Chapter 10

Economic Game Behavior Among the Shuar

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Previous cross-cultural research on decisionmaking in economic games by Joseph Henrich and his colleagues (Henrich, Boyd, . . . McElreath 2004; Henrich, Boyd, . . . Henrich 2005) revealed both substantial variation across cultures and substantial deviation from the predictions of traditional economic models. Some of the most "selfish" behavior, as measured by offers in the ultimatum game, was observed in the smallest-scale societies, such as the Machiguenga, Quichua, and Hadza. These societies are characterized by both relatively small social groups and relatively low market integration. However, the same can be said of the Ache and the Achuar, who exhibited offers trending typically toward even splits. Although these cultures share many features, such as small social scale and subsistence ways of life, they also differ in myriad ways, including, among many other factors, different cultural histories and ecologies. What combination of factors best explains the distribution of offers seen within and between cultures?

The Shuar of Ecuador are an interesting population to investigate in this regard, especially when compared to the Achuar, Quichua, and Machiguenga populations examined in prior research. Culturally, the Shuar are most similar to the Achuar. The two populations have languages that, for the most part, are mutually intelligible, they share many customs and cultural practices, and they are descended from the same ancestral culture. Both, like the Machiguenga, are highly individualistic cultures in many ways, and traditionally neither has a political organization above the level of household or extended family (Harner 1972; Johnson 2000). Compared to the Achuar, however, the Shuar have a longer history of economic and cultural exchange with the Spanish colonial culture of highland Ecuador, as well as a higher degree of market integration (Blackwell et al. 2009; Bremner and Lu 2006; Lu 2007; Rubenstein 2001; Rudel, Bates, and Machinguiashi 2002). Geographically, they exhibit substantial overlap with the Quichua, sometimes living in the same villages and in essentially the same economic circumstances. In prior research, however, Quichua exhibited very different economic decisionmaking than Achuar living in the same community (Patton 2004). Interestingly, the Quichua are known locally for higher degrees of market integration and market savvy than the Achuar, and yet they exhibited lower offers in the UG, behavior that is generally more consistent with less market integration.

Chinimpi, the Shuar village where we played the games presented in this study, is situated toward the middle to upper end of the spectrum of market integration among Shuar communities. The most market-integrated Shuar communities are those situated in or near the relatively large and long-established cities of Macas and Sucua, where there have been Shuar merchants and businesspeople for many years. One study, conducted in provinces north of our study site, found that rates of wage labor among five indigenous groups (Quichua, Shuar, Secoya, Cofan, and Huaorani)

were highest for the Shuar (Lu 2007). However, many Shuar live in jungle villages accessible only by foot, canoe, or small plane; in these remote locations, wage labor is not possible and there is only sporadic trade with markets. For most Shuar villages, true market integration begins with the arrival of a road, which occurred in Chinimpi in the early 1990s. At the time of this study, 2002, Chinimpi was a village in transition—though still very much Shuar in its customs, the village was becoming increasingly experienced with the Ecuadorian cash-based economy. We were intrigued by the question of how the Shuar of Chinimpi would play economic games such as the dictator game (DG), the ultimatum game (UG), and the third-party punishment game (TPG). Would they exhibit relatively low offers, like the Machiguenga and Quichua, or higher offers, like the culturally similar yet less market-integrated Achuar?

THE STUDY POPULATION

The Shuar are a hunter-horticulturalist society in the Upper Amazon region of eastern Ecuador and northwestern Peru. Traditionally, the Shuar had little or no political or social organization above the level of the household except for limited purposes, such as trade in specific resources, such as blowgun arrow poison, or temporary alliances in warfare (Harner 1972; Karsten 1935). Even within villages, the Shuar ethos could be characterized as highly individualistic, at least at the level of individual family units, and this ethos persists today. Anyone who has spent time in a Shuar village, or among the culturally similar Achuar (Patton 2004), will note that there is a strong cultural norm toward the right of individuals to make decisions on their own. This manifests in frequent within-village feuds and in the frequency with which people in traditional Shuar villages simply leave, with their families, when conditions are not to their liking.

These cultural norms seemed to work well in the low population densities and relative isolation in which many Shuar lived until recently. In areas of the Amazon Basin, where huge areas of land are uninhabited by people, it is possible for a family to live in relative isolation, supporting itself with the help of a few nearby households. It is also relatively easy to move to a new location if troubles arise with neighbors. Today, however, the living conditions of most Shuar people are in transition as roads, electricity, and commerce encroach ever more rapidly into the Amazon region and as population densities increase and land is divided into permanent parcels by the government. These changes have led many Shuar to live in situations to which their norms of family-level independence may not be ideally suited.

Where roads and commerce have been long established, as in Macas, Sucua, and the surrounding areas, Shuar culture has had substantial time to accommodate to the cash economy of Ecuador (Lu 2007; Rudel et al. 2002). In more remote areas, certain cultural changes resulting from the efforts of missionaries are noticeable (such as reduced homicide rates), but subsistence practices, as well as other traditional elements of Shuar culture, remain relatively unaffected by the modern Ecuadorian economy, as one might expect given the absence of roads and the poor navigability of most rivers in the upper Amazon area. To anyone who has visited this region, roads are an obvious factor in culture change. In areas located within a day's walking distance from a road, or where a road has recently arrived, the change in economic and subsistence-related practices is palpable, though the Shuar language and many aspects of Shuar culture remain relatively unaffected, based on comparison with previous ethnographic work with the Shuar (Harner 1972; Karsten 1935).

