The Ultimatum Game in Southwestern Tanzania: Ethnic Variation and Institutional Scope[1]

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Experimental economic games offer anthropologists an additional tool for measuring norms of fairness and concerns over inequality within and between groups (Camerer and Fehr 2002). The game that has attracted the most attention, the ultimatum game, involves two anonymous players. The first player, the proposer, offers the responder a portion, *e*, of a set amount of money, *x*. The responder is then given the chance to accept or to reject the offer. A rejection of the offer leaves both players with nothing, whereas acceptance of the offer leaves the proposer with the offer, $x-e$, and the responder with *e*. Rational-choice theory under standard assumptions predicts that proposers will offer the smallest possible allocation of *x* while responders will accept any offer—something is better than nothing. In stark contrast to these predictions, modal offers from students in industrialized countries are generally 50% of *x* and offers less than 20% of *x* are frequently rejected (Kagel and Roth 1995).

Henrich et al. (2001) asked whether the seemingly ubiquitous pattern among subjects from industrialized countries was the result of universal patterns of behavior or of individuals' economic and social environments. They played the ultimatum game with individuals from 15 geographically and economically diverse societies and found game play to be considerably more heterogeneous than in studies conducted in industrialized countries. To account for this variation, they hypothesized that game play reflects the societal institutions[2] within which the players' lives are imbedded. All populations have institutional rules promoting sharing or "fair" transactions, but these vary in the degree to which they are stressed and the boundaries within which they apply (Barth 1969). For example, Machiguenga horticulturalists of the Amazon have few institutions beyond the family level, and sharing or cooperation occurs mainly within the family. In contrast, the institutions of Orma pastoralists of Kenya are broader in scope because they require cooperation both within and between villages (Henrich et al. 2001).

We played the ultimatum game with individuals from two sympatric Tanzanian ethnic groups (Sukuma and Pimbwe) experiencing similar physical environmental conditions and state political forces. Sukuma live on the outskirts of densely settled Pimbwe villages, and members of the two ethnic groups interact on a daily basis. The two groups differ markedly in the scope of their social institutions, however, and we used this difference to make predictions regarding ultimatum-game play. Building on the work of Henrich et al. (2001), we formulated the following three hypotheses:

1. *The institutional-scope hypothesis.* Because Sukuma institutions are broad in scope, with in-groups cross-cutting even distant villages, Sukuma will make similar offers and rejections to players living both *within* and *outside of* their village. In contrast, Pimbwe, whose institutions encourage sharing within villages rather than between, will offer lower amounts and punish less when playing with individuals *outside of* their village.

2. *The magnitude hypothesis*. Because of their generosity and tendency to enforce sharing rules (Abrahams 1967), Sukuma will make higher offers and reject low offers more frequently than Pimbwe, who lack such rules and rarely enforce cooperation rules outside of the family.

3. *The macro/micro hypothesis*. Individuals' ethnic affiliation, used as a proxy for institutional rules, will have a greater effect on offers and rejections than individual economic and demographic characteristics.

ETHNOGRAPHIC DESCRIPTION

Pimbwe and, recently, Sukuma live interspersed in several villages in the northern section of southwestern Tanzania's Rukwa region. The Pimbwe (the original inhabitants of the area), who once hunted game, have depended mainly on maize horticulture since the establishment of a national game reserve in the region. Their political structure involved loosely linked clans controlled by a chief in a centrally located village (Willis and International African Institute 1966). Political integration between clans existed, but overall there was little need for large-scale cooperation between settlements. After the state settlement scheme of the 1970s (Ujamaa), some of the Pimbwe were forced to leave their isolated households in the forest and settle in villages that now contain a few thousand people.

