# Does culture matter in economic behavior?

## Ultimatum Game Bargaining among the Machiguenga of the Peruvian Amazon

by

Joe Henrich

Department of Anthropology
505 Manhattan Beach Blvd #6
Manhattan Beach, CA 90266
Phone (310) 213-2314
Fax (310) 206-7833
henrich@ucla.edu

## Ultimatum Game Bargaining among the Machiguenga of the Peruvian Amazon

**Abstract**

In revising economic theory, researchers have generally assumed, often implicitly, that all humans deploy similar, pan-human cognitive machinery for making economic decisions. This paper, however, reports results from an experimental economics game (the Ultimatum Game) performed in the Peruvian Amazon which substantially deviate from the robust results found elsewhere in the world. These data strongly suggest that cultural differences (socially transmitted behavioral rules) may fundamentally affect basic economic behavioral patterns.

During the last 20 years experimental economists have demonstrated that human economic reasoning substantially deviates from the predictions of positive game theory under a number of important conditions—including risk, bargaining, cooperation, etc. (see Kagel and Roth 1995 or Davis and Holt 1993 for overviews). In response to this, some economists have begun to modify economic theory to incorporate what we've learned from this laboratory research (Bolton 1991;Fehr and Schmidt 1997). Like most efforts to model human behavior in economics, these new approaches, implicitly or explicitly, make certain universalist or pan-human assumptions about the nature of human economic reasoning. That is, they assume that humans everywhere deploy the same cognitive machinery for making economic decisions, and consequently, will respond similarly when faced with comparable economic circumstances. Here, I address this assumption with experimental evidence (Ultimatum Game results) from the Peruvian Amazon. Comparisons of the Machiguenga result with a Los Angeles control experiment and existing cross-cultural data suggest that economic decisions and economic reasoning may be heavily influenced by cultural differences—that is, by socially transmitted rules about how to behave in certain circumstances (economic or otherwise) that may vary from group to group as a consequence of different cultural evolutionary trajectories. And consequently, if experimental games are to be taken seriously, in that they capture aspects of economic reasoning relevant to real life, and if the Machiguenga results stand the test of scrutiny and can be replicated elsewhere, then the assumption that humans share the same economic decision-making processes must be reconsidered.

**The Ultimatum Bargaining Game**

The Ultimatum Game (hereafter abbreviated UG) is a simple bargaining game that has been extensively studied by experimental economists. In this game, two players are allotted a sum of money (termed the "stakes"). The first player, called the "proposer," offers a portion of the total sum to a second person, called the "responder." The responder can either accept or reject the proposer's offer. If the responder accepts, she (or he) receives the amount offered and the proposer receives the remainder (the initial sum minus the offer). If the responder rejects the offer, then neither player receives anything. Players typically receive payments in real money and usually remain anonymous to other players, but not to the experimenters—although experimental economists have extensively manipulated both of these

variables. In the Machiguenga and Los Angeles experiments described herein, players were always anonymous to other players (but not the experimenter), and the stakes were large relative to previous UG experiments and the subjects' socioeconomic status.

Previous UG experiments clearly demonstrate two important things. First, game behavior substantially deviates from the predictions of positive game theory (under standard preferences). Positive game theory (specifically, subgame perfect equilibrium and money maximization) unambiguously predicts that proposers should offer the smallest, non-zero amount possible, and responders should always accept. For example, if $20 is allocated to a pair of players with the smallest unit being $1, then the proposers should offer $1 to the responder and keep $19 for himself. Responders should always accept any non-zero offer—responders face a choice between 0 and something (in the subgame perfect case it's between $0 and $1). In contrast, experimental subjects from industrial societies behave quite differently: the modal offer is typically 50% and the mean offer averages between 40 and 50% of the total. Responders usually accept average offers, but often reject offers lower than 20% of the total sum (Camerer and Thaler 1995; Roth 1995).

