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Prediction of Game Behavior Based on Culture Factors

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Abstract: This paper investigates the cultural differences in values and decision making in on-line surveys and games, comparing subjects from the United States and India. The empirical data validates the existence of cultural differences seen previously for in-person game performance; there are also significant differences in answers to Hofstede's Values Survey Models questions, the derived Hofeste dimensions, and our own values questions. We also use this data to make predictions of game play, country of origin, and values, based on other features. We are also able to predict the national culture of the participants by considering their behavior in the game. The results show that our value model is significantly better than other indicators such as Hofstede's dimensional values at predicting game play, but Hofstede questions are best at predicting country of origin.

Keywords: Cultural Differences, Decision Making and Negotiation, Low Stakes Ultimatum Game, Multi Attribute Decision Making, Culture, Cross Cultural Ultimatum Game, Mechanical Turk

1 Introduction

Previous research has shown that decision-making behavior does not simply maximize economic self-interest and varies systematically across cultural background (Camerer, 2003; Henrich et al., 2005). While the body of work on quantitative measurement of the effect of cultural background on people's decision making process is ever increasing, it is still very

limited.. In this paper we intend to add to this knowledge, looking specifically at several different models of culture, two simple negotiation games, and populations of on-line players from two different national culture groups: The United States and India. We present what we believe to be the first cross-cultural study of online low-stakes game play for the Ultimatum game and Dictator game.

Our goal is to create models of decision-making behavior that is sensitive to the role of cultural background and individual values, as well as the specific context. In particular, we are focusing on decision-making behavior in the context of simple negotiation games. In previous work (Nouri and Traum 2011, Nouri et al., to appear 2013), we have posited that multi-attribute decision-making techniques (Fishburn, 1968) can be applied to social-decision making, by allowing different weights to be assigned to different valuations of a situation. Valuations include self-gain (as in the traditional economic models), but also factors like total gain, other gain, relative gain, and fairness. Individual differences in decision-making can be attributed to different weights on the valuation, and different trends across cultural groups can be attributed to different distributions of weights across individuals in the different groups. In (Nouri and Traum, 2011), we used weights based on Hofstede's Cultural dimensions (Hofstede, 2001), and tested the model by having agents play the ultimatum game. This model did show results that were broadly consistent with the reported results of human players in multiple cultures, in terms of average offer and rejection rate, however the specific choice of weights were somewhat ad hoc and the model was limited to considering only high and low values for each dimension, rather than actual values. In (Nouri et al., 2012), we learned weights from distributions of culture-specific player data, using inverse reinforcement learning techniques. This resulted in models that could generate distributions of play that were closer to the culture that they were designed for than other cultures, however, a set of training data from the culture is required to learn the weights, and it was not discernible whether these models represented the players actual values.

In this paper, we present new work aimed at eliciting the actual values that players report, as well as examining correlations between these values and game play as well as correlations to the Hofestede dimensions and the raw questions that were used to form the Hofstede dimension values. Our hope is that using this data can lead to better, more

accurate models, as well as an ability to generalize to other cultures, where we have some notion of cultural values, but no performance data.

The rest of the paper is structured as follows. In section 2, we review background work related to observed cultural differences in negotiation game play and models of culture. In Section 3, we present our experimental design, in which we elicited game play behavior, Hofstede's Values Survey Module (Hofstede et al., 2008), and our own values survey, for two different games (dictator game and ultimatum game) and two different broad national cultures: US and India. In Section 4, we present the results, looking at cultural and game-specific differences among each of these elements. In Section 5, we apply machine-learning techniques to try to predict game play based on cultural factors (country of origin, Hofstede dimension values, VSM question answers, and our value questionnaire), as well as trying to predict country of origin, based on game play, Hofstede dimension values, VSM question answers, or our value questionnaire.

2 Background and Related Work

2.1 Cultural Differences & On-line games

Country-level differences are observed in different levels of social, cultural, financial and economical behavior. A high level economic example is the difference in behavior towards the security of property as public good (Campos et al., 2012). Behavioral game theorists try to measure these phenomena by looking into games that appear to reflect the common interactional patterns of everyday life. A very good example of such work on demonstrating country level differences in behavior is (Roth, et al 1991) in which four countries of Israel, Japan, US and Yugoslavia are studied in terms of bargaining and market behavior. (Heinrich et al., 2005) studies the influence of culture on decision making process in economic domains by running the ultimatum, public goods, and dictator games among 15 small-scale societies. This study not only reveals substantially more behavioral variability across social cultural groups than has been found in previous research but also suggests that group-level differences in economic organization and the structure of social interactions explain a substantial portion of the behavioral variation across societies. This

study also provides evidence that the available individual-level economic and demographic variables do not consistently explain game behavior, either within or across groups.