Originally from the northern part of Tanzania, Sukuma agro-pastoralists have since the 1960 and '70s migrated in large numbers to every region in Tanzania (Galaty 1988). Today there are nearly as many Sukuma as Pimbwe living in the study area. Traditionally, the Sukuma lived in a multiple chiefdom system in which local chiefs controlled large areas but also cooperated with distant chiefs. The Sukuma also had powerful organizations and clubs at the village level (Abrahams 1967, Abrahams and International African Institute 1967) that

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2. We define "institutions" as sets of cultural rules that, through sanctions, maintain patterns of behavior.

have preadapted them to sophisticated cooperation among agricultural cooperatives (Lang 1978) and *sungusungu* justice institutions (Bukurura 1994). Village *sungusungu* organizations cooperate effectively across the country to capture and prosecute thieves (Paciotti 2002).

Ethnohistorical data point to differences in the scope of institutions between these ethnic groups. The Pimbwe have smaller-scale institutions that encourage cooperation within smaller units such as clans or villages, whereas the Sukuma cooperate at the ethnic-group level with even distant villages. Ethnographic data in the study region confirm that these institutional patterns have persisted. Pimbwe have few large-scale gatherings or events involving individuals from outside the extended family or friendship networks; they interact mostly with their families and friends from their village. As a result, Pimbwe residential mobility is low, and most individuals live in the village in which they were born. Finally, the Pimbwe have weak third-party institutions of social control and rely mainly on the state, gossip, and personal violence to mediate disputes. In contrast, Sukuma organize yearly dance competitions in which almost all the Sukuma in the study area participate. There is a continual influx of new Sukuma migrants, and individuals are immediately integrated into their new communities. While the Pimbwe are regarded as stingy, the Sukuma are renowned by Tanzanians for their exceptional generosity. Anthropologists have written about how Sukuma mothers socialize generosity in their young children by forcing them to share food with others (Varkevisser 1973). In contrast to Pimbwe, Sukuma have strong symbolic in-group markers such as jewelry, colorful capes, and hats. All of this helps create the trust that is important for maintaining efficient rule enforcement within the *sungusungu* organizations (Paciotti 2002).

METHODS AND ANALYSIS

In the village of Mahenge,[3] 20 Sukuma and 20 Pimbwe were chosen from a larger sample of households visited previously during research on the *sungusungu*. This sample was nonrandom because of logistical problems, but given our knowledge of the study population we feel that it captures much of the variation with respect to the variables of interest for both ethnic groups. In the village of Kahama, we were unable to obtain a sample of Sukuma participants but did obtain an additional sample of Pimbwe participants to test for intervillage variation.[4] Thirty-seven Pimbwe were randomly selected from a sample of houses that were part of a larger study on children's growth.

In Mahenge, individuals were placed into *within-village* and *between-village* treatments. Participants in the within-village treatment were told that they would play the ultimatum game with a member of their ethnic group from their own village. Those in the between-village treatment were told that they would play the game with members of the village of Kahama. Because we were able to obtain only a small sample of Sukuma from Mahenge and none from Kahama, we chose to have Sukuma and Pimbwe from Mahenge play the roles of both proposer and responder, with participants first proposing an offer and then responding to a preexisting offer. The researcher and an assistant individually visited participants at their homes. In each treatment, participants were matched without their knowledge to the participants whom the researchers had just visited. Thus, it was necessary to give the *first* participant in each treatment a sham offer for the rejection role in the game. In addition, offers given to responders for between-village treatments were taken not from another village but from the participant previously visited in Mahenge. Each player was told that the researcher would return the following day to report the responder's decision and, if the offer had been accepted, give them the money. Players who received false information during the games were carefully debriefed after game play.[5] In Kahama, the 16 proposers and 21 responders were visited on a single day with a local assistant and were given the same instructions as for the within-village treatment in Mahenge. Proposers were visited first and then responders were randomly matched to proposers' offers.[6]

Other than manipulation of within-village and between-village conditions, identical protocols were used in each treatment. The game was explained in Swahili using a pretested script, examples were given, and individuals played only after we were assured that they understood the game. Each player was told that the money used was not our personal money and had been given to us specifically for research.[7] Data on age, gender, amount of maize harvested last year (in 70-kg bags), and years of education for each participant were collected (table 1). After completing the game, players were questioned about their game play. We chose to play the game with 1,000 Tanzanian shillings, approximately one day's

3. Names of villages have been changed.

4. We had not yet conducted research with Sukuma in Kahama, and therefore individuals did not know us and were reluctant to participate. Playing with these individuals might have introduced bias.