Second, although UG results consistently and substantially deviate from the predictions of game theory, these results are very robust. Experimental economists have systematically studied the influence of various factors on the game's results, including stake size[1] (Cameron 1995; Tompkinson and Bethwaite 1995; Hoffman et. al. 1996) degree of anonymity (Forsythe et al. 1994; Bolton and Zwick 1995), context (Hoffman et al. 1994; Konow 1996) and "culture" (Roth et al. 1991; Cameron 1995; Slonim and Roth 1998), and concluded that each has little or no effect on players' behavior.

---

[1] For example, Cameron's (1995) analysis of ultimatum game data from Indonesia, where she was able to provide sums equivalent to approximately three months salary for test subjects, strongly rejects the hypothesis that higher stakes move individuals closer to game-theoretic behavior. Similarly, Hoffman, McCabe and Smith (1996) tested the effect of raising the stakes from $10 to $100 dollars, and found they could not "reject the hypothesis that the offers are identical with $10 stakes and with $100 stakes." Generally, the data suggest that proposers move away from game-theoretical predictions and toward a 50-50 split; responders, consequently, accept these proportionately higher offers more frequently.

Most important in the present context: existing experimental data and analyses have shown that people from many parts of the world (Europe, Asia and North America) behave quite similarly in the UG. In studies from places as different as Ljubljana (Slovenia), Pittsburgh, Tokyo (Roth et al. 1991), Yogyakarta (Indonesia, Cameron 1995), Tucson (Hoffman et al. 1994) and Los Angeles, proposers make similar mean offers (40 to 50% of the total), and responders frequently reject low, "inequitable" offers.

This robust pattern of UG behavior has led many economists to develop models which posit that humans possess either an innate taste for costly punishment, an innate sense of fairness or some combination of both (Camerer and Thaler 1995; Roth 1995; Bolton and Zwick 1995; Konow 1996). However, my UG data indicate that the Machiguenga behave very differently than subjects drawn from industrialized populations, and therefore, that notions about what's fair and/or what deserves punishment are culturally variable—meaning that people behave differently as a consequence of having grown up in different places. Because of the potential importance of the Machiguenga society to interpreting the data, I will first briefly describe the lifeways of the Machiguenga and then present the results.

**The Machiguenga**

Traditionally, the Machiguenga lived (and some continue to live) in mobile single-family units and small extended-family hamlets scattered throughout the tropical forests of the southeastern Peruvian Amazon, while subsisting on a combination of hunting, fishing, gathering and manioc-based swidden horticulture. Economically-independent at the family-level, this Arawakan-speaking people possess little social hierarchy or political complexity, and most sharing and exchange occurs within extended kin circles. Cooperation above the family level is almost unknown, except perhaps, for cooperative fish poisoning (Baksh 1984).

During the last 30 years, missionaries, markets and government-administered schools have sedentized and centralized most of the Machiguenga into a number of villages in a continual process of increasing market integration. As these demographic changes have strained local game and wild food resources, the Machiguenga have gradually intensified their reliance on horticultural products, especially manioc (a starchy root crop). In an effort to buy increasingly available western goods, many Machiguenga farmers have begun to produce cash crops (primarily coffee and cocoa), raise domesticated animals (e.g.

5

chickens, ducks and guinea pigs) and participate in limited wage labor (usually for logging or oil companies; see Henrich 1997).

Although most Machiguenga now live in small communities of about 300 people, they remain primarily a family-level society. This means that families fully produce for their own needs (food, clothing, etc.) and don't rely on institutions or other families for their social or economic welfare, although there is a constant demand for market items such as machetes, salt, sugar and steel axes. With the exception of recent river trips to the nearest (minimum 8-hour trip) towns, anonymous transactions are almost unknown. When local bilingual schools (Machiguenga-Spanish) are not in session and the incessant rains of the wet season make travel difficult, many families move away from the community to live in their distant gardens—often located 2 to 3 hours away from the village (Henrich 1997).