In most prior work people participate in face to face laboratory conditions. A few recent studies have begun to look into what happens when these games are played online. These studies have reestablished the classical findings in behavioral studies such as the effect of framing and priming on Mechanical Turk participants (e.g., Buhrmester et al 2011; Rand, 2011). (Amir et al., 2011) has also shown that running economic games experiments on Mechanical Turk are comparable to those run in laboratory setting even when using very low stakes for payment. These experiments alleviate concerns about the validity of economic games experiments run online versus ones in the laboratory. There have also been studies t (e.g., Suri and Watts, 2011; Horton et al., 2010) that have shown that self-reported demographics on Amazon Turk in these tasks are reliable.

2.2 Hofstede's Dimensional Model of Culture

Hofstede's model of culture (Hofstede, 2001; Hofstede and Hofstede, 2005; Hofstede et al., 2008) posits that cultures vary systematically along several dimensions, such as ways of coping with inequality, uncertainty, relations with groups, and gender. Based on statistical analyses of the trends of answers to questions about values and attitudes, four different dimensions were identified (with three additional dimensions added later). These dimensions are PDI: Power Distance (large vs. small), IDV: Individualism vs. Collectivism, MAS: Masculinity vs. Femininity, UAI: Uncertainty Avoidance (strong vs. weak), LTO: Long- vs. Short-Term Orientation, IVR: Indulgence vs. Restraint, and MON: Monumentalism vs. Self-Effacement.

The values of a culture for the dimensions can be estimated using instruments like the Values Survey Module 2008 (Hofstede et al., 2008). This is a 28-item questionnaire, with a set of questions that relate to each dimension. The questions are shown in Table 1, with answers ranging from 1 to 5.

Table 1. Hofstede Questions from VSM 2008

Question Number	Question	Related Dimension

Q1	have sufficient time for your personal or home life	IDV
Q2	have a boss (direct superior) you can respect	PDI
Q3	get recognition for good performance	MAS
Q4	have security of employment	IDV
Q5	have pleasant people to work with	MAS
Q6	do work that is interesting	IDV
Q7	be consulted by your boss in decisions involving your work	PDI
Q8	live in a desirable area	MAS
Q9	have a job respected by your family and friends	IDV
Q10	have chances for promotion	MAS
Q11	keeping time free for fun	IVR
Q12	moderation: having few desires	IVR
Q13	being generous to other people	MON
Q14	modesty: looking small, not big	MON
Q15	If there is something expensive you really want to buy but you do not have enough money, what do you do?	LTO
Q16	How often do you feel nervous or tense?	UAI
Q17	Are you a happy person?	IVR
Q18	Are you the same person at work (or at school if you're a student) and at home?	LTO
Q19	Do other people or circumstances ever prevent you from doing what you really want to	IVR
Q20	how would you describe your state of health these days?	UAI
Q21	How important is religion in your life?	MON
Q22	How proud are you to be a citizen of your country?	MON
Q23	How often, in your experience, are subordinates afraid to contradict their boss (or students their teacher?)	PDI
Q24	One can be a good manager without having a precise answer to every question that a subordinate may raise about his or her work	UAI
Q25	Persistent efforts are the surest way to results	LTO
Q26	An organization structure in which certain subordinates have two bosses should be avoided at all cost	PDI
Q27	A company's or organization's rules should not be broken - not even when the employee thinks breaking the rule would be in the organization's best interest	UAI
Q28	To what extent We should honor our heroes from the past	LTO

The value for each dimension is calculated as a linear combination of the answers to four questions, as shown in Table 2. The constant for each dimension is used to normalize scores. In section 4, we use constants chosen so that our values for the US match the values from the literature.