5. We acknowledge that deception should be avoided because of potential harm to participants and contamination of the experimental pool for future research. We believe, however, that the monetary gain to our participants far outweighed any potential harm and that the knowledge gained from the study justified the small risk of biasing future research efforts.

6. Because we were initially concerned about contamination, one of us (CAH) stopped the game early in the day. Thus, rather than visit the homes of more proposers, offers were randomly selected from those offers that had already been mentioned and used to collect more responder data. This boosted the number of Pimbwe responders to 21. These offers are not sham offers but actual offers from Pimbwe proposers.

7. This was done in an attempt to avoid the problems mentioned by Gil-White (2002).

TABLE 1
Study Design and Treatment Results

Treatments		Participant Characteristics				Offer and Rejection Data				
Group and Treatment	*N*	Gender (male/female)	Age (mean [S.D.])	Education (mean [S.D.])	Maize (mean [S.D.])	Mean	Mode	S.D.	Rejections/ Total Players[a]	Income-Maximizing Offer
Mahenge										
Pimbwe										
Within-village	10	5/5	27.30 (5.29)	5.80 (2.53)	4.44 (4.41)	430	500	125	4/10	200
Between-village	10	5/5	42.00 (15.47)	5.20 (2.90)	3.50 (4.58)	150	150	158	0/10	100
Sukuma										
Within-village	10	9/1	37.6 (14.43)	2.70 (3.09)	24.5 (25.67)	610	900	228	0/10	100
Between-village	10	9/1	36.10 (8.63)	2.70 (3.30)	17.40 (9.48)	520	500	103	1/10	100
Kahama	16	8/8	35.69 (7.84)	5.13 (3.00)	4.13 (3.42)	406	500/300	153	8/21	300

[a]Rejections of 100 shillings.

wage in the village.[8] At the time this was a little more than one U.S. dollar, and it is close to the standard wage for most wage-labor activities in the village, including brick making, harvesting, and repairing roads. In the study area, 200 shillings buys soap, 9,000 a goat, 700 a chicken, 150 a shot of chloroquine, and 10 an aspirin tablet.

We adopted a method similar to the strategy-method ultimatum game because, in contrast to the ultimatum game, it enables the researcher to collect actual rejection data over the range of all the possible offers.[9] With this method, before responders hear the offer they must set an acceptable offer range. We first asked responders whether they would accept 100 shillings and then 200, 300, 400, and so on until they reached a point at they would accept anything higher. Then we asked them to state the range of offers they would and would not accept, explaining that if the real offer was below their range they would not receive any money.[10] Finally we informed them of the actual offer and paid them accordingly.

The institutional-scope hypothesis was tested by comparing treatments with respect to the adjusted mean values of proposers' offers. The hypothesis predicts a difference in offer size among the within-village (Mahenge-Mahenge) and between-village (Mahenge-Kahama) Pimbwe treatments (PMM versus PMK) but not among the Sukuma between-village treatments (SMM versus SMK). The magnitude hypothesis was evaluated by comparing the adjusted mean values of offer size for the two ethnic groups. The prediction is that after controlling for differences in "education," "maize," and "treatment," Pimbwe will offer substantially smaller portions of the money than Sukuma. Lastly, to test the macro/micro hypothesis, we compared the effects of "ethnic group," "maize," and "education" on mean offer size.

