Can Uncertainty Avoidance Explain Prospect Theory?

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Abstract
This study examines results acquired from surveys administered to German and American university students to determine whether a relationship exists between an individual’s ranking on Hofstede’s cultural dimension of uncertainty avoidance and the individual’s predisposition to behave according to the tenets of prospect theory. Results indicate American and Germans choose similarly among risky alternatives. Moreover, results for the American subsample indicate that Americans with higher uncertainty avoidance choose alternatives that are more certain. Lastly, there is no difference in the relationship between uncertainty avoidance and choices among risky alternatives between the American and German subsamples.

We would like to thank our colleagues and students at the four German universities that participated in this study: the Cologne University of Applied Sciences, the University of Applied Sciences and Arts Dortmund, the Berufsakademie Bad Mergentheim, and the University Duisburg-Essen.
1. Introduction

On April 9, 2010, an article in the Financial Times referenced the “emotional markets hypothesis” relative to the Greek debt crisis. Also mentioned in the article was a conference on the future of economics, held at King’s College in Cambridge. One of the main conclusions of this conference was that:

“…economists and market traders alike need to devote far more time to human psychology, rather than just the raw economic numbers beloved of many policy wonks.

‘We need to recognise that humans are partly rational and partly instinctive,’ Adair Turner, head of Britain’s Financial Services Authority, solemnly declared. Or as Mr. Soros echoed: ‘Economic phenomena have thinking participants, natural phenomena do not ... [but] participants’ thinking does not accurately represent reality.’”

The article held that economic behavior depends as much on culture and on politics as on traditional economic analysis. Interestingly, very little research has been conducted as to how different cultures engage in economic decision making. One step in this direction is to investigate whether the economic choices individuals make depend on that individual’s cultural dimensions.

The manifestation of culture in an individual’s choices and preferences has been shown through previous research (Hofstede 1983). Although Hofstede’s dimensions are not comprehensive and cannot accurately describe all inhabitants of a country, they do present a framework through which a nation’s preferences and behavior can be predicted. Prospect theory (Kahneman and Tversky, 1979) has shown that individuals often abandon expected utility theory and instead become risk-averse in their gains and risk-seeking in their losses. We seek to identify relationships between an individual’s uncertainty avoidance and predisposition for subscribing to prospect theory within Germany and the United States.

Kahneman and Tversky’s research has generated critical acclaim over time, as has Hofstede’s. However, no study to date has investigated whether individuals exhibiting a high level of uncertainty avoidance will exhibit varying risk-seeking or risk-averting behavior as predicted by Prospect Theory. For example, if an individual exhibits a high degree of uncertainty avoidance, this individual should be more risk-averse with respect to gains than an individual with relatively low uncertainty avoidance. Moreover, a person with high uncertainty avoidance may act in a less risk-seeking, or even a risk-averse, manner relative to losses than a person with low uncertainty avoidance.

Prospect theory suggests that people exhibit risk-averse behavior in gains and risk-seeking behavior in losses. Kahneman, Knetsch and Thaler (1991) elaborate:

A central conclusion of the study of risky choice has been that such choices are best explained by assuming that the significant carriers of utility are not states of wealth or welfare, but changes relative to a neutral reference point (Kahneman et al., 1991, p. 199).

We anticipate that the degree of loss aversion will correlate with uncertainty avoidance. That is, we expect a higher occurrence of loss aversion in countries with higher uncertainty avoidance indexes, as those individuals should prefer to avoid risk in the formation of asset portfolios.

This study aims to examine the relationship between prospect theory and uncertainty avoidance in the aforementioned countries. The paper will proceed as follows. First, we will determine if German students
exhibit a higher degree of uncertainty avoidance than American students. Next, we will explore whether German students are more risk-averse than Americans in their gains and less risk-seeking in their losses. Finally, we will investigate whether different levels of uncertainty avoidance result in different prospect theory choices, and whether that relationship is constant across countries.

The remainder of this paper is organized as follows. The literature review is presented in Section 2, while the hypotheses are developed in Section 3. The data and methodology are discussed in Section 4. Results are discussed in Section 5. Section 6 concludes and provides some suggestions for future research.

2. Literature Review

2A. Uncertainty Avoidance

Geert Hofstede, in his study of organizational behavior disparities between countries, identified four dimensions of culture upon which a country may vary (Hofstede 1983). We will juxtapose the respective country’s uncertainty avoidance index score against specific principles of Prospect Theory to determine if a relationship exists. Hofstede originally developed four cultural dimensions, which are summarized below:

**Power Distance (PDI)** reflects the extent to which members of organizations and institutions (like the family) accept and expect unequal power distributions unequally.

**Individualism (IDV)** reflects the extent to which individuals in a society are integrated into groups. Individualistic societies are those where the ties between individuals are loose. Collectivist societies are those where people are integrated into strong, cohesive in-groups, often extended families (with uncles, aunts and grandparents) which continue protecting them in exchange for unquestioning loyalty.

**Masculinity (MAS)** versus its opposite, femininity, refers to the distribution of roles between the genders in a society. The assertive pole is called 'masculine' and the modest, caring pole 'feminine'.

**Uncertainty Avoidance Index (UAI)** reflects a society's tolerance for uncertainty and ambiguity. It indicates to what extent members of a culture feel either uncomfortable or comfortable in unstructured situations, which are novel, unknown, surprising, different from usual. Uncertainty avoiding cultures try to minimize the possibility of such situations. Uncertainty accepting cultures exhibit greater tolerance toward opinions different from what they are used to.

Hofstede (1983) further describes the uncertainty avoidance index (UAI) as measuring the mean residual level of anxiety the inhabitants of a country experience and the extent to which individuals will avoid behaviors that might increase their anxiety. Germany has a UAI score of 65 compared to 46 for the United States, implying that Germans should, on average, be less comfortable with uncertainty and ambiguity than Americans (Hofstede, 1983, p. 52).

Although focused only on the United States, Alessandri (2008) documents a relationship between perceived risk and procedural rationality. Alessandri found that as managers perceive more risk in their decisions, their approaches to decision making become more analytical, and they become more focused on gathering information to help guide their choice. This attempt to mitigate uncertainty in management supports the notion that uncertainty avoidance exists in organizations and varies relative to perceived risk of a situation. Thus, if an individual perceives a situation to be risky, he or she may act to reduce the uncertainty inherent in the situation and act in a more risk-averse manner. This is particularly interesting
in light of the relationship between uncertainty avoidance and risky choices, since Alessandri’s findings imply that a greater degree of risk aversion is accompanied by higher levels of uncertainty avoidance.

Since Hofstede’s initial research other studies have identified and explored uncertainty avoidance in organizations. Portz and Lere (2010) find that in cost center management, German companies are more likely to be structured in a manner that narrows a manager’s focus and reduces ambiguity. Conversely, managers in U.S. companies typically enjoy more flexibility and are encouraged to have a broad focus even if it means working interdepartmentally. This disparity has been interpreted to represent a difference in the two countries’ respective uncertainty avoidance rankings.

Beckmann et al. (2007) document the presence of uncertainty avoidance in the portfolio compositions of asset managers from four different countries. Germany and the United States performed as Hofstede’s research would predict, with the more uncertainty avoidant German asset managers neglecting to invest their assets under management as actively as they were permitted. U.S. asset managers, however, exercised most of the freedom permitted them by their investors. This research monitored underutilized tracking error, which is the degree to which an asset manager will invest as actively as she is allowed. Consequently, Beckmann et al. suggest that uncertainty avoidance could be responsible for the lower returns experienced by asset managers with greater degrees of underutilized tracking error (2007).