The Basic Setting

This study was conducted in 2002 in the Shuar centro (village) of Chinimpi, which is located in the northwest corner of Morona Santiago Province, just south of the town of Palora, at latitude 1°48′

south, longitude 77°57′ west. Of the many aspects of this village that we might mention, some are quite typically Shuar, and others make it rather unusual for a Shuar village. Because the basic features of Shuar culture have been described elsewhere (see Harner 1972; Karsten 1935; for an ethnography of the closely related Achuar culture, see Descola 1996), we refrain from describing those features here. Note also that our descriptions of conditions and data, while given in present tense, apply to Chinimpi as it was in 2002.

Internally, the political organization of Chinimpi is typical of Shuar villages today (Rubenstein 2001). Landholding heads of household (mostly men but a few women) are socios (members) of the village, which gives them voting rights as well as the obligation to participate in mingas, or community work parties. There are approximately fifty socios, and the total population of the village is about three hundred (relatively large for a Shuar village), though a smaller population participates regularly in village life. The village elects several officials each year by a vote of the socios, including a president, vice president, secretary, and treasurer. There is a school that has recently begun to offer high school–level classes taught by bilingual teachers fluent in both Spanish and Shuar. (The average adult in Chinimpi has had approximately six years of formal education; see figure 10.1 for the distribution of study participants' years of schooling.) And electricity has arrived, though it is frequently cut off by the power company for lack of payment.

Subsistence, Income, and Wealth

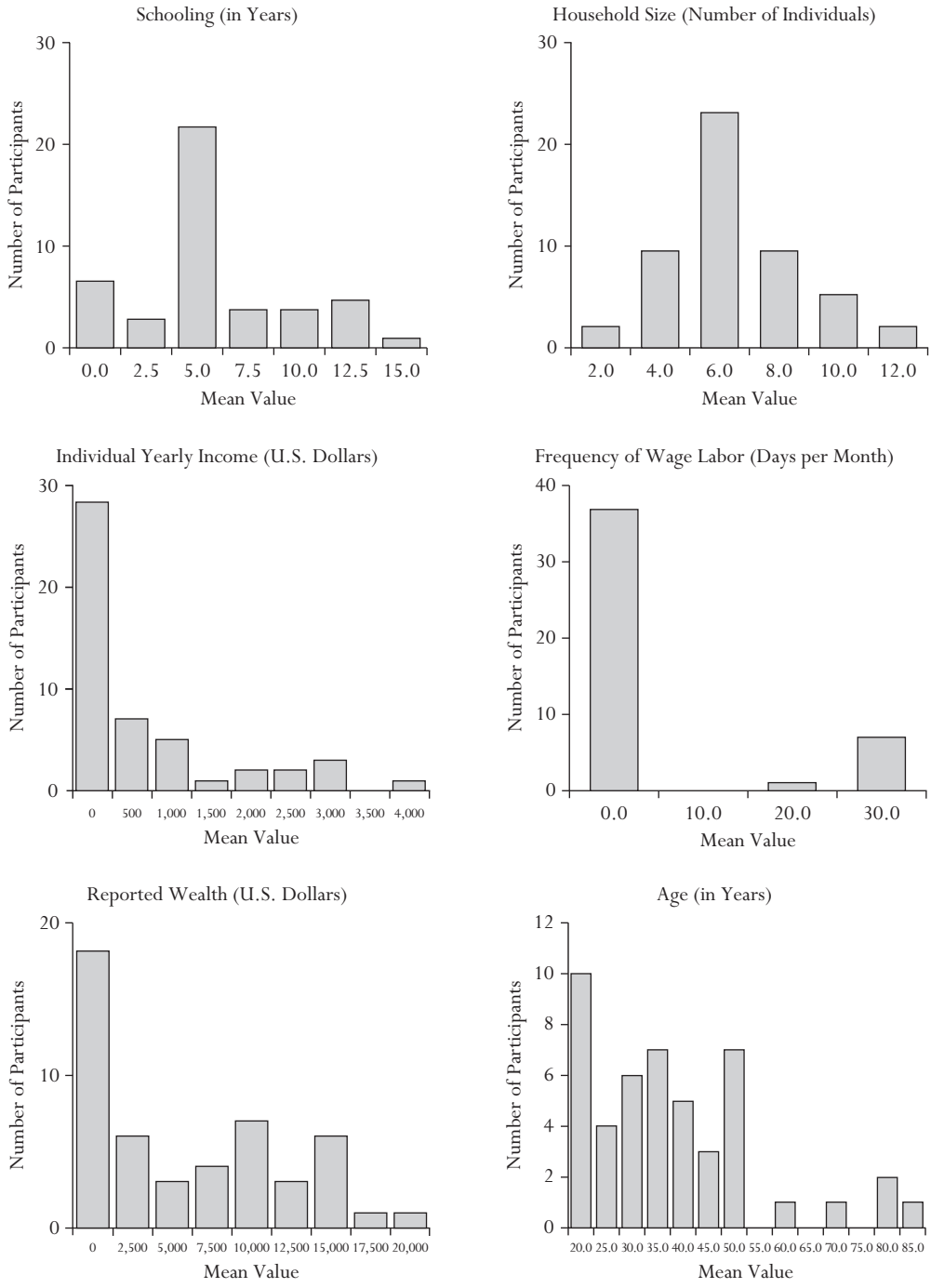
Owing to the depletion of animal resources, the Shuar in Chinimpi have lost many of their traditional methods of making a living, and though most of them are familiar with a cash economy, they have limited opportunities for engaging in modern market activities. (At the time of the study, there was not yet readily available daily transportation to the nearby market town of Palora.) Many household heads periodically cut and sell wood—a sporadic source of income at best. Although the sale of wood for lumber was fairly common until about 2000, this practice has recently tapered off as trees within hauling distance from the road have been depleted and the Ecuadorian government has passed a law regulating the size of fellable rain-forest trees.

