risk attitude in

the follow-up questionnaire is to allow us to control for subjects' underlying risk attitudes when comparing lottery choices between treatments. Perhaps the subjects in one treatment happen to be very risk averse with money and their choices are driven more by their attitudes than peer effects. Including an additional measure of risk attitude allows us to observe differences between treatments that are not accounted for by differences in risk attitude.

The risk attitude questions in my follow-up questionnaire come from the German Socio-Economic Panel. These questions involve an 11-point Likert scale rating of the willingness to take risks in different contexts. Specifically, questions are asked about taking risks in the following contexts: while driving, with financial investment, when engaging in leisure and sport, with your career, with your health, and with social approval[37]. The questions have been validated experimentally and shown to be good predictors of behaviour in each context (Dohmen *et al*, 2011).

I also present subjects with a hypothetical social risks problem, inspired by Weber *et al* (1998). In Chapter Three of this thesis, British students showed a greater tendency to take social risks than Asian students, which could be due to a greater need to maintain good relationships in collectivist cultures. In order to test for peer effects in social risks as well as financial risks, I give the percentage of people choosing each option from the control sessions to those in the treatment sessions. As with financial risks, I expect Asian students to be more susceptible to peer effects in social risks than British students. The social risks problem is framed as follows:

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[37] I add the question about social approval to capture cultural differences in attitudes toward social risks.

Imagine you have a good relationship with your roommate, and that your roommate is currently facing an important decision. You have a strong opinion about the decision your roommate should make, and need to decide whether or not to give your roommate advice. If you give advice that your roommate appreciates, this will greatly enhance your relationship. However, if your roommate dislikes your advice, this will seriously harm your relationship. If you give no advice, this will have no effect on your relationship. Will you give advice or remain silent?

Finally, subjects in the treatment sessions are presented with an extra question in their follow-up questionnaire. The subjects are asked whether or not they considered the previous results and if so how did this affect their decision. I expect more Asian students to be influenced by their peers than British students, and to be more likely to choose in-line with the majority. The questions from the follow-up questionnaire are presented below in Appendix Five.

5.4 Results

5.4.1 Lottery Choices

Similarly to Hsee and Weber (1999), I calculate a risk preference index to compare the risk preferences of those taking part in the experiment. The risk preference index represents the number of risky choices taken out of the six options. Therefore, the risk preference index has a minimum of zero and maximum of six, with higher numbers representing more risky choices. Twelve students give inconsistent responses, where they switch from preferring a safe option to a risky option when the value of the safe option is higher than the safe option they chose previously. However, the number of risky choices still gives us some useful information regarding risk preference, even if inconsistent. Also, as

risk preference tends to be malleable (Beauchamp *et al*, 2012), rather than a stable underlying characteristic, inconsistent responses are a reflection of real life decision making. Therefore, I decide to keep the inconsistent responses for the analysis. As a robustness check, I repeat the analysis with the inconsistent responses removed and find that the conclusions of this chapter remain unchanged.

Table 5.2 below shows the average risk preference index by nationality. In the control sessions, Asians choose more risky options than British students on average, but the difference is not statistically significant ($p = 0.736$[38]). However, in the treatment sessions, British choose more risky options than Asian students on average. This difference is not statistically significant either ($p = 0.454$). Interestingly, the British students in the treatment group are more risk seeking than the British students in the control group ($p = 0.138$), which may be related to the peer effects treatment, or other demographic factors. Later on we will check for any cultural differences when controlling for underlying risk attitudes as well as other demographic factors.

Table 5.2: Average Risk Preference Index[39]

	British	Asian
Control	1.55	1.80
	(1.00)	(1.44)
Treatment	2.05	1.79
	(1.19)	(1.13)

As can be gleaned from the summary statistics above, there is little difference in the distribution of risky choices between treatments for the Asian

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[38] Throughout this chapter, we use a Mann-Whitney *U*-test to determine whether the samples are statistically different.
[39] Standard deviations are given in parentheses.

students. However, the British students take significantly more risky choices in the treatment condition than in the control condition. We now look at the lottery choices in more detail to see whether there are any cultural or treatment differences. Table 5.3 below shows the proportion of students choosing each option for each question in the control condition. These proportions are then presented to students in the respective culture's treatment conditions. None of these differences in proportions between cultures are significant for any of these questions[40].

Table 5.3: Choices in the Control Conditions

Question	Options	British Students	Asian Students
1	Safe: Receive £4 ECU for sure Risky: Flip a coin; Receive £20 if heads or £0 if tails	Safe: 15% Risky: 85%	Safe: 30% Risky: 70%
2	Safe: Receive £6 ECU for sure Risky: Flip a coin; Receive £20 if heads or £0 if tails	Safe: 65% Risky: 35%	Safe: 45% Risky: 55%
3	Safe: Receive £8 ECU for sure Risky: Flip a coin; Receive £20 if heads or £0 if tails	Safe: 65% Risky: 35%	Safe: 70% Risky: 30%
4	Safe: Receive £10 ECU for sure Risky: Flip a coin; Receive £20 if heads or £0 if tails	Safe: 100% Risky: 0%	Safe: 90% Risky: 10%
5	Safe: Receive £12 ECU for sure Risky: Flip a coin; Receive £20 if heads or £0 if tails	Safe: 100% Risky: 0%	Safe: 90% Risky: 10%
6	Safe: Receive £14 ECU for sure Risky: Flip a coin; Receive £20 if heads or £0 if tails	Safe: 100% Risky: 0%	Safe: 95% Risky: 5%

There is also little cultural difference in risk preferences in the treatment conditions. However, perhaps the more interesting differences are those *within-*

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[40] Using a two-sided two-sample *Z*-test for difference in proportions.