Further research by Shane (1995) examines several championing roles that have been found to increase rates of innovation in the United States. Shane (1995) found that uncertainty-accepting societies are more likely to prefer innovation-championing roles than are uncertainty-avoiding societies (Shane, 1995, p. 64). Shane’s research suggests that cultures more tolerant of uncertainty should be expected to have higher rates of innovation, as these cultures would be more accepting of the roles necessary to develop such innovation (Shane, 1995, pp. 64-65). The link between uncertainty avoidance and innovation is questionable, however, as research by Rhyne (2002) showed higher levels of self-reported new product innovation in Belgium (higher UAI score) versus the United States (lower UAI score), which contradicts prior research.

2B. Prospect Theory

The notion that a loss is felt with greater magnitude than a gain, and that individuals are risk-seeking in losses while risk-averse in gains, was identified and explained by Daniel Kahneman and Amos Tversky (1979). Their research established that individuals routinely defy expected utility theory as the result of psychological motivations.

Since Kahneman and Tversky’s (1979) seminal work, several papers have further investigated prospect theory, occasionally with contradicting results. Abdellaoui et al. (2007), using outcomes greater than those used in Kahneman and Tversky’s original study (1979), experienced results that further supported prospect theory in that utility was convex for losses and concave for gains. However, Etchart-Vincent (2004) used loss outcomes comparable to those used by Abdellaoui et al. (2007) and found less convexity in losses. Fehr-Duda et al. (2010) find that risk aversion increases as gains become larger in scale. However, their research does not find that risk-seeking behavior present in losses changes relative to the size of the loss. This supports Abdellaoui’s (2000) findings that the convexity of the value function for losses is less pronounced than is the concavity of the value function for gains.
Lozza et al. (2010) document that participants in framing and preference research attach greater value to a bonus when it is framed as a loss aversion (reduction in tax burden) as opposed to a gain (an increase in income). This supports Kahneman and Tversky’s finding that a loss is more painful than a gain is pleasurable. Consequently, individuals attach greater value to the aversion of a loss. This supports the reflection effect noticed by Kahneman and Tversky (1979) wherein individuals, for very small probabilities, are more likely to gamble on a potentially large gain than take a small certain gain (risk-seeking behavior in gains). They are also more likely to take a small certain loss rather than gamble on a large potential loss (risk-averting behavior in losses).

Research has also identified that, while the majority of study participants (70%) exhibit the reflection effect in their preferences, a significant fraction (24%) have been shown to be risk-averse in both gains and losses (Baucells and Villasis, 2010). Baucells and Villasis (2010) suggest that instead of taking an average of all preferences in research involving prospect theory and utility functions researchers should separate participants into reflective and averse classes. This finding is motivational to the present study, as we seek to investigate whether individual levels of uncertainty avoidance lead to varying levels of risk-seeking behavior.

Garvey and Lee (2010) find that, although prospect theory can be predictive of lottery preferences, choices among risky alternatives are often partially a manifestation of personality traits. Garvey and Lee find that individuals are more likely to choose a particular alternative when the framing of a proposition resonates with their personality dispositions and appetite for risk (2010).

Dohmen et al. (2008), in studying an adult German population, find that education and knowledge-based measures of cognitive ability are positively related to participants’ performance in a probability judgment assignment. Dohmen et al. (2008) interpret these results to mean that biased probability judgment often translates into inferior economic outcomes, and they suggest that education significantly reduces cognitive biases. Since our sample consists of German and American students, which are arguably more highly educated than the average citizen, we expect our samples to be less prone to cognitive biases that may result in inferior economic outcomes.

Existing literature suggests that individuals tend to behave as described by prospect theory. Moreover, the literature on uncertainty avoidance confirms Hofstede’s original idea that individuals exhibit different levels of uncertainty avoidance depending on their country of origin. However, no study to date has investigated whether an individual’s level of risk-seeking or risk-averting behavior can be predicted using that individual’s degree of uncertainty avoidance. If a culture’s degree of risk aversion can be predicted using uncertainty avoidance, then it is possible that different asset markets are priced differently given the prevailing culture in that market.

By incorporating the research identified in the literature review and analyzing survey data from American and German participants we intend to identify and describe, if it exists, correlation between the aforementioned principles of behavioral finance and cultural dimension. We expect there to be an inverse correlation between uncertainty avoidance and risk aversion, as individuals wishing to mitigate any uncertainty would demonstrate a proclivity for less risk in their investments.
3. Hypothesis

We anticipate that there will be a disparity between German and American survey respondents regarding uncertainty avoidance. German students are expected to score substantially higher than American students on the uncertainty avoidance index, confirming Hofstede’s original findings (Hofstede, 1983, p. 52). This leads us to the following hypothesis:

**H1: German students exhibit a higher degree of uncertainty avoidance than American students.**

We will next explore the possibility that individuals’ choices among risky alternatives can be explained by the individuals’ degree of uncertainty avoidance. Specifically, we expect individuals with a higher degree of uncertainty avoidance to choose alternatives that are more certain, ceteris paribus. If there is a positive relationship between uncertainty avoidance and choices among risky alternatives, then it may be possible to develop a predictive model in which an individual’s level of uncertainty avoidance can be used to forecast how individuals will choose when given risky choices. We hypothesize:

**H2: Higher uncertainty avoidance results in less risky choices by individuals.**

Lastly, although it is possible that the level of uncertainty avoidance differs between the two countries investigated here, the relationship between uncertainty avoidance and the choice of risky alternatives should be relatively constant and should not vary across countries. Thus, we hypothesize:

**H3: The relationship between uncertainty avoidance and risky choices is constant across countries.**

If a correlation could be established as to the relationship between a culture’s uncertainty avoidance and the amplitude of their loss aversion we might be able to anticipate the likelihood of a culture’s acceptance of a financial proposition based on information regarding where this culture falls along the uncertainty avoidance continuum. Hofstede’s dimension of uncertainty avoidance could be an important predictive tool, allowing for the reasonable speculation as to the potential receptivity of German or American cultures to investment opportunities. This research could also explain inconsistency in investment conventions between the two countries.

4. Data and Methodology

The survey instrument utilized here was administered to two sections of an introductory business course in the college of business of a regional southern university and to a variety of business course sections at four German universities: the University of Applied Sciences Cologne (Institute for Insurance), the University Duisburg-Essen, the University of Applied Sciences and Arts Dortmund and the Berufsakademie Bad Mergenthalen. In addition to some demographic questions, the survey contains questions to measure 1) the level of individual uncertainty avoidance, and 2) the various components of prospect theory described above in the hypotheses. This allows us to directly test the stated hypotheses. The entire survey is presented in the Appendix. The demographic questions were written by the authors, the uncertainty avoidance were a combination of questions from Dorfman and Howell (1988) (2 questions) and Srite and Karahanna (2006) (1 question). We also included two additional questions intended to capture uncertainty avoidance. The prospect theory choices were taken directly from Kahneman and Tversky (1979).

The course at the U.S. institution includes majors from all business disciplines and both commuter and traditional students. Students were informed about the survey in class prior to launching the survey,
through email communication, and through a Blackboard announcement. All students completing the survey received extra credit and were aware of this prior to completing the survey. Students were informed that they should not answer questions they did not feel comfortable answering.