As a result of limited opportunities to engage in market activities, villagers in Chinimpi generally have low levels of income and wealth by the measures we used. The average reported annual income per household in Chinimpi in 2002 was U.S.$737.00 (standard deviation = 956.00; see figure 10.1). Most households engage in no active renting, selling, or trading of goods in markets. A few households own cattle or pigs, which are typically sold in a market setting, though this practice is not widespread. There is also significant wealth disparity in this regard: mean reported cattle wealth was $U.S.712.04 (standard deviation = 1,420.00). Nearly all household heads own a finca (a ranch), averaging 32.09 hectares in area (standard deviation = 23.78) and worth approximately U.S.$4,846.53 (standard deviation = 4,974.00) (for the distribution of overall household wealth and distribution of household sizes, see figure 10.1). Only very rarely do households sell their land. Most families rely mainly on their own labor on their fincas to provide them with their food resources and other subsistence materials. The average household in Chinimpi acquires less than one-quarter of its nutrition from the Sunday markets of Palora. However, some individuals participate frequently in wage labor (figure 10.1). The distribution is bimodal, with most individuals engaging in zero wage labor but another, smaller group almost continuously employed.

Cooperation, Norms, and Institutions

As mentioned earlier, while the Shuar live in small, face-to-face communities consisting of intermarried, extended families, they also strongly value individual autonomy. This extends to

FIGURE 10.1 *Demographic Characteristics of the Shuar Sample for All Three Games (Pooled)*



Source: Authors' compilation based on author data.

economic matters as well. For example, in a study of land use practices in five indigenous societies in Ecuador, Jason Bremner and Flora Lu (2006) found that, among the Shuar, 96 percent of land cultivation was on land considered private, with only 4 percent on communal land. In contrast, among the Huaorani, who live to the north of the Shuar, 95 percent of land cultivation was on communal land. However, the Shuar way of life does require substantial degrees of cooperation in areas like hunting, land-clearing, and house-building. For example, the Shuar exhibit food-sharing norms that are fairly typical of hunter-horticulturalist societies (Hames 1990; Kaplan and Hill 1985): high-variance foods are shared widely among families, especially meat, whereas low-variance foods, such as garden foods (manioc, plantains, and so on), are mostly consumed within the family. And the cultural institution of the minga, or communal work party, suggests that the Shuar possess specific, highly developed norms of cooperation for certain social contexts.

Seen throughout Ecuador, mingas are community-level cultural institutions that appear to be stabilized by the power of shame-based sanction and reputation in fairly small groups and that work reasonably well for activities like clearing grass from airstrips or soccer fields once a month. People who do not show up are chastised, and helping is seen as part of one's duty in being a "good" community member. One cannot profitably shirk for long in a small community where absences are noticed; showing up and making at least some contribution is the only way to avoid negative reputational effects, such as—traditionally anyway—diminished prospects for mates, social exchange partners, and other profitable social interactions. Shuar informants agree, however, that there are substantial differences in actual effort expended by individuals during mingas (Price 2005), and the means of fine-grained monitoring and regulation of effort are poor. Therefore, mingas might not be stable when scaled up to cases where more is at stake and people stand to benefit substantially from the contributions of others, as in profit-based collectives. Even in regular community-wide mingas, at which the participation of all socios is required, the population size of Chinimpi—and ecological and social changes that have left residents relying on their own individual efforts in fincas and on wood-cutting rather than hunting—seems to be undermining the traditional reputation-based sanctioning system.

One recent event sheds some light on group-level cooperative norms among the Shuar and the question of whether these can be readily adapted to culturally novel contexts. Chinimpi's location on a road, its size, and its position as the geographic nucleus of several surrounding Shuar villages that are accessible only by foot led to its being selected as the site for a sugar cane–processing project funded by the World Bank. The funded part of this project, which was the construction of a small zinc-roofed shelter for a motor-powered sugar cane grinder and drying vats, had been completed at the time of the study, but no profit had been generated. No stable labor force had been assembled, and the plant had yet to see any activity other than the testing of the equipment. (As of 2013, the plant still exists and has been operational at times, but it has yet to become a stable business enterprise, despite the formation of a sugar cane growers' cooperative in Chinimpi.) The initial failure of the project was, arguably, largely due to the fact that the World Bank and its subcontractors simply built the plant, conducted some initial training sessions, and then left, abandoning the project to people with insufficient expertise to run it. However, the villagers' inability to solve the collective action problems associated with making the plant into a successful business—such as recognizing the need for individuals to invest in sugar cane cultivation well before anyone could see any profits—may have been due to cultural factors, in particular, the lack of cultural norms and institutions for running a collective economic enterprise of any kind. An initial attempt to form a sugar cane growers' cooperative to provide raw material for the plant, using the minga model but with discrete personal contributions of growing land to a collective pool, collapsed within a year (see Price 2005).

This example raises the possibility that norms for cooperation are context-specific. Thus, while there are well-established norms for food-sharing and participation in one-time minga events such as house-building or field-clearing, there are no such norms for collective economic activity. This could be described as a possible case of cultural disequilibrium, or cultural inertia: existing cultural norms of cooperation have not yet been adjusted to allow efficient, group-level cooperation in a market economy setting.