Offers were analyzed using SAS generalized linear model commands (Littell et al. 1991). The effects of maize, education, and age were not associated with the size of the proposers' offers within ethnic group,[11] but there were marked differences in maize and education between the ethnic groups. To accommodate these differences, the variables "maize," "education," and "age" were initially entered into an analysis of covariance. "Treatment" was entered as a fixed effect, and our hypotheses regarding offers were tested by comparing the estimated mean offer sizes associated with each treatment after statistically adjusting for the effects of maize and education. We used Tukey's adjustment for multiple comparisons to control for the type 1 experimentwise error. Further, we nested "treatment" within "ethnic group" to evaluate whether ethnicity alone was a significant predictor of offer size. Education was coded as "0" if the individual had never been to school and "1" if he or she had received at least one year of schooling. Examination of the residual plots showed that a wealthy

8. Standard cross-cultural methodology (Henrich et al. 2001) is to use the equivalent of one day's wages for the ultimatum game. However, stake size has been shown to be of little importance in these games (Camerer and Fehr 2002).

9. We thank Joe Henrich for pointing this out.

10. We did not, as the strategy method requires, ask participants to state whether they would accept *every* possible offer. We assumed that their preferences were transitive and stopped after they told us what was the lowest possible offer they would accept.

11. We were unable to obtain a substantial number of female Sukuma participants and therefore did not include gender in the multivariate model. However, gender was not associated with offer size in Pimbwe treatments. Gender has been found to have mixed effects in bargaining games conducted among participants from industrial societies (Ortmann and Tichy 1999) and proved insignificant in the cross-cultural study (Henrich et al. 2001).

Pimbwe man and a wealthy Sukuma man were influential cases. Because deletion of these two cases did not substantially alter our conclusions, we present only the full model. Age was dropped from the model because it had no effect on offer size. Finally, rejection data were analyzed using logistic regression and Fisher's exact test.

RESULTS

Table 1 presents descriptive data for offers, rejections, and income-maximizing offers (IMOs). IMOs are calculated by multiplying the offer size by one minus the proportion of players who said that they would reject at this level (e.g., IMO = [1,000−offer]*[1−prob(rejection)]). The highest IMO value is the offer proposers would have made if they had been fully knowledgeable and income-maximizing. For example, if 90% of the players said that they would not accept an offer of 100 shillings, then the expected return to someone offering 100 shillings was only 90 shillings. The proportion of players rejecting at each level was calculated from the strategy-method data. Offer means, modes, standard deviations, and proportions of individuals who rejected offers vary with the treatment.

Figure 1 presents the results for offers by treatment. The variables "ethnic group," "treatment," "education," and "maize" were all significant predictors of offer size. In support of the institutional-scope hypothesis, adjusted mean offers were significantly lower in the between-village treatment for Pimbwe (PMM versus PMK, $p = 0.0002$), but for Sukuma offers the treatments were statistically indistinguishable (SMM versus SMK, $p = 0.3491$). In support of the magnitude hypothesis, Pimbwe players from each village offered similar amounts to their within-village responders (PMM versus PKK, $p = 0.9033$) and each of these treatments' means was lower than Sukuma within-village offers (SMM versus PMM, $p = 0.0666$; SMM versus PKK, $p = 0.0042$). Moreover, there were highly significant differences in adjusted mean values by ethnic group, even after allowing for differences in "education," "maize," and "treatment" effects (Pimbwe 320 shillings versus Sukuma 583 shillings, $p < 0.0001$). Lastly, in support of the macro/micro hypothesis, when mean values are adjusted by "ethnicity," the effects of the microlevel variables were much smaller than those of the ethnic variable. An increase of one bag of maize (approximately 70 kg) reduced offer size by 4 shillings ($\beta = -4.76$, $p = 0.0109$), and having any education at all reduced offer size by 143 shillings ($\beta = -143.99$, $p = 0.0066$). In contrast, as we have seen, being Pimbwe resulted in a 263-shilling reduction in offer size.