**Methodology**

To deal with the particular challenges of performing experiments in the Machiguenga ethnographic setting, I had to modify the typical experimental procedures used in the Ultimatum Game. First, I gathered twelve men together between the ages of 18 and 30 under the auspices of "playing a fun game for money." I explained the game to the group in Spanish using a set script written in simple terminology like "first person" to reference the proposer and "second person" for the responder (Spanish is a second language for the Machiguenga). After this I had a bilingual school teacher (an educated Machiguenga) re-explain the game in the Machiguenga language (translating from my script), and display the money that we would be using to make payments. After this, each participant entered my house (the guest hut) individually. We explained the game a third time, and I asked a number of hypothetical, practice questions intended to test the participants comprehension of the game. We re-explained parts of the game as necessary. Often numerous examples were necessary to make the game fully understood. After the individual confidently answered at least two hypothetical questions correctly, I would submit the actual question with a pile of 20 *soles* (Peruvian money) in view. The following day, after having successfully gotten 12 responses and paid out some money, I began seeking randomly-selected individuals to play the game. Most people had already heard of the game and were eager to play. I privately explained the game to each individual (usually in their house) and ran through the same testing procedure as the previous day.

6

During this process several people were rejected because they, after 30+ minutes of explanation, could not understand the game—at least they could not correctly answer the hypothetical questions.

The initial 12 players were volunteers, but the next 30 players were selected at random from my demographic survey. Similarly, most players were randomly assigned to their roles—proposer or responder—prior to playing the game. Players, however, were not informed of their respective roles until after they had correctly answered the two hypothetical questions. To prevent some of the initial 12 individuals from guessing with whom they might be paired, I began by assigning the first five players to the role of proposer, after which I then switched to randomly assigning the roles. The last 3 players were all responders—in order to even out the numbers of proposers and responders. I paired responders with proposers by randomly selecting from among the outstanding offers. Machiguenga players were told that their anonymous partner was another member of their community (Camisea), but nothing more was said about how this individual would be chosen, their age, sex or family.

Demographically, Camisea contains 260 people from 36 households, with about 70 adults. These 36 households can be roughly divided into 12 extended families. The player pool contains 14 females and 28 males. The females ranged in age from 24 to 37 years, while the males ranged from 17 to 56. The mean age for all the players was 26.3 years.

Although such things as procedural differences seem unlikely to explain the substantial differences observed between the Machiguenga and the typical robust results—considering that procedural variations in the UG have been extensively tested and nothing approaching these differences has ever emerged—I repeated a nearly identical version of the Machiguenga UG with UCLA graduate students in Los Angeles in order to control for (1) stake size, (2) 'community closeness', (3) experimental procedures, (4) instructional details, (5) age of players, and (6) the experimenter himself. First, the Machiguenga's 20-*soles* stake equals about 2.3 days pay from the logging or oil companies that occasionally hire local labor. In order to match this amount, I set the UCLA stake at $160, which is about 2.3 days pay for a graduate student working as a "reader" ($9-$10 per hour after taxes). Second, because the Machiguenga were told that they were playing with an anonymous person *from their community*, which contains about 70 adults, I limited the UCLA experiment to graduate students in the Department of Anthropology (also a community of about 70 adults), and informed the subjects accordingly. Third, as with

the Machiguenga, all UCLA subjects received the game instructions both written and verbally, in a one-on-one situation with the experimenter, and had to answer hypothetical test questions before actually playing the game. Unlike the Machiguenga, UCLA students also had to sign a consent form before playing. Fourth, in both cases I used the same written instructions (translated into English at UCLA), and the same pattern of examples and test questions. Fifth, the average age of Machiguenga subjects was 26.3 years, while UCLA graduate students have an average age of 25.7 years.