Disequilibrium and Cultural Inertia

In Shuar communities like Chinimpi (but not, perhaps, in Shuar communities with a longer history of market integration), the norms and social institutions that underlie and stabilize cooperation and sharing are adapted to patterns of subsistence and social organization that have been stable for a long time: small, family-based villages that subsist entirely on hunted and gardened foods and trade with neighboring communities for essential items like machetes, salt, and blowgun dart poison. For the kinds of activities and interactions that characterize such environments, Shuar social norms are quite adequate, and it is our impression that, for the most part, the Shuar of Chinimpi still use these norms to guide social interactions. Over the past few decades, however, the social, economic, and natural environments have changed substantially, and these changes are only just now beginning to have palpable effects. For example, animal resources have been steadily depleted for some time. This depletion has accelerated in recent years, so that now many game animals and fish are gone. Population pressure prevents expansion of hunting grounds to more distant adjacent areas because they are all occupied. Gradually, hunting as a practice has tapered off. The frequency of fishing has also drastically declined, though people still fish, and some express surprise that streams do not replenish between fishing events. The fact that expectations are violated even among people who have lived their entire lives in the area points to the absence of personal and cultural adjustment to recent changes in the local ecology.

Consistent with these ecological changes, Shuar in Chinimpi have carved up the local landscape into discrete, individually owned plots where they focus on private subsistence activities. Because of differences in land holdings and other factors, there are now significant income and wealth disparities among families. This disparity has combined with other factors—such as the arrival of the road, electricity, and the sugar cane–processing plant—to contribute to the pervasive state of disequilibrium and anxiety about the future among the Shuar today. Many families are nutritionally stressed (see Hagen, Barrett, and Price 2006), and people are in search of labor or other means to acquire foods and other necessities. As the Shuar are gradually being forced to turn to outside markets, the effects on cultural norms and practices remain unclear.

METHODS

We recruited forty-nine individuals, ages nineteen to eighty (mean age = 37.96; standard deviation = 16.15; see figure 10.1) to play three economic games—the dictator game, the ultimatum game, and the third-party punishment game—spread across two consecutive days of game play. Recruitment took place as follows. Several weeks before the games were to take place, we arranged a villagewide meeting during which we explained the purpose of the larger project to community members and sought community consent to host the experimental games. Potential subjects were informed that we would be playing games with money, and their casual comments indicated that they did not anticipate any details about the structure of the game settings. In the days leading up to the first day of experiments, the president of the community made announce-

ments to community members reminding them of the approach of the games, their voluntary nature, and their serious experimental nature.

The experiments themselves took place in a small building, one of three used for school classes and village meetings, all located at the far end of the village. All subjects congregated in one room as standard instructions were read, after which they observed as each of them drew a numbered ticket from a hat, which was used to determine the order of game play.

On the first day of game play, forty-one subjects (twenty-six males and fifteen females) played the DG in a morning session and the UG in an afternoon session. Standard procedures were followed as closely as possible, and we had no noticeable problems with contamination or collusion. We recruited a number of people to prepare lunch and refreshments, which we made available to persuade subjects to remain in the experiment area and to make it easier for us to monitor subjects during the games. We also appointed several participants to positions as monitors in the waiting areas. With the groups separated, the refreshments and a volleyball game in a central courtyard kept the waiting subjects occupied.

During the second day, forty-eight individuals (twenty-eight males and twenty females) participated in the TPG. Because of the small number of active community members in Chinimpi, we were unable to recruit a large number of fresh subjects to play the TPG on the second day. Only eight fresh subjects were available. Six of these new subjects were also recruited to play the DG and the UG on the second day of overall game play, after they played the TPG. Note that data for three individuals for whom we were unable to find partners were discarded.

In the days following the games, we conducted postgame interviews with a number of individuals. The interviews confirmed our impression that subjects anticipated neither the structure nor the content of the games, as well as our impression that there had been no problems with collusion or contamination. However, our relatively small sample sizes lead us to approach our data with caution.