Table 2. Hofstede Dimension Value Formulae

Power Distance Index (PDI) =	35(m07 – m02) + 25(m23 – m26) + C(pd)
Individualism Index (IDV) =	35(m04 – m01) + 35(m09 – m06) + C(ic)
Masculinity Index (MAS) =	35(m05 – m03) + 35(m08 – m10) + C(mf)
Uncertainty Avoidance Index (UAI) =	40(m20 - m16) + 25(m24 – m27) + C(ua)
Long Term Orientation Index (LTO) =	40(m18 – m15) + 25(m28 – m25) + C(ls)
Indulgence versus Restraint Index (IVR) =	35(m12 – m11) + 40(m19 – m17) + C(ir)
Monumentalism Index (MON) =	35(m14 – m13) + 25(m22 – m21) + C(mo)

We find the Hofstede model of culture attractive because it includes the following features:

- Explicit dimensions of cultural norms that can be tied to valuation
- Multiple ways in which cultures can be similar or differ
- Data on dimension values for a large range of (national) cultures

On the other hand, it is not trivial to relate the general values to evaluation of a specific situation. Therefore we also examine another valuation scheme that can be more directly tied to the outcomes of simple games. This is described in Section 3.

2.3 Support Vector Machines

In section 5, we create classifiers that attempt to predict offers or country of origin from other available information about an individual. To do this we use support vector machines (SVM) with the radial basis function kernel. Some recent applications and extensions of support vector machines in pattern recognition are handwritten digit recognition (Cortes and Vapnik, 1995), object recognition (Blanz et al., 1996), and face detection and identification in images (Osuna, Freund and Girosi, 1997). In most of these cases, SVM

generalization performance (i.e. error rates on test sets) either matches or is significantly better than that of competing methods.

3 Data Collection Design

3.1 Participants

The tasks were set up as "hits" on Amazon Mechanical Turk, open to participants from the US and India. Roughly two hundred participants were recruited for each culture, and assigned randomly to one of two game conditions described below (107 for each culture for the dictator game, and 101 for each culture for the ultimatum game). Each participant was told they would receive a $0.5 fee for participating in the task and they had an opportunity to earn up to another $0.5 based on their performance in the game. They were told they would receive $0.05 for each 10 points that they accumulated in the game.

3.2 Games

The Ultimatum Game. is a simple bargaining game for two players in which the first player, often called the "proposer," is provisionally allotted a divisible "pie"(usually money). The proposer then offers a portion of the pie to a second person, often called the "responder." The responder, knowing both the offer and the total amount of the pie, then has the opportunity to either accept or reject the proposer's offer. If the responder accepts, he or she receives the amount offered and the proposer receives the remainder (the pie minus the offer). If the responder rejects the offer, then neither player receives anything. In either case, the game ends and the two subjects receive their winnings accordingly. This stylized negotiation was first studied in (Guth et al., 1982).

The Dictator Game. The Dictator Game is played exactly like the standard Ultimatum Game, except that the responder is not given an opportunity to accept or reject the offer. The proposer merely dictates the division. In the Dictator Game positive offers cannot result from a fear of rejection. Thus, when used in conjunction with the Ultimatum Game, this experimental tool allows researchers to determine whether proposers make positive offers out of a 'sense of fairness' or from a 'fear of rejection' (Henrich et al., 2005).

Just like in the case of standard Ultimatum game, in this game, the canonical assumption would predict that the proposers would offer the minimum possible offer to the other person but numerous studies have shown that people deviate from this prediction and make considerable amounts of the pie offers to the other person. (Camerer, 2003).

3.3 Decision-making Values Survey

In order to directly calculate weights for the model from (Nouri and Traum, 2011), we created a survey of desiderata for making game decisions, shown in Table 3. Participants were asked to indicate how important each factor was in their decision making process, on a scale from -5 (very important to avoid) to 0 (not important) to 5 (very important to have).

Table 3. Decision-making Values

Abbreviation	Value Description
V_{self}	**Getting a lot of points**
V_{other}	**The other player getting a lot of points**
$V_{compete}$	**Getting more points than the other player**
$V_{fairness}$	**having the same number of points as the other player**
V_{joint}	**Making sure that if we add our points together we got as many points as possible**
V_{rawls}	**The player with fewest points (whoever that is) gets as many as possible**
$V_{lower\ bound}$	**Making sure to get some points (even if not as many as possible)**
V_{chance}	**The chance to get a lot of points (even if there's also a chance not to get any points)**

3.4 Method

Participants who accepted the "hit" from Amazon mechanical turk went through the following sequence:

1. Fill out the VS08 Hofestede Survey (Table 1), as well as demographic information about their country of origin and native language.
2. Receive instructions about the game (Dictator Game or Ultimatum Game). They were told that they would be playing with another participant from their country.
3. Make an offer as the proposer in Dictator Game or Ultimatum game, proposing a partition of 100 points between themselves and their partner in the game.
4. Fill out the Decision-making values survey (Table 3)
5. Receive their partner's move (in the case of the ultimatum game) and their final reward. In reality, there was no partner and the ultimatum game responses were chosen according to a fixed protocol.

