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A Multidimensional Homo Economicus: Cultural Dimensions of Economic Preferences in Four Countries

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Abstract

Previous work in experimental economics reveals specific differences in economic behavior, especially reciprocity and free-riding behavior, across cultures. We expand the possible pallet of cross-cultural behavioral differences that may exist. We hypothesize that different kinds of strategic interaction and individual decision-making behaviors differ across locations. The variety of experiments we use allow us to report multidimensional rather than just single dimensional differences in behavior across locations. In order to build a broad *Homo Economicus* we conducted economic experiments in four dissimilar locations: Hangzhou, China; Niamey, Niger; Grenoble, France; Manhattan, Kansas; and West Lafayette, Indiana. Each subject completed an ultimatum bargaining game experiment, Voluntary Contribution Mechanism experiment, time preference experiment, and risk preference experiment. Results indicate economic behavior is not independent of location. Location differences are greatest for strategic interaction behavior and less prevalent for individual decision-making behavior.

Keywords: Time preference, risk preference, voluntary contribution mechanism, Ultimatum bargaining game, cultural, China, France, Niger, Kansas, Indiana, US

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A Multidimensional Homo Economicus: Dimensions of Economic Preferences in Four Countries

Recent experimental and behavioral economic research reveals the traditional definition of *Homo Economicus* is insufficient. *Homo Economicus* was identified as a self-interested, own utility maximizing being. Experimental market and incomplete contract research shows this is not always the case. When markets do not work or contracts are not complete, outcomes of the transactions depend on parties' levels of altruism, strategic behavior, tastes, sentiments, and other social and cultural preferences (Bowles and Gintis 1993). Thus, a broader understanding of social and economic interactions is needed in order to meet moral philosophers' aspirations of understanding the role of society in shaping human behavior.

Ecological rationality implies neither the market nor *Homo Economicus* evolve independent of cultural and biological processes. Ecological rationality assumes people use rationality passed on through cultural and biological processes when making choices. Individuals' decisions are based on experience and inherited knowledge. The inherited knowledge is of an innate nature (Smith 2003). Yet, the role of social and cultural preferences and strategic behaviors in completing transactions in and away from the market place are seldom captured in economic models, especially general equilibrium models. Samuel Bowles (1998) argues that these cultural and individual traits do not only play a role in transactions, but are embed in and shaped by the structure and political economy of the market place. Economic forces and market structure are influential to determining the transmission of cultural traits.

Recent cross-cultural experimental economic work reveals that there are societal differences in economic behavior. Alvin Roth et al. (1991) initiated a stream of work when they

used a cross-cultural experiment to test whether subject groups in different international locations would follow the game theoretic prediction outcome for the ultimatum bargaining game. They found that subjects did not consistently display behavior consistent with the ultimatum game model predictions in any one of the four countries included in the study and that patterns of bargaining behavior were statistically different across countries. Following this work, Joseph Henrich led a group of researchers to see how ultimatum bargaining behavior differed across fifteen small-scale societies. They found there was wide variation in the offers across locations: in two societies mean offers were 30 to 40 percent while mean offers exceeded 50 percent in other societies (Henrich et al. 2001).

These findings and others from cross-cultural investigations of differences in Voluntary Contribution Mechanism (VCM) giving and risk behavior indicate that there are cultural and societal differences in strategic and economic behavior (Cason et al. 2002, Henrich et al. 2004, Weber and Hsee 1998). These studies are enlightening in that they each identify and provide information about a behavioral difference across populations, but they are limited in testing for the breadth of differences which may exist across cultures. For example, work by other social scientists indicates that cultures vary across several different dimensions. Sociologists and anthropologist have found cultures to differ in their degree of hierarchy, individualism, orientation toward tradition, risk avoidance, egalitarianism, fatalism, and masculinity among other traits (Hofstede 1980, 1997; Thompson et al. 1985). Further, often there is an inter-relationship between dimensions of culture (e.g., collectivist cultures are often very hierarchical too). The exploration of economic dimensions of behavioral differences across cultures is comparatively very limited to date.

The current study investigates multiple dimensions of economic behavior across culturally isolated groups. Experimental economic methods are used to test for location differences in strategic and individual decision-making behaviors. From this, we may be able to develop a broader, richer understanding of *Homo Economicus* using multiple economic behavioral measures. Findings indicate that behavior differs in more than one dimension across cultures. Strategic behavior is most likely to differ across location groups.

Objectives

The primary objective of this work is to measure differences in altruism, reciprocity, time preference, risk preference, and tendencies to free-ride in China, France, Niger, Kansas, and Indiana. These experiments are used to test the null hypothesis that economic behavior is independent of location. The ultimatum bargaining game and voluntary contribution mechanism (VCM) experiments measure strategic interaction behavior between subjects. The remaining two, the time preference and risk preference experiments, are used to obtain measurements of subjects' individual decision-making behaviors.

Several features of this study are worth noting. First, the experiments offer new scope. The combination of strategic interaction and individual choice experiments allows rich behavioral comparisons across cultures. Second, all of the subjects in this study are college students. This helps to control for relative income differences across subjects. All of the subjects received real cash payments for their participation in the experiments. They received a show-up fee as well as payments for each of the experimental activities[1].

The four different experiments were conducted in one, master experimental session to obtain within subject comparisons across experiments. The earnings for each of the

experiments were not determined until the entire end of the master experimental session to prevent earnings from one experiment influencing the subjects' behavior in another experiment. The only experiment in which earnings were discovered as the experiment progressed was the VCM, the last and final experiment. Total earnings from all of the experiments were paid out to the subjects at the end of the master experimental session.

Data

The experiments were conducted in Hangzhou, China; Grenoble, France; Niamey, Niger; Manhattan, Kansas; and West Lafayette, Indiana from March to through May of 2003. The experiment participants included 96 subjects at the Hangzhou site, 70 subjects at the Grenoble site, 60 subjects at the Niamey site, 57 subjects at the Manhattan site, and 63 subjects at the West Lafayette site.