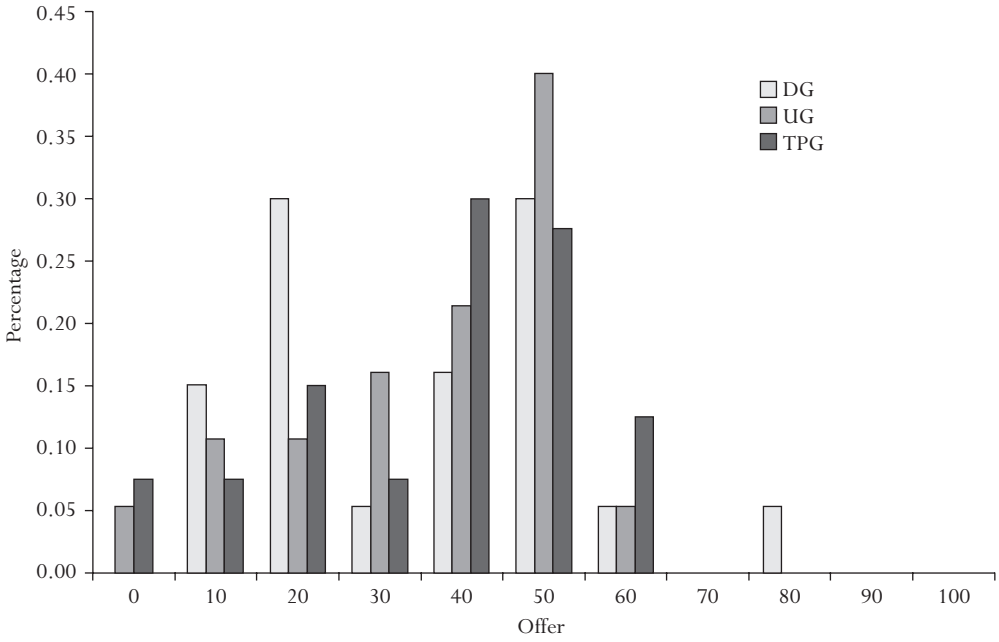
RESULTS

We analyzed data for twenty pairs of individuals who played both the DG and the UG. The mean offer in the DG was 35.24 percent (standard deviation = 19.14) of the stake, with modes at both 20 and 50 percent (see figure 10.2).

We examined possible effects of six different variables on DG offers, using the standardized regression method employed in all of the chapters in this volume, as well as for all of the regressions reported here. First, we rescaled all of the variables, with the exception of sex (which was entered as a dummy variable, 0 = male, 1 = female), by dividing each data point by the standard deviation for that variable among the sample of participants making DG offers. We then performed a linear regression using all six variables (model 1). In addition, five more regressions were performed (models 2 through 6), removing each of the six variables one at a time, in the following order: age, sex, education, income, wealth, and household size. The results of these regressions are shown in table 10.1. Histograms showing the raw (not rescaled by standard deviation) distribution of the independent variables used in the regressions (with the exception of sex) are shown in figure 10.1.

As table 10.1 shows, none of the variables, with the exception of household wealth in model 1, had a significant impact on DG offers. Household wealth is significant at $p < 0.10$ in model 1, with a coefficient of −0.5, indicating a 50 percent decrease in offers with each standard-deviation increase in household wealth. However, household wealth does not account for a significant amount of variance in models 2 through 5. In addition, we found that one of the variables we measured as a proxy for market integration, frequency of wage labor in the past month, accounts

FIGURE 10.2 *Player 1 Offer Amounts in the Dictator Game, Ultimatum Game, and Third-Party Punishment Game*



Source: Authors' compilation based on author data.

for a significant amount of variance when entered in addition to the other variables in model 1 (see model 7). A one-standard-deviation increase in frequency of wage labor increased offers by approximately 50 percent. Wage labor is negatively correlated with household wealth (Pearson R-squared = −0.482, $p = 0.027$). In a final model, model 8, we entered only household wealth and wage labor as variables and found that the wage labor variable accounts for a significant amount of variance, while household wealth does not. In this model, again, a one-standard-deviation increase in frequency of labor boosts contributions by about 50 percent.[1]

The mean ultimatum game offer was 36.67 percent (standard deviation = 16.53) of the stake, with a prominent mode at 50 percent (see figure 10.2). UG offers were not significantly higher than DG offers (Wilcoxon test, $z = 0.287$, $p = 0.774$). Player 2s expressed relatively low levels of stated propensity to reject low offers. Most subjects indicated that they would be willing to accept offers of zero. Thirty percent of player 2s (six of twenty) indicated that they would reject an offer of zero (see figure 10.3).

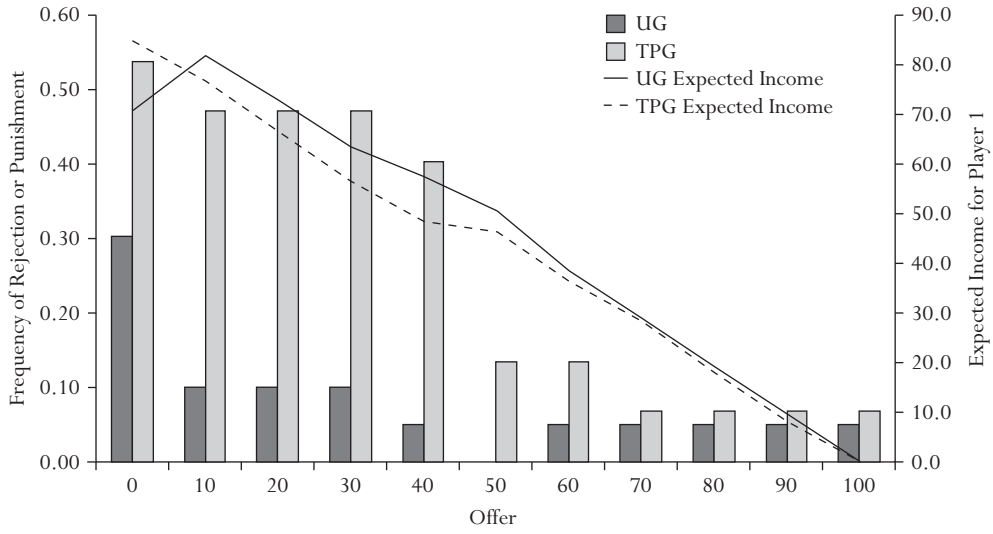
Possible effects of our six target variables were examined using regression in the manner reported earlier. Results of the regression are shown in table 10.2. Of the six variables examined, only household size had a significant, positive, impact on UG offers (in models 2, 5, and 6). This was a positive effect, with one standard deviation in household size increasing offers by 35 to 50 percent, depending on the model.[2] Because wage labor had a significant impact on offers in the DG, in some models we looked for effects of this variable on UG offers using regression analysis, but found none, so these analyses are not reported here. Finally, to examine the question of consistency in player offers across games we computed the correlation between DG offers