4 Results

We investigate differences between behavior of the US and Indian player groups. We examine differences in game play (size of offers), Hofstede Values, as cacluated using the formulae in Figure 2, Hofstede questions, as shown in Table 1, and our Decision-making values, shown in Table 4.

4.1 Offers in the Ultimatum Game and the Dictator Game

Table 4 shows a summary of mean offers and Standard Deviations for US and Indian players in the Dictator and Ultimatum games. Following the trend of reported results of different previous studies we also observe that in our experiments the majority of the participants from both US and India offer a significant amount of the money to the other person.

Table 4. Summary of Offers across Game and Culture

Condition (mean,std)	Dictator Game	Ultimatum Game

US	39.81, 21.23	48.51, 16.08
India	37.75, 27.96	45.14, 20.52
Both	38.78, 24.78	46.83, 18.47

Ultimatum Game. As reported in Table 4, the average offer for US participants was $48.51 in comparison to the average offer of $45.14 for the Indian participants. More detailed distributions are shown in in Figure 1. 63% of the US participants offered half of the money to the other person in the game in comparison to the 40% of the Indian participants. The result of one way ANOVA test on offers in Ultimatum Game grouped by the country of the proposers does not show a significant difference in offers (p= 0.20). The Kruskal-Wallis[1] test trends toward significance (p= 0.058)

The KL-divergence[2] value between to distributions is 0.2048.

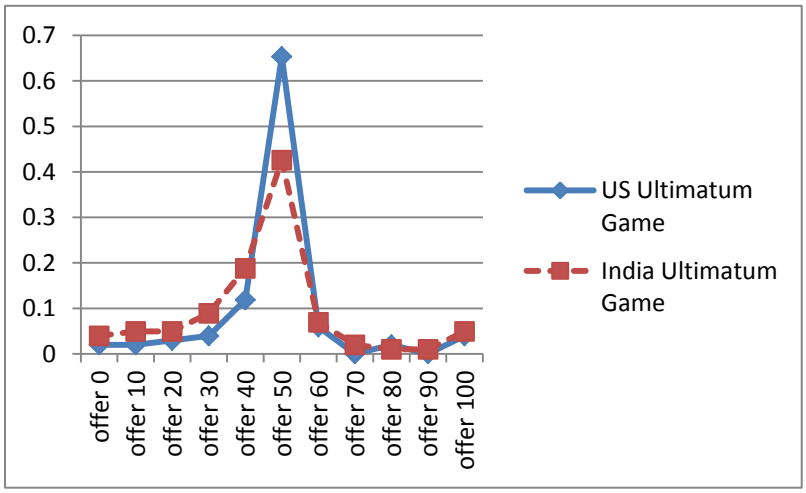

Figure 1. Offer Distribution in Ultimatum Game

Dictator Game. As shown in Table 4, the average offer for US participants was $39.8 in comparison to the average offer of $37.7 for the Indian participants. More detailed

[1] Kruskal-Wallis compares the medians of the samples in X, and returns the p-value for the null hypothesis that all samples are drawn from the same population (or equivalently, from different populations with the same distribution). Note that the Kruskal-Wallis test is a nonparametric version of the classical one-way ANOVA, and an extension of the Wilcoxon rank sum test to more than two groups.

[2] To measure the difference between the distributions of offers we use Kullback-Leibler divergence measure between two probability distributions P and Q that is defined as follows:

D KL(P||Q) = i=1 P(i)log2 P(i) Q(i)

where n is the number of points in the distribution that we consider. Because KL divergence is asymmetric we calculate DKL(P||Q) and DKL(Q||P) and then we take the average. The lower the KL divergence the closer the distributions.

distributions are shown in in Figure 2. 48% of the US participants offered half of the money to the other person in the game in comparison to the 30% of the Indian participants. We were not able to detect a significant difference in game performance between US and Indian participants in either the one-way ANOVA (p= 0.5453) or the Kruskal-Wallis test (p=0.4368). The KL-divergence value between the two distributions is 0.2914.