Figure 5.2: Proportion of Asian Students Choosing the Safe Option for Each
Question
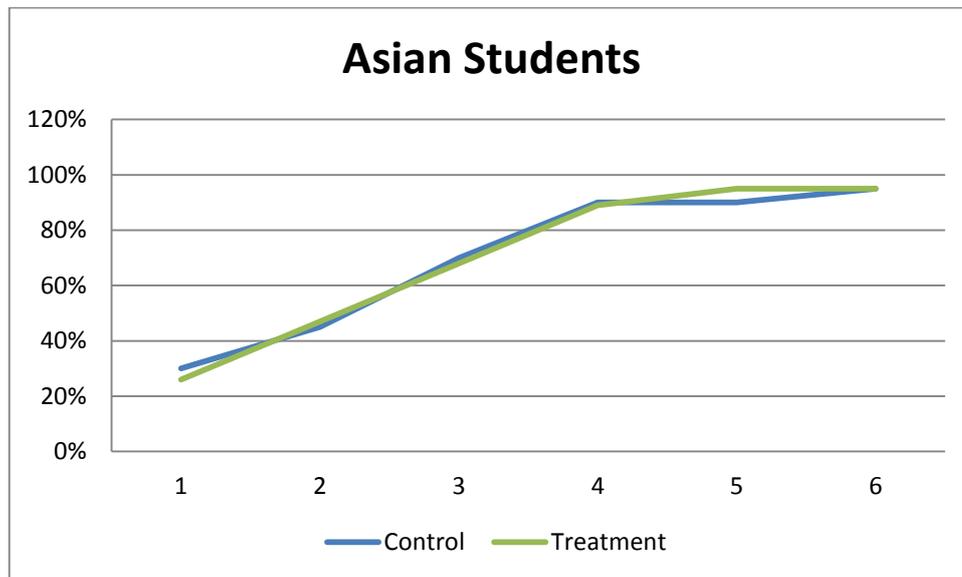
Figure 5.3: Proportion of British Students Choosing the Safe Option for Each
Question
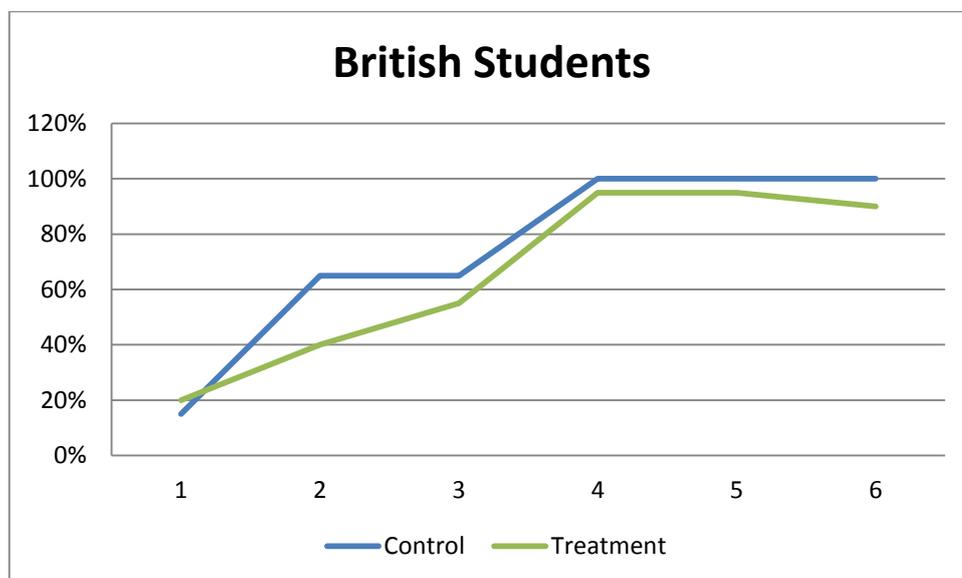
cultures between treatments. Figures 5.2 and 5.3 above show how the

distribution of choices compares between treatments, for Asian and British

students respectively. Although the distribution of choices for Asian students is

roughly the same between treatments, the British tend to make riskier choices in

the treatment condition. However, rather than displaying herding behaviour, the British students are moving away from the majority choices towards the minority choices, which is an example of contrarian behaviour. This makes sense as those from individualistic cultures like Britain are likely to place value on being different from other people. Although mean risk preference is higher for British in the treatment group, a two-sample Kolmogorov-Smirnov test of equality of distributions shows no significant difference in distributions between the treatment and control sessions (p = 0.452). We now need to control for demographics and underlying risk attitudes to see whether there are factors other than contrarianism that are driving behaviour.

5.4.2 Survey Questions

When looking at cultural differences in context-specific risks, we can see from Table 5.4 below that Asians are less willing to take risks than British in every category. This contrasts my Hypothesis One, that Asians will be more willing to take financial risks than British, but the difference is not quite significant (p = 0.103). As expected, the Asian students are also less willing to take social risks than the British, but again this difference is not quite significant (p = 0.135). We will use these measures of risk attitude to control for differences in risk preference when testing for peer effects in social and financial risks.

While most of the other categories show similar results for both cultures, there is a noticeable difference in the willingness to take risks with health. The British students indicate an average willingness to take health risks of 4.13 out of 10, which compares to only 2.64 for the Asian students. This difference is statistically significant (p = 0.011) and can possibly be explained by Confucian values such as patience and self-control among the Asian students. Students

who believe in these values would be less likely to over-indulge in unhealthy food or alcohol than students who believe in living for the moment.