TABLE 10.1 *Linear Regressions of Shuar Dictator Game Offers*

Variable (Divided by Standard Deviation)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Age	−.365						−.341	
	(.342)						(.316)	
Female	−.714	−.587					−.307	
	(.501)	(.489)					(.511)	
Education	−.334	−.0154	.0362				−.391	
	(.384)	(.244)	(.243)				(.356)	
Individual income	.117	−.0169	.0501	.0659			.110	
	(.277)	(.248)	(.245)	(.214)			(.255)	
Household wealth	−.531*	−.474	−.338	−.335	−.347		−.281	−.154
	(.286)	(.283)	(.262)	(.254)	(.245)		(.296)	(.200)
Household size	.230	.0405	−.102	−.0941	−.0988	−.292	.287	
	(.337)	(.288)	(.265)	(.252)	(.245)	(.209)	(.312)	
Frequency of wage labor in previous month							.524*	.532**
							(.281)	(.207)
Constant	3.523***	2.529***	2.297***	2.333***	2.419***	2.524***	2.761**	1.735***
	(1.18)	(.730)	(.713)	(.652)	(.573)	(.583)	(1.162)	(.326)
Observations	21	21	21	21	21	21	21	21
Model significance	0.421	0.422	0.470	0.303	0.161	0.179	0.224	.011
Adjusted R-squared	0.023	0.014	−0.014	0.045	0.093	0.045	.170	.339

Source: Authors' compilation based on author data.
Note: Standard errors are in parentheses. All coefficients are rescaled (divided by standard deviation).
***Coefficient significant at < 0.01 level in two-tailed test
**Coefficient significant at < 0.05 level in two-tailed test
*Coefficient significant at < 0.10 level in two-tailed test

FIGURE 10.3 *Frequency of Rejections or Punishment in the Ultimatum Game and the Third-Party Punishment Game*



Source: Authors' compilation based on author data.

and UG offers within players, but found no significant correlation (Pearson R-squared = 0.169, $p = 0.465$).

Another variable of interest in the ultimatum game is the minimal acceptable offer (MinAO): the smallest offer that was not rejected by player 2. We computed MinAOs for the UG and performed the standard series of regressions described earlier. Results are shown in table 10.3. Here the only variable that had a significant impact on UG MinAOs was household wealth, in models 3 and 5. However, scatter-plot analysis revealed that this effect was being driven by two individuals who expressed minimal acceptable offers of 40 and 50 percent of the stake, respectively, and both of whom were greater than half a standard deviation above the mean wealth. We removed these two individuals from the analysis and ran model 5 again. The result, reported in table 10.3 as model 7, shows that the effect of household wealth on UG MinAOs disappears when these two individuals are removed.

Finally, we analyzed data from the third-party punishment game. Because of an error in subject assignment, we had to throw out data for three subjects in the TPG. Analyzing data for forty-five subjects, we found that, as in the UG, offers were generally higher in the TPG, with a mean of 37.93 percent (standard deviation = 17.92) of the stake, with modal offers at both 40 percent and 50 percent (see figure 10.2). Levels of stated willingness to punish were moderate. Approximately half of the player 3s indicated that they would pay to punish offers of 0, 10, or 20 percent, with this willingness abating for higher offers up to 50 percent of the stake (see figure 10.3).

Using the same method as before, we performed a series of linear regressions on TPG offers. The results are shown in table 10.4. As before, the overall level of variance in offers explained by the models was low, and none of the six independent variables had a significant effect on offers. As we did with the MinAO in the UG, we computed the lowest acceptable offer not punished in the TPG. The results are shown in table 10.5. No significant effects of any of the

TABLE 10.2 *Linear Regressions of Shuar Ultimatum Game Offers*

Variable (Divided by Standard Deviation)	(1)	(2)	(3)	(4)	(5)	(6)
Age	.159					
	(.297)					
Female	−.350	−.406				
	(.435)	(.412)				
Education	−.0189	−.158	−.122			
	(.334)	(.206)	(.202)			
Individual income	−.147	−.0887	−.0423	−.0952		
	(.240)	(.209)	(.203)	(.180)		
Household wealth	−.0288	−.0536	.0405	.0321	.0481	
	(.249)	(.238)	(.049)	(.213)	(.207)	
Household size	.396	.478*	.380	.352	.359*	.386**
	(.292)	(.242)	(.459)	(.212)	(.207)	(.168)
Constant	.813	1.246*	1.085*	.965*	.840*	.825*
	(1.025)	(.730)	(.593)	(.547)	(.484)	(.468)
Observations	21	21	21	21	21	21
Model significance	0.437	0.332	0.300	0.200	0.106	.033
Adjusted R-squared	0.014	0.061	0.063	0.098	0.134	0.177

Source: Authors' compilation based on author data.
Note: Standard errors are in parentheses. All coefficients are rescaled (divided by standard deviation).
**Coefficient significant at < 0.05 level in two-tailed test
*Coefficient significant at < 0.10 level in two-tailed test

TABLE 10.3 *Linear Regressions of Shuar Ultimatum Game Minimal Acceptable Offers*