The locations were selected, in part, because of their geographic isolation from each other[2]. This enables us to explore differences in economic behavior across groups who have different cultural experiences. Previous work by Geert Hofstede (1997) indicates that groups in the different countries have historically differed along at least four dimensions of culture: power distance, individualism, masculinity, and uncertainty avoidance. In table 1, one can see that Asian, French, and West African cultures all have more power distance or there is a greater degree of distance between superiors and their subordinates than in the United States. Both United States and French cultures are individualistic relative to Asian and West African Cultures. Masculinity is valued higher in the United States than in the other locations. This means that in the United States masculine behaviors such as aggression and ambition are

[1] The show up fee and experiment payments were converted using the purchasing power parity index to ensure relatively equal earnings across locations.

valued higher than feminine behaviors which include compassion and passiveness. Finally, the French avoid uncertainty more than groups in the other locations.

Experimental Methods

The ultimatum bargaining experiment in this study is very similar to that of Guth et al. (1982), but the Proposer and Responder decision processes are simultaneous. Thus, the extensive form of the game collapses into one step. The Proposer decides how much of their $5 endowment (or its PPP equivalent in China, France, and Niger) he/she will allocate the respondent. The Proposer has eleven discrete choice options presented to them in a worksheet. The options are divided into ten percent increments from zero to 100 percent of the endowment. At the same time as the Proposers make their allocation decision, the Respondents have a similar worksheet to complete. They decide the minimum amount of the endowment they are willing to accept from Proposer. Once the worksheets are marked, the experimenter collects them.

The earnings from this experiment are determined by matching Proposers and Respondent answers according to randomly predetermined matching arrangements. If the Proposer suggested a payment above the Respondents minimum payment requirement, then the allocation is divided as the Proposer suggested. If the Proposer did not make an offer acceptable to the Respondent, then neither party receives payment.

The VCM was employed to measure individuals' tendency toward free-riding. Subjects made 16 different investment decisions through eight investment periods in this experiment. In each period, they were randomly paired with another, anonymous subject (they were never paired with the same subject they were paired with during the ultimatum bargaining game

[2] This excludes Manhattan and West Lafayette. Manhattan was selected as a control site to test the degree of difference between two more geographically and culturally similar sites.

experiment). Each subject decided how many of thirteen tokens they would invest in a private account and how many they would invest in a public account. The investment return to a single subject in each period depended on how many tokens he or she invested in the private account and how many tokens he or she and the person they were paired with invested in the public account in that round. The return to the public account was three-quarters of the return to the private account. The returns from the private account only accrued to the individual based on the number of tokens he or she invested in that account in that period. The returns to the public account accrued to both investors at the same rate and was based on the total number of tokens both investors placed in the public account.

It was possible for a subject to invest nothing in the public account and still receive the return from the tokens the person they were paired with placed in the account. If both individuals invested all or almost all of their tokens into the public account, then their total earnings in that round would be greater than their earnings if they each invested all of their tokens in their individual private accounts. The degree to which an individual placed tokens in their private account instead of the public account is a measure of their free-riding behavior.

The time preference experiment followed the ultimatum bargaining experiment in the master experimental session. It was used to measure subjects' discount rates and was based on Harrison et al.'s (2002) methodology. Subjects choose between receiving $5 (or its purchasing power equivalent in their country) in one week or a greater amount in 25 weeks. In the initial decisions, subjects choose between receiving $5 in one week or 8% more in 25 weeks. As they moved on from the first decision, they began choosing between receiving $5 in one week and an increasingly larger percent of money in 25 weeks. Their discount rate is measured by recording the point at which they move to receiving the money in 25 weeks instead of one

week in the decision in table 2. In other words, what additional percent of $5 would it take to induce someone to delay their payment for 25 weeks? The payment is delayed 24 weeks after the first payment option.

The earnings were determined at the end of the experimental session by randomly pulling numbers from an envelope. Fifteen pieces of paper, numbered one through 15, were placed in the envelop. The experimenter drew out one of the numbers to determine which one of the subject's decisions in the time preference worksheet would be realized. For example, if the experimenter pulled out the number 5, he or she would look to see what the subject marked for number 5. If the subject marked A, then the subject would receive $5 in the mail in one week. The subject would receive $7.00 in the mail in 25 weeks if he/she marked B.

Measurements of subjects' relative risk aversion levels are obtained using a worksheet of lottery choices similar to that of Holt and Laury (2002). The students make ten, repeated choices over lotteries with varying degrees of risk. The payoff options are reported in the two left-hand columns of table 3. In the first few decisions, the expected payoff is higher for Option A and, thus, it is less risky then Option B—there is a low downside risk for Option A. As the subjects continue through the decisions, the expected payoffs for Option B become more rewarding as their payoff increases. Initially, Option B is very risky, with a high probability of receiving close to nothing, $0.25. By the last decision, Option B is the most rewarding. There is a 100% chance of receiving $9.60 in Option B compared to a 100% chance of receiving $5.00 in Option A. The relative risk aversion range associated with each choice is displayed in the right-hand column of table 3[3]. After students complete the worksheet, a ten-sided die is rolled

[3] The Holt and Laury methodology assumes constant relative risk aversion for money x. The risk aversion coefficient, r, is derived from the utility function $u(x) = x^{1-r}$ for $x > 0$. A risk

to determine which of the choices will be binding. From the die roll number, the monitor checks whether the subject choose Option A or B for that choice. Then, the die is rolled a second time to determine the final outcome. For example, if the experiment monitor rolled the die and produced a three on the first roll, he/she would look at the decision that the subject made for the 3rd choice. Lets say the subject chooses Option A. On the second roll of the die, the subject will receive $5.00 if the die lands with one to three facing upward and $4.00 if the die lands with faces four to ten facing upward. If the subject had chosen Option B for the 3rd choice, then they would receive $9.60 if the die displayed faces one to three and $0.25 otherwise.

Results

Results from strategic interaction experiments are presented first, followed by results from the individual decision-making experiments. For each experiment, a general description of the outcome from each experiment is first reported. Second, summary statistics and simple statistical tests of location differences in behavior are presented. Third, typically, econometric regression results are reported as the results of the tests of null hypotheses related to the role of demographic characteristics and culture on each type of economic behavior.

A report of the cumulative percent of Proposers not offering minimum amounts of the endowment and the cumulative distribution of Respondents' minimum endowment demands are reported in figure 1. The cumulative distributions of Proposers' minimum endowment offers are represented by the dash lines which decrease from the upper left-hand corner of the chart to the lower right-hand corner of the chart. The Respondents' minimum endowment

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averse individual's r is less than zero. Risk neutrality implies r=0, and risk aversion implies r>0.

cumulative distributions are represented by the series of solid lines which increase in value from the lower left-hand corner of the chart to the upper right-hand corner of the chart.