Table 5.4: Average Willingness to Take Risks on a Scale from 0–10[41]

	British	Asian
General	5.58	5.44
	(1.99)	(2.25)
Driving	3.00	2.41
	(1.75)	(2.44)
Financial Investment	5.58	4.74
	(2.09)	(1.96)
Leisure and Sport	7.10	6.46
	(2.04)	(1.89)
Career	5.58	5.00
	(2.18)	(2.22)
Health	4.13	2.64
	(2.65)	(2.61)
Social Approval	5.73	5.00
	(2.16)	(2.03)

Table 5.5 below shows the average willingness to take financial risks by treatment and nationality. When looking at the willingness to take financial risks, we can find no significant difference between treatments for the British students ($p = 0.427$). This means that the tendency for British students to make riskier decisions in the treatment condition is unlikely to be explained by differences in risk attitudes alone. As for the Asian students, those in the control condition indicate a greater willingness to take financial risks than those in the treatment session, but the difference is not significant ($p = 0.181$). However, the Asians show little difference between treatments in their lottery choices. Perhaps those Asians in the treatment condition were inspired to make riskier choices based on their peers' choices in the control condition. We now consider these results in-light of demographic variables.

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[41] Standard deviations are given in parentheses.

Table 5.5: Average Willingness to Take Financial Risks on a Scale from 0–10[42]

	British	Asian
Control	5.40	5.25
	(2.06)	(1.52)
Treatment	5.75	4.21
	(2.15)	(2.25)

Gender is an important factor that can affect risk attitudes, with males tending to take greater financial risks than females. In-line with previous results (e.g. Dohmen *et al*, 2011), males rate their willingness to take financial risks significantly higher than females in these experiments ($p = 0.005$). Males also have a higher risk preference index in the lottery choice task, but this difference is not significant ($p = 0.672$). As similar proportions of males and females attend the British session, the difference between treatments is unlikely to be driven by gender. On the other hand, the Asian treatment session contains a higher proportion of females than the control session. The higher proportion of females in the Asian treatment session could be one reason they have a lesser willingness to take financial risks than the control session.

Age can also be important for determining risk attitudes (Dohmen *et al*, 2011). However, as the students attending these experiments tend to be of similar age, I do not expect to find a significant effect of age on risk attitudes. In-line with this prediction, age is insignificant in the estimation of both risk preference index and the survey measure of willingness to take financial risks. With a greater dispersion of ages in the sample, we may obtain some more interesting results on how age interacts with culture, conformity, and risk attitudes.

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[42] Standard deviations are given in parentheses.

As subject major may also affect risk attitudes, I endeavoured to invite similar proportions of students from each subject area to each session. However, as most of the Asian students registered for economic experiments are studying business, this is not such an easy task. To avoid any bias, I invite a high proportion of British business school students in attempt to match the proportion of Asian business school students. Overall, the proportions are fairly similar, with 85% of Asian students studying a business major, compared to 78% of British students studying business. There are no significant differences in either risk preference index or the survey measure of financial risk attitude between business and non-business majors.

I include all of these demographic factors, along with the measure of underlying financial risk attitude, in an ordered probit[43] regression on the risk preference index. In addition, I include a binary variable, *Peer Effects*, equal to one if the participant took part in the treatment session and zero if they took part in the control session. Gender and subject major are also represented as binary variables, with *Female* equal to one if female, and *Business Major* equal to one if studying business. *Age* is a continuous variable measured in years and *Financial Risk* measures the willingness to take financial risks on a scale from 0 – 10. I use robust standard errors to account for heterogeneity in the sample. I run this regression both overall and for each cultural group separately[44]. Results are presented below in Table 5.6.

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[43] An ordered probit model accounts for the ordinal nature of the data by focusing on the ranking of outcomes rather than precise quantitative values (Greene, 2003, p. 736).

[44] In the overall regression, I also included a binary variable for cultural group, as well as an interaction term between treatment and culture. However, neither of these variables were significant and were subsequently dropped from the analysis. Results from these regressions are available in Appendix Six.

Table 5.6: Coefficients from Ordered Probit Regression on Risk Preference Index[45]

	Entire Sample	British Sample	Asian Sample
Female	0.100	-0.128	0.465
	(0.244)	(0.349)	(0.458)
Age	0.033	-0.222	0.250**
	(0.068)	(0.165)	(0.122)
Business Major	-0.350	-0.483	-0.472
	(0.331)	(0.368)	(0.581)
Financial Risk	0.151**	0.150	0.244*
	(0.069)	(0.102)	(0.128)
Peer Effects	0.361	0.650*	0.008
	(0.259)	(0.370)	(0.422)
Cut 1	0.366	-4.686	5.389
	(1.403)	(3.021)	(2.827)
Cut 2	1.140	-3.842	6.185
	(1.395)	(3.007)	(2.836)
Cut 3	1.897	-3.055	6.979
	(1.392)	(2.961)	(2.886)
Cut 4	3.475	-1.368	8.606
	(1.421)	(2.916)	(2.990)
Cut 5	3.772	N/A	N/A
	(1.413)		

As the magnitude of coefficients cannot be directly interpreted in ordered probit models, I focus on the sign and significance of results. In both the overall and Asian sample regressions, financial risk attitude has a significant and positive effect on the lottery choices. This makes sense, as a greater willingness to take financial risks should result in riskier lottery choices. The only significant demographic variable is age and this is only significant for the Asian group, where age has a positive effect on the risk preference index. Interestingly, the treatment binary variable is only significant for the British students, where they make significantly more risky choices on average in the treatment session than the

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[45] Robust standard errors are given in parentheses. Significance at the 10%, 5%, and 1% level of confidence is indicated with *, **, and ***, respectively. In ordered probit models, the probability of the dependant variable taking on any particular value is given by the probability a latent variable lies between each cut point.

control session. This shows that the British students are affected by the peer effects treatment, even when controlling for their underlying risk attitudes and demographics.

Although the British appear to be engaging in contrarian behaviour, they certainly do not admit to this in their follow-up questionnaires. Only two British students in the treatment session admit they considered the previous results, compared to seven Asian students. When asked how the previous results affected their decisions, the two British students make the following comments:

"I took the previous decisions into account on question 3 and gave a different answer because of this."