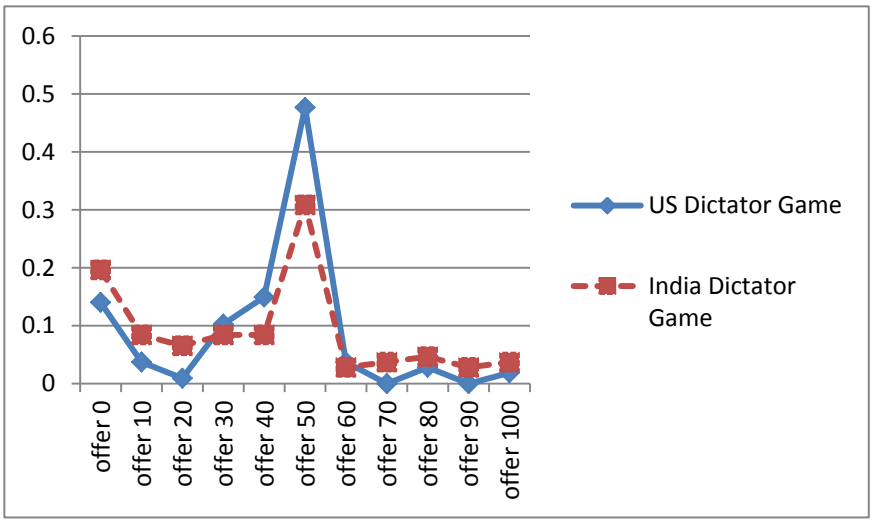

Figure 2. Offer Frequency in the Dictator Game

The comparison of all individual offers in both games shows significant game effect on the amount of the offers in the game, offers made in ultimatum game being higher than offers in the dictator game. We believe this is mainly due to fear of rejection in Ultimatum game. (Camerer, 2003)

The KL-divergence value between Ultimatum Game distribution and Dictator Game distribution of the US participants is 0.35, and for Indian participants the KL-divergence value is 0.42.

4.2 Hofstede's dimensional values

Given that the procedure was exactly the same for both games up to this stage and that we recruited subjects from the same pool with the same method, we report the culture profiles calculated for the two countries here with both games aggregated. We analyzed the cultural scores of the participants based on the answers that they provided to the Hofstede

questionnaire VS08 and calculated the values for the Hofstede's dimensional culture model for participants of the two countries, according to the formulae in Table 2. The initial results are shown in Table 5.

Table 5. Hofstede values Calculation

Dimensions	PDI	IDV	MAS	UAI	LTO	IVR	MON
US scores reported by Hofstede	**40**	91	62	46	**29**	**68**	0
India scores reported by Hofstede	**77**	48	56	40	**61**	**26**	0
Initial calculated US	15.21	11.10	-2.18	-56.37	9.18	**30.31**	**-2.93**
Initial calculated India	17.95	0.67	5.38	-53.17	4.83	**56.00**	**70.98**
Constants using US baseline	24.78	79.89	64.18	102.37	19.81	37.68	2.93
ANOVA p-values	0.60	**0.05***	0.13	0.62	0.47	**0.00****	**0.00****

As mentioned in (Hofstede and Hofstede, 2005), the difference observed between the reported values and the new calculated ones can be attributed to many factors such as the differences between the demographics of the people who take the survey and culture change throughout time (the Hofstede scores are based on the IBM survey in 1970). Given that set of matched samples from different countries should include at least one sample matched with the others in our study for one country covered before with Hofstede score; we chose US to be the base country. The base value score for MON dimension is set to 0 since this dimension was not present in the earlier version of Hofstede's cultural model. The final scores are shown in Figure 3. We notice significant differences between Indian and US norms for three of the seven dimensions, as shown in the last line of Table 5. No linear correlation was observed between the Hofstede Scores and the offers made.

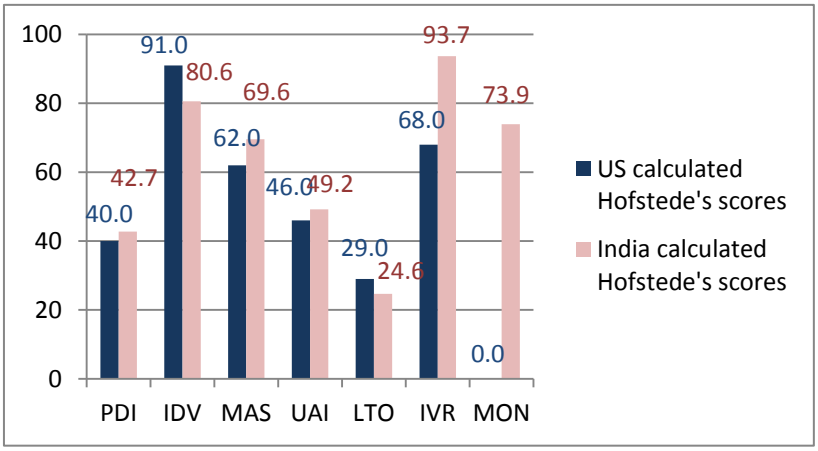

Figure 3. Derived Hofstede Dimension Scores

4.3 Hofstede's Survey Questions

We also analyze differences in the distribution of the individual VSM 2008 survey questions, shown in Table 1. These provide a more fine-grained, though less theoretically motivated view of the cultural differences. Table 6 shows the questions that have significant differences in distribution across the countries at the * ($p < 0.05$), ** ($P < 0.01$), and ** (P, 0.001) levels.