In Germany, students were also informed about the survey prior to administering it. However, the German students did not receive extra credit for completing it, as this is not standard practice in Germany. The surveys were administered in English, and all students who took the survey were fluent in English. Nonetheless, at least one individual from the U.S. was present to answer clarifying questions while the students completed the survey. As in the U.S., students were informed that they should not answer questions they were not comfortable answering.

In the U.S. 283 students completed the survey. Of these students, 70 students either did not answer some questions in the survey or provided nonsensical responses, leaving a final U.S. sample of 213 students. In Cologne, the survey was administered to 108 students in six different insurance courses. Eliminating incomplete surveys resulted in a final sample of 81 students from the Cologne University of Applied Sciences. In Duisburg, the survey was administered to a mass section of business management with 191 students, with a final sample of 117 students. In Dortmund, the survey was administered to 71 students in five different business courses, with a final sample of 34 students. In Bad Mergentheim, the survey was administered to 88 students in five different business courses, with a final sample of 64 students.

Consequently, the overall sample for the U.S. consists of 213 students, while the total German sample consists of 296 students. The demographic characteristics of the sample are summarized in Table 1.

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1 In fact, some of the courses in Cologne, Dortmund, and Bad Mergentheim were taught in English.
Table 1. Sample Description

<table>
<thead>
<tr>
<th></th>
<th>Mean (Median) Age</th>
<th>% Male (% Female)</th>
<th>% Traveled Abroad</th>
<th>% Employed Prior to University</th>
<th>% Employed at Time of Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entire Sample</td>
<td>23.46 (22)</td>
<td>49% (51%)</td>
<td>89%</td>
<td>51%</td>
<td>63%</td>
</tr>
<tr>
<td>U.S. Sample</td>
<td>23.53 (23)</td>
<td>52% (48%)</td>
<td>74%</td>
<td>73%</td>
<td>62%</td>
</tr>
<tr>
<td>German Sample</td>
<td>22.99 (23)</td>
<td>46% (54%)</td>
<td>99%</td>
<td>36%</td>
<td>64%</td>
</tr>
</tbody>
</table>

As shown in the table, the total sample had a median age of 22, with 49% of respondents being male and the other 51% being female. 89% of the entire sample had traveled abroad at least once, 51% were employed prior to university and 63% indicated that they were employed at the time of the survey. Participants from the United States had a median age of 23, with 52% of our survey respondents being male. 73% of the U.S. sample affirmed that they had been employed prior to entering university and 62% continued to hold jobs while attending college. Another 74% of those who took the questionnaire indicated that they had traveled abroad at least once. 46% of German respondents identified themselves as being male. The median age of our questionnaire participants in Germany was 23 and 99% indicated that they had traveled abroad at least once. 36% of our German students had been employed prior to university and 64% were employed at the time of the survey.

Although not reported in Table 1, we computed the average uncertainty avoidance index for each of the two countries. Responses to these five questions were averaged for each country. For the US, the average UA score was 3.32, while it was 3.17 for the German sample. This difference is significant at the .01 level. H1 is therefore rejected. These results contradict Hofstede’s original 1983 results. However, Hofstede acknowledged that cultures can and do change over time. Given the recent global financial crisis, it is perhaps not surprising that the US has a higher uncertainty avoidance score; if the survey had been conducted at the height of the housing bubble, the results could have been much different.

5. Results

Table 2 presents the results from the prospect theory questions originally presented in Kahneman and Tversky (1979). Seventeen of these original questions are presented to provide a cross-section of the different effects shown by Kahneman and Tversky. In Table 2, columns 3 and 4 present the original results by Kahneman and Tversky. In their paper, the authors reported only significance at the 1% level.
Table 2. Results from Kahneman and Tversky (1979) and from American and German Samples.

<table>
<thead>
<tr>
<th>Effect</th>
<th>Question</th>
<th>KT Choice 1</th>
<th>KT Choice 2</th>
<th>Total Sample Choice 1</th>
<th>Total Sample Choice 2</th>
<th>U.S. Choice 1</th>
<th>U.S. Choice 2</th>
<th>Germany Choice 1</th>
<th>Germany Choice 2</th>
<th>U.S./Germany Difference p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certainty</td>
<td>(50% 3-week tour of England, France and Italy; 1-week tour of England with certainty)</td>
<td>67.00%***</td>
<td>33.00%</td>
<td>59.72%***</td>
<td>40.28%</td>
<td>54.46%</td>
<td>45.54%</td>
<td>63.51%***</td>
<td>36.49%</td>
<td>0.040**</td>
</tr>
<tr>
<td>Certainty</td>
<td>(4000, 2;3000, 0, 25)</td>
<td>65.00%***</td>
<td>35.00%</td>
<td>61.49%***</td>
<td>38.51%</td>
<td>61.03%***</td>
<td>29.97%</td>
<td>61.82%***</td>
<td>38.12%</td>
<td>0.8570</td>
</tr>
<tr>
<td>Reflection</td>
<td>(4000, 2;3000, 0, 25)</td>
<td>42.00%</td>
<td>58.00%</td>
<td>49.90%</td>
<td>51.10%</td>
<td>50.70%</td>
<td>49.32%</td>
<td>49.34%</td>
<td>50.68%</td>
<td>0.7570</td>
</tr>
<tr>
<td>Certainty</td>
<td>(4000, 2;3000, 0, 25)</td>
<td>14.00%</td>
<td>86.00%***</td>
<td>17.09%</td>
<td>82.81%***</td>
<td>18.78%</td>
<td>81.22%***</td>
<td>15.88%</td>
<td>84.12%</td>
<td>0.3900</td>
</tr>
<tr>
<td>Reflection</td>
<td>(4000, 2;3000, 0, 25)</td>
<td>92.00%***</td>
<td>8.00%</td>
<td>61.49%***</td>
<td>37.09%</td>
<td>62.81%***</td>
<td>36.49%</td>
<td>62.81%***</td>
<td>34.04%</td>
<td>0.040**</td>
</tr>
<tr>
<td>Low Probability</td>
<td>(6000, 0.001; 3000, 0.002)</td>
<td>73.00%</td>
<td>27.00%</td>
<td>73.67%***</td>
<td>26.33%</td>
<td>72.3%***</td>
<td>27.70%</td>
<td>74.66%***</td>
<td>25.34%</td>
<td>0.5490</td>
</tr>
<tr>
<td>Low Probability/R</td>
<td>Reflection (4000, 0.001; 3000, 0.002)</td>
<td>73.00%</td>
<td>27.00%</td>
<td>73.67%***</td>
<td>26.33%</td>
<td>72.3%***</td>
<td>27.70%</td>
<td>74.66%***</td>
<td>25.34%</td>
<td>0.5490</td>
</tr>
<tr>
<td>Reflective</td>
<td>(6000, 0.001; 3000, 0.002)</td>
<td>30.00%</td>
<td>70.00%***</td>
<td>53.63%</td>
<td>46.37%</td>
<td>51.64%</td>
<td>48.36%</td>
<td>55.07%*</td>
<td>44.93%</td>
<td>0.4470</td>
</tr>
<tr>
<td>Low Probability</td>
<td>(5000, 0.001; 5000, 0.002)</td>
<td>72.00%***</td>
<td>28.00%</td>
<td>59.33%***</td>
<td>40.67%</td>
<td>55.87%*</td>
<td>44.13%</td>
<td>61.82%***</td>
<td>38.12%</td>
<td>0.1770</td>
</tr>
<tr>
<td>Low Probability/R</td>
<td>Reflection (5000, 0.001; 5000, 0.002)</td>
<td>72.00%***</td>
<td>28.00%</td>
<td>59.33%***</td>
<td>40.67%</td>
<td>55.87%*</td>
<td>44.13%</td>
<td>61.82%***</td>
<td>38.12%</td>
<td>0.1770</td>
</tr>
<tr>
<td>Isolation</td>
<td>Two-stage (1000; 5, 5000)</td>
<td>16.00%</td>
<td>84.00%***</td>
<td>27.70%</td>
<td>72.30%***</td>
<td>34.27%</td>
<td>65.73%***</td>
<td>22.97%</td>
<td>77.03%***</td>
<td>0.005***</td>
</tr>
<tr>
<td>Isolation/R</td>
<td>Reflection (1000; 5, 5000)</td>
<td>17.00%</td>
<td>83.00%***</td>
<td>43.61%</td>
<td>56.39%***</td>
<td>43.66%</td>
<td>56.34%*</td>
<td>43.58%</td>
<td>56.42%*</td>
<td>0.9840</td>
</tr>
<tr>
<td>Concavity of Gains</td>
<td>(6000, 25, 4000, 0.00, 25, 2000, 25)</td>
<td>69.00%***</td>
<td>31.00%</td>
<td>38.70%</td>
<td>61.30%***</td>
<td>38.70%</td>
<td>61.30%**</td>
<td>36.15%</td>
<td>63.85%***</td>
<td>0.1650</td>
</tr>
<tr>
<td>Convexity for Losses</td>
<td>(6000, 25, 4000, 0.00, 25, 2000, 25)</td>
<td>18.00%</td>
<td>82.00%***</td>
<td>21.41%</td>
<td>78.59%***</td>
<td>18.78%</td>
<td>81.22%***</td>
<td>23.31%</td>
<td>76.69%***</td>
<td>0.2190</td>
</tr>
<tr>
<td>Isolation/R</td>
<td>Reflection (4000, 8,300)</td>
<td>22.00%</td>
<td>78.00%***</td>
<td>26.13%</td>
<td>73.87%***</td>
<td>32.39%</td>
<td>67.61%***</td>
<td>21.62%</td>
<td>78.38%***</td>
<td>0.006***</td>
</tr>
</tbody>
</table>