"Usually followed the pattern"

However, of the two British students who considered the previous results, three of their decisions go against the majority, out of twelve choices in total. This compares to only two out of forty-two decisions going against the majority among the Asian students who considered the previous results. The Asian students make the following comments, when asked how the previous results affected their decisions:

"how much money I can get maximum"

"knowing others responses is important to make my decision"

"When I made a decision, I would consider that how others were thinking, and then I made some decisions based on the results others made. But overall, the results didn't have much effect."

"for the question 3, I was thinking to take the risk. but I changed my mind when I saw the general choices from other people was not taking risk. then I changed my mind."

"when the proportion of people who chose yes is high, I decided to choose yes as well"

"I will be less willing to take risk if most people do not take the risk."

"To double check if my decision was approved by the majority after I have made my own decision."

These questionnaire results are as expected, since imitating others has positive connotations such as harmony in collectivist cultures but negative connotations such as lack of free-will in individualist cultures. To avoid these negative emotions, the British students are unlikely to admit being influenced by other people, even if they were influenced by going against the majority. Paradoxically, as noted by Jetten *et al* (2002), individualists are conformist in their non-conformity.

5.4.3 Social Risks

As part of the follow-up questionnaire, I present subjects with a hypothetical social risks problem, where they must decide whether or not to give advice to a roommate. Results by treatment and nationality are given below in Table 5.7. In both treatments, more British than Asian students indicate they would give advice to the roommate, which is the riskier option in this scenario. However, the cultural differences are small compared to the differences between treatments, with more students going for the safer option when given information about the choices of their peers. Interestingly, the students display contrarian

behaviour, by going against the majority choices from the previous sessions. However, none of these differences in proportions are statistically significant[46].

Table 5.7: Proportion of Students Choosing to Give Advice

	British	Asian
Control	80%	75%
Treatment	70%	63%

Similarly to financial risks, we can use our measure of willingness to take social risks from the follow-up questionnaire to control for underlying social risk attitude in the face of peer effects. As shown in Table 5.8 below, there is no difference in the average willingness to take social risks between treatments for Asian students, with an average willingness of 5 out of 10 in each treatment. In contrast, the British students indicate a greater willingness to take social risks in the treatment condition than in the control condition, with an average of 6.10 in the treatment condition, compared to 5.35 in the control. However, this difference is not statistically significant ($p = 0.224$).

Table 5.8: Average Willingness to Take Social Risks on a Scale from 0–10[47]

	British	Asian
Control	5.35	5.00
	(2.01)	(2.08)
Treatment	6.10	5.00
	(2.29)	(2.03)

Although insignificant, the differences between treatments support the notion that British are engaging in contrarian behaviour. Firstly, the minority choice becomes more popular when the students are told it is the minority choice.

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[46] Using a two-sided two-sample *Z*-test for difference in proportions.
[47] Standard deviations are given in parentheses.

Secondly, the students choose the safe option more readily in the treatment condition, even though they indicate a greater willingness to take social risks than those in the control. The students are choosing against the majority, even though their preferences indicate they should prefer the riskier option even more than those in the control session.

I use a probit regression to see whether there are any significant treatment effects when controlling for demographics and underlying social risk attitude. My dependent variable is a binary variable equal to one if the person indicates they would give advice in the roommate problem, and zero if they choose to remain silent. I include the same demographic variables as the regression on risk preference index, but this time include a measure of the underling social risk attitude. The variable *Social Risk* indicates how subjects rate their willingness to take social risks on a scale from 0 – 10. Results from the regression are presented below in Table 5.9.

The only significant variable in the below regression is the binary variable for whether or not the subject is studying a business major. As the coefficient is negative, those studying business are *less* likely to take the social risk by giving advice. This effect works entirely through the British sample, with collinearity in the British sample regression but insignificance in the Asian sample regression. As there is no difference in underlying social risk attitudes between business and non-business majors, this result could be driven by how business majors interpret the question, rather than underling attitudes. Perhaps they see the scenario as a strategic interaction rather than a risky situation *per se.* Although the summary statistics indicate a possible contrarian treatment effect on the British students, there are no significant treatment effects in the regression. More research with

higher sample sizes is necessary to obtain a clearer result about cultural differences in peer effects in social risks.

Table 5.9: Coefficients from Probit Regression on Roommate Problem[48]

	Entire Sample	British Sample	Asian Sample
Female	-0.235 (0.324)	0.188 (0.480)	-0.294 (0.566)
Age	-0.005 (0.093)	0.021 (0.195)	0.118 (0.174)
Business Major	-1.004* (0.544)	Omitted	-0.650 (0.760)
Social Risk	0.024 (0.078)	-0.084 (0.126)	0.161 (0.118)
Peer Effects	-0.186 (0.331)	0.058 (0.491)	-0.421 (0.464)
Constant	1.684 (1.961)	0.425 (3.780)	-1.787 (3.785)

5.5 Discussion

5.5.1 Overview

For financial risks, these experiments show that British students make riskier choices when given information about the majority choices of their peers. In this case, the British show contrarian behaviour rather than herding, as they tend to go against the majority choices. However, the Asian students show neither contrarianism nor herding. According to Hypothesis Two, I expected the Asian students to imitate the majority choices and have a more clustered distribution of choices in the treatment session compared to the control session. However, there are no significant differences in the distribution of choices

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[48] Robust standard errors are given in parentheses. Significance at the 10%, 5%, and 1% level of confidence is indicated with *, **, and ***, respectively. In ordered probit models, the probability of the dependant variable taking on any particular value is given by the probability a latent variable lies between each cut point.

between treatments for Asian students, even when accounting for demographic factors and underlying risk attitudes. Nonetheless, when looking at conformity as a scale, the British students are less conformist than the Asian students, which is in-line with Hypothesis Three. Also, although the Asian students did not choose very differently between the two treatments, their comments in the follow-up questionnaire support the notion of strong peer influence in collectivist cultures.