The Proposer cumulative distribution is interpreted as the percent of participants who were willing to give at least *x* percent of the endowment. For example, looking at the upper left-hand corner of the chart, 100% of the participants in China were willing to give more than zero percent and ten percent of the endowment to the Respondent. Likewise, in Indiana and France, 97% of the percent of the Proposers offered more than zero percent of the endowment to the Respondents while only 93% of Kansas and Nigeriéns offered more than zero percent of the endowment to the Respondents.

The rate at which minimum offers increased differs across the different locations. In China, low offers appear to be the least acceptable with 98% of Proposers offering at least 30 percent of the allocation. In Niger and France, it was more likely that a Proposer would offer less to the Respondent. In Niger and France, only 63% and 68% of Proposers, respectively, offered more than 30 percent of the endowment to the Respondent. Proposers in Kansas and Indiana minimum offer likelihoods decrease at similar rates moving from left to right across the chart. In all locations, less than 20% of the Proposers offered more than fifty percent of the endowment. In France, Kansas, and Indiana, less then ten percent of the Proposers offered more than 50 percent of the endowment.

The minimum Respondent demand cumulative distributions reveal greater differences in the rate and frequency in which different groups will accept minimum amounts of the endowment. None of the subjects in Niger will accept less then 20 percent of the endowment. In contrast, eleven percent of subjects in Kansas are willing to accept nothing from the Proposer. The rate of endowment acceptance increases the most dramatically for French

subjects. Only six percent of the subjects will accept nothing from the Proposer, but 56% of the subjects will accept only 30 percent of the endowment. The greatest difference in acceptance levels exists between Nigerien and French subjects. While 77% of Nigerien subjects would accept 50 percent or more of the endowment, only 17% would accept 40 percent or less of the endowment. These differences in giving and acceptance rates and the significance of the differences are discussed in more detail below.

The proportion of experiment participants who were willing to accept a given offer in the different experiment countries and location is reported in table 4. Starting at the left of the table, the first column reports the number of respondents who are willing to accept nothing from the Proposer. Moving across table 4 to the right, the percent of the endowment participants are willing to accept increases in ten percent increments.

Respondents in Kansas and Indiana were the most willing to accept nothing, with an average of nine percent of the population stating that they would accept zero percent of the endowment in the United States. The willingness to accept nothing decreased in China and France to six percent of the population. None of the Nigerién subjects were willing to accept nothing. Kansas and French subjects were the most likely to accept allocations of less than 50% of the original endowment. Thirty-three percent of Nigerién subjects demanded 50% or more of the allocation. These differences in Respondents' minimum acceptance levels may reflect their expectations of the group. Respondents in Kansas and Indiana, from more individualistic cultures, may allow the Proposer to act in a more self-interested manner while individuals from the more collectivist cultures expect their Proposers to be more generous. It is clear that French subjects were more willing to accept lower proportions of the endowment

than their counterparts in the other countries and that the Nigerién participants demanded a larger proportion of the endowment that those in other countries.

The Wilcoxon test to test for distributional differences in respondents' minimum acceptance levels across locations. The Wilcoxon test statistics indicate that nearly all of the distributions' respondents' minimum acceptance amounts are significantly different. The only insignificant differences ($p>0.10$) are those between Kansas and Indiana, China and Indiana, and Kansas and China. One expects the behavior between Indiana and Kansas subjects to be the same. One may expect differences between Chinese and American subjects because of the cultural and governmental differences between the two societies. In past studies, however, Chinese and American students have behaved in like ways when the Chinese subjects were in an anonymous experiment environment such as the current experiment (Kachelmeier and Shehata 1997). Thus, due to the combination of similar individualistic believes among subjects in the United States and China, and the anonymity of the experiment, it may not be surprising that the subjects' behavior is similar in both countries in this experiment.

Table 5 shows the percent of Proposers offering a given proportion or percentage of their endowment to the Respondents. One will observe that the majority of Proposers offered half of the endowment to the Respondent in every country except France. There, less than half of the Proposers offered half of the endowment. In France, the largest group of Proposers offered less than 50% of the endowment to the Respondents. In Niger, the largest share of Proposers (37%) offered half of the endowment. Kansas had the highest percentage of Proposers offering half of the endowment (76%). In China, 98% of the Proposers offered between 40% and 70% of their endowment. None of the Chinese subjects offered either

nothing or everything to their Respondent. In all of the other locations except China and Kansas, a small percentage of Proposers did offer to give the Respondent all of the endowment.

Wilcoxon tests of distributional differences in Proposers' offer amounts across locations reveal there are fewer significant differences in Proposer offer rates compared to differences in Respondent acceptance rates. Again, Kansas and Indiana are similar, but the distribution of offer rates of China is different from Indiana. This reflects the increased tendency of Chinese Proposers to make offers around 50%, relative to Proposers in Indiana and Kansas. Niger does not have a significantly different distribution ($p>0.10$) to Indiana and France.

The large decrease in the number of accepted offers in Niger is worthy of discussion. This is one location that, prior to the experiment, Proposers may have been better informed of the likelihood that their offer will be accepted or rejected. Of the four countries studied, there is more money sharing and lending amongst Nigerién household, family, and tribal members than in the other countries. Due to the smaller number of accessible trustworthy banking institutions and lack of savings accounts, many individuals often go to family members and friends for loans and money gifts. The country also has a very high unemployment rate. Many people may be supported by one wage earner. Not only are individuals often asking to borrow or called upon to lend money, food is also a common good that is shared. At night, poorer families walk the streets of Niamey with empty bowls to collect the leftover food from families who were able to prepare fresh food that day.