Table 6. Cultural Differences for VSM 2008 Questions

Question Number	ANOVA p-value	Question	Related Dimension
Q3	0.01**	get recognition for good performance	MAS
Q4	0.02*	have security of employment	IDV
Q5	0.03*	have pleasant people to work with	MAS
Q6	0.02*	do work that is interesting	IDV
Q9	0.00***	have a job respected by your family and friends	IDV
Q10	0.01**	have chances for promotion	MAS
Q13	0.01**	being generous to other people	MON
Q14	0.00**	modesty: looking small, not big	MON
Q16	0.02*	How often do you feel nervous or tense?	UAI
Q17	0.00***	Are you a happy person?	IVR

Q20	0.01**	how would you describe your state of health these days?	UAI
Q21	0.00***	How important is religion in your life?	MON
Q22	0.00***	How proud are you to be a citizen of your country?	MON
Q24	0.00***	One can be a good manager without having a precise answer to every question that a subordinate may raise about his or her work	UAI
Q26	0.00***	An organization structure in which certain subordinates have two bosses should be avoided at all cost	PDI
Q27	0.00**	A company's or organization's rules should not be broken - not even when the employee thinks breaking the rule would be in the organization's best interest	UAI
Q28	0.01**	To what extent We should honor our heroes from the past	LTO

No correlation was found between each answer to the questions and the offers made.

4.4 Decision-Making Values

Figures 4-6 show differences between participants from the US and India on the Decision-making Values Survey in Table 3. Figure 4 shows median values in the Dictator Game, Figure 5 shows median values in the Ultimatum Game, and Figure 6 shows median values across both games.