5.5.2 Cultural Norms

Contrarian behaviour is expected in individualist cultures such as Britain, especially when an experimenter is obviously trying to influence the participants by blatantly showing the previous results. The students may have felt as though the experimenter was trying to coerce them into choosing in-line with the majority, and therefore chose against the majority in order to restore their free-will. This explanation is consistent with Brehm's theory of psychological reactance (1966). Psychological reactance is a negative emotional state brought about by people perceiving their freedom as being limited through obligation or coercion. People feeling this way are likely to behave in such a way as to restore their freedom, perhaps by choosing against the majority in these experiments.

One implication of contrarian behaviour is that people from individualistic cultures may be resistant to policies that try to influence people by social norms. Some people may even react negatively, by doing the opposite of what the policy intends. For example, a message that "most people enjoy alcohol responsibly" may encourage individualists to stand out from the crowd by breaking the norm. Policymakers need to be aware of how policies can affect people from different cultural groups in different, and perhaps unintended, ways.

While the British behave according to their cultural norms, the Asian students do not show evidence of conformity in these experiments. One reason for this could be that the Asians had similar preferences to begin with, which limits the scope to become more conformist in-light of new information. Many Asians mentioned in their follow-up questionnaire that the decisions of others confirmed their original choices. An experiment that contrasts peer preferences with individual preferences may be better placed to elicit conformity preferences among Asians, such as Asch's line judgement task (1952, 1956).

Another reason for the result could be that the students in the previous session were not considered part of an in-group. In collectivist cultures, in-group formation is a long process that requires bonding (Triandis, 1989). As the students in the treatment session did not even *see* the students in the control session, it is likely they were treated as strangers. Indeed, Williams and Sogon (1984) document higher conformity by Japanese students when they are dealing with familiar people than with strangers. Perhaps if this experiment was run amongst a group of friends or classmates, we would see greater conformity among the Asian students.

5.5.3 Methodological Issues

In order to better understand the results, we need to look at various methodological issues that could be driving the behaviour and apparent cultural differences. Firstly, the fact that the experiment was presented in English may introduce some bias. Keysar *et al* (2012) show that using a foreign language, as opposed to native language, reduces biases in decision making. This is likely because people are less emotionally and cognitively attached when thinking in a

foreign language, and therefore make decisions more systematically and less intuitively.

One bias that raises a particular concern for these experiments is the certainty effect (Kahneman and Tversky, 1979; Allias, 1953). The certainty effect is where people have a bias towards certain outcomes, when they would prefer a riskier option when probabilities are scaled by a fixed constant. As the experiments in this chapter involve choices between certain outcomes or a lottery, the participants may be subject to the certainty effect. In addition, the Asian students may be less subject to the certainty effect than the British students, as the instructions are in English. As part of the follow-up questionnaire, I ask participants for their native and second languages. Only 3 out of the 19 Asian participants list English as their native language, compared to all of the British students. As certainty bias encourages choosing the sure outcome, the Asian students may have made riskier choices in these experiments than if the instructions were in their native language. However, my instructions are very short and choices between simple lotteries seem unlikely to be interpreted very differently between cultures.

When considering certainty bias, the questions arises as to whether people felt a bias towards a certain outcome in the roommate problem. The question is framed such that one option has a certain outcome, "*If you give no advice, this will have no effect on your relationship*", and the other option has a risky element, depending on whether or not the roommate appreciates the advice. Although giving no advice may be seen as a certain outcome, this scenario is less straightforward than the lottery choices. For example, subjects may imagine a scenario where the roommate makes a bad decision and they regret not giving

them advice, which could have avoided the bad outcome. Therefore, even the supposed certain outcome may not be interpreted as certain by the subjects.

As well as a possible cultural difference in certainty bias in the decision making task, we need to consider other possible flaws with the task itself. Similarly to the Holt and Laury (2002) lottery choice task, which was used in Chapter Three of this thesis, the lottery choice task by Hsee and Weber (1999) does not produce a large amount of variety in the data. Most people switch from preferring the risky option to the safe option at around question two in the Hsee and Weber (1999) task. As most people are risk averse, hardly anyone chooses the coin flip when the safe option is more than about £6. I used this task as Hsee and Weber (1999) found some promising cultural differences when running this task hypothetically. However, perhaps including more intermediary choices between the questions people tend to switch on would provide us with a richer dataset. There is also some evidence that lottery choice tasks do not accurately predict risk taking in real life situations and that context-specific questionnaire measures may provide more predictive power (Dohmen *et al*, 2011).

As mentioned in Chapter Three of this thesis, the strength of identification with national cultures can vary widely among individuals. The students who attended these experiments may hold particularly individualist or collectivist values, regardless of their nationality. We can only attribute the results to culture if we understand the cultural values held by participants. Jetten *et al* (2002) use a questionnaire to measure strength of identification with national culture, as well as endorsement of individualist or collectivist values. Measures such as these should be included in future cross-cultural work.

5.6 Conclusions

In these experiments, I expected that students from collectivist Asian cultures would be more conformist than students from individualist cultures such as Britain. However, rather than the Asian students imitating their peers more than British students, the difference is evidenced by British students being contrarian and choosing against their peers. This makes sense, as those from individualist cultures tend to value uniqueness. The British students do not openly admit being influenced by others, which also makes sense as peer influence is seen negatively as a constraint on personal freedom in individualist cultures. While the British students try to restore their freedom by choosing against the majority, they are paradoxically still being influenced by others, even though the influence pushes them in the other direction to what the majority are doing. On the other hand, the Asian students seem happy to admit that they are influenced by the behaviour of others, as evidenced by their responses to the follow-up questionnaire.