Notes to Table 2:
* Significant at the .10 level.
** Significant at the .05 level.
*** Significant at the .01 level.
a The total sample consists of 509 American and German students.
b The U.S. sample consists of 214 American students from a regional southern university.
c The German sample consists of 295 German students from four German universities: The University of Applied Sciences Cologne, the Berufskademie Bad Mergentheim, the University of Applied Sciences and Arts Dortmund, and the University Duisburg-Essen.
In Tables 2 through 6, the questions are presented in a choice format in the second column of each table. Thus, the first question gives readers the choices between a 50% chance of winning a three-week tour of England, France and Italy and a one-week tour of England with certainty. The third question in the second row gives survey participants readers a choice between receiving $4,000 (4,000 euros in Germany) with probability .8 and $3,000 (3,000 euros) with certainty. The other questions are interpreted similarly. The two-stage game question in the isolation question set is not as obvious. The two-stage game question for the positive side is:

In addition to whatever you own, you have been given 1000. You are now asked to choose between

A: 1000 with probability .50  
B: 500 with certainty

The entire survey is included in the Appendix.

Columns 5 and 6 in Table 2 present the results from our total sample of 508 American and German students. As indicated in these columns, the results for our total sample confirm Kahneman and Tversky’s results for 12 out of the 17 questions. Four of the reflection effect questions are not supported by our sample, with two of these questions having the opposite sign as expected. For example, when asked to choose between (-4000,.8; -3000), 92 percent of respondents in KT’s original paper chose to gamble and picked the first choice. In our sample, however, only about 53 percent of the respondents chose to gamble. Given the recency of the financial crisis to the administration of these surveys, it is perhaps not surprising that so many students chose not to gamble. The last question where the response from our sample does not coincide with the KT findings concerns the convexity of losses; when asked to choose between (-6000, .25; -4000,.25,-2000,.25), 70 percent of KT’s original sample chose the first choice, thus implying that the sum of the absolute values of the separate 4000 and 2000 losses is greater than the 6000 loss, which implies convexity in losses. In our sample, however, we find no significant difference with respect to the two choices, implying neither convexity nor concavity in the domain of losses.

Columns 7 and 8 of Table 2 present the results for the US. These results are virtually indistinguishable from the total sample results, with one exception. In addition to the five questions that differed from KT’s original findings for the total sample, when given the choice of a 5 percent probability of a three-week tour of England and a 10 percent probability of a one-week tour, most respondents in the US still chose the less likely 5 percent, confirming KT’s findings. This difference, however, is not significant at conventional levels.

Columns 9 and 10 of Table 2 present the results for the German sample of 295 students from four different universities. For the German sample, the same five questions that did not line up with KT’s original findings did not line up for this sample.

The last column of Table 2 presents the p-value for a test of difference between the US and German responses, by question. For six questions, there is a significant difference between the US and German responses. However, for four of these six questions where the difference is significant the respective American and German responses were significant in the same direction. Thus, for these four questions, the magnitude was simply more pronounced for one of the samples. For example, when given the choice of (50% 3-week tour of England; 1-week tour with certainty), 69 percent of American respondents chose the certain outcome and 59 percent of the German respondents chose the certain outcome. That difference is significant at the .05 level.
For two questions, the proportion difference between America and Germany is significant and the individual American and US responses are not in the same direction. When asked to choose between (5% 3-week tour of England; 10% 1-week tour) German respondents significantly preferred choice 1, while there was no significant preference among the American respondents. When asked to choose between (-4000,.8;3000), 57 percent of the German respondents preferred to gamble, while there was no significant preference among the American respondents. For these two questions, it therefore seems that the German sample is more prone to gambling than the American sample, which is surprising.

Overall, the results displayed in Table 2 indicate a strong resemblance to the findings originally reported by Kahneman and Tversky (1979), with minimal differences between the two subsamples of American and German students. These results are encouraging, since they indicate that prospect theory and loss aversion persist in both countries.

While Table 2 reports the choices American and German students make when faced with risky alternatives, it does not speak to the degree to which uncertainty avoidance influences those choices. The questions presented in Table 2 can be grouped together to form pairs and, if an individual is particularly uncertainty avoidant, certain responses should be expected for these paired questions. For example, consider the third and fourth question in Table 2: (4000,.8;3000) and (-4000,.8;-3000). KT reported, and our respondents confirm, that most individuals will choose the certain 3000 gain but avoid the certain loss. However, respondents with a high degree of uncertainty avoidance would perhaps be expected to prefer the certain -3000 over the possible 4000 loss.

To evaluate whether a higher degree of uncertainty avoidance results in different choices when our American sample is faced with risky alternatives, Table 3 presents the mean for the uncertainty avoidance construct for each of seven question pairs. To accomplish this, we first grouped the questions such that the positive and negative counterparts were included in each pair. Next, we formed three uncertainty avoidance (UA) categories of 0, 1, and 2, which are increasing in uncertainty avoidance. Here, a UA category of zero indicates that the individual chooses the riskier alternative for both questions; a UA category of 1 indicates that the individual chooses the riskier alternative for one of the two questions; a UA category of 2 indicates that the individual chooses the less risky alternative for each of the two questions.
Table 3. Test for Uncertainty Avoidance Differences Across Responses for Grouped Questions (American Sample).