Finally, in both experiments I was the primary investigator: I explained the game, presented the examples and posed the questions to the subjects. Although it's certainly true that I am not perceived in the same way by these two groups, this experiment does control for some aspects of experimenter bias. In typical UG experiments, subjects do not usually know the experimenter, but I am known in both groups, and players may need to interact with me in the future. So, if knowing the experimenter and expecting future interaction with him causes people to behavior more fairly, then we should expect both Machiguenga and UCLA graduate students to behave more fairly—double blind experiments have produced 'less fair' results; see Hoffman et. al. 1994). One might even suggest that the Machiguenga should behave especially fairly in order to 'look good' in front of a 'rich' westerner with many useful items to give out. Second, if in the course of administering the game I unconsciously display leading facial expressions, use suggestive tones or exhibit some other personal qualities which cause people to propose and accept low amounts, then the control group should reveal similar behavior—previously cross-cultural researchers have worried about this and attempted to test for it (see Roth et. al. 1991: 1071). Note that, at UCLA, unlike the Machiguenga situation where I was accompanied by a local assistant, I worked alone with subjects during the experiment.

**Results**

Table 1 shows UG results from the Machiguenga, a Los Angeles control group, and a number of other experiments performed in different parts of the world. Clearly, the Machiguenga data differs substantially from the patterns found in other UG results. In comparison to other high stakes games in Yogyakarta (Indonesia) and Los Angeles (the control), where the mean offers were 44% and 48% respectively, Machiguenga proposers offered only 26%. This result also contrasts with games using more typical stakes: mean offers in Tokyo, Pittsburgh, Yogyakarta and Tucson are all 44% or 45% of the total—

8

almost double that of the Machiguenga. All the experiments have modes at 50%, except in the low stakes game in Yogyakarta, where it is 40%, and among the Machiguenga, where the modal offer drops to 15%.

Note that the Los Angeles control group data does look slightly different from the typical U.S. results. The mean is slightly higher and the variance is smaller (the mode, 50%, entirely dominates Los Angeles offers). Both of these differences (the mean and variance) tend in directions opposite to those demonstrated by the Machiguenga (relative to the typical results), and cannot explain the Machiguenga differences. However, the pattern of differences between the Los Angeles data and typical U.S. data is consistent with the effect created by increasing the stakes (more "fair" offers and less variance in offers) shown in previous experimental studies—and the Los Angeles experiment was certainly a high stakes" game[2].

Figure 1 overlays three high stakes games: the Machiguenga, the Los Angeles control and the high stakes Yogyakarta game. Clearly, the distribution of Machiguenga proposer offers is substantially different from the other two, which appear much more similar. Table 1 provides the $p$-values for the Epps-Singleton non-parametric tests (EST) confirm that the distributional characteristics of the Machiguenga data are quite different from both the other high stakes games.[3]. The test also indicates a marginal difference ($p = 0.08$) between the Yogyakarta data and the Los Angeles data, but in a direction opposite to the Machiguenga data. This is consistent with the possibility that smaller cultural differences may also exist between Americans and Indonesians (more on this later), but may also be a product of the procedural differences discussed earlier.

---

[2] It also seems likely, however, that anthropology graduate students represent a self-selected and biased portion of the U.S. population, which tends to exhibit a greater sense of social responsibility and concern for economic equality than the average person. Consequently, proposers make more "fair" offers, and responders are quite willing to reject "unfair" offers (according to post-game interviews). So then, in the same way that graduate students in economics tend to make lower than average offers, anthropology graduates may tend to make higher than average offers.

[3] The Epps-Singleton non-parametric statistical test is ideal for the discrete, non-normally-distributed data typically produced by ultimatum games (see Forsythe et. al. 1994). This test compares the overall distributional characteristics of two data sets, rather than just their central tendencies (as does the Mann-Whitney test). This is important because often the mean of a UG data set captures little about the overall data.

Because the stake size usually does not strongly affect the game results (Cameron 1995; Hoffman et. al. 1996; Roth et. al. 1991), it's also useful to compare the Machiguenga data to other experiments that used the more typical stakes of about $10. Figure 2 overlays the distribution of proposer offers for the Machiguenga, Pittsburgh and Jerusalem. The three distributions appear quite different. As with the high stakes games, the Machiguenga are highly significantly different in overall distribution characteristics from both University of Pittsburgh students and Hebrew University students. Also, the central tendencies of the Pittsburgh (mean of 0.44) and the Jerusalem (mean of 0.36) data are significantly different (using the Mann-Whitney $p = 0.024$), although the EST, which places less emphasis on central tendencies, yields a non-significant $p$-value of 0.16. As illustrated in Figure 2, bimodal distributions appear to underlie both the Jerusalem and Machiguenga data: the Machiguenga distribution appears to have a secondary mode at 50% and Jerusalem shows a secondary mode at 10%.[4]