We used Fisher's exact test to evaluate the likelihood that participants in each treatment would reject 100 shillings. The results contradicted the magnitude hypothesis because Pimbwe were *more* likely to reject offers than Sukuma in the within-village treatments (PMM versus SMM, $p = 0.045$ one-sided test). The institutional-scope hypothesis, however, was supported; only Pimbwe participants from within-village treatments punished with rejections (PMM versus PMK, $p = 0.0127$ one-sided test)

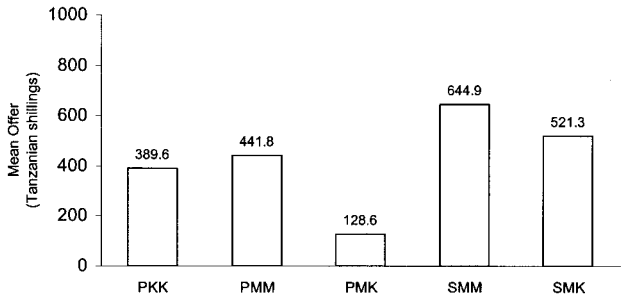

FIG. 1. *Model-adjusted mean offer, by treatment.*

whereas the Sukuma behaved similarly in the two treatments (SMM versus SMK, $p = 0.3049$). Further, with respect to intervillage consistency, the number of individuals who rejected offers was similar in the Mahenge and Kahama within-village treatments ($p = 0.1000$). Finally, because only one Sukuma rejected 100 shillings in the strategy-method procedure, we were unable to use multivariate analyses to evaluate the macro/micro hypothesis between ethnic groups. However, concerning Pimbwe treatments, a logistic regression model indicated that "education," "maize," and "gender" were not associated with the probability of rejecting 100 shillings.

DISCUSSION AND CONCLUSIONS

Using our knowledge of Pimbwe and Sukuma ethnography, we made various predictions about ultimatum-game play. The general support for these predictions suggests that the game is a valid instrument for exposing differences between groups in their penchant for sharing and punishing. The institutional-scope hypothesis was well supported.[12] The magnitude hypothesis was partially supported: Sukuma made higher offers than Pimbwe, although, surprisingly, they rejected low offers much less frequently than Pimbwe. Of particular interest, the Sukuma are known ethnographically to be generous, and their "hyperfair offers" (greater that 50%), in addition to the extremely generous offer of 90%, provide a quantitative measurement of that generosity. Such generosity has been found in only one other group, the Lamalera of Indonesia, whose daily lives also involve considerable large-group cooperation (Alvard 2002). Finally, the macro/micro hypothesis was supported in that ethnicity had a larger effect on offers than the microeconomic variables.

12. As an additional test of the institutional-scope hypothesis, seven Pimbwe from Kahama were asked to play the game with Pimbwe from Mahenge. We have not reported the results because the seven participants had not interacted with us in previous research and this would have introduced potential confounds. However, these results potentially contradict the institutional-scope hypothesis because their offers were statistically similar to the within-village Pimbwe treatments. Other cross-cultural experimentalists have found village and "camp" effects (Gurven 2002, Marlowe 2002).

Analysis of income-maximizing offers provides additional evidence that Sukuma prefer to share in the ultimatum game rather than attempt to maximize their individual monetary payoff. As predicted, Sukuma seem motivated to share regardless of the risk of rejection, whereas the Pimbwe do seem to consider risk of rejection, especially in the within-village treatments. Sukuma face low risks by offering small amounts but offer large portions anyway. In contrast, Pimbwe proposers seem to attempt to maximize their income because the income-maximizing offers correspond with actual offers. Pimbwe participants in Kahama seem well aware of a threshold. Offers of 100 shillings faced an approximately 50% chance of rejection, 200-shilling offers faced a 33% chance of rejection, and offers of 300 shillings faced only a 15% chance of rejection. Pimbwe informants explained that taking too much would result in rejections, and one participant who offered a low amount explained that he wanted to "try his luck." In fact, only two proposers' actual offers (one for 20% of the money and the other for 30%) were rejected as being below the responders' minimum acceptable amount.

Henrich et al. (2002) found that the effect of individual-level variables such as age, gender, and wealth on offer and rejection data largely disappeared when "ethnic" variables were included. Our results are similar. The effects of "age," "maize," and "education" were not associated with offer sizes *within* ethnic groups. However, the effects of "maize" and "education" on offer size, although smaller than that of "ethnicity," did not diminish to statistical insignificance. This result may be partly because Sukuma and Pimbwe fall at polar extremes with respect to education and maize production (see table 1). Nevertheless, we acknowledge that microlevel variables may play a small role in influencing game play.