<table>
<thead>
<tr>
<th>Effect</th>
<th>Questions</th>
<th>UA Category Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0(^a)</td>
</tr>
<tr>
<td><strong>Certainty</strong></td>
<td>(50% 3-week tour of England, France and Italy; 1-week tour of England with certainty) (5% 3-week tour of England, France and Italy; 10% 1-week tour of England)</td>
<td>3.32 (.72)</td>
</tr>
<tr>
<td><strong>Certainty Reflection</strong></td>
<td>(4000,.8;3000) (-4000,.8;3000)</td>
<td>3.27 (.92)</td>
</tr>
<tr>
<td><strong>Certainty Reflection</strong></td>
<td>(4000,.2;3000,.25) (-4000,.2;3000,.25)</td>
<td>3.28 (.65)</td>
</tr>
<tr>
<td><strong>Certainty Reflection</strong></td>
<td>(6000,.45;3000,.9) (-6000,.45;3000,.9)</td>
<td>3.43 (.12)</td>
</tr>
<tr>
<td><strong>Low Probability</strong></td>
<td>(6000,.001;3000,.002) (-6000,.001;-3000,.002)</td>
<td>3.34 (.42)</td>
</tr>
<tr>
<td><strong>Low Probability Reflection</strong></td>
<td>(5000,.001;5) (-5000,.001;5)</td>
<td>3.29 (.89)</td>
</tr>
<tr>
<td><strong>Isolation/Reflection</strong></td>
<td>Two-stage (1000,.5;500) Two-stage (-1000,.5;500)</td>
<td>3.27 (.66)</td>
</tr>
<tr>
<td><strong>Concavity of Gains</strong></td>
<td>(6000,.25;4000,.25,2000,.25) (-6000,.25;-4000,.25,-2000,.25)</td>
<td>3.52 (.05)**</td>
</tr>
<tr>
<td><strong>Convexity of Losses</strong></td>
<td></td>
<td>3.29 (.98)</td>
</tr>
<tr>
<td>All 16 Questions Combined(^b)</td>
<td></td>
<td>3.24 (.66)</td>
</tr>
<tr>
<td>Positive Questions Only(^c)</td>
<td></td>
<td>3.15 (.01)***</td>
</tr>
<tr>
<td>Negative Questions Only(^d)</td>
<td></td>
<td>3.29 (.98)</td>
</tr>
</tbody>
</table>
Notes to Table 3:

* Significant at the .10 level.
** Significant at the .05 level.
*** Significant at the .01 level.

a Categories are formed based on the level of risk aversion inherent in the questions. A more risk averse individual would be expected to choose the more certain outcome, ceteris paribus, for each pair of questions. A UA category mean of 0 means that the individual chooses the less certain outcome (i.e., the outcome contradictory to risk-aversion) for each question; a category mean of 1 means the individual chooses the more certain outcome for one of the two questions; a category mean of 2 means the individual chooses the more certain outcome for both of the questions. The p-value for UA category 0 is for the difference between categories 0 and 1; the p-value for UA category 1 is for the difference between categories 1 and 2; and the p-value for UA category 3 is for the difference between categories 0 and 2.

b Category 0 for all 16 questions consists of responses of 0-6, where the number indicates the number of responses corresponding to a more risk-averse choice; category 1 consists of responses 7-10; category 2 consists of responses 11-16. Thus, the higher the category, the more risk averse the individual is.

c Category 0 for the seven positive questions (the tour question was excluded from this analysis) consists of responses of 0-2, where the number indicates the number of responses corresponding to a more risk-averse choice; category 1 consists of responses 3-5; category 2 consists of responses 6-7. Thus, the higher the category, the more risk averse the individual is.

d Category 0 for the seven negative questions (the tour question was excluded from this analysis) consists of responses of 0-2, where the number indicates the number of responses corresponding to a more risk-averse choice; category 1 consists of responses 3-5; category 2 consists of responses 6-7. Thus, the higher the category, the more risk averse the individual is.

The three rightmost columns in Table 3 present the UA means, for the five uncertainty avoidance questions for each of the three categories discussed in the previous paragraph. Below each category, p-values are reported for differences in these means. For category 0, the p-value is for differences between categories 0 and 1; for category 1, the p-value is for differences between categories 1 and 2; for category 2, the p-value is for differences between categories 0 and 2. If greater UA results in individuals choosing the less risky alternative, then we should expect higher UA categories to have a significantly higher mean. Table 3 shows that this is the case for only one question pair; when given the choice (4000,.2;3000,.25) and its negative counterpart, American individuals with a UA mean of 3.47 pick the more certain 3000 and -3000, while American individuals with a UA mean of 3.28 pick the less certain 4000 and -4000. This difference is significant at the .05 level. The differences for the other seven question pairs are not significant.

To investigate whether the UA categories differ for all sixteen questions combined, we conducted the same test. Again, the results indicate that there is no significant difference in choice alternatives across UA categories. Interestingly, as shown in the last two rows of Table 3, when the sample is split between positive and negative questions only, each of these differences is significant! For positive questions and negative questions, it indeed appears that Americans with a higher degree of uncertainty avoidance pick the choices that are less risky!
Table 4. Test for Uncertainty Avoidance Differences Across Responses for Grouped Questions (German Sample).

<table>
<thead>
<tr>
<th>Effect</th>
<th>Questions</th>
<th>UA Category Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0^a</td>
</tr>
<tr>
<td>Certainty</td>
<td>(50% 3-week tour of England, France and Italy; 1-week tour of England with certainty) (5% 3-week tour of England, France and Italy; 10% 1-week tour of England)</td>
<td>3.08 (.09)*</td>
</tr>
<tr>
<td>Certainty Reflection</td>
<td>(4000,.8;3000) (-4000,.8;3000)</td>
<td>3.18 (.62)</td>
</tr>
<tr>
<td>Certainty Reflection</td>
<td>(4000,.2;3000,.25) (-4000,.2;3000,.25)</td>
<td>3.14 (.57)</td>
</tr>
<tr>
<td>Certainty Reflection</td>
<td>(6000,.45;3000,.9) (-6000,.45;3000,.9)</td>
<td>3.18 (.92)</td>
</tr>
<tr>
<td>Low Probability</td>
<td>(6000,.001;3000,.002) (-6000,.001;3000,.002)</td>
<td>3.14 (.91)</td>
</tr>
<tr>
<td>Low Probability/Reflection</td>
<td>(5000,.001;5) (-5000,.001;5)</td>
<td>3.11 (.74)</td>
</tr>
<tr>
<td>Isolation</td>
<td>Two-stage (1000,.5;500) Two-stage (-1000,.5;500)</td>
<td>3.13 (.98)</td>
</tr>
<tr>
<td>Convexity of Losses</td>
<td>(6000,.25;4000,.25;2000,.25) (-6000,.25;4000,.25;2000,.25)</td>
<td>3.22 (.33)</td>
</tr>
<tr>
<td><strong>All 16 Questions Combined</strong></td>
<td></td>
<td>3.05 (.07)*</td>
</tr>
<tr>
<td>Positive Questions Only</td>
<td></td>
<td>3.24 (.20)</td>
</tr>
<tr>
<td>Negative Questions Only</td>
<td></td>
<td>3.17 (.78)</td>
</tr>
</tbody>
</table>
Notes to Table 4:
* Significant at the .10 level.
** Significant at the .05 level.
*** Significant at the .01 level.
a Categories are formed based on the level of risk aversion inherent in the questions. A more risk averse individual would be expected to choose the more certain outcome, ceteris paribus, for each pair of questions. A UA category mean of 0 means that the individual chooses the less certain outcome (i.e., the outcome contradictory to risk-aversion) for each question; a category mean of 1 means the individual chooses the more certain outcome for one of the two questions; a category mean of 2 means the individual chooses the more certain outcome for both of the questions. The p-value for UA category 0 is for the difference between categories 0 and 1; the p-value for UA category 1 is for the difference between categories 1 and 2; and the p-value for UA category 3 is for the difference between categories 0 and 2.
b Category 0 for all 16 questions consists of responses of 0-6, where the number indicates the number of responses corresponding to a more risk-averse choice; category 1 consists of responses 7-10; category 2 consists of responses 11-16. Thus, the higher the category, the more risk averse the individual is.
c Category 0 for the seven positive questions (the tour question was excluded from this analysis) consists of responses of 0-2, where the number indicates the number of responses corresponding to a more risk-averse choice; category 1 consists of responses 3-5; category 2 consists of responses 6-7. Thus, the higher the category, the more risk averse the individual is.
d Category 0 for the seven negative questions (the tour question was excluded from this analysis) consists of responses of 0-2, where the number indicates the number of responses corresponding to a more risk-averse choice; category 1 consists of responses 3-5; category 2 consists of responses 6-7. Thus, the higher the category, the more risk averse the individual is.