On the receiving end, responders from industrial societies often reject offers below 20% (see "Rej<20%" in Table 1), although these offers are quite rare. For example, proposers in both Los Angeles and Pittsburgh made 0 and 1 offers below 20%, respectively. Machiguenga responders, however, almost always accept offers less than 20%, and nearly half of the total offers (10 of 21 offers) were below 20%. The overall rejection rate for the Machiguenga was also quite low (0.048), especially when compared with Tokyo, Pittsburgh, Jerusalem and Yogyakarta. Interestingly, in addition to the difference in the central tendency of the Jerusalem experiment, it also reveals the highest overall rejection rate and the highest rejection rate of offers below 20%. Moreover, Jerusalem shows the second highest proportion of offers less than 20%, second only to the Machiguenga.

---

[4] Roth et al. used the Round 10 data (the last round) for inter-study comparison. Using either Round 1 or Round 10 to compare to a single-shot game generates analytical ambiguities. In round 10 players may have modified their strategy through learning, while in round 1 players know it's a repeated game (but not repeated with the same person), so they may also make strategic adjustments compared to a single-shot game.

10

Although the Yogyakarta data cannot be distinguished from the Pittsburgh data in terms of central tendency (using the Mann-Whitney test, see Cameron 1995), the EST reveals an overall distributional difference ($p = 0.023$) not previously noted in the literature. This difference can be observed by comparing such distributional characteristics as Indonesia's mode, standard deviation and frequency of offers below 20% with typical results from the U.S. (exemplified by the Pittsburgh and Tucson data).

Discussions, post-game interviews, and observations of body language gleaned from both the Machiguenga and Los Angeles experiments provide some further explanatory insights into the differences between Machiguengas and Westerners. The Machiguenga often had difficulty articulating why they were willing to accept low offers, but several individuals made it clear that they would always accept any money regardless of how much the proposer was getting. Rather than viewing themselves as being "screwed" by the proposer, they seemed to feel it was just bad luck that they were responders, and not proposers. Los Angeles players, in contrast, claimed they would reject "unfair" offers (below 25% usually), and a few claimed they would reject any offer below 50%. Correspondingly, some Los Angeles proposers, when asked why they offered 50%, said they were thinking of offering less, and that most people would accept less, but they figured there were some people out there who might reject an offer below 50%, so they wanted to be sure to get the $80 (half of the $160 stake). The few Machiguenga who offered 50%, when asked why, said that 50/50 was "fair." When asked if they thought their fellow Machiguengas would accept less, they said "yes, for sure." Many Los Angeles proposers, particularly those who seemed to know exactly what they were going to offer immediately (rather than pondering over it for 5 minutes or so like many other Los Angeles proposers) said they offered 50% "to be fair."

Taken together, these data suggest that Machiguenga responders did not expect a balanced offer, and Machiguenga proposers were well aware of this. The few Machiguenga proposers who offered 50% were, without exception, those who'd had greater exposure and dealings with Westerners and especially North American Evangelical missionaries—so they may have acquired some western notions of fairness from these contacts. Los Angeles proposers were a mix of people concerned with fairness and people concerned with avoiding punishment. Interviews suggest that many Los Angeles proposers accurately assessed the potential behavior of responders (according to responder claims), and adjusted their behavior to ensure offer acceptance.

Besides the substantial differences between the Machiguenga and everywhere else, I have discussed differences between Los Angeles and Yogyakarta using high stakes, between Pittsburgh and Yogyakarta using lower stakes, and noted the existing difference between Pittsburgh and Jerusalem. It's difficult to explain these differences in UG behavior without considering that, perhaps, subjects from different places arrived at the experiments with different rules of behavior, expectations of fairness and/or tastes for punishment.