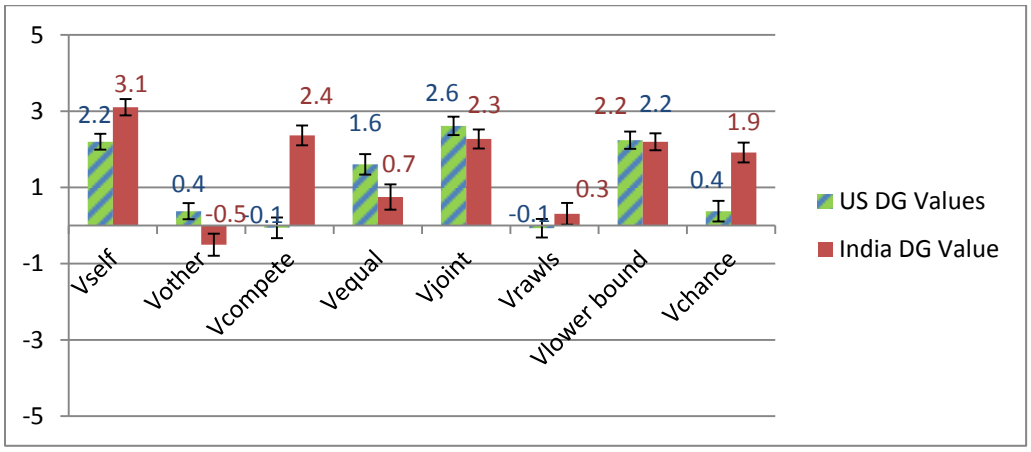

Figure 4. Decision Making Values in Dictator Game

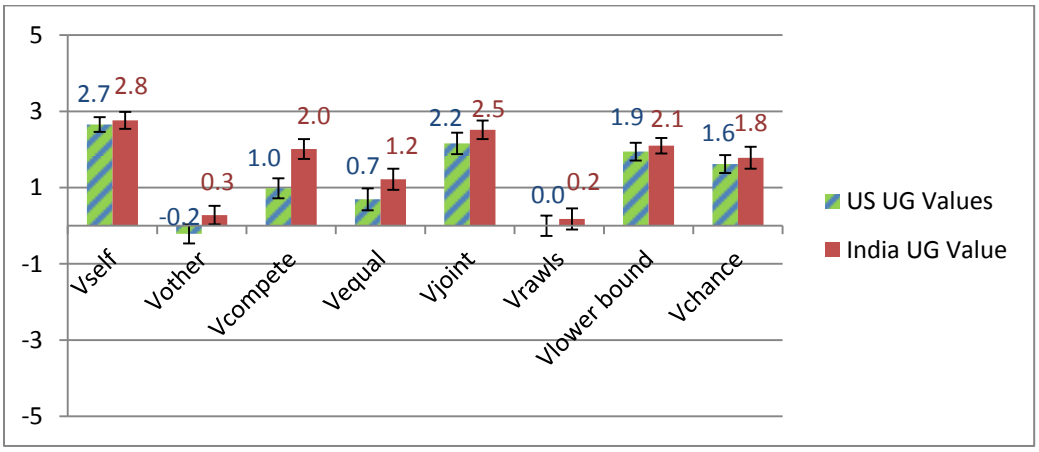

Figure 5. Decision-making Values in Ultimatum Game

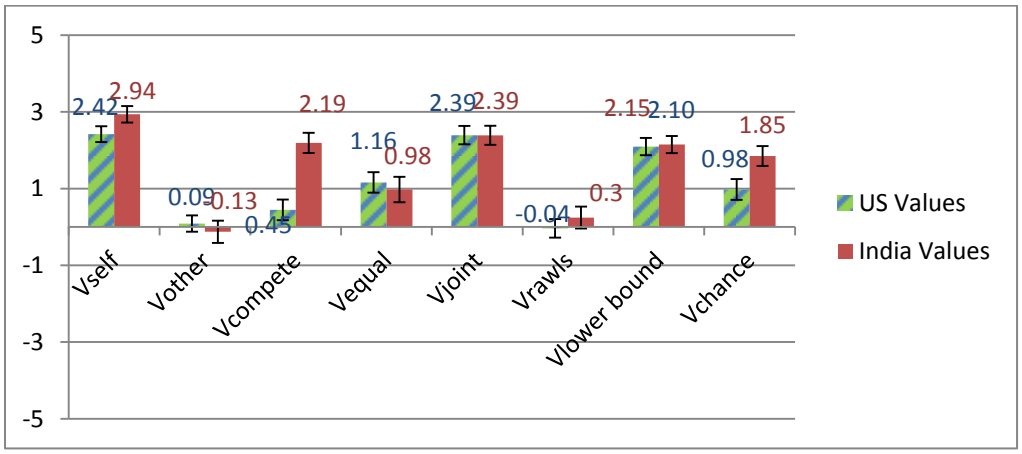

Figure 6. Decision-making Values across both Games

Since participants are asked to report their values after making the offer in the Ultimatum game and the Dictator game, the difference between the values on some dimensions can be attributed to the effect of the game on participants. However, there were significant differences in values for the two games only for US participants on dimensions Vcompete (p=0.01), Vequal (p=0.04) and Vchance (p=0.001). No such difference is observed among Indian participants. Table 7 shows the results of ANOVA analysis comparing the differences in decision-making values. We can see the following significant differences between players from US and India: Indians are more competitive and care more about own gain and the chance to get points (dictator game only).

Table 7. ANOVA analysis of Country effect on Decision-making Values

P values	Vself	Vother	Vcompete	Vfairness	Vjoint	Vrawls	Vlower bound	Vchance
Ultimatum Game	0.11	0.43	**0.00*** **	0.89	0.75	0.41	0.41	0.37
Dictator Game	0.06	0.75	**0.00*** **	0.31	0.77	0.49	0.64	**0.00*** **

Table 8 shows the result of the correlation[3] test between the reported values with the amount of offers. All of the correlation values had (p-value<0.00**) and were statistically significant. The dimensions corresponding to Vself and Vcompetence and Vlower bond and Vchance are negatively correlated with the amount of offers made by the participants and is compatible with the intuition behind the definition of the dimensions. As expected, Vother and Vfairness and Vjoint and Vrawls are positively correlated with the amount of offers made by the participants implying that the more players care about these dimensions the higher offers they made in the games.