Table 4 repeats the analysis in Table 3 for the sample of 295 German students. For the individual eight question pairs, the results are similar to those reported in Table 3; for only two question pairs greater UA is associated with individuals choosing the less risky choices. Unlike for the American sample, however, there is little evidence that greater UA results in picking less risky choices for all sixteen questions combined and for negative questions only. However, for positive questions, the difference between UA categories 1 and 2 is highly significant, providing some support that great UA results in picking less risky choices for at least positive choice alternatives.

To further investigate the direct link between UA and choices among risky alternatives, we next regressed the UA categories for each of the eight question pairs, as formed in Tables 3 and 4, on the individual UA construct averages. The results from these regressions are shown in Table 5.

If higher UA leads to individuals’ choosing the less risky alternative, then the coefficient $\beta_1$ should be positive. Panel A of Table 5 reports the results for the American sample, while Panel B reports the results for the German sample. The results reported in Table 5 are identical to the results reported in Tables 3 and 4, which should be expected. For the American sample, in addition to one individual question pair, the positive and negative question choices are positive related to uncertainty avoidance. For the German sample, only two individual question pairs show the expected relationship between UA and choices among risky alternatives. Overall, these results provide only minimal support for H2, that higher UA is associated with choosing more certain alternatives.
Table 5. Regression Results for Prospect Theory Questions Regressed on An Uncertainty Avoidance Index.

<table>
<thead>
<tr>
<th>Effect</th>
<th>Question</th>
<th>Intercept ($\beta_0$)</th>
<th>Uncertainty Avoidance ($\beta_1$)</th>
<th>R-Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certainty</td>
<td>(50% 3-week tour of England, France and Italy; 1-week tour of England with certainty)</td>
<td>.88 (2.88)**</td>
<td>.08 (.88)</td>
<td>-.10%</td>
</tr>
<tr>
<td>Certainty</td>
<td>(5% 3-week tour of England, France and Italy; 10% 1-week tour of England)</td>
<td>.88 (2.88)**</td>
<td>.08 (.88)</td>
<td>-.10%</td>
</tr>
<tr>
<td>Certainty Reflection</td>
<td>(4000,8;3000) (-4000,8;-3000)</td>
<td>.77 (2.34)**</td>
<td>.14 (1.41)</td>
<td>0.50%</td>
</tr>
<tr>
<td>Certainty Reflection</td>
<td>(4000,2;3000,25) (-4000,2;-3000,25)</td>
<td>.24 (.68)</td>
<td>.19 (1.88)*</td>
<td>1.20%</td>
</tr>
<tr>
<td>Certainty Reflection</td>
<td>(6000,45;3000,9) (-6000,45;-3000,9)</td>
<td>1.39 (4.66)**</td>
<td>.02 (.19)</td>
<td>-.50%</td>
</tr>
<tr>
<td>Low Probability</td>
<td>(6000,001;3000,002) (-6000,001;-3000,002)</td>
<td>.74 (2.25)**</td>
<td>.01 (.06)</td>
<td>-.50%</td>
</tr>
<tr>
<td>Low Probability Reflection</td>
<td>(5000,001;5) (-5000,001;-5)</td>
<td>.56 (1.65)*</td>
<td>.13 (1.31)</td>
<td>0.30%</td>
</tr>
<tr>
<td>Isolation</td>
<td>Two-stage (1000,5;500) Two-stage (-1000,5;-500)</td>
<td>.92 (2.61)**</td>
<td>.09 (.89)</td>
<td>-.01%</td>
</tr>
<tr>
<td>Concavity of Gains</td>
<td>(6000,25;4000,25,2000,25) (-6000,25;-4000,25,-2000,25)</td>
<td>1.56 (5.48)**</td>
<td>-.08 (-.94)</td>
<td>-.10%</td>
</tr>
<tr>
<td>All 16 Questions Combined a</td>
<td></td>
<td>.77 (2.51)**</td>
<td>0.10 (1.09)</td>
<td>0.10%</td>
</tr>
<tr>
<td>Positive Questions Only b</td>
<td></td>
<td>.51 (2.11)**</td>
<td>.16 (2.21)**</td>
<td>1.80%</td>
</tr>
<tr>
<td>Negative Questions Only c</td>
<td></td>
<td>.38 (1.37)</td>
<td>.17 (2.01)**</td>
<td>1.40%</td>
</tr>
</tbody>
</table>
### Panel B – Regressions by Grouped Questions (German Sample)

<table>
<thead>
<tr>
<th>Effect</th>
<th>Question</th>
<th>Intercept ($\beta_0$)</th>
<th>Uncertainty Avoidance ($\beta_1$)</th>
<th>R-Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certainty</td>
<td>(50% 3-week tour of England, France and Italy; 1-week tour of England with certainty)</td>
<td>.61 (2.38)**</td>
<td>.11 (1.37)</td>
<td>.30%</td>
</tr>
<tr>
<td>Certainty</td>
<td>(5% 3-week tour of England, France and Italy; 10% 1-week tour of England)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certainty Reflection</td>
<td>(4000,.8;3000) (-4000,.8;-3000)</td>
<td>.106 (.40)**</td>
<td>.03 (.44)</td>
<td>-0.30%</td>
</tr>
<tr>
<td>Certainty Reflection</td>
<td>(4000,.2;3000,.25) (-4000,.2;-3000,.25)</td>
<td>.78 (2.88)**</td>
<td>.03 (.39)</td>
<td>-0.30%</td>
</tr>
<tr>
<td>Certainty Reflection</td>
<td>(6000,.45;3000,.9) (-6000,.45;-3000,.9)</td>
<td>1.44 (6.45)**</td>
<td>-0.02 (-.24)</td>
<td>-0.30%</td>
</tr>
<tr>
<td>Low Probability</td>
<td>(6000,.001;3000,.002) (-6000,.001;-3000,.002)</td>
<td>.27 (1.04)</td>
<td>.14 (1.70)**</td>
<td>0.60%</td>
</tr>
<tr>
<td>Low Probability</td>
<td>(5000,.001;5) (-5000,.001;-5)</td>
<td>.39 (1.46)</td>
<td>.18 (2.11)**</td>
<td>1.20%</td>
</tr>
<tr>
<td>Isolation Reflection</td>
<td>Two-stage (1000,.5;500) Two-stage (-1000,.5;-500)</td>
<td>1.14 (4.40)**</td>
<td>.09 (1.06)</td>
<td>.00%</td>
</tr>
<tr>
<td>Concavity of Gains</td>
<td>(6000,.25;4000,.25,2000,.25) (-6000,.25;-4000,.25,-2000,.25)</td>
<td>1.21 (4.90)**</td>
<td>.00 (.01)</td>
<td>-.30%</td>
</tr>
<tr>
<td>All 16 Questions Combined</td>
<td></td>
<td>.72 (3.11)**</td>
<td>0.11 (1.50)</td>
<td>0.40%</td>
</tr>
<tr>
<td>Positive Questions Only</td>
<td></td>
<td>.85 (4.37)**</td>
<td>.06 (1.01)</td>
<td>0.00%</td>
</tr>
<tr>
<td>Negative Questions Only</td>
<td></td>
<td>.74 (3.53)**</td>
<td>.04 (.62)</td>
<td>-0.20%</td>
</tr>
</tbody>
</table>