Variable (Divided by Standard Deviation)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Age	1.501						
	(3.734)						
Female	−0.257	−0.632					
	(8.544)	(8.234)					
Education	2.690	1.805	1.934				
	(4.741)	(4.071)	(3.581)				
Individual income	2.954	3.410	3.482	3.935			
	(3.860)	(3.577)	(3.336)	(3.157)			
Household wealth	6.558	6.569	6.474*	7.092*	7.632**		−0.390
	(4.121)	(3.995)	(3.672)	(3.411)	(3.439)		(1.155)
Household size	−6.099	−5.964	−5.966	−5.657	−4.513	−0.662	1.212
	(3.891)	(3.759)	(3.632)	(3.506)	(3.439)	(3.277)	(1.054)
Constant	3.728	8.598	8.283	9.726	9.088	7.667	−1.262
	(15.742)	(9.744)	(8.537)	(7.926)	(8.037)	(8.843)	(2.565)
Observations	20	20	20	20	20	20	20
Model significance	0.462	0.338	0.209	0.124	0.113	0.842	0.489
Adjusted R-squared	0.002	0.062	0.124	0.163	0.135	−0.053	−0.030

Source: Authors' compilation based on author data.
Note: Standard errors are in parentheses. All coefficients are rescaled (divided by standard deviation).
**Coefficient significant at < 0.05 level in two-tailed test
*Coefficient significant at < 0.10 level in two-tailed test

TABLE 10.4 *Linear Regressions of Shuar Third-Party Punishment Game Offers*

Variable (Divided by Standard Deviation)	(1)	(2)	(3)	(4)	(5)	(6)
Age	−0.108					
	(0.418)					
Female dummy (not divided by standard deviation)	1.057	1.101				
	(0.727)	(0.669)				
Education	0.148	0.243	0.145			
	(0.455)	(0.256)	(0.269)			
Individual income (in U.S. dollars)	0.365	0.349	0.241	0.278		
	(0.273)	(0.252)	(0.263)	(0.245)		
Household wealth (in U.S. dollars)	0.573	0.591	0.206	0.228	0.217	
	(0.391)	(0.364)	(0.302)	(0.289)	(0.292)	
Household size	−0.253	−0.311	0.117	0.146	0.107	0.226
	(0.462)	(0.384)	(0.306)	(0.291)	(0.292)	(0.240)
Constant	0.764	0.484	0.828	0.959	1.369**	1.346**
	(1.339)	(0.741)	(0.769)	(0.706)	(0.613)	(0.602)
Observations	15	15	15	15	15	15
Model significance	0.532	0.379	0.604	0.469	0.516	0.365
Adjusted R-squared	−0.039	0.068	−0.091	−0.020	−0.045	−0.009

Source: Authors' compilation based on author data.
Note: Standard errors are in parentheses. All coefficients are rescaled (divided by standard deviation).
**Coefficient significant at < 0.05 level in two-tailed test

TABLE 10.5 *Linear Regressions of Shuar Lowest Unpunished Offers in the Third-Party Punishment Game*

Variable (Divided by Standard Deviation)	(1)	(2)	(3)	(4)	(5)	(6)
Age	−1.583					
	(1.518)					
Female dummy (not divided by standard deviation)	1.253	3.163				
	(2.742)	(2.051)				
Education	−1.514	−0.362	−0.260			
	(1.614)	(1.182)	(1.259)			
Individual income (in U.S. dollars)	2.089	1.917	1.258	1.090		
	(1.361)	(1.358)	(1.375)	(1.056)		
Household wealth (in U.S. dollars)	−0.543	−0.788	−1.209	−1.257	−0.934	
	(1.043)	(1.021)	(1.050)	(0.978)	(0.929)	
Household size	0.857	1.467	0.796	0.741	0.187	−0.0355
	(1.298)	(1.164)	(1.152)	(1.071)	(0.929)	(0.903)
Constant	3.562	−5.576	−0.255	−0.256	2.757	2.971
	(10.737)	(6.237)	(5.542)	(5.296)	(4.429)	(4.425)
Observations	15	15	15	15	15	15
Model significance	0.509	0.511	0.746	0.575	0.615	0.969
Adjusted R-squared	−0.020	−0.030	−0.172	−0.070	−0.076	−0.077

Source: Authors' compilation based on author data.
Note: Standard errors are in parentheses. All coefficients are rescaled (divided by standard deviation).

six variables on lowest unpunished offers were found. Of the fifteen offers made by player 1s, five were punished (33.3 percent).

Because few fresh subjects were available to play the TPG, we made role assignments as follows. All eight fresh players were assigned to the role of player 3. For the remainder, we attempted to keep each player in the same role across games. Thus, fifteen players were player 1 in all three games, and fifteen were player 2 in all three games. However, to balance the players for the TPG we had to shift roles for seven players. Four people took the role of player 1 in the DG and UG, then shifted to player 3 in the TPG. Three people were player 2 in the first two games and shifted to player 3 for the TPG. Data from three players had to be discarded because partners could not be found.

For repeat players, was there consistency, or patterned inconsistency, between their play in the TPG and earlier games? For repeat player 1s, there was no significant correlation between offers in the TPG and the DG (Pearson R-squared = 0.045, $p = 0.873$), nor between offers in the TPG and the UG, though TPG and UG offers were closer to significant positive correlation (Pearson R-squared = 0.404, $p = 0.135$). There was no significant difference in overall level of offers between the UG and TPG, the DG and TPG, or the DG and UG (Wilcoxon signed rank test). In general, we could find no significant patterned relationship in play by the same players across games.