My two secondary hypotheses fail to gain support from these experiments. Asian students do not choose riskier options than the British students in the lottery choice task, and neither do they indicate a greater willingness to take risks with money in their follow-up questionnaire. This contrasts previous evidence that students from collectivist cultures are more financially risk seeking than those from individualist cultures (Hsee and Weber, 1999). In addition, my hypothesis that the distribution of choices among Asian students will converge to the mean in the presence of peer effects, is not confirmed by this experiment. More studies with larger sample sizes and a greater variety of choice options are needed to

ascertain whether Asian students are more likely to conform to their peers than

British students.

Chapter Six: Concluding Remarks

In this thesis I have explored differences in decision making between students from collectivist Asian cultures and students from individualist Western cultures. My main findings include larger financial risk-sharing networks among the Asian students, the tendency to reply on stereotypes when interacting with someone from another culture, and a tendency towards contrarian behaviour amongst the British. These results reinforce the idea that culture affects behaviour and should be considered in economic models. The challenge now is to further refine cross-cultural experiments to isolate competing explanations for results. We can then move on to study more representative samples to gain an understanding of how culture affects behaviour at the macro level.

Although I only deal with student samples in this thesis, which are not representative of entire cultures, we can still learn something interesting about the particular groups studied. Asian students studying in the UK or New Zealand are a large group of people who have significant impacts on the economies of their host countries. Knowing how behaviour differs between home students and Asian international students will be useful for university planners. For example, a marketing campaign to encourage social interactions between home and international students may benefit from an understanding of how cultural stereotypes affect interactions. Similarly, encouraging students to study hard using peer effects may be more effective for Asian international students than home students. Governments and financial services firms may also be interested in differences in risk attitudes and risk-sharing networks between the two groups, when designing financial support products for students, such as insurance policies and emergency support schemes.

Asian students who are studying abroad are likely to be more individualistic than the average person in their home country (Zou *et al*, 2009). Therefore, my results in Chapters Three and Five may show a lower bound on the population differences between individualist and collectivist cultures. Interestingly, we find contrasting results on the social risks problem between the two chapters, with the majority of Asian students showing aversion to taking the risk in Chapter Three, but the majority opting to take the risk in Chapter Five. We also find slightly contrasting results in the context-specific risk attitude measures, with Asians in Chapter Five being *less* willing to take risks with money than the British. However, Asians are less willing to take social and health risks, which is consistent with the findings in Chapter Three.

In the future, I hope to avoid the sample bias of comparing home and international students, by studying cultural differences between groups *within* the same country. This also alleviates the problem of background risk which could differ by home country (Harrison *et al*, 2007). In particular, I am interested in comparing behaviour of NZ Europeans and Maori, which are two integrated groups with unique cultural identities. I would also like to use a greater variety of risk attitude measures, especially to measure social risks. Work by Weber *et al* (2002) to develop a scenario based, context-specific, risk attitudes questionnaire looks particularly promising. I avoided scenario based measures of risk attitudes in this thesis due to possible interpretation differences between cultures (Weber and Hsee, 1999). However, interpretation differences are likely to be minor when comparing two cultures who speak the same language and are from the same country, such as Maori[49] and NZ Europeans.

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[49] Modern day Maori speak English fluently.

Finally, we need to consider the relevance of studying cultural differences in the future. As we move towards a more globalised world, cultural differences are likely to decline over time. For example, many families in New Zealand now consist of both Maoris and NZ Europeans, and the term New Zealander is increasingly being used to describe ethnicity, as discovered in Chapter Three of this thesis. Now that cultural differences are being documented, we can track changes over time to see whether the differences decline and even eventually disappear. Although cultures have developed separately for thousands of years, the bringing together of cultures through travel and technology suggests we may now be heading in the other direction, with increasing similarities and declining differences.

Appendix One: Online Survey Questions (UK version)

1. Imagine you need £100 today for a deposit on your next accommodation, but cannot afford this until the end of the month. If you do not pay today you will lose the accommodation. You have no savings and cannot receive the money from your family. Please give the full names of any people at the University of Exeter who you could ask to borrow this money from. You can list any number of people.

2. Imagine you need to study for an exam but have lost your lecture notes. Please give the full names of any classmates who you could ask to borrow the notes from.

3. Please list any friends you could ask for advice when you need to make an important decision, such as which job offer to accept.

4. Please answer the following questions (Yes/No): Do you smoke? Have you ever been charged with a traffic offence? Do you plan to become self-employed? Do you (or will you) invest in the stock market? Do you play any active sports? Do you plan to work in the public sector?

5. How willing are you to take risks in general, with 0 being not at all willing to take risks, and 10 being very willing to take risks?

6. Please estimate your willingness to take risks with regard to the following areas, with 0 being not at all willing to take risks, and 10 being very willing to take risks: Driving, Financial Investment, Leisure and Sport, Career, Health, Social Approval.

7. Please enter the following demographic information: Full name, Age (in years), Gender, Academic Major, Year of study, Nationality, Nationality(ies) of your parents, List the national cultures that were influential in your upbringing, Native language.

8. Will you be willing to participate in paid future experiments in relation to this survey? If you answer "yes" please leave your email address so we can contact you.

Appendix Two: Experiment Instructions (UK version)

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. The instructions will be read aloud. After the instructions are read aloud, you will be given a further 5 minutes to read the instructions again to clarify your understanding. 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 £0.05. 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.

Each of you is assigned to a group of 4 players. You will remain in the same group of 4 players throughout the experiment. Each group member is identified with a player ID, but you will not be given the names of any other players. Your name will not be revealed to anyone except the experimenters.

The experiment consists of four parts. In the first part, you will play three different versions of a game with the other players in your group of 4. Instructions for the subsequent parts will be given after the first part is complete.