Notes to Table 5:

* Significant at the .10 level.
** Significant at the .05 level.
*** Significant at the .01 level.

---

* Category 0 for all 16 questions consists of responses of 0-6, where the number indicates the number of responses corresponding to a more risk-averse choice; category 1 consists of responses 7-10; category 2 consists of responses 11-16. Thus, the higher the category, the more risk averse the individual is.

** Category 0 for the seven positive questions (the tour question was excluded from this analysis) consists of responses of 0-2, where the number indicates the number of responses corresponding to a more risk-averse choice; category 1 consists of responses 3-5; category 2 consists of responses 6-7. Thus, the higher the category, the more risk averse the individual is.

*** Category 0 for the seven negative questions (the tour question was excluded from this analysis) consists of responses of 0-2, where the number indicates the number of responses corresponding to a more risk-averse choice; category 1 consists of responses 3-5; category 2 consists of responses 6-7. Thus, the higher the category, the more risk averse the individual is.
Thus far, the results indicate minimal evidence that greater uncertainty avoidance is associated with Americans’ and Germans’ choices among risky alternatives. The results reported in Table 2 indicate that Americans and Germans, for the most part, make similar choices to the results originally reported by Kahneman and Tversky (1979). An interesting follow-up question is whether Americans and Germans show a different relationship between uncertainty avoidance and choices among risky alternatives. If UA can at least partially explain individuals’ choices among risky alternatives, then the results should be expected not to differ across countries.

Table 6 presents an additional regression analysis, including two additional independent variables: an interaction term between the UA index and a dummy variable D, which is equal to unity for a German respondent and zero otherwise. The second independent variable is the dummy variable itself. In the regression results, the coefficient $\beta_3$ indicates the additional change in the dependent variable for Germans, holding UA constant. As shown in Table 6, none of the coefficients are significant, illustrating that there is no significant difference in the relationship between uncertainty avoidance and choices among risky alternatives between Americans and Germans. This supports our third hypothesis, H3.

Overall, the results reported in Table 2 through 6 reveal the following. First, the choices among risky alternatives reported here are quite similar to the original results reported by Kahneman and Tversky (1979) for the total sample and for each of the two subsamples. Second, there is limited evidence that choices among risky alternatives can be explained by the cultural dimension of uncertainty avoidance. However, at least for the American sample, there is some evidence that individuals with higher uncertainty avoidance pick choices that are more certain. Third, there appears to be no difference between the American and German samples in the relationship between uncertainty avoidance and choices among risky alternatives.²

6. Conclusion

Our research has confirmed much of what Kahneman and Tversky discovered in 1979. Many of their prospect theory questions have been confirmed 30 years later, even if Hofstede’s assertions regarding cultural disparity in uncertainty avoidance have not. For our sample of 509 German and American students, we find that our first hypothesis, that Germans exhibit more uncertainty avoidance than people from the United States, is not supported. For the US, the average UA score was 3.32, while it was 3.17 for the German sample. This difference is significant at the .01 level. These results contradict Hofstede’s original 1983 results.

Regression analyses performed on our samples have shown that the prospect theory choices one makes are at least partially predicated on their UA index score. Specifically, our second hypothesis, that higher

² We reran the regressions in Table 5 and 6 after adding gender, employment status prior to entering university, current employment status, and travel experience as independent variables. None of the demographic variables were consistently and significantly positively or negatively related to uncertainty avoidance. Moreover, the Table 6 regression results did not change as a result of including gender, employment status prior to entering university, current employment status, and travel experience in the regressions. In Panel A of Table 5 (U.S. sample), the marginally significant coefficient for the certainty/reflection question set was no longer significant after including these demographic variables (new p-value = .128). In Panel B of Table 5 (German sample), the marginally significant coefficient for the first low probability/reflection question set was no longer significant (new p-value = .141). Except for these exceptions, the results are virtually identical to those reported in Tables 5 and 6, even after including the demographic variables.
uncertainty avoidance results in less risky choices by individuals, receives partial support when investigating each country individually and when combining both subsamples. Disparity in UA index scores within cultures preclude us from making broad generalizations based on entire countries, but our results support the notion that given an individual’s UA index score we can partially predict what prospect theory options they would choose. Specifically for the American subsample, results indicate that Americans with higher uncertainty avoidance choose alternatives that are more certain. We also find support for our third hypothesis, that there is no significant difference between the relationship between uncertainty avoidance and risky choices between Germany and the United States.

There is still additional research to be done. We investigate only two countries in the current study. It would be interesting to investigate whether the relationships reported here hold when additional countries are included, particularly if those countries possess significantly different cultural attributes than the US and Germany. Moreover, it would be interesting to investigate whether the results are robust over time; does the relationship between UA and prospect theory choices remain constant when countries are faced with events such as the global financial crisis that radically change the level of UA on a macro level? We believe that much can be learned from future research that continues to investigate the relationship between positive theories of choices and cultural dimensions.
Table 6. Regression Results for Prospect Theory Questions Regressed on An Uncertainty Avoidance Index and Interaction Term.