Given the openness of interpersonal transfers in this society, it may be surprising that there were not more matches in the ultimatum bargaining experiment (i.e. Responders indicated a minimum willingness to accept below the Proposers' offers). Several possible explanations may account for the apparent decreased altruism in Niger despite prevalent gift-giving in the

country. First, the gift-giving that is observed on a daily basis may not be motivated by altruism. Rather, individuals may give gifts as a form of property insurance. Gift-giving may prevent poorer people from coming to your house to try to steal food or money. Economic behavioral research in rural Paraguay finds that farmers give gift of foods to the poor to prevent theft from their fields (Schechter 2004). Likewise, in Niger, it may be wise to give some money or food regularly in order to prevent theft. Second, because money lending between friends and especially family members is more common in Niger, individuals may be more conservative when giving it away. There often is one wage earner in a household (the household can include multiple generations, wives and their children, and adult siblings and their families) and this earner is often called upon to provide for a multitude of individuals. When asked to give money to one person, the money holder may be conservative with the allocation, knowing that many more requests may come to him/her for money from the same pool of money. Thus, he or she may offer less than the person will request.

The anonymous aspect of the experiment also presents a very different condition from that individuals face in Nigerién society. In the experiment, Responders do not know who Proposers are. Therefore, the Proposer does not have to worry about being approached afterward if the Respondent does not like the offer the Proposer makes. This may have allowed the Proposers, especially, and the Respondents to act in a less altruistic and less reciprocal manner than they would in everyday life.

The second strategic interaction experiment to be considered is the VCM. Behavior in the VCM is different across locations. An overview of the mean token contributions to the VCM private account is presented in table 6. The biggest contrast in behavior occurs between France and Niger. In Niger, subjects invested a greater percent of their tokens in the private

account from the onset and did not change their investment strategy as much as subjects in other countries did. Over the course of the eight rounds of the game, French subjects behavior changed drastically as they went from high public good contributions to the lowest level of public account contributions in the last round of the experiment. This section of the essay reports and discusses the findings from the VCM public goods game in detail.

Overall, the average number of contributions to the private account increases in the latter rounds of the experiment (see table above). In all countries except Niger (where private account contributions remained high), participants put less than half of their tokens in the private account in the first three rounds. Then, in the fourth and fifth rounds they begin to more than half of their tokens in the private account. By the last round, over 80 percent of their tokens are in the private account. In contrast, subjects in the United States, China, and Niger were all contributing an average of 69% of their tokens into the private account in the last round.

The greatest amount of variability of token contribution took place in France during the first 6 rounds of the game. The French subjects were observed to take more of an "all or nothing" approach or strategy to the experiment. Many subjects would either place all of their tokens in the private account or all of their tokens in the public account during the initial rounds of the game. As they moved through the rounds and saw lower returns from the group account, the majority began putting all of their tokens in the private account, bringing down the deviation in investment patterns.

Figure 2 offers an alternative view of the VCM results where the average contributions to the public account are reported. One can see that the French subjects reached a much stronger "free-riding" equilibrium than their counterparts. Investment behavior changed from

low-levels of free-riding to higher levels of free-riding in every country. The country with the least amount of behavioral change across rounds was Niger, where there were higher levels of investment into the private account or free-riding in the initial rounds of the experiment than in any other country.

Tests for behavioral differences across locations will focus on the first-round of the VCM. The contribution statistics for this round are displayed in table 7. The average first round contribution to the public account across the entire population was 7.25 tokens. By location, the average contribution in the Chinese experiments is closest to this, 7.49 tokens. The average first-round token contribution in Niger is the lowest, 5.02 tokens. The least variability in first-round token contributions occurs in Niger while the highest is in Kansas. There are differences in mean first-round VCM contributions across subject gender. Across all locations, men contributed an average of 7.76 tokens, one more token then women did on average.

Ordinary least squares regression analysis of first period token contributions into the public account reveals that rates of contributions are significantly different across countries and gender (see table 8). The dependent variable in the regression is the number of tokens contributed to the public account. Dummy variables are used to represent subjects' nationality and gender in the reduced form model. The country variables take on a one value if the subject is from that country and are zero otherwise. Niger is omitted as an alternate country. The female gender variable takes a value of one for female subjects and is zero otherwise. The results indicate that average contributions from men in each country into the public account in the first round are greater than Nigerien subject contributions in all alternative countries. Kansas men contributed an average of over four more tokens than Nigerien men did to the public account in the first round. At every location, women tended to contribute less to the

public account then men, but this was significant in only two places, China and Kansas. In both places, women contributed at least two fewer tokens than men did to the public account. Thus, men were initially more cooperative than women in these locations.

As one can see from figure 2, the rate of decline of public account token contributions appears to be significantly different across different locations. On average, across all countries, individuals decreased their public good investments by 33.96 percent. Ordinary least squares regression is used to test the effect of location and gender on rate of change in public good investment across rounds. The percentage change in contributions from round 1 to round 8 is the dependent variable for the regression results reported in table 9. There are significant differences across locations in their public good investments from round one to round eight or the first to final rounds (relative to Niger). Chinese, Indianan, and French subjects' rate of decline was much greater than that of Nigerien subjects. One could infer that cooperation decreased the most in these countries across time. Despite the overall decline in cooperation across all locations, women more are likely to continue to contribute to the public account. Further analysis shows that the mean decline in VCM public accounts is 42.59 percent among men and only 25.52 percent among women across all locations. It appears that although their cooperation declines, women were more willing to continue to perpetuate cooperation across the different rounds.

The time preference experiment is the first of the two individual choice experiments to be considered. The results from the time preference experiment indicate there are limited location based differences in time preferences. Before we report the experiment results, we want to note that China is not included in the analysis. The worksheets used to measure time preference were not correct in China and the data from the Chinese experiment can not be used.

Table 10 reports the mean estimated annual discount rate for the different locations and demographic groups using interval censored estimates. The mean discount rate for all countries is 165.51 percent. This is much higher than the discount rate found by Harrison et al. (2002) in the Danish population, but well within the possible range of discount rates from meta-analysis by Frederick et al. (2002). The standard error of Nigerien subjects' discount rates is higher than the other locations. Comparing the other four locations, Nigerién subjects had the highest estimated average discount rate, 208.57 percent, followed by Indiana, 177.07 percent. Indiana's estimated discount rate is over 35 percentage points higher than either Kansas or France.

The discount rate means are also estimated for different demographic group. The average median discount rates are very similar for men and women, 163.04 and 168.06 percent. The variation is greater for discount rate comparisons across working status groups.[4] There is only one subject who identified him/herself as working full-time. He/She had an estimated average discount rage of 207.97 percent. The other working groups included students who identified themselves as working part-time or were enrolled in a work study program (this mainly includes subjects in the United States). The work study students had the lowest average estimated annual discount rate of the working population, 135.87 percent, and the part-time working students had the highest, 177.34 percent. The individuals who were full-time students (i.e., did not work) had average discount rates of 168.16 percent.