**Public Goods Games among the Machiguenga support Ultimatum Game Result**

Recent common property resource experiments performed by Smith (1999) among the Machiguenga (in the same village as the ultimatum game) show a decisive difference from the one-shot CPR games commonly played in the U.S.[5] The Machiguenga contribute an average of 20% of the total to the common pool, while people in the U.S. typically contribute between 40% and 60%. Similarly, the modal contribution for Machiguenga is 0—complete defection—while the modal U.S. offer is often 50%. These findings are consistent with my ultimatum game results and with the idea that the Machiguenga have little sense of obligation to, or expectation of cooperation with, randomly selected co-villagers (as well as with the more general claim about the presence of cultural differences in experimental games).

**Extensive ethnographic research among the Machiguenga supports Ultimatum Game results**

Extensive ethnographic fieldwork performed by Johnson (1983) and Baksh (1984) support the hypothesis that differences in socially-learned behavioral patterns are responsible for the UG performance differences observed between the Machiguenga and other subject pools. Johnson describes the Machiguenga as independent, individualistic, practical, straightforward, self-reliant and not overly concerned with public opinion. The Machiguenga hate wage labor, and although they desire cash (which is quite scarce), they will often refuse to do work not to their liking. Community work projects and cooperative gardening ventures typically flop, as many individuals refuse to contribute at all, or they help for a while

---

[5] The basic CPR game has the following form: Some number of players, often between 4 and 10, receive an individual endowment of real money. Each player, often in secret, can contribute between zero and their total endowment to a common pool. Then, after each player has had an opportunity to contribute to the common pool, the total sum in the pool is augmented by some percentage. The newly increased sum is then divided *equally* among the all players. For an introduction to CPR games see Davis & Holt (1993).

and leave on a whim. Democratically-elected community leaders, after three decades of striving to "build community," remain largely powerless and ineffective.

The Machiguenga have little, if any, sense of social responsibility beyond their extended kin circle. Machiguenga families are economically independent and mobile. Friction with neighbors causes dispersal—nuclear families may live entirely alone in the forest for months at a time. Until recently, the Machiguenga lacked personal names and referred to other individuals by their appropriate dravidian kinship term (Snell 1964)—suggesting that non-kin contacts were sufficiently rare as to negate the necessity to invent names. Marriages even have a cross-cousin and local group preference (meaning your potential husband or wife has an appropriate kin term and should live nearby). As a rule, the Machiguenga lack any sense of group identity or unity (Johnson 1978); the term "Machiguenga" merely represents a western classification of their language group. Together, this ethnographic description supports the idea that the Machiguenga have little or no expectations of favorable treatment from anonymous persons and thus no reason to punish. That is, there's no expectation of "fairness" to violate and get punished for violating.

**Conclusion**

As the first test of the UG's robustness outside of industrialized societies (and one of the few experimental economics games ever performed in such a context), the Machiguenga UG results indicate suggests that culturally-transmitted behavioral variation may substantially affect decision-making. This result amplifies Roth et al.'s (1991) similar, but more tentative conclusion. After four UG experiments in which they carefully controlled for stake size, procedural variations, translation differences and currency scales, Roth et al. concluded that the small, significant differences found between Tokyo, Pittsburgh and Jerusalem can best be explained as "cultural differences." Later, Roth (1995), in examining the difference found between American and Israeli proposers, suggests that these results indicate a difference in what is perceived as "fair", or what is "expected" under the circumstances. My comparison of Machiguenga and Los Angeles subjects yields a similar conclusion, only more extreme. Machiguenga proposers seemed to possess little or no sense of obligation to provide an equal share to responders, and responders had little or no expectation of receiving an equal share, or any desire to punish unequal divisions. The modal offer of 15% seemed quite "fair" to most Machiguenga. Similarly, after reviewing a wide range of results from

ultimatum and dictator games, Camerer & Thaler (1995) suggest that, "people have simply adopted rules of behavior they think apply to themselves and others, regardless of the situation."