Part One

In the first game that you will play, you will be linked with 1 other player within your group of 4. You will therefore play the 2-player game described below. The game consists of a choice between X and Y. Your payoff depends on both your own choice and the choice of the player you are linked with.

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. One of the three versions of the game will be randomly selected to determine your payoff from part one.

In the 2-player game, if both you and the other player choose X, you each receive a payoff of 60 ECU. If both players choose Y, you each receive a payoff of 35. If one player chooses X while the other chooses Y, the player choosing X receives 0 while the player choosing Y receives 35. You will not know the choice of the other player until after you have made a decision.

2-player Game

		Other Player's Choice	
		X	Y
Your	X	60	0
Choice	Y	35	35

You will then play a 3-player and 4-player version of the game. In the 3-player version you will play the game with 2 other players within your group of 4, and in the 4-player version you will play the game with 3 other players. The experimenters will randomly match you to other players.

The payoff tables for these games are illustrated below.

For the 3-player and 4-player games, the other players' choices are given by how many players choose each option. For example, in the 4-player game, 2X1Y means that 2 of the other players choose X and 1 player chooses Y. In this case, if you choose X you will receive 40 and if you choose Y you will receive 35. You will not know the choices of the other players until after you have made a decision.

3-player Game

		Other Players' Choices		
		2X	1X1Y	2Y
Your	X	60	30	0
Choice	Y	35	35	35

4-player Game

		Other Players' Choices			
		3X	2X1Y	1X2Y	3Y
Your	X	60	40	20	0
Choice	Y	35	35	35	35

Please record your decision of X or Y for each version of the game on your decision sheet when asked to do so. The responses will then be collected and the results compiled. Your decision sheet showing the decisions of all 4 players in your group and your payoff from each version of the game will then be returned. Please raise your hand if you have a question at any stage during the experiment.

You will now have the opportunity to form links with other players within your 4-player group. If you form any links, you will play the same game as you played in part one with the player(s) you are linked with. You can propose a link to any other player. If a player you propose a link to also proposes a link to you, a link is formed. However, if a player you propose a link to does not propose a link to you, then no link is formed. You can propose and form as many links as you wish within your 4-player group, including zero. If you form no links, you will receive an automatic payoff of 35 ECU, without playing the game. Each link you propose will cost you 5 ECU.

If you form any links, you will play another round of the game you played in part one. The number of links you form will determine which version of the game you play. For example, if you form two links, you will play the 3-player version of the game with the two players you formed links with. The number of links you form and the player IDs of those you form links with will be revealed to you before you play the game. Please note, the players you are linked with may have a different number of links to you, and therefore may face a different payoff table to you. The payoff tables for this game are the same as in part one, and are illustrated again below.

2-player Game

		Other Player's Choice	
		X	Y
Your	X	60	0
Choice	Y	35	35

3-player Game

		Other Players' Choices		
		2X	1X1Y	2Y
Your	X	60	30	0
Choice	Y	35	35	35

4-player Game

		Other Players' Choices			
		3X	2X1Y	1X2Y	3Y
Your	X	60	40	20	0
Choice	Y	35	35	35	35

Please tick the player ID(s) of any players you wish to form links with on your link proposal sheet. You do not need to tick your own player ID. These sheets will be collected and a decision sheet will be returned to you showing the player IDs of any

players you have formed links with. If you form no links, you will still be given a decision sheet but do not need to make a decision.

When you receive your decision sheet for part two, please record your decision of X or Y. The responses will then be collected and the results compiled. Your decision sheet showing the decisions of all 4 players in your group and your payoff from part two will then be returned. Please raise your hand if you have a question at any stage during the experiment.

Please choose between each of the following lottery options, by selecting *either* lottery A or lottery B in each row. One of the rows will be randomly selected and played out to determine your payoff from this part of the experiment. Therefore, it is important that you consider each decision carefully.

As an example, imagine that the second row in the table is randomly selected for payoff. If you chose lottery A in the second row, you will receive 20.00 ECU with 20% probability and 16.00 ECU with 80% probability. If you chose lottery B in the second row, you will receive 38.50 ECU with 20% probability and 1.00 ECU with 80% probability.

You can choose lottery A or lottery B as many times as you wish in the following table, but must make a decision for each of the 10 rows.

Lottery A	Lottery B	Your Choice (A or B)
10% chance of 20.00 ECU 90% chance of 16.00 ECU	10% chance of 38.50 ECU 90% chance of 1.00 ECU	
20% chance of 20.00 ECU 80% chance of 16.00 ECU	20% chance of 38.50 ECU 80% chance of 1.00 ECU	
30% chance of 20.00 ECU 70% chance of 16.00 ECU	30% chance of 38.50 ECU 70% chance of 1.00 ECU	
40% chance of 20.00 ECU 60% chance of 16.00 ECU	40% chance of 38.50 ECU 60% chance of 1.00 ECU	
50% chance of 20.00 ECU 50% chance of 16.00 ECU	50% chance of 38.50 ECU 50% chance of 1.00 ECU	
60% chance of 20.00 ECU 40% chance of 16.00 ECU	60% chance of 38.50 ECU 40% chance of 1.00 ECU	
70% chance of 20.00 ECU 30% chance of 16.00 ECU	70% chance of 38.50 ECU 30% chance of 1.00 ECU	
80% chance of 20.00 ECU 20% chance of 16.00 ECU	80% chance of 38.50 ECU 20% chance of 1.00 ECU	
90% chance of 20.00 ECU 10% chance of 16.00 ECU	90% chance of 38.50 ECU 10% chance of 1.00 ECU	
100% chance of 20.00 ECU 0% chance of 16.00 ECU	100% chance of 38.50 ECU 0% chance of 1.00 ECU	

Please complete the following questions.