[4] Working status is included as a proxy for income in this experiment. All of the subjects in the experiment were enrolled as undergraduate students at a university. However, they may have work different amounts outside of school depending on their overall wealth level. It is assumed that more needy students will pursue employment outside of school.

An interval censored model is used to test the effect of location, culture, and demographic characteristics on time preference behavior following Harrison et al. (2002). The following these null hypotheses are tested using this model:

1. A subject's discount rate range is independent of location.
2. A subject's discount rage range is independent of gender.
3. The experimental time preference measurements are independent of income.

The hypotheses are tested using an interval censored regression model using the following functional relationship for each individual i: [Minimum Discount $Rate_i$, Maximum Discount $Rate_i$]=f($Location_i$, $Gender_i$, Academic $Major_i$, Employment $Status_i$, and $Culture_i$). Location is included by using a binary (0,1) indicator variable for each location (i.e. China, France, Indiana, Kansas, and Niger). The gender or female variable takes on a value of one if the participant is female and zero otherwise. Four additional dummy variables are used to classify each individual into one of four different working statuses: full-time employment, part-time employment, or full-time student. Working status is used to indicate economic background. Niger and "Other Work" are omitted as relative comparison variables for the location and academic major groups of variables.

The interval-censored regression results for the test of the null hypotheses are displayed in table 11 (they were estimated using the Lifereg procedure in SAS). The overall likelihood ratio test indicates that all coefficients are significantly different from zero. One of the three null hypotheses are rejected. Subjects' discount rates are not independent of location. Their discount rates do appear to be independent of income measures and gender. There are only two significant variable coefficients. There are associated with the France ($P<0.05$) and Kansas ($p<0.05$) dummy variables.

The results from the risk experiment are analyzed in a similar fashion to the time preference experiment. The mean estimated relative risk aversion coefficients for different demographic groups are presented in table 12. These are calculated using the interval censored procedure similar to that used for the discount rate. In general, across the total population and all subgroups, the estimated relative risk aversion coefficient is positive and, thus, it is assumed that the average subject is relatively risk averse. The total average relative risk aversion coefficient is 0.4151. Across the locations, China subjects have the lowest relative risk aversion coefficient on average while Indianan subjects have the highest relative risk aversion coefficient on average. Niger has the largest confidence interval. It is six times larger than any of the confidence intervals associate with the other estimates—an indication of the degree of heterogeneity in the risk aversion behavior in Niger. The average estimated relative risk aversion coefficient is higher for women than men, 0.4344 versus 0.3943. The individual who is employed full-time in addition to being a student appears to have mean relative risk aversion coefficients that is nearly twice the average for the other working groups. It does appear that more risk averse individuals are working students.

An interval censored model is used to derive the parameter estimates to explain differences in the estimated relative risk aversion coefficients across different groups. Four different model specifications were tested in the development of the model displayed in table 13. The preliminary model tested only the effect of location on the estimated relative risk aversion coefficient. The next included both location variables and a gender variable to test the effect of gender on the estimated relative risk aversion coefficient. None of the parameters in these preliminary models were significant. More analysis will be conducted to attain more information about the heterogeneity of risk preferences within location.

Conclusions

The economic experiments conducted in this research reveal that the degree of location differences in economic behavior differ by the type of the behavior being measured. There is more variability across locations in subjects' strategic economic behavior than for individual decision making behavior. The VCM and ultimatum bargaining game experiment were used to measure cooperation and reciprocity. Findings from these experiments indicate that Nigerien subjects were the least cooperative and least altruistic. While Nigerien Responders had high offer expectations in the ultimatum bargaining game experiment, the Proposers were conservative in their proposals and much less likely to meet Responders demands than Proposers in other countries. French and American Respondents had the lowest offer expectations and Proposers often met these expectations. Chinese Responders offers expectations were very close to Proposers, where 50% of the endowment was often exchanged.

In the VCM, the French subjects' behavior was the most dynamic. They gave the greatest, average amount of tokens to the public account in the first round, but had the lowest average public account token contributions by the eighth round of the game. There was little behavioral adjustment by Nigerien subjects across rounds. They gave less than 40% of their tokens to the public account in the first round of the VCM. Indianan, Chinese, and Kansan subjects behaved most similarly in the VCM. They contributed approximately 60% of their tokens to the public account in the first round and approximately 30% of their tokens to the public account in the last round of the VCM.

Behavioral differences are less marked across individual decision making experiments. There is a significant difference in Nigerien subject behavior and other subject behavior in the time preference experiment. The Nigerien subjects had a significantly higher discount rate than

Indianan, Kansan, and French subjects on average. There are not any significant differences in risk behavior across locations.

These results do reinforce Bowles' (1998) and Smith's (2003) arguments that economic interaction is related to cultural and biological processes. Individuals who have different evolutionary experiences in geographically isolated groups behave differently across a variety of economic contexts, especially those involving strategic interaction. The difference in experimental economic outcomes for strategic interaction and individual decision making experiments has great implications for policy and development work across geographic locations. The increased degree of difference in behavioral outcomes for the strategic interaction experiments indicates that policy development for projects which include group interaction and collaboration need more thought. Incentives which work to encourage investment in a public project in one location may not transfer to another location. On the other hand, if one is trying to induce investment into a private venture, investment incentives will be much more transferable across space.

References

Bowles, Samuel. 1998. Endogenous Preferences: The Cultural Consequences of Markets and other Economic Institutions. *Journal of Economic Literature* XXXVI (March): 75-111.

Bowles, Samuel and Herber Ginits. 1993. The Revence of Homo Economicus: Contested Exchange and the Revival of Political Economy. *Journal of Economic Perspectives* 7(1): 83-102.

Cason, Timothy N., Tatsuyoshi Saijo, Takehiko Yamato. 2002. Voluntary Participation and Spite in Public Good Provision Experiments: An International Comparison. *Experimental Economics*. 5: 133-153.

Harrison, Glenn W., Morten I. Lau, and Melonie B. Williams. 2002. Estimating Individual Discount Rates in Denmark: A Field Experiment. *The American Economic Review* 92 (5): 1606-1617.