This evidence generates at least three important questions: 1) Where do people get their rules, expectations, or notions of fairness from? 2) Why do these rules, etc. seem to vary among groups of people? and 3) How much can these varying rules, expectations and notions affect real economic behavior? One approach to these questions is to treat humans as social animals who acquire many of their behavioral rules, rule calibrations, beliefs and practices from other humans via social learning (see Boyd & Richerson 1985 for a theoretical treatment). The second question can then be addressed by specifying the cognitive apparatuses, imitation rules or interactional processes that maintain similarities within groups. The third question depends on how important social learning is for economic behavior. If the Machiguenga results can stand the test of scrutiny and can be replicated elsewhere, then cultural transmission can substantially affect economic decisions. If cultural differences do greatly influence economic behavior, then the implicit assumption that all humans share the same economic decision-making processes, the same sense of fairness, and/or the same taste for punishment must be brought into question[6].

Some researchers have expressed skepticism about the relative importance of game results from remote, non-market contexts because economists are primarily concerned with behavior of markets and market institutions—thus the behavior of non-market peoples is of little concern to economics. First, many economists would dispute this restriction their domain, and instead would claim to be interested in *human* economic behavior. The field of development economics, for example, endeavors to address problems in partially market-integrated societies, like the Machiguenga. A quarter of the world's population, and most of China, are peasants who live partially in and partially out of the market (Ellis 1988). Second, it's quite possible that the sense of fairness and/or taste for punishment  (or the "rules" of Camerer & Thaler) that generate the typical ultimatum game behavior also underlie the functioning of market systems and institutions. Thus, to understand the evolution of such systems and their supporting institutions, we need to understand the evolution of the norms of fairness and punishment that allow these systems to operate.

---

[6] This by no means suggests that we cannot generalize about human behavior. Rather, it suggests we need a theory of culture, or of cultural transmission in order to do so.

It's quite clear that markets and market institutions function quite poorly or not at all in places where such norms do not exist. Third, knowing if notions of fairness and tastes for punishment are culturally or genetically programmed substantially affects how we understand their dynamics. For example, culturally transmitted beliefs, values, tastes, rules and expectations can change drastically in 100 years or less, while genetic changes occur on thousand year time scales. If these expectations and tastes are culturally transmitted, Westerners could be playing the ultimatum game quite differently in the next century. However, if these are genetically encoded, we are likely to be playing the same way for a long time to come.

From a certain perspective the Machiguenga results should not seem all that surprising. Prior to the Machiguenga experiment, all previous UG research had been performed among sedentary, market-dependent populations inhabiting industrial, state-level societies with long histories of political complexity and highly integrated divisions of labor—a combination of characteristics representing only a small fraction of the world's available cultural diversity[7]. By restricting attention to literate, industrial, market societies, many of the important dimensions along which such things as culturally-transmitted norms about fairness and punishment (i.e. UG behavior) vary may have unknowingly been kept constant. Consequently, if we

---

[7] Certainly a majority of the people involved in the majority of economic transactions in the world do live in industrial, market-integrated societies. However, if we are interested in understanding how culture influences game behavior, then we need to take advantage of the tremendous variability provided by the full spectrum of social groups, regardless of their contribution to the overall population of the world.

Some might think that variables like "state-level society" and " a long history of political complexity" are irrelevant." I think this is an empirical question, and we currently lack the data to properly evaluate it. Something is going on with the Machiguenga, and these are some of the dimensions that all previous studies have kept constant, but along which the Machiguenga differ.

Also, some readers might question whether Indonesia qualifies as 'industrial'. Cameron (1995) performed the Indonesian experiments in the city of Yogyakarta—a major cultural center that supports a population of 400,000—with "students in the Faculty of Sociology and Politics at Gadjah Mada University" (p.3). Some regions of Indonesia, like those living on Borneo, the outer Islands or Irian Jaya, could not be described as an part of an 'industrial society, however the rich, elite, university students in southern Java live in an industrial world loaded with cars, factories, asphalt, wage labor, electricity, markets and cola-cola.

observe small differences in mean offers between places as similar as Pittsburgh and Jerusalem, then larger differences between places as vastly different as Pittsburgh and the Machiguenga village of Camisea should not seem so unexpected.