DISCUSSION AND CONCLUSIONS

Compared to other societies examined in this volume and elsewhere, the Shuar fall within the normal range of economic game behavior in certain ways, but they are also unusual in some regards. Using the UG as a benchmark, we see that the Shuar are certainly less generous in their offers than university students in a variety of countries; UG offers for the latter range between 42 and 48 percent (Henrich et al. 2004). However, when compared to a previous cross-cultural study of UG behavior (Henrich et al. 2004), the mean of Shuar offers in the UG, at 37 percent, is within the range of observed mean offers of a diverse set of fifteen cultures, which ranged from 25 to 57 percent of the initial stake. (Interestingly, the Shuar mean UG offer of 37 percent found here was somewhat lower than the 43 percent found for the Achuar, a culturally similar group, by Patton [2004].) On the other hand, the Shuar appear to have a low rejection rate in the UG, when compared to other populations: among the societies studied in this volume, they were tied for the lowest rejection rate in the UG with Fijians and the Tsimane'. This does not indicate, however, that the Shuar are never punitive: their TPG punishment rates were relatively high compared to these populations.

For the DG, the Shuar mean offers, at 35 percent (with modes at 20 and 50 percent), were between those seen for other populations. For example, the Shuar were more generous in their offers than university students, who showed a mean at 25 percent and a mode at zero, and less generous than the rural U.S. population of adults in Missouri (chapter 18, this volume, available at: http://www.russellsage.org/Ensminger), who show a mean offer of 47 percent, with a mode at 50 percent. As far as offers go, the Shuar do not appear to be on either end of the distribution of low to high offers seen in other cultures, though they may tend toward the less generous end. With regard to rejecting offers in the UG, the Shuar are relatively tolerant, but less so as third-party punishers.

The DG can be particularly revealing of economic preferences because other players have no chance to respond. As in some other populations, we observe two distinct modes in the DG: one fair, and another more consistent with money-maximization (though still significantly above zero). We speculate that this bimodal distribution, which is apparent in various games in other

populations (Camerer and Fehr 2004; Ensminger 2004; Ruffle 1998), reflects the presence of distinct strategies, or game framing effects, among the players. There are several possible explanations for these distinct playing styles: (1) differences in understanding of the money at play in the game, with some subjects interpreting it as a public windfall (leading to a sharing expectation) and others interpreting it as a private gift (leading to a private property interpretation); (2) differing degrees of responsiveness to the anonymity of the games; (3) differing degrees of adherence to norms of fairness; (4) differences in motivation to engage in reciprocity interactions (and perhaps differing degrees of awareness that no positive or negative reciprocity would be possible in the DG); and (5) other possible differences in motivation or interpretation of the games. (One subject, for example, knowing this was an international study comparing cultures, reported a desire for the Shuar to appear generous.)

Higher offers in the DG came mainly from individuals who engaged more frequently in wage labor (table 10.1, models 7 and 8), a variable negatively related to individual and household wealth. Although in the DG higher offers came from less wealthy people who did more wage labor, in the UG we found that wealthier people required higher offers to accept the split proposed by player 1 (table 10.3, models 3 to 5). In other words, wealthier people gave less in the dictator game and expected more in the ultimatum game. This is one of the few patterns we found that held across more than one game.

Among the Orma of East Africa, Jean Ensminger (2004) found a similar effect of wage labor on offers in the UG, in the same direction: individuals engaging in wage labor offered significantly higher fractions of the initial stake when in the position of player 1. Ensminger notes that these results are consistent with the overall findings of the fifteen-society study by Joseph Henrich and his colleagues (2004), in which greater "fairness" was associated with increasing degrees of market integration. Ensminger (2004, 380) suggests that "among those selling either their labor or their goods, there may be a higher premium placed upon reputation, and . . . one way of signaling a good reputation is to behave fair-mindedly." We agree, though we would suggest that subjects also seek to generate, rather than merely signal, a good reputation through such behavior.

In the context of Shuar living in Chinimpi, it might be that individuals who engage frequently in wage labor—who are poorer—have a greater motivation to initiate and maintain profitable reciprocity relationships such as contractual labor exchange interactions. They may more readily import a schema of reciprocal economic exchange into the game setting, causing them to make higher offers. In the same way that some players among the Au and Gnau of New Guinea make hyper-fair offers consistent with the social practice of incurring social credit through competitive gift-giving (Tracer 2004), less wealthy wage laborers may behave as individuals attempting to initiate reciprocal exchange relationships and to establish an initial reputation for generosity and goodwill. This is consistent with the UG MinAO data suggesting that they have more forgiving thresholds for the termination of exchange. However, this is speculative and awaits confirmation in further work.

Although we find that the decisionmaking exhibited by our Shuar population exhibited a pattern that differed from that of any of the other societies studied here—yet also was not out of the bounds of the observed variation—it remains to be seen what combination of factors best explains Shuar decisionmaking in these games. We feel that the impact on individual play of players' interpretations of the stylized situations presented by behavioral economic games is an important area for future research. Of particular interest is the question of how money, which is evolutionarily novel for all people and culturally novel for many, interacts with preexisting cultural norms and intuitive inference systems in populations that have little experience with it.

We would like to express our deep thanks to the people of Chinimpi and nearby communities for their participation in this study and for their generosity and hospitality during our stay.

NOTES

1. As a robusticity check, we generated scatter plots of both wage labor and household wealth against DG offers and found that these effects are not driven by outliers. Additionally, separate correlation analyses showed significant correlations between wage labor and DG offers (Pearson R-squared = 0.614, $p = 0.003$) and between household wealth and DG offers (Pearson R-squared = −0.420, $p = 0.058$).
2. As a robusticity check, we plotted household size against UG offers to confirm that there was a positive relationship between the two variables that was not driven by outliers. Household size and UG offer were significantly correlated (Pearson R-squared = 0.467, $p = 0.033$).

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