Henrich, Joseph, Robert Boyd, Samuel Bowles, Colin Camerer, Ernst Fehr, Herbert Gintis, and Richard McElreath. 2001. In Search of Homo Economicus: Behavioral Experiments in 15 Small-Scale Societies. *The American Economic Review* 91 (2): 73-78.

Henrich, Joseph, Robert Boyd, Samuel Bowles, Colin Camerer, Ernst Fehr, Herbert Gintis, and Richard McElreath. 2004. Overview and Synthesis. In *Foundations of Human Society: Economic Experiments and Ethnographic Evidence from Fifteen Small-Scale Societies*, edited by Joseph Henrich, Robert Boyd, Samuel Bowles, Colin Camerer, Ernst Fehr, and Herbert Gintis. Oxford: Oxford University Press.

Hofstede, Geert. 1980. *Cultures Consequences.* Beverly Hills: Sage Publications.

Hofstede, Geert. 1991. *Cultures and Organizations: Software of the Mind*. United Kingdom: McGraw-Hill.

Holt, Charles A. and Susan K. Laury (2002). Risk Aversion and Incentive Effects. *The American Economic Review* 92 (5): 1644-1655.

Kachelmeier, Steven and Mohamed Shehata. 1997. Internal Auditing and Voluntary Cooperation in Firms: A Cross-Cultural Experiment. *The Accounting Review* 72 (3): 407-431.

Roth, Alvin E., Vesna Prasnikar, Masahiro Okuno-Fujiwara, and Shmuel Zamir. 1991. Bargaining and Market Behavior in Jerusalem, Ljubljana, Pittsburgh, and Tokyo: An Experimental Study. *The American Economic Review* 81 (5): 1068-1095.

Schechter, Laura. 2004. Theft, Gift-giving, and Trustworthiness: Honesty is Its Own Reward in Rural Paraguay. Working Paper. Department of Agricultural and Resource Economics, University of California, Berkeley.

Thompson, Michael, Richard Ellis, and Aaron Wildavsky. 1990. *Culture Theory*. Boulder: Westview Press.

Smith, Vernon L. 2003. Constructivist and Ecological Rationality in Economics. *The American Economic Review* 93 (3): 465-508.

Weber, Elke U. and Christopher Hsee. 1998. Cross-cultural Differences in Risk Perception, but Cross-cultural Similarities in Attitudes Towards Perceived Risk. *Management Science* 44 (9): 1205-1217.

World Bank. 2004. *World Development Indicators*. Washington, D.C.

Table 1. The Value Survey Module (VSM) index scores for China, France, Niger, and the United States (Hofstede 1997)

Country	Power Distance	Individualism	Masculinity	Uncertainty Avoidance [a]
Hong Kong [b]	68	25	57	29
France	68	71	43	86
West Africa [b]	77	20	46	54
United States	40	91	62	46

[a] The index scores for each cultural measurement range from 0 to 100. A score of 100 indicates a culture which places great importance on that value. A score of 0 indicates little importance is put on the relating value.
[b] Direct data is not available for China and Niger. Index scores for Hong Kong and West Africa are used for China and Niger, respectively.

Table 2. Discount rate measurement exercise with interest rate information for time preference experiment (United States version)

Choices	Option A (Receive one week from now)	Option B (Receive 25 weeks from now)	Annual Interest Rate (Percent)	Annual Effective Percentage Rate (Percent)[a]	Decision
1	$5.00	$5.40	8.00%	18.19%	
2	$5.00	$5.80	16.00%	38.00%	
3	$5.00	$6.20	24.00%	59.49%	
4	$5.00	$6.60	32.00%	82.67%	
5	$5.00	$7.00	40.00%	107.55%	
6	$5.00	$7.40	48.00%	134.16%	
7	$5.00	$7.80	56.00%	162.51%	
8	$5.00	$8.20	64.00%	192.61%	
9	$5.00	$8.60	72.00%	224.47%	
10	$5.00	$9.00	80.00%	258.13%	
11	$5.00	$9.40	88.00%	293.58%	
12	$5.00	$9.80	96.00%	330.84%	
13	$5.00	$10.20	104.00%	369.93%	
14	$5.00	$10.60	112.00%	410.86%	
15	$5.00	$11.00	120.00%	453.63%	

[a]The interest compounds once every 24 weeks for 2.17 times per year.

Table 3. United States version of risk experiment payoffs and associated relative risk aversion coefficient for the ten paired lottery-choice decisions

Investment Option A	Investment Option B	Expected Payoff Differences	Relative Risk Aversion Coefficient
1/10 of $5.00, 9/10 of $4.00	1/10 of $9.60, 9/10 of $0.25	$2.92	-∞ to -1.72
2/10 of $5.00, 8/10 of $4.00	2/10 of $9.60, 8/10 of $0.25	$2.08	-1.71 to -0.95
3/10 of $5.00, 7/10 of $4.00	3/10 of $9.60, 7/10 of $0.25	$1.25	-0.94 to -0.49
4/10 of $5.00, 6/10 of $4.00	4/10 of $9.60, 6/10 of $0.25	$0.41	-0.48 to -0.15
5/10 of $5.00, 5/10 of $4.00	5/10 of $9.60, 5/10 of $0.25	-$0.43	-0.14 to 0.14
6/10 of $5.00, 4/10 of $4.00	6/10 of $9.60, 4/10 of $0.25	-$1.26	0.15 to 0.41
7/10 of $5.00, 3/10 of $4.00	7/10 of $9.60, 3/10 of $0.25	-$2.10	0.42 to 0.67
8/10 of $5.00, 2/10 of $4.00	8/10 of $9.60, 2/10 of $0.25	-$2.93	0.68 to 0.97
9/10 of $5.00, 1/10 of $4.00	9/10 of $9.60, 1/10 of $0.25	-$3.77	0.98 to 1.37
10/10 of $5.00, 0/10 of $4.00	10/10 of $9.60, 0/10 of $0.25	-$4.60	13.30 to ∞

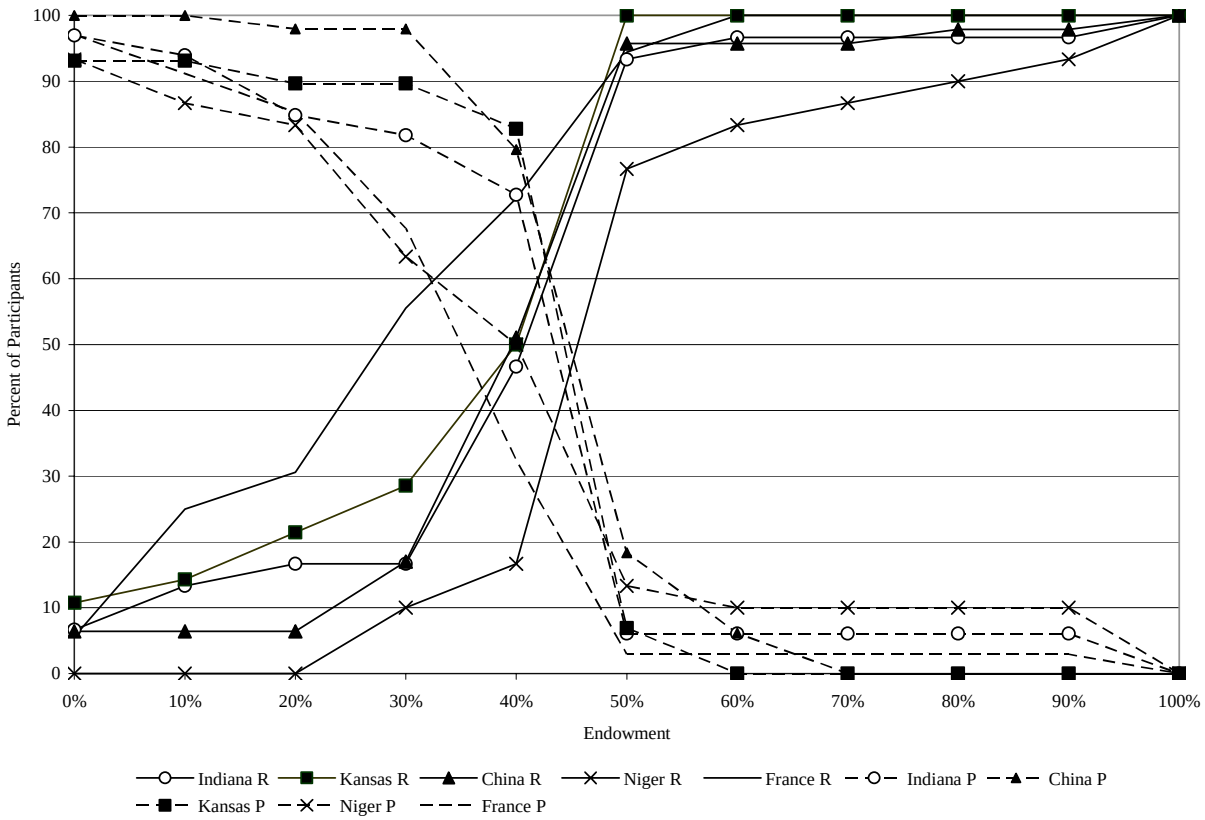

Figure 1. Cumulative Distributions of Proposers' Minimum Endowment Offers (P) and Responders' Endowment Demands (R)

Table 4. Respondents' Cumulative Minimum Required Endowment Allocation Demands

	Endowment Allocation	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	Number of Responders	Percent of Respondents										
Total USA	58	9	14	19	22	48	97	98	98	98	98	100
Indiana	*30*	*7*	*13*	*17*	*17*	*47*	*93*	*97*	*97*	*97*	*97*	*100*
Kansas	*28*	*11*	*14*	*21*	*29*	*50*	*100*	*100*	*100*	*100*	*100*	*100*
China	47	6	6	6	17	51	96	96	96	98	98	100
Niger	30	0	0	0	10	17	77	83	87	90	93	100
France	36	6	25	31	56	72	94	100	100	100	100	100

Table 5. Percent of Proposers offering different proportions of the endowment

	Endowment Allocation	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	Number of Proposers											
Total USA	62	5	2	6	2	8	71	3	0	0	0	3
Purdue	*33*	*3*	*3*	*9*	*3*	*9*	*67*	*0*	*0*	*0*	*0*	*6*
Kansas	*29*	*7*	*0*	*3*	*0*	*7*	*76*	*7*	*0*	*0*	*0*	*0*
China	49	0	0	2	0	18	61	12	6	0	0	0
Niger	30	7	7	3	20	13	37	3	0	0	0	10
France	34	3	6	6	18	35	29	0	0	0	0	3

Table 6. The mean number and standard deviation of tokens contributed to the private account in each round of the public goods experiment across experiments.

			Number Mean of Tokens Contributed To Private Account							
Site	# of Obs.		Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	Round 7	Round 8
Indiana	63	Mean	5	6	6	7	7	8	8	9
		S.D	4	4	4	4	4	4	3	4
Kansas	57	Mean	5	6	6	6	7	7	8	9
		S.D.	4	4	5	5	5	4	5	5
China	96	Mean	6	6	6	7	7	7	8	9
		S.D.	3	4	4	4	5	4	4	4
Niger	60	Mean	9	8	8	8	8	8	8	9
		S.D.	3	3	4	4	4	4	4	4
France	70	Mean	5	5	6	8	8	9	10	11
		S.D.	5	5	6	6	5	5	4	4

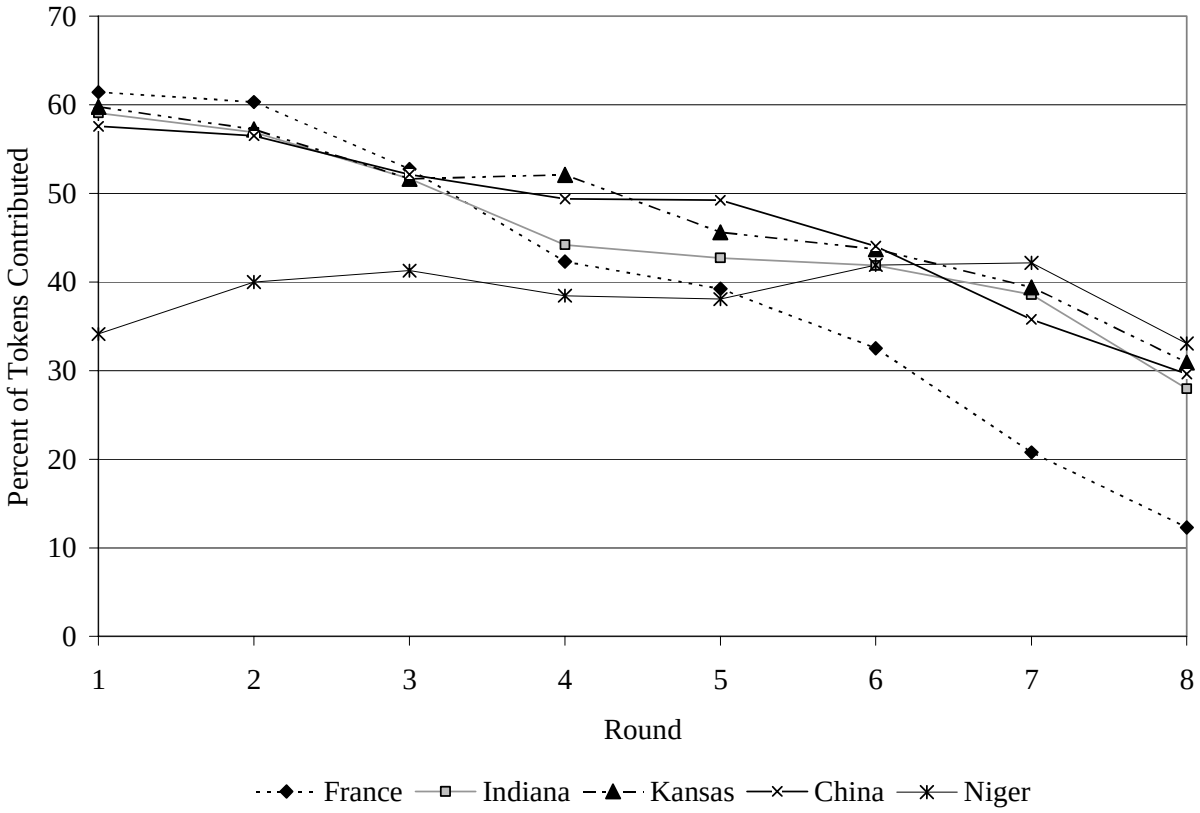

Figure 2. Average percent of tokens contributed to the public account per round of the VCM

Table 7. Mean first-round contributions to the VCM by demographic group

Demographic Group	Average First-Round Public Account Contribution	Standard Error
	(Tokens)	
Total	7.25	0.22
Location		
China	7.49	0.66
France	7.99	0.71
Kansas	7.78	0.75
Indiana	7.73	0.73
Niger	5.02	0.52
Gender		
Female	6.75	0.44
Male	7.76	0.32

Table 8. Ordinary least squares regression estimation with location and gender variables to predict first-round VCM contributions

Parameter	Estimate	Standard Error
Intercept	5.0811**	0.6542
China	3.5059**	0.8788
France	3.2523**	0.9133
Kansas	4.3102**	1.0567
Indiana	2.7589**	1.0303
Female*China	-2.1380**	0.8170
Female*France	-0.7850	0.9575
Female*Kansas	-2.7148*	1.0744
Female*Indiana	-0.1821	1.0248
Female*Niger	-0.1680	1.0567

$F=4.16$, $R^2=.1006$

** indicates $p<0.0001$

Table 9. Ordinary least square regression of the percentage change in token contributions to the public account from round one to round eight of the VCM across locations and gender

Parameter	Estimate	Standard Error
Intercept	-10.2743	13.4880
China	-35.8605*	16.4170
France	-58.9427**	17.5006
Kansas	-21.8916	18.5305
Indiana	-41.5329*	18.0889
Female	18.5091*	10.8304

F=3.03, p=0.0108

* indicates 90% significant, **indicates 95% significant

Table 10. Mean estimated annual discount by location and demographic group

Demographic Group	Estimated Mean (Percent)	Standard Error (Percent)
Total*	165.51	7.51
Location		
France	138.67	20.31
Kansas	142.01	20.96
Indiana	177.07	21.16
Niger	208.57	15.28
Gender		
Women	163.04	10.29
Men	168.06	10.95
Employment		
Full-Time	207.97	NA
Part-Time	177.34	17.75
Student Only	168.16	9.84
Work Study	135.87	15.80

*China is not included in the calculation of the overall mean.

Table 11. Interval censored regression analysis of discount rate measures (w/o China) [α]

Variable	Coefficient	Standard Error
Intercept	2.0400**	0.4199
France	-0.7153**	0.2029
Indiana	-0.3092	0.2191
Kansas	-0.6465**	0.2279
Female	0.0287	0.1480
Full-Time Employment	0.6578	1.1575
Part-Time Employment	0.1454	0.4240
Full-Time Student	0.0360	0.4071
Work Study	-0.2429	0.4533

*=90% significant

**=95% significant

[α]Model likelihood test ratio is 17.596 ($p<0.025$)

Table 12. The average estimated relative risk aversion levels for the China, France, Indiana, Kansas, and Niger

Demographic Group	Average Estimated Relative Risk Aversion Coefficient	Standard Error
Total	0.4151	0.0504
Location		
Indiana	0.4997	0.0525
Kansas	0.4823	0.0609
China	0.2887	0.0550
Niger	0.4304	0.3140
France	0.4542	0.0533
Gender		
Female	0.4344	0.0378
Male	0.3943	0.0932
Employment		
Full-time	0.8423	0.2216
Part-time	0.4327	0.0610
Student Only	0.4328	0.0726
Work Study	0.4198	0.0786
Other Work	0.3666	0.1478

Table 13. Relative risk aversion interval censored regression parameter estimates

Parameter	Estimate	Standard Error
Intercept	-0.0863	0.3237
China	-0.1193	0.1680
Indiana	0.1192	0.1862
Kansas	0.1084	0.1931
France	0.0788	0.1756
Female	0.0230	0.1024
Full-Time Employment	0.9336	0.7055
Part-Time Employment	0.4388	0.3198
Full-Time Student	0.4882	0.3049
Work Study	0.4719	0.3294

*=90% significant

**=95% significant

Note: None of the coefficient values are significant.