**Reference List**

Baksh, Michael. 1984. "Cultural Ecology and Change of the Machiguenga Indians of the Peruvian
Amazon." University of California Los Angeles.

Bolton, Gary E. 1991. "A Comparative Model of Bargaining Theory and Evidence." *The American
Economic Review* 81(5):1096-136.

Bolton, Gary E. and Rami Zwick. 1995. "Anonymity Versus Punishment in Ultimatum Bargaining." *Games
and Economic Behavior* 10:95-121.

Boyd, Robert and Peter Richerson. 1985. Culture and the Evolutionary Process. Chicago IL: The
University of Chicago Press.

Camerer, Colin and Richard H. Thaler. 1995. "Anomalies: Ultimatums, Dictators and Manners." *Journal of
Economic Perspectives*  9(2):209-19.

Cameron, Lisa. 1995. "Raising the Stakes in the Ultimatum Game: Experimental Evidence From
Indonesia." Princeton University.

Davis, Douglas D. and Charles A. Holt, editors. 1993. *Experimental Economics.* Princeton, N.J.: Princeton
University Press.

Ellis, Frank. 1988. *Peasant Economics.*  Melbourne: Cambridge University Press.

Fehr, Ernst and Klaus M. Schmidt. 1997. "A Theory of Fairness, Competition, and Cooperation."

Forsythe, Robert, Joel L. Horowitz, N. E. Savin, and Martin Sefton. 1994. "Fairness in Simple Bargaining
Experiments." *Games and Economics Behavior* 6:347-69.

Henrich, Joseph. 1997. "Market Incorporation, Agricultural Change, and Sustainability Among the
Machiguenga Indians of the Peruvian Amazon." *Human Ecology* 25(2):319-51.

Hoffman, Elizabeth, Kevin McCabe, Keith Shachat, and Vernon Smith. 1994. "Preferences, Property
Rights, and Anonymity in Bargaining Games." *Games and Economic Behavior* 7:346-80.

Hoffman, Elizabeth, Kevin McCabe, and Vernon Smith. 1996. "On Expectations and Monetary Stakes in Ultimatum Games." *International Journal of Game Theory* 25:289-301.

Johnson, Allen. 1983. "Machiguenga Gardens." Pp. 29-63 in *Adaptive Responses of Native Amazonians*, editors Raymond Hames and W. Vickers. New York: Academic Press.

Johnson, Orna. 1978. "Interpersonal Relations and Domestic Authority Among the Machiguenga of the Peruvian Amazon." Columbia University.

Kagel, John H. and Alvin E. Roth, editors. 1995. *The Handbook of Experimental Economics*. Princeton: Princeton University Press.

Konow, James. 1996. "A Positive Theory of Economic Fairness." *Journal of Economic Behavior & Organization* 31:13-35.

Roth, Alvin. 1995. "Bargaining Experiments." Pp. 253-348 in *The Handbook of Experimental Economics*, editors John H. Kagel and Alvin E. Roth. Princeton: Princeton University Press.

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." *American Economic Review* 81:1068-95.

Slonim, Robert and Alvin E. Roth. 1998. "Learning in High Stakes Ultimatum Games: An Experiment in the Slovak Republic." *Econometrica* 66(3):569-96.

Smith, Natalie. 1999. "Common-Pool Resources Game among the Machiguenga." www.ben2.ucla.edu\~henrich.

Snell, Wayne. 1964. "Kinship Relations in Machiguenga." Hartford Seminary Foundation, Hartford, Conn.

Tompkinson, Paul and Judy Bethwaite. 1995. "The Ultimatum Game: Raising the Stakes." *Journal of Economic Behavior and Organization* 27:439-51.

**Fig 1**.  High Stakes cross-cultural proposer offer distributions for the Machiguenga, Indonesia and Los

Angeles

**Fig. 2.** Cross-cultural proposer offer distributions for the Machiguenga, Pittsburgh and Jerusalem