In the ultimatum game, rejections are a form of punishment that is costly to both proposers and responders. The different institutions of social control operating within the two ethnic groups may illustrate why Sukuma are less likely to punish their fellow ethnic-group members. The Pimbwe—lacking strong institutions of social control *at the ethnic-group level*—generally resolve their disputes with personal violence or by getting assistance from families and the state justice system. In contrast, Sukuma institutions of social control stress collective rather than individual punishment, deviants being dealt with through the collective efforts of the *sungusungu* and other informal courts governed by neighborhood elders. An astute official correctly advised us that playing the ultimatum game with Sukuma would be difficult because Sukuma generally consult with their peers or elders before making decisions such as those involving punishment.

Another explanation for the punishment data is that Pimbwe are more concerned about inequality than Sukuma. Pimbwe often gossip about the means by which individuals have obtained wealth, and wealthy individuals share their resources to avoid witchcraft accusations. Further, male Pimbwe elders are granted little status. In contrast, wealthy Sukuma males are often the most prestigious in the community and are less concerned about witchcraft accusations. This may reflect the institutions in Sukuma society that give male elders legitimate authority to control women and the youth. Further, because of the stochastic nature of herding economies (Borgerhoff Mulder and Sellen 1994), rich Sukuma individuals can quickly become poor and vice versa. As a result, Sukuma may be more tolerant of inequality in their communities because they know that it is likely to be relatively short-lived.

The opportunity to take large proportions of the money and accept low offers was given to all participants. We believe that the strong ethnic-group and treatment effects in ultimatum-game play were the result of individuals' bringing institutional rules from their real lives into the game. Sukuma have learned that sharing with other Sukuma (regardless of where they live) is mandatory—those who fail to share are often punished. Pimbwe also have sharing rules, but extreme generosity, especially to Pimbwe outside of the local clan or village, is not stressed. These rules alter the payoff structure so that an individual's utility is no longer defined purely on the basis of monetary income. Pimbwe, knowing that sharing is important in their village, cannot take too much money or they will be punished. However, when playing with a distant village this rule does not apply. In contrast, a Sukuma explained that members of his ethnic group share generously with all Sukuma because "it is disgraceful to act like a hyena and take too much." In sum, although individuals from each ethnic group have the capacity to act altruistically, the *degree* of self-sacrificing behavior relative to self-interested behavior and the *scope* of sacrifice are contingent on institutional rules (Richerson and Boyd 1999).

In conclusion, when carried out in the developing world, experimental games are an inexpensive and easy addition to the ethnographer's toolkit. Although we acknowledge the limitations of such games (Camerer and Fehr 2002), they do offer a new method for theoreticians to test competing hypotheses about human behavior (Smith, Borgerhoff Mulder, and Hill 2001) and for social scientists to assess different types of institutions across communities.

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Selfishness and Fairness in Economic and Evolutionary Perspective: An Experimental Economic Study in Papua New Guinea[1]

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Although often seen as among the most idealistic and the most dismal of sciences respectively, the disciplines of anthropology and economics in fact have much in common. Both are concerned with understanding and predicting regularities and variability in human behavior, and both have historically studied human behavior in more or less "natural" environments (cultures, societies, populations, and markets). Moreover, unlike some social and natural sciences, they have historically shunned experimental manipulation of subjects. The similarities between *evolutionary* anthropology and economics are even more apparent, with both postulating that human behaviors (and, for the former discipline, aspects of morphology as well) are designed to maximize some outcome. According to most economists, humans behave in the service of maximizing utility, the usefulness or satisfaction provided by some preferred good, activity, or balance thereof. In industrialized societies, where access to individuals' preferred goods and activities is facilitated largely through monetary transactions, most economists expect them to behave as maximizers of material payoffs. For scientists guided by the logic of evolutionary theory, behavior is designed to maximize fitness, the proportional representation of an individual's genes in succeeding generations. Fitness maximization,

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