1. Imagine you have a good relationship with your roommate, and that your roommate is currently facing an important decision. You have a strong opinion about the decision your roommate should make, and need to decide whether or not to give your roommate advice. If you give advice that your roommate appreciates, this will greatly enhance your relationship. However, if your roommate dislikes your advice, this will seriously harm your relationship. If you give no advice, this will have no effect on your relationship. Will you give advice or remain silent? Please circle your choice below.

                    Remain silent   Give advice

2. What is the approximate yearly before-tax income of your parents/guardians in pounds?

_____

3. How many siblings do you have?

_____

4. Please rate your current mood on the following scale by circling a number, with 1 being entirely pessimistic and 5 being entirely optimistic:

Pessimistic   Neutral   Optimistic

1   2   3   4   5

5. Please rate the current financial stability in your home country, with 1 being extremely volatile and 5 being very stable:

Volatile   Neutral   Stable

1   2   3   4   5

Appendix Three: Regression with Cultural Dummy Variable Interactions

Coefficients from Ordered Probit Model[50] Dependent Variable: Willingness to Take Financial Risks	
Financial Network Size	0.040** (0.020)
Academic Network Size	-0.000 (0.023)
Social Network Size	-0.048** (0.020)
Age	-0.018 (0.013)
Female	-0.561*** (0.097)
British	0.054 (0.135)
Asian	1.901** (0.900)
NZ Euro	0.246 (0.191)
Asian * NZ Study	-0.122 (0.324)
Asian * Financial Network Size	0.042 (0.037)
Asian * Age	-0.064 (0.044)
Asian * Gender	-0.235 (0.255)
Cut 1	-2.504 (0.347)
Cut 2	-1.980 (0.347)
Cut 3	-1.377 (0.339)
Cut 4	-0.989 (0.337)
Cut 5	-0.714 (0.337)
Cut 6	-0.300 (0.336)
Cut 7	0.227 (0.333)
Cut 8	0.881 (0.336)
Cut 9	1.578 (0.349)
Cut 10	2.301 (0.397)

---

[50] Robust standard errors are given in parentheses, rounded to three decimal places. Significance at the 10%, 5%, and 1% level of confidence is indicated with *, **, and ***, respectively. In ordered probit models, the probability of the dependant variable taking on any particular value is given by the probability a latent variable lies between each cut point.

Appendix Four: 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.

Questionnaire

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

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?

- OK Button -

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.

<u>Game One</u>

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	**2**	60, 60	0, 40
Choice	**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

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 -

Appendix Five: Experiment Instructions

<u>Instructions</u>

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.

Your earnings from the experiment will be in 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.

During the experiment you will be asked to make a series of decisions. At the end of the experiment, **<u>one</u>** of the decisions you make will be randomly selected to determine your payoff. This will be done by a dice roll, as you will make six decisions in total.

Some of the choices will involve a lottery where you have a 50% chance of each payoff. In these cases, we will flip a coin to determine your payoff.

The experiment will begin shortly. Please raise your hand if you have a question at any stage.

<u>Follow-up Questionnaire</u>

Imagine you have a good relationship with your roommate, and that your roommate is currently facing an important decision. You have a strong opinion about the decision your roommate should make, and need to decide whether or not to give your roommate advice. If you give advice that your roommate appreciates, this will greatly enhance your relationship. However, if your roommate dislikes your advice, this will seriously harm your relationship. If you give no advice, this will have no effect on your relationship. Will you give advice or remain silent?

In Peer Effects Treatments: Yesterday we ran the same questionnaire, and XX% of participants chose to give advice while XX% of participants chose to remain silent.

- OK Button -

How willing are you to take risks in general, with 0 being not at all willing to take risks, and 10 being very willing to take risks?

- OK Button -

How willing are you to take risks when driving, with 0 being not at all willing to take risks, and 10 being very willing to take risks?

- OK Button -

How willing are you to take risks with financial investment, with 0 being not at all willing to take risks, and 10 being very willing to take risks?

- OK Button -

How willing are you to take risks when engaging in leisure or sport, with 0 being not at all willing to take risks, and 10 being very willing to take risks?

- OK Button -

How willing are you to take risks with your career, with 0 being not at all willing to take risks, and 10 being very willing to take risks?

- OK Button -

How willing are you to take risks with your health, with 0 being not at all willing to take risks, and 10 being very willing to take risks?

- OK Button -

How willing are you to take risks with social approval, with 0 being not at all willing to take risks, and 10 being very willing to take risks?

- OK Button -

In Peer Effects Treatments: During the experiment, we gave you information on the results from yesterday's session. Did you consider these results when making your decisions?

If you answered "yes" above, please tell us how the previous results affected your decisions?

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

- OK Button -

Please answer the following questions:

Age (in years):

Gender: M/F

Subject major:

Nationality:

Nationality(ies) of your parents/guardians:

Country of birth:

Native language:

Second languages:

- OK Button -

Appendix Six: Regression with Binary Variable for Culture and Interaction Term

Coefficients from Ordered Probit Regression on Risk Preference Index[51]	
Female	0.112
	(0.265)
Age	0.046
	(0.088)
Business Major	-0.407
	(0.343)
Risk Attitude	0.143**
	(0.068)
Peer Effects	0.588
	(0.358)
Asian	0.213
	(0.341)
Asian * Peer Effects	-0.452
	(0.545)
Cut 1	0.660
	(1.773)
Cut 2	1.433
	(1.764)
Cut 3	2.192
	(1.761)
Cut 4	3.795
	(1.796)
Cut 5	4.104
	(1.816)

[51] Robust standard errors are given in parentheses. Significance at the 10%, 5%, and 1% level of confidence is indicated with *, **, and ***, respectively. In ordered probit models, the probability of the dependant variable taking on any particular value is given by the probability a latent variable lies between each cut point.

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