[3] The correlation is calculated as $R(i,j) = \frac{C(i,j)}{\sqrt{C(i,i)C(j,j)}}$ and the covariance matrix C = cov(X) corrcoef(X) is the zeroth lag of the normalized covariance function, that is, the zeroth lag of xcov(x,'coeff') packed into a square array. Each p-value is the probability of getting a correlation as large as the observed value by random chance, when the true correlation is zero. Values close to 1 indicate that there is a positive linear relationship between the data columns. In the table above values close to -1 indicate that one column of data has a negative linear relationship to another column of data (anti-correlation). Values close to or equal to 0 suggest there is no linear relationship between the data columns.

Table 8. Correlation analysis between Decision-making Values and Offer Values in the games

Correlation	Vself	Vother	Vcompete	Vfairness	Vjoint	Vrawls	Vlower bound	Vchance
Dictator Game	-0.35	0.36	-0.33	0.36	0.24	0.20	-0.03	-0.28
Ultimatum Game	-0.14	0.23	-0.26	0.27	0.20	0.05	-0.05	-0.09

No such linear correlation was observed between each individual dimension of the Hofstede scores and the offer values in the games.

5 Prediction of the culture and behavior

In this section, we use machine learning in order to make a model of our data that can predict the value of the offer an individual would make in the dictator game or in the ultimatum game based on different features of their cultural background. We perform two experiments: trying to predict the offer, and trying to predict the country of origin. For each experiment we try all other sets of features.

5.1 Prediction of offers

We used support vector machine (SVM) classifiers to predict the offers made, using each of the following sets of features:

a) Country of the origin
b) Hofstede's calculated scores (section 4.2)
c) Answers to the Hofstede Survey Questions (section 4.3)
d) Decision-making values (Section 4.4)

Given that the number of sample points we had were limited to the data we collected in our experiment (101 distinct data points for each country in the Ultimatum Game and 107 data points from each country in the Dictator game that made up a total of 416 individual data points), we used a 10-fold cross-validation training/test paradigm. We performed a

support vector machine (SVM) classification with parameters C and γ optimized through grid search. For the prediction model, (SVM) classifier with the radial basis function kernel was trained and tested.

Table 9. Prediction of Offers from Cultural Features

Percent correct	**Dictator Game** (214 total)	**Ultimatum Game** (202 total)
Country (US or India)	39.55%	51.61%
Hofstede Scores (7 dimensions)	39.56%	50.05%
Hofstede Questions (28 questions)	39.24%	53.52%
Decision-making Values (8 values)	**52.86%**	**54.90%**
Random baseline: frequency of offers in the data	21%	32%
Most common offer baseline (50%)	38%	51%

The final reported accuracy in Table 9 is the average of the all the predictions made in each round of the 10-fold cross-validation. For each game, the best classifier is based on our Decision-making values. In the dictator game Welch's two sample t-test shows that this is significantly better than all other classifiers ($p < 0.01$). For the Ultimatum game, the decision-making value classifier performs significantly better than the classifier using Hofstede's scores ($p < 0.05$), however it is not significantly better than the other classifiers.

5.2 Prediction of country based on offers in the Game

We also use the same method as in section 5.1 to try to predict country of origin from game play, the Hofstede values, the Hofstede Questions, and the Decision-Making values. Table 10 shows the results (all of the differences are significant). We can see that the Decision-making values again out-performs the Hofestede scores, but in this case, the model trained on the individual Hofstede questions is better able to distinguish the country of the participant.

Table 10. Prediction of Country of Origin

percent correct	**Dictator Game** (214 total)	**Ultimatum Game** (202 total)
Offers (11 values)	53.40%	54.11%
Hofstede Scores (7 dimensions)	64.42%	69.85%
Hofstede Questions (28 questions)	**76.39%**	**77.79%**
Decision-making Values (8 values)	60.09%	65.70%
Random Baseline	50%	50%

6 Discussion and Conclusion

In terms of the general behavior in the two games most people tend to offer about 50% to the other side of the interaction and the offers are higher in the Ultimatum game in comparison to the Dictator game. The offers in both games follow a normal distribution. Considering the simplicity of these one shot games we were not able to detect meaningful cultural differences between the US and Indian offers in the context of the ultimatum Game and dictator Game. Significant cultural differences are observed in the answers to the Hofstede survey questions and the score values. It is worth mentioning that the reported values by participants demonstrate that they have more than one valuation criteria when they were making their decisions. We are able to make SVM based models that can predict the behavior in the games based on the national culture or self reported value of the players. We are also able to determine what culture the participants belong to with higher than chance probability based on the offers that they make in the games.

In future we will investigate more complex negotiation scenarios and whether we can make computational agents that use the self reported values for their policies in the negotiation.

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