<table>
<thead>
<tr>
<th>Effect</th>
<th>Question</th>
<th>Intercept ($\beta_0$)</th>
<th>UA ($\beta_1$)</th>
<th>UA*D ($\beta_2$)</th>
<th>D ($\beta_3$)</th>
<th>R-Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certainty</td>
<td>(50% 3-week tour of England, France and Italy; 1-week tour of England</td>
<td>.88</td>
<td>.08</td>
<td>.03</td>
<td>-.27</td>
<td>1.60%</td>
</tr>
<tr>
<td>Certainty</td>
<td>with certainty) (5% 3-week tour of England, France and Italy; 10% 1-week</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certainty</td>
<td>tour of England)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reflection</td>
<td>(50% 3-week tour of England, France and Italy; 1-week tour of England</td>
<td>.77</td>
<td>.14</td>
<td>-.10</td>
<td>.29</td>
<td>0.10%</td>
</tr>
<tr>
<td>Reflection</td>
<td>with certainty) (5% 3-week tour of England)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reflection</td>
<td>(4000,.8;3000)</td>
<td>.24</td>
<td>.19</td>
<td>-.16</td>
<td>.55</td>
<td>0.20%</td>
</tr>
<tr>
<td>Reflection</td>
<td>(-4000,.8;3000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reflection</td>
<td>(6000,.45;3000,.9)</td>
<td>1.39</td>
<td>.02</td>
<td>-.03</td>
<td>.06</td>
<td>-.40%</td>
</tr>
<tr>
<td>Reflection</td>
<td>(-6000,.45;3000,.9)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Probability/</td>
<td>(6000,.001;3000,.002)</td>
<td>.74</td>
<td>.01</td>
<td>.13</td>
<td>-.50</td>
<td>0.10%</td>
</tr>
<tr>
<td>Reflection</td>
<td>(-6000,.001;3000,.002)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Probability/</td>
<td>(5000,.001;5)</td>
<td>.56</td>
<td>.13</td>
<td>.04</td>
<td>-.17</td>
<td>0.70%</td>
</tr>
<tr>
<td>Reflection</td>
<td>(-5000,.001;5)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolation/Reflection</td>
<td>Two-stage (1000,.5;500)</td>
<td>0.92</td>
<td>.09</td>
<td>-.01</td>
<td>.22</td>
<td>1.00%</td>
</tr>
<tr>
<td>Isolation/Reflection</td>
<td>Two-stage (-1000,.5;500)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concavity of Gains</td>
<td>(6000,.25;4000,.25;2000,.25)</td>
<td>1.56</td>
<td>-.08</td>
<td>.08</td>
<td>-.35</td>
<td>-.10%</td>
</tr>
<tr>
<td>Convexity for Losses</td>
<td>(-6000,.25;4000,.25;2000,.25)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All 16 Questions</td>
<td>Combined(^a)</td>
<td>.77</td>
<td>.10</td>
<td>.01</td>
<td>-.05</td>
<td>0.20%</td>
</tr>
<tr>
<td>Positive Questions</td>
<td>Only(^b)</td>
<td>.51</td>
<td>.16</td>
<td>-.10</td>
<td>.34</td>
<td>0.60%</td>
</tr>
<tr>
<td>Negative Questions</td>
<td>Only(^c)</td>
<td>.38</td>
<td>.17</td>
<td>-.13</td>
<td>.36</td>
<td>0.70%</td>
</tr>
<tr>
<td></td>
<td>Combined(^a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Positive Questions Only(^b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Negative Questions Only(^c)</td>
<td></td>
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</tr>
</tbody>
</table>

Notes to Table 6:

* Significant at the .10 level.
** Significant at the .05 level.
*** Significant at the .01 level.

\(^a\) Category 0 for all 16 questions consists of responses of 0-6, where the number indicates the number of responses corresponding to a more risk-averse choice; category 1 consists of responses 7-10; category 2 consists of responses 11-16. Thus, the higher the category, the more risk averse the individual is.

\(^b\) Category 0 for the seven positive questions (the tour question was excluded from this analysis) consists of responses of 0-2, where the number indicates the number of responses corresponding to a more risk-averse choice; category 1 consists of responses 3-5; category 2 consists of responses 6-7. Thus, the higher the category, the more risk averse the individual is.

\(^c\) Category 0 for the seven negative questions (the tour question was excluded from this analysis) consists of responses of 0-2, where the number indicates the number of responses corresponding to a more risk-averse choice; category 1 consists of responses 3-5; category 2 consists of responses 6-7. Thus, the higher the category, the more risk averse the individual is.
References


Shane, S., 1995, Uncertainty avoidance and the preference for innovation championing roles, *Journal of International Business Studies* 26, 47-68.

Appendix

Background Information

1. My age is ______

2. I am
   a. female
   b. male

3. Were you employed prior to attending University?
   a. yes (if yes, please specify which industry:______)
   b. no

4. Are you employed now?
   a. yes (if yes, please specify which industry:______)
   b. no

5. Have you declared a major?
   a. yes (if yes, please specify which major:______)
   b. no

6. International exposure information
   a. I have never traveled to another country
   b. I have traveled to more than one but less than three other countries
   c. I have traveled to more than three other countries

Instructions: For the questions below, imagine that you are actually faced with the choice or scenario described, and then indicate the decision you would make. There is no correct answer to any of the problems indicated below. Answer the following questions by circling the number that most corresponds with your overall agreement or disagreement with the question.

0 = No basis to judge
1 = Strongly disagree
2 = Disagree
3 = Neither agree nor disagree
4 = Agree
5 = Strongly agree

1) It is important to have job requirements and instructions spelled out in detail so that people always know what they are expected to do.

0 – 1 – 2 – 3 – 4 – 5
2) People should avoid making changes because things could get worse.

0 – 1 – 2 – 3 – 4 – 5

3) Rules and regulations are important because they inform workers what the organization expects of them.

0 – 1 – 2 – 3 – 4 – 5

4) All organizations should have clear and consistent job descriptions and requirements or else all the employees will sit around and do nothing.

0 – 1 – 2 – 3 – 4 – 5

5) I would prefer to be unhappy in my current job rather than unemployed and searching for another one.

0 – 1 – 2 – 3 – 4 – 5

Respond to the following questions by circling the letter corresponding to the choice you prefer. Assume all amounts are in dollars. Imagine that you are actually faced with the choice described, and then indicate the decision you would make. There is no correct answer to any of the problems indicated below. The aim of this section is to find out how people choose among risky prospects.

1. In addition to whatever you own, you have been given 2000. You are now asked to choose between
   A: -1000 with probability .50
   B: -500 with certainty
   0 with probability .50

2. Choose between
   A: 50% chance to win a three-week tour of England, France and Italy.
   B: A one-week tour of England, with certainty.

3. Choose between
   A: -5000 with probability .001
   B: -5 with certainty
   0 with probability .999
Choose between
A: 6000 with probability .25  B: 4000 with probability .25
0 with probability .75  2000 with probability .25

Choose between
A: -4000 with probability .20  B: -3000 with probability .25
0 with probability .80  0 with probability .75

In addition to whatever you own, you have been given 1000. You are now asked to choose between
A: 1000 with probability .50  B: 500 with certainty
0 with probability .50

Choose between
A: 4000 with probability .80  B: 3000 with certainty
0 with probability .20

Choose between
A: -6000 with probability .45  B: -3000 with probability .90
0 with probability .55  0 with probability .10

Choose between
A: 5% chance to win a three-week tour of England, France and Italy.
B: 10% chance to win a one-week tour of England.

Choose between
A: 6000 with probability .45  B: 3000 with probability .90
0 with probability .55  0 with probability .10

Choose between
A: 6000 with probability .001  B: 3000 with probability .002
0 with probability .999  0 with probability .998

Choose between
A: 4000 with probability .20  B: 3000 with probability .25
0 with probability .80  0 with probability .75

Choose between
A: -6000 with probability .25  B: -4000 with probability .25
0 with probability .75  -2000 with probability .25

Choose between
A: -6000 with probability .001  B: -3000 with probability .002
0 with probability .999  0 with probability .998
15. Consider the following two-stage game. In the first stage, there is a probability of .75 to end the game without winning anything, and a probability of .25 to move into the second stage. If you reach the second stage you have a choice between

A: 4000 with probability .80
   0 with probability .20

B: 3000 with certainty

Your choice must be made before the game starts, i.e., before the outcome of the first stage is known.

16. Choose between

A: 5000 with probability .001
   0 with probability .999

B: 5 with certainty