Fairness without Punishment: Behavioral Experiments in the Yasawa Islands, Fiji

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This paper reports results from three behavioral experiments done in the villages of Teci and Dalomo on Yasawa Island in Fiji. We performed the Dictator Game (DG), the Strategy Method Ultimatum Game (UG), and the Third Party Punishment Game (3PPG), as explained in Chapter 1. For comparison to an established reference population, we also performed an identical set of experiments among students at Emory University. Our major results are summarized in the following six points:

1) Fijians are substantially less willing to punish in both the UG and 3PPG than Emory students. For example, most Fijians accept an offer of zero in the UG, while all Emory students rejected such offers.
2) However, despite the weakness of punishment in Fijians, most people still make equitable offers. By contrast, Emory student offers appear motivated by the threat of punishment.
3) We find some evidence for the 'U-Shape' in the distribution of rejections across offers in the UG (i.e., rejections of both low *and* high offers), although the effect is quite muted compared to most other groups with U-shaped rejection distributions.
4) Consistent with our previous empirical work on individual-level effects (Henrich et al. 2004), we find little evidence supporting the effect of market integration, or the importance of demographic or economic variables on game behavior. However, in combination with DG offers (as a predictor variable), sex and wealth can predict 90% of the variation in UG offers.
5) Our analyses also fail to show that social status, centrality in the social network, or kinship (average relatedness) are important predictors of game behavior.

Our paper is organized as follows. First, we describe the ethnographic context. Second, we lay out our methodology, assuming the reader is familiar with the general approach described in Chapter 1. Third, we present the results from the three games, and compare the results across games and subject pools. Fourth, we summarize our efforts to account for individual variation in experimental play. Fifth, we analyze data on emotions and contextual interpretations of the game based on our post-game interviews. Finally, we briefly consider the ontogeny of social preferences, how the nature of daily village life might both reflect and transmit these preferences, and how dual inheritance theory might lend provide an explanation.

Ethnographic Context

The villages of Teci (pronounced *Tethee*) and Dalomo, with a combined population of about 210, are situated on the eastern shore of Yasawa Island in the northwestern corner of the Fijian archipelago. Teci is about a 15-minute walk from Dalomo, a 90-minute walk from Bukama, and a 2.5-hour walk from Nabukaru. To travel to the city of Lautoka, on the main island of Viti Levu, most villagers use a cargo

ship that takes between 1 and 2 days. Although it is possible to take a 5-hour ferry from a point in the central part of the Yasawan chain, the transportation to the ferry and the ferry itself, costs considerably more than the cargo ship. The few motorboats run by the villagers are not big enough to make a safe crossing to Lautoka.

In the dry, infertile, deforested grasslands of this Makatea island (a platform of coral reef), economic life is based primarily on a combination of root-crop horticulture (yams and sweet manioc), littoral gathering (shellfish, mollusks) and fishing. Men bear the responsibility for clearing gardens (slashing and burning if necessary) and planting. Both men and women collect firewood, harvest agricultural products, and weed the gardens. Men, women, and children also do gathering, although women do more of this than men or children. Fishing is done principally by men, especially young men, and mainly involves free-dive spear fishing. Men also use nets to catch both fish and turtles. Women and young boys do hook and line fishing. Women bear the primary responsibility for food preparation, cooking, laundry, and cleaning.

There are three main sociopolitical institutions that govern village life: the traditional chiefly system, the government-instituted *Turaga ni Koro*, and the Christian churches. The most important of these institutions is the traditional system based on kinship, clans, and chiefs. Teci and Dalomo have five main *mataqolis* (pronounced *matangalees)* or clans that together form a single *Yavusa*. A *Yavusa* is the largest territorial unit in the traditional Fijian system. Each Fijian village usually corresponds, one-to-one, with a *Yavusa*, with one chief per *Yavusa*. However, Teci and Dalomo are part of the same *Yavusa*, and there is a single chief for both villages. The chief lives in Teci, the older village. Leadership in each of the *mataqolis* is assigned by a combination of age, gender, descent, skill, and political acumen. The head of the chiefly clan is installed by a council of elders. The chief, together with the heads of the various *mataqolis*, makes decisions, deals with problems, and determines punishment. Because Teci's previous chief had only recently died and his heir (actually his older brother's son) was still young, the new chief had not yet been formally "installed" by the village elders. Nonetheless, most people referred to the heir

as the chief (*Tui Teci*), and we will do so here. At the time of our study, the villages were governed by the council of elders.

Now integrated, and operating in parallel with the traditional system, is the democratically elected *Turaga ni koro* ("head of the village"), who acts as the representative of the Fijian national government. Both Teci and Dalomo have their own *Turaga ni koros*. The *Turanga ni koros* responsibilities are varied, and include such things as dealing with visitors and keeping the village well-maintained. Though not an official part of their duties, the Dalomo *Turnaga ni koro* operated the village radio-phone, and the Teci *Turnaga ni koro's* family operated a village store that sold basic food stuffs and owned the only boat. In most matters we observed, the *Turaga ni koro* worked in concert with the council of elders and the chief.

Layered across these institutions, Teci and Dalomo also support three different Christian religious sects—Methodist, the Evangelical Assemblies of God, and Seventh Day Adventist Churches—in five separate congregations. Churches make numerous contributions to the village, from organizing feasts to welcoming visitors.

Connections with the larger Fijian economy and municipal service are quite limited. There are no towns, and the only road on the island is a dirt path used by an exclusive private resort near Bukama (the only resort on Yasawa Island). There are few opportunities for wage labor. The resort employs three people from Teci and Dalomo, and about twice a month a small cruise ship brings tourists into the village of Dalomo (which maintains almost entirely traditional housing) for a Kava ceremony and *Meke* (traditional dance). There is no telephone service, except for the radio phone. There are three primary schools on the island, including one in Teci. For education beyond the 8th grade, which most people do not have, students must go either to the island of Naviti in the center of the Yasawa group, or to Viti Levu.

Access to market goods typically occurs in three ways. First, several families maintain small supplies of flour, kava, yeast, sugar, salt, and other basic items, which they sell to their neighbors. Second, people travel on the cargo ship—which comes to Teci once a month—to sell crabs, coconuts, mats and other products in Lautoka, and resupply on items like cooking oil and kerosene. Third, the

private resort maintains a small, overpriced store where basic necessities can be purchased. Villagers do not make frequent use of the resort store.

All residents of Teci and Dalomo speak *Teci* (a Fijian dialect) and *Bauan* (Standard Fijian). A few people also speak English, though only a handful speak it with any proficiency. The men and women who are competent in English tend to have worked at some point in their lives in the tourist industry. Although English is officially taught in school, only a few of the older school children have learned more than a few phrases.

Methods

Each of the games was conducted according to the protocols detailed in Chapter 1. Only the features that are unique to our experiments will be described here. Our games were conducted over a four week period, with 4 DG/UG sessions held on two consecutive days, and three 3PPG sessions held on three consecutive days about 2 weeks later. Recruitment for all of the sessions followed the same procedure. A list of all eligible players was generated and randomly ordered. The day before a game session, our field assistants recruited players by working down the list until the required number of players had been reached. Each player was given a slip of paper that stated the day, time and location of the session. For subsequent sessions, people who had already played were removed from the list, and the recruitment was repeated with the remaining eligible villagers. If a villager declined to participate, he/she was still included on the list for subsequent sessions. Often people who declined when first approached did so because they had a prior obligation or because they were hesitant to participate in this unknown activity (this becomes important later). Recruitment became easier after the first day of games when people learned that the games were harmless and yielded lots of money.

DG and UG: Because of a week-long school holiday, we were able to conduct the DG/UG experiments in the 4-room school. The school is located atop a hill on the outskirts of the village. Typically, villagers go up the school area to bring their children lunch when school is in session and at the

end of the day when the men play rugby in the field by the school. Villagers do not generally pass by the school unless they are going there for a particular purpose.

As the players arrived, they congregated outside the classroom and our four Fijian field assistants moved through the crowd completing demographic information sheets. When we were ready to begin, we all moved into the first classroom and a hat with sticky nametags was passed around the room. Each person selected a number and affixed the sticker to his/her chest. These numbers determined the order in which people played. Following the instructions (explained in standard Fijian by a field assistant) and payment of show-up fees, players were called one at a time into one of two other rooms to play the game. In the first game room the games were conducted by Joe and a female Fijian assistant. A parallel process occurred next door with Natalie and a male Fijian field assistant. The dual-room design allowed us to stay within the time constraints.

Players awaiting their turn remained in the first room, where a film was shown on our laptop (powered by a solar-recharged battery). A field assistant monitored the classroom to ensure that no conversations about the game took place. Conversations were not a problem, as nearly everyone was mesmerized in front of the laptop. As players completed their game decision, they moved into a fourth room where tea and biscuits were served.

Once everyone had completed the DG, all the players were brought back into the starting room where the UG was explained. The procedure of moving from waiting in Room 1, to playing in Room 2 or 3 and then proceeding to the post-game waiting area in Room 4, was repeated during the UG. At the end of the second game, players were again brought into room 1 and envelopes with payoffs from both games were distributed to each player and everyone was thanked and dismissed. Over the course of the 4 sessions, 35 pairs played the DG and UG.

3PPG: Recruitment for the 3PPG was the same as for the DG/UG experiments. People who had played the DG/UG were not included in the list of eligible players for the 3PPG, although a few repeat players filled the roles of players 1 and 2 during sessions in which we were unable to recruit 30 new trios. Since the school was not available when we conducted the 3PPG, these sessions were played in the

village in three adjacent houses. As with the DG/UG, all the players gathered in one house where assistants helped players complete demographic information sheets, numbers were picked from a hat, show-up fees were paid, and the game was explained in Fijian by a field assistant. After these preliminaries, a film was shown and the dual-experimenter approach was again employed. After players had their turn they were told they could leave, but were not permitted to return to House 1 where players were still awaiting their turn. Players were told to return in the afternoon to receive their payoff. The House 1 monitor made sure that no players re-entered the house after their turn. A total of 30 trios played the 3PPG.

Results

In this section we will summarize the basic findings for all three experiments in Fiji by focusing primarily on five behavioral measures: offers in the DG, UG and 3PPG, and punishment in the UG and 3PPG. First, we compare the Fijian results from each of the games. Second, we compare our Fijian findings to a set of experiments using the same protocols and the same primary experimenters, conducted with students at Emory University. Third, we attempt to explain the variation across our Fijian participants using a set of social, economic and demographic variables. In doing this we test both the market integration hypotheses and the effects of age, sex, income, wealth, household size, status, 'network centrality' and kinship. Finally, we analyze the data for the possible effects of 'degree of understanding' and the collusion, contagion and/or contamination that might have been produced by the time between sessions of the experiment.

Fijian offers are equitable despite a lack of punishment

Figure 1 summarizes the offers made by Fijians in each of the three games. The modal offer in all three games was one-half of the initial endowment, with 46% of Player 1's (hereafter "P1s") offering this in the UG, 40% in DG, and 33% in the 3PPG. Mean offers follow the same pattern with averages of 39% in the UG, 35% in the DG, and

Table 1: Comparisons of offer distributions

p-values (2-sided)	DG-UG	DG-3PPG	UG-3PPG
Epps-Singleton	0.78	0.31	0.097
Wilcoxon	0.19	0.32	0.16

27% in the 3PPG. Table 1 shows the results of three pairwise non-parametric comparisons. Testing the hypothesis that the samples are drawn from the same distribution, only the Epps-Singleton test comparing the UG and 3PPG suggests a significant difference.[1]

Using the DG as the non-punishment baseline, we can examine the effect of the two kinds of punishment found in UG and DG. For the UG, the threat of direct punishment may have increased the offers by about 4%, although the increase was not large enough to detect at conventional significance levels. Under the potential threat of third party punishment, the mean offer actually drops from 35% to 27%.

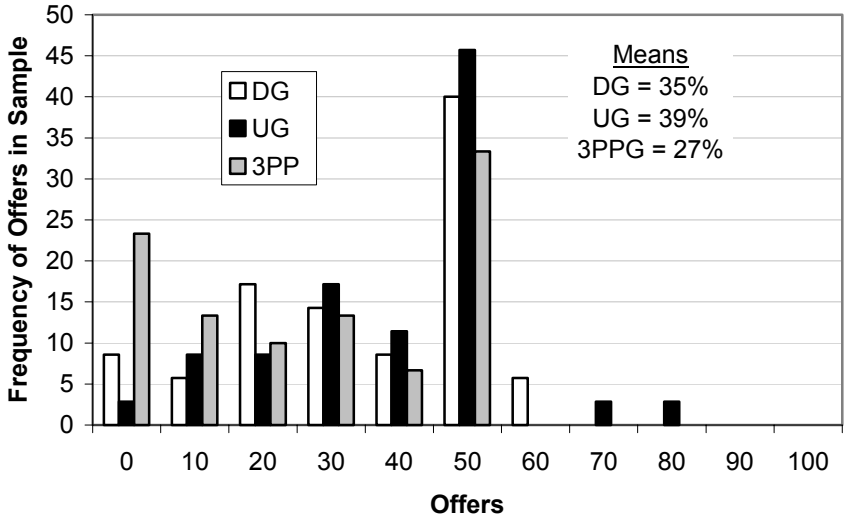


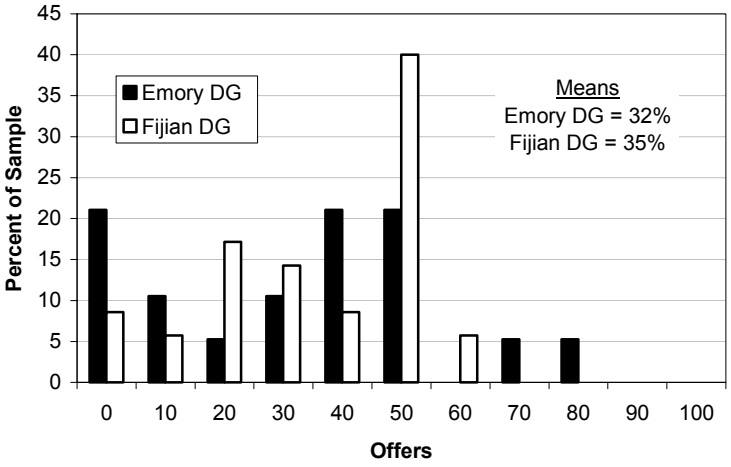
Figure 1. Offer distribution for the Dictator Game (white), the Ultimatum Game (black) and the Third Party Punishment Game (grey).

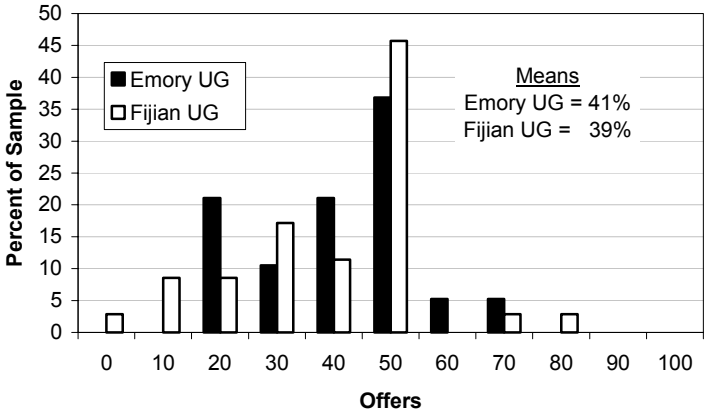
Figures 2A, B and C compare the offers made by Fijians and Emory students in the same experiments.[2] For the DG, Figure 2A shows that our sample of Fijians offer 3% more on average than the

[1] The Epps-Singleton test is a non-parametric test that, in simulation studies, has been shown to be particularly powerful for the small samples involving the distributional shapes typically found in UG data (Forsythe et al. 1994).
[2] Our DG and UG experiments were all conducted with Emory freshman recruited by RA from the same dormitory (a community of sorts) in the middle of spring term. Our 3PPG experiments were done with a range of students from across campus recruited using a posted flyer. We used a dormitory in the first two games in order to match—to the degree possible with students—the day-to-day interaction among fellow villagers. This is impossible in the 3PGG because of the number of subjects required from a single dorm.

Emory students, although this difference is not statistically significant (ES $p = 0.38$). For the UG, Figure 2B shows that our sample of Emory students offers 2% more than the Fijians, although this difference is also not significant (ES $p = 0.62$). Comparing the DG and UG shows that that offers increase an average of 9% from the DG to UG (presumably because of the threat of punishment) at Emory, but only by 4% in Fiji. Finally, in our 3PPG, Fijians offer significantly more than Emory students. The distribution of Fijian offers has a mode at 50%, and a secondary mode at zero percent, while the Emory students have a clear mode at 0%. (EXPERIMENT TO BE COMPLETED).

It is striking that the Fijian villagers and Emory subjects make very similar offers and that the effects of punishment seem to have similar effects in both groups. Both groups offer the most in the UG, with its threat of direct punishment, the next most of in the DG, with no threat of punishment, and the least in the 3PPG, with the threat of third-party punishment.





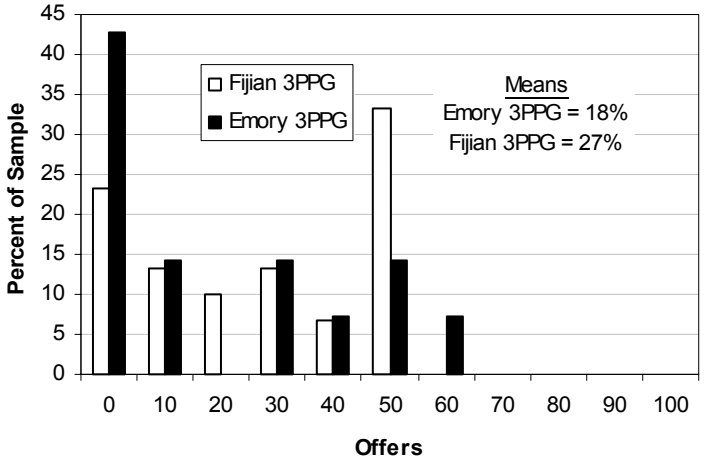


Figure 2. Comparisons of Fijian and Emory offer distributions. Figure 2A, top, compares DG offer distributions; Figure 2B, middle, compares UG offer distributions; and Figure 2C, bottom, compares 3PPG offer distributions.

Second and Third Party Punishment

The differences in willingness to punish between the Fijian and Emory samples are striking (Figure 3). The bars show the proportion of responders in the UG who were willing to reject at each of the possible offer amounts. While both distributions show that the likelihood of rejection declines as offers increase to 50%, Fijians are substantially less willing to reject low offers than are Emory students. For example, for offers of zero, 100% of our sample of Emory students would reject, while only 29% of Fijians would (i.e., over 70% were willing to accept an offer of zero). At the smallest non-zero offer (10%), over 40% of Emory students would reject compared to only 15% of Fijians.

If individuals are purely self-interested, they should be indifferent between accepting and rejecting an offer of zero. This means 50% of participants would pick 'accept' and 50% would pick 'reject'. We tested this null hypothesis and found that Fijians were statistically *less likely* to punish than a purely selfish null hypothesis would predict ($p = 0.012$; binomial probability test). In contrast, Emory students are statistically more likely to punish than the purely self-interested hypothesis would predict ($p < 0.001$). As we point out below, the Fijians response to offers of zero is particularly difficult to account for using the kinds of theoretical approaches that have been successful in explaining games with students.

On the other side of the 50/50 offer, some Fijians in Teci and Dalomo are willing to reject 'hyper-fair' offers, while not a single Emory student was willing to reject any offer above 40%. This willingness to reject hyper-fair offers gives a 'U-shape' to the distribution of Fijian rejections, and makes an offer of 50/50 the only offer in Fiji that will always be accepted. While offers above 50% are not rejected very often, the frequency of rejections for high offers is comparable to those for low offers. Thus, an offer of 100% is rejected 20% while an offer of 0% is rejected 29% of the time. An offer of 90% is rejected 12% of the time, while an offer of 10% is rejected 15% of the time.

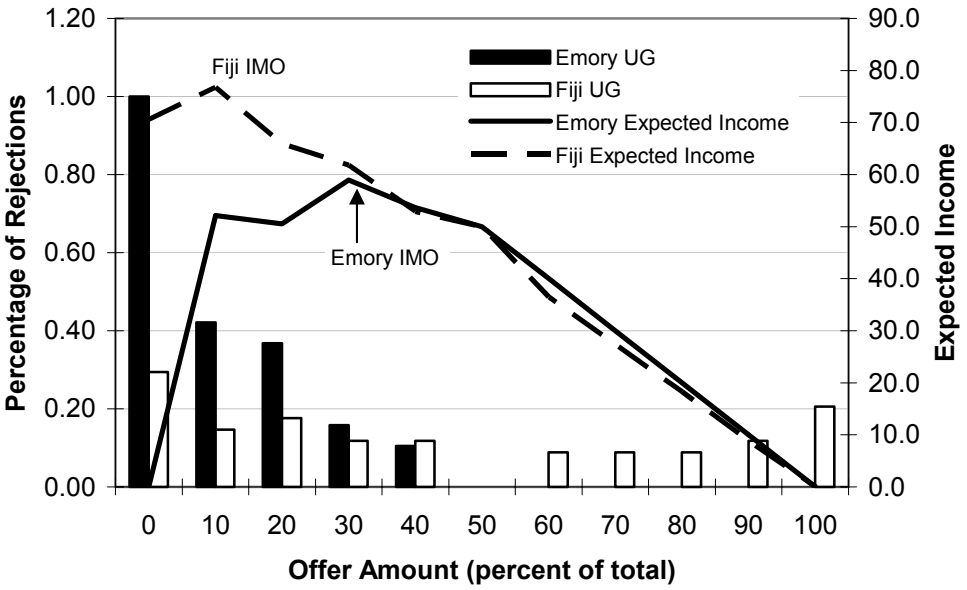


Figure 3. This compares the distributions of responder rejections across all possible offers for Fijian and Emory students. The curves show the expected income to a proposer for each possible offer.

Using the rejection distributions, we calculated the expected income for offer amounts in our two populations, and plotted it as a line in Figure 3. Using this expected income curve, we can ask what offer a proposer would make if he/she wanted to maximize his/her income from the game. Following our previous work, we call the offer that would maximize a proposer's income the income maximizing offer (hereafter IMO). The IMO for the Fijian population occurs at an offer of 10% (giving an income of 77% of the total endowment)—this is also the prediction for responders from the canonical model of pure self-interest; the next best IMO is 0% which yields an income of 71%. In contrast, the IMO of the Emory students is an offer of 30% (yielding an income of 59%), and the second best IMO comes from an offer of 40%, which yields an expected income of 54% of the pot. While the Fijian curve of expected income shows a sharp and steady drop after the IMO at 10%, the Emory student curve is nearly flat between 10% and 50%, with a sharp decline beyond the 50/50 offer.

Comparing second and third party punishment

Figure 4 compares the willingness of Fijian proposers to reject offers in the UG to their willingness to punish third parties in the 3PPG. The patterns are quite similar. An offer of zero evokes punishment from 29% of the second parties (responders in the UG) and 33% of 3rd parties. Offers of 10% provoke rejections from 15% of second-party responders and 27% of 3rd parties. For offers above 50%, 3rd parties also show some willingness to punish. In comparing these propensities for rejection, it is important to remember that the costs of punishing, to both the punisher and Player 1, are quite different in these two games, so direct comparisons of the distributions of punishment can be misleading.[3] Using the punishment data from both games, we calculated the expected income to a proposer making that offer (the IMO, as above). In the 3PPG the IMO occurs at zero, after which the expected income drops steadily across all offers. After an offer of 10%, the expected income curves for the UG and 3PPG drops in lock step with the expected income for the same offer in the UG.

[3] As noted, in comparing the taste for punishment in the UG and 3PPG, it is important to consider the cost to the punisher and the cost inflicted on Player 1. For offers of 0%, punishing costs 2nd party punishers zero, and 3rd party punishers 20% of their endowment. The cost inflicted on P1 is 100% of the endowment in the UG, and 60% for the 3PPG. For an offer of 10%, the cost to the second party punisher in the UG is 10%, while the cost to the third party remains 20%. Meanwhile, the cost inflicted on P1 is 90% in the UG and 60% in the 3PPG. For offers of 20%, the costs of punishing are equal, but the costs inflicted on P1 are 80% and 60%.

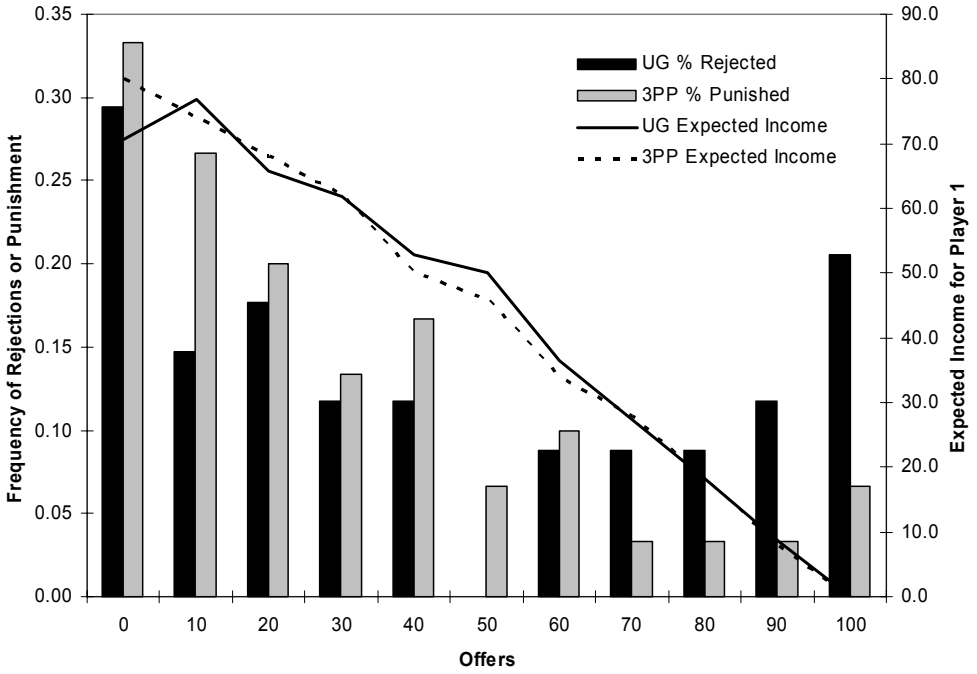


Figure 4. A comparison of rejections for Fijians made across possible offers by 2nd parties in the UG and 3rd parties in the 3PPG.

Comparing Third Party Punishment among Fijians and Emory Students

[complete after final 3ppg session]

Figure 5 compares the behavior of player 3 in the 3PPG in Fiji and Emory. As we saw in the UG, the general patterns of punishment across offers less than 50% are similar, except that Fijians are again less likely to punish than the Emory students. While 60% of Emory students will pay to punish an offer of 0%, only about 30% of Fijians will. Similarly, for an offer of 10%, two-thirds of Emory students will pay to punish, while only 27% of Fijians will do so. Both groups show a plateau for offers of 20-40%. At Emory, 50% of students will punish these offers, while only an average of 17% of Fijians will do so. For offers of 50% and above, punishment abruptly stops for Emory students while, as in the UG, some Fijians are willing to punish hyper-fair offers. Between 3 and 7% of Fijians will continue punishing all the way up to 100%.

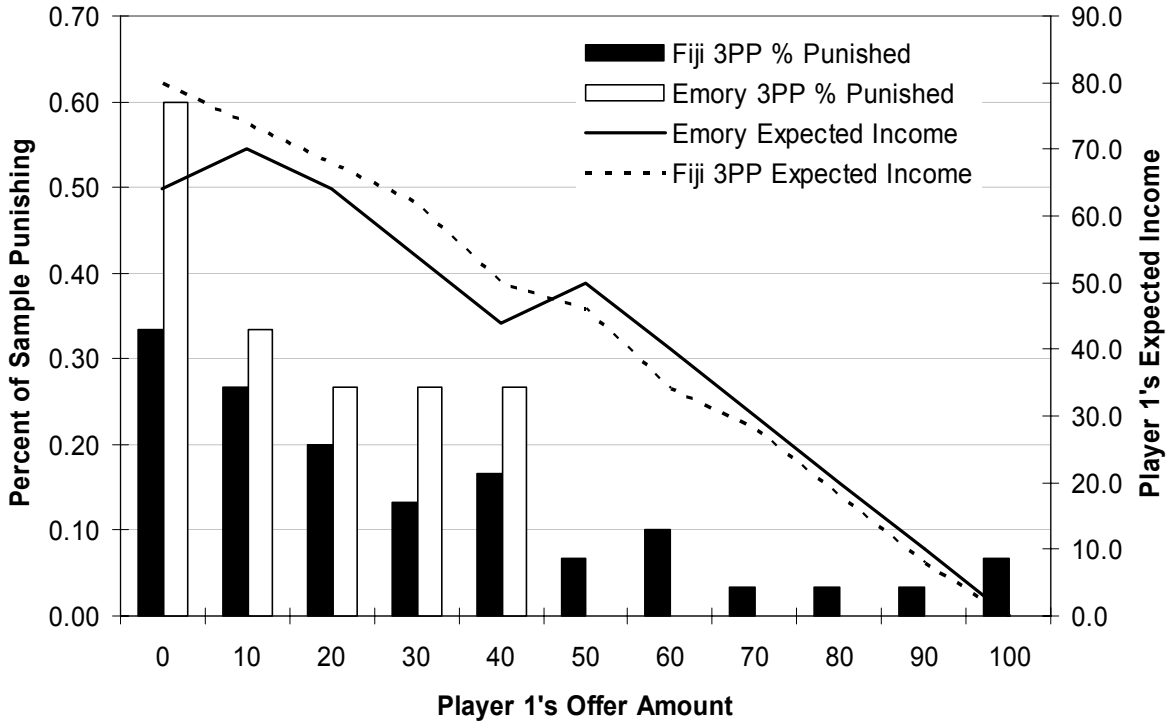


Figure 5. Comparison of Third Party Punish in Fiji and at Emory University

Studying the Within Group Variation in Game Behavior in the Fijian Sample

For each of our five behavioral measures across our three games we systematically, and in coordination with the other papers in this volume, studied the predictive power of a set of six economic/demographic variables and the relationship between DG and UG offers. In addition, we examine the effects of social status, network centrality and kinship on game play, as well as examining the data for evidence of 'confusion' (or misunderstanding), collusion and contagion between sessions.

To match the analysis of economic and demographic variable across sites, we examined the following as independent variables: age (in years), sex, education (years of formal schooling completed), individual annual income (hereafter 'income'), household wealth ('wealth'), and household size. [4] Figure

[4] Wealth captures the sum of all income-generating assets owned by members of the household. Household size is everyone in the household, including children. The details of how we operationalized these measures are available in the appendix of this volume.

6 shows the histograms for these variable from the overall population in order to give a sense of the distributions of our independent variables (we sampled our subjects from these distributions). For each of the behavior measures, we estimated a series of multiple linear regression equations with these as predictor variables. Unless otherwise stated, all the regressions below are ordinary least squares using the aforementioned variables. For comparability of regression coefficients, and for the stability of the regressions, we have scaled all of the individual predictors by their standard deviations. For potentially significant results, we did two robusticity checks. First, because the standard errors of our regression coefficients are likely in question, we ran a bootstrapping procedure to estimate the coefficient and the distribution of those coefficients.[5] We also ran a robust regression that minimizes the *absolute* distance between the regression line and the data point (rather than the square of the distance, as these can give unwanted weight to outliers). The overall summary of all this analysis is: economic and demographic variables do not predict variation in game behavior in any consistent way. This negative finding is fully consistent with prior investigators from a variety of researchers (Camerer 2003: Chapter 2; Henrich et al. 2004).

Dictator Game

Table 2 shows our project-standardized set of regression results using DG offer as the dependent variable. This analysis indicates that economic and demographic variables do not predict DG offers. The adjusted R^2 never exceeds 0.001 for any of these models.

[5] We did this by resampling the data and estimating the coefficients 1000 times with replacement. This gives us 1000 estimates of our coefficients. The standard deviation in this bootstrapped sample gives us an improved estimate of the standard error.

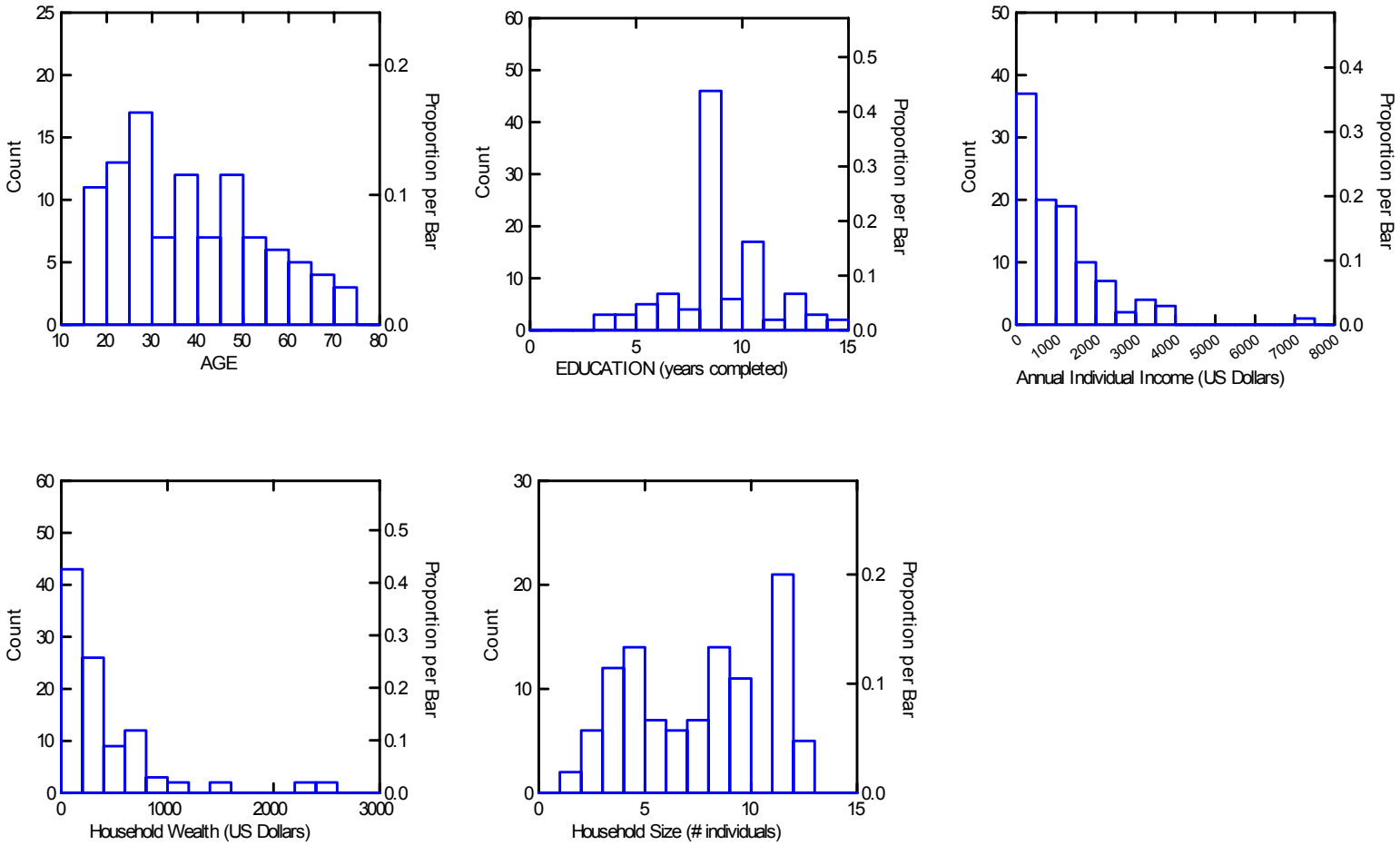


Figure 6. Histograms for age, education, individual income, and household wealth per household member.

Table 2. Linear Regression of Fijian Dictator Game Offers

Variable (Divided by std. dev.)	Model 1 (*n* =34)	Model 2	Model 3	Model 4	Model 5	Model 6
Age	-8.12					
	(5.08)					
Female	-6.94	-4.00				
	(8.00)	(8.00)				
Education	-0.41	1.05	0.69			
	(2.02)	(1.85)	(1.68)			
Individual Income	0.77	2.473	3.74	3.96		
	(4.83)	(2.47)	(4.06)	(3.97)		
Household Wealth	-2.48	-3.08	-2.96	-2.69	-2.00	
	(3.58)	(-3.075)	(3.60)	(3.49)	(3.42)	
Household Size	1.62	2.59	3.28	3.41	2.61	2.02
	(3.60)	(2.59)	(3.33)	(3.27)	(3.17)	(2.96)
Constant	60.3**	22.1	20.2	25.3**	30.1***	30.5***
	(28.9)	(16.8)	(16.1)	(10.2)	(8.98)	(7.49)
Observations	34	34	34	34	34	35
Model Significance	0.53	0.77	0.68	0.53	0.54	0.50
Adjusted R-squared	0.00	0.00	0.00	0.00	0.00	0.00

Note: Standard errors in parentheses. All coefficients are scaled (divided by) the std. dev.
***** 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.**

However, a further exploration of possible interactions between the variables shows an interesting sex difference. For females alone, none of the standard five independent variable matters. However, for males (n = 16), both age and education are significant and robust. From the bootstrapping analysis, the coefficients are -16.9 for age and -7.04 for education, with standard errors (and bootstrapped 95% confidence intervals) of 5.34 (-26.6 to -5.2) and 4.23 (-13.8 to 2.53) respectively.[6] Alone, these two variables and a constant explain about 40% of the variation (adjusted R^2) in male offers. In short, older, more educated males offer less in the DG, with age showing more than twice the effect size of education.

[6] The OLS regression yield corresponding coefficients and standard errors of -17.6 and 5.13 for age, and -7.8 and 3.7 for education. We used to bootstrap analysis because, given the small sample and non-normality of the data, these are likely more accurate. Robust regressions that minimize the sum of the absolute differences between data and the regression line yield comparable results.

Strategy Method Ultimatum Game

Table 3 shows the same analysis for UG offers using our six predictors. The best regression explains about a quarter of the variation (adjusted R^2) and involves sex and household size. Females offer about 17% less than males and people from larger households offer less (a standard deviation change in household size reduces an offer by about 5%). These effects do not vary much in our bootstrapping analyses or our robust regressions. When the sample is partition by sex, we find that household size has twice the effect on female offers compared to males.

Table 3. Linear Regression of Fijian Ultimatum Game Offers

Variable (Divided by std. dev.)	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Age	-0.373					4.04	7.87***
	(4.61)					(3.93)	(2.14)
Female	-19.7**	-19.6***	-18.67***	-17.4***	-17.14***	-15.7**	-13.1**
	(7.27)	(6.95)	(6.36)	(5.56)	(5.39)	(6.02)	(5.65)
Education	1.14	1.30				1.91	4.46*
	(4.18)	(3.66)				(3.41)	(2.62)
Individual Income	-2.21	-2.13	-1.69			-2.67	-1.41
	(4.37)	(4.18)	(3.92)			(3.56)	(3.41)
Household Wealth	1.205	1.18	1.42	1.18		2.29	2.25
	(3.28)	(3.20)	(3.08)	(3.00)		(2.69)	(2.71)
Household Size	-5.431	-5.39	-5.13	-4.67	-5.33**	-6.32**	-5.19**
	(3.26)	(3.15)	(3.02)	(2.79)	(2.58)	(2.66)	(2.50)
DG Offer						9.69***	10.8***
						(2.57)	(2.40)
Constant	60.13**	58.4***	61.5***	58.4***	61.1	26.8	
	(26.2)	(14.6)	(11.48)	(8.87)	(7.60)	(23.1)	
Observations	33	33	33	33	34	33	33
Model Significance	0.14	0.08*	0.04**	0.019**	0.006	0.003***	0.00***
Adjusted R-squared	0.13	0.16	0.19	0.21	0.24	0.43	0.91

Note: Standard errors in parentheses. All coefficients are scaled (divided by) the std. dev.
***** 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.**

We also explored the relationship between DG and UG offers. Figure 7 shows similar, substantial correlations between DG and UG offers for Fijians and Emory students. As explained in the first chapter, we did this in part to explore the relationship between offers in the two games. Do individuals who make high offers in the DG make similar offers in the UG? Our design, with the two games played

consecutively, should allow us to set an upper bound on this relationship.[7] Both samples show a strong positive relationship between DG and UG offers, with correlations of $r = 0.51$ ($p = 0.085$, not different from zero) and $r = 0.42$ ($p = 0.085$) for Fiji and Emory, respectively. This tells us that there is considerable consistency across games, and the degree of consistency is about the same at the two sites.

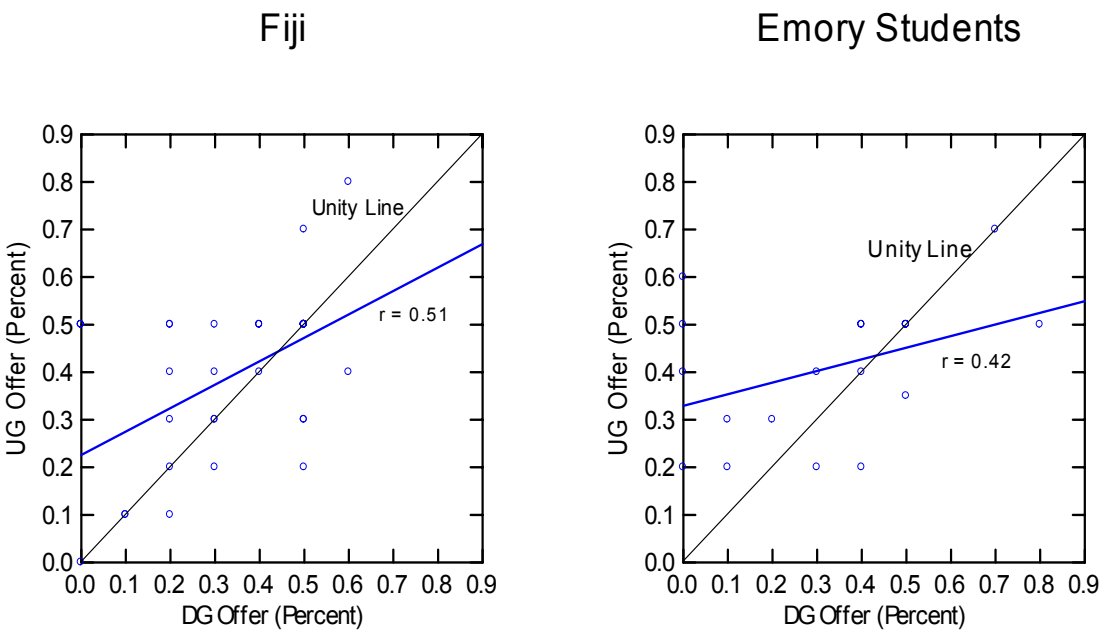


Figure 7. Scatter plots for DG and UG offers showing correlations among Fijians and Emory Students.

If we take the DG offer as a measure of an individuals 'altruism' in this game situation, we might be able to use the DG offer in combination with our other economic and demographic variables to predict how a person will react in the UG. Table 3 shows that if DG offer is combined with our demographic and economic variables, 43% in UG offers is explained (Model 6). If we remove the constant, the variance explained increases to 91% (Model 7). With DG offer controlled for, we see that females offer less than males, older people offer more than younger people, more educated people offer more then less educated people, and people from larger households offer less than people from smaller households.

[7] As noted in Chapter 1, we believe that this correlation is an upper bound because in our experimental design participants played the DG and UG consecutively. If plays in each game had been spaced by weeks or months, we expect that the correlation would be the same or less, but not more. This assumes that at least some players might want to be consistent and that their ability to accurately recall what they did decays over time.

Looking at the responder side of the UG, 31 of our 34 UG responders had a distribution of accept/rejection decisions across offers that permitted us to represent their behavior with a single number, their minimum acceptable offer (MAO).[8] An individual's MAO represents the threshold *below* which they will begin rejecting. Taking this as a dependent variable, we examined the effect of our six predictor variables. Table 4 shows that age and education emerged as significant predictors of about equal magnitude (note that age and education themselves are correlated $r = -0.38$), with the best model explaining about 32% of the variation. Bootstrapping yields comparable coefficient and standard error of -5.21 and 2.5 (respectively) for age, and -5.19 and 2.9 for education.

Table 4. Linear Regression of Fijian UG MAO

Variable (Divided by std. dev.)	Model 1	Model 2	Model 3	Model 4	Model 5
Age	-6.06*** (2.12)	-5.98*** (2.08)	-5.53** (2.09)	-5.57** (2.05)	-5.85*** (2.11)
Female	2.079 (5.06)				
Education	-5.690** (2.08)	-5.68** (2.04)	-5.07** (2.03)	-5.23** (1.92)	-5.62*** (1.96)
Individual Income	4.46 (3.19)	3.87 (2.79)			
Household Wealth	-0.073 (2.34)	0.026 (2.29)	-0.65 (2.27)		
Household Size	4.270* (2.25)	4.22* (2.21)	3.64 (2.20)	3.60 (2.16)	
Constant	26.7** (12.1)	28.5 (11.12)	31.0** (11.2)	31.2 (10.9)	40.7 (9.62)
Observations	31	31	31	31	31
Model Significance	0.022**	0.011	0.01	0.004	0.004
Adjusted R-squared	0.29	0.32	0.29	0.32	0.27

Note: Standard errors in parentheses. All coefficients are scaled (divided by) the std. dev.
***** 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.**

[8] If an individual rejected both high and low offers ('U-shaped'), we set their MAO at their lower threshold. This was the case for only four people—27 had only lower thresholds ('linear') and 3 others had rejection patterns that was neither U-shaped nor linear. All Emory students had a linear pattern of rejections.

Third Party Punishment Game

As above, we examined the predictive power of our six variables on offers and MAOs in the 3PPG. For offers, Table 5 shows the findings with the best model predicting only about 19% of the variation. Age appears to have small effects, with older individuals offering a bit more.

For all of the experimental-behavioral measures we looked for a difference between our two villages, Teci and Dalomo. Offers in the 3PPG are the only place where 'village effects' appeared. Moving from Teci to Dalomo decreases one's offer in the 3PPG by around 3 points, controlling for economic and demographic factors. Model 8 shows that the effect of age is weakened, but still present, when village is included.

Table 5. Linear Regression of Fijian Third Party Punishment Game Offers

Variable (Div by std. dev.)	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Age	6.94*	7.11*	6.80*	7.17*	6.9*	6.91*	0.89	1.24*
	(3.91)	(3.80)	(3.46)	(13.2)	(3.53)	(3.45)	(0.79)	(0.65)
Female	-3.71						-1.24	
	(9.78)						(1.86)	
Education	0.90	1.15					-0.57	
	(5.26)	(5.11)					(1.07)	
Individual Income	-4.87	-4.31	-4.25				-0.92	
	(3.11)	(2.69)	(2.61)				(0.59)	
Household Wealth	-6.40	-6.27	-6.02	-5.49			-1.01	
	(4.06)	(3.96)	(3.72)	(3.95)			(0.78)	
Household Size	0.53	-0.10	0.22	1.98	-0.065		0.13	
	(4.53)	4.02)	(3.50)	(3.61)	(-7.33)		(0.85)	
Village							-2.96*	-3.06**
							(1.60)	(1.33)
Constant	15.75	13.46	17.7	8.06	9.22		8.54	3.61*
	(24.19)	(23.0)	(13.3)	(13.24)	(12.2)		5.40	(1.93)
Observations	26	26	26	27	30	30	26	30
Model Significance	0.22	0.14	0.078*	0.16	0.16	0.055	0.12	0.015**
Adjusted R-squared	0.11	0.15	0.19	0.094	0.06	0.09	0.21	0.21

Note: Standard errors in parentheses. All coefficients are scaled (divided by) the std. dev.
***** 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.**

For our last behavioral variable, we regressed MAO for the 3PPG on our six demographic and economic variables (Table 6). Using all six variables, nothing is significant at a conventional level, although age and income have large coefficients (but also large standard errors).[9]

Table 6. Linear Regression of Fijian Third Party Punishment Game Minimum Acceptable Offers (MAO)

Variable (Divided by std. dev)	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Age	11.3					
	(6.91)					
Female	-4.12	-9.38				
	(9.93)	(10.2)				
Education	0.42	-4.42	-4.75			
	(5.73)	(4.14)	(4.11)			
Individual Income	-12.6	-16.0	-14.4	-14.2		
	(8.93)	8.67	(8.47)	(8.53)		
Household Wealth	0.092	0.21	1.20	0.83	0.046	
	(5.10)	(5.36)	(5.22)	(5.26)	(5.44)	
Household Size	-2.93	-1.62	-0.83	-2.20	-1.89	-1.43
	(5.26)	(5.48)	(5.39)	(5.30)	(5.51)	(5.21)
Constant	0.50	48.4**	41.0**	26.8	15.6	14.1
	(41.5)	(21.0)	(19.4)	(15.1)	(14.0)	(12.9)
Observations	24	25	25	25	25	26
Model Significance	0.20	0.43	0.40	0.43	0.94	0.79
Adjusted R-squared	0.14	0.004	0.01	0.00	0.00	0.00

Note: Standard errors in parens. All coefficients are scaled (divided by) the std. dev.
***** 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.**

Social Network measures of Prestige and Centrality

To evaluate the potential relationship between measures of prestige (or status) and 'network centrality' we used the project's standardized network question to gather data from the entire *Yavusa* (see Chapter 1). We asked every person over the age of 10 who they 'usually talk to about any kind of problem.' People were permitted to list as many or as few individuals as they wanted. All individuals spontaneously named between zero and five individuals. Using these data, for each person we summed

[9] Due to a shortage of players, some people in the 3PPG had played in our DG and UG sessions. Whenever possible, we assigned returning players to the role of Player 2, and tried to avoid allowing Player 1s from the DG/UG sessions to be Player 1s again. There are 3 individuals who were Player 1 in all three games; interestingly, their offers in aren't much different from their offers in the other two games. Thirteen individuals played P2 in the DG/UG sessions and P1 in the 3PPG. We compared the offers of our 17 first timers to the offers of the 13 repeat players and found no difference.

how many times they were named by other people weighted by the order of naming (named first, second, etc. by a particular person).[10] This gives us each individual's 'in-degree' and we believe provides a crude measure of social status. We then regressed each of our experimental-behavioral measures on this status measure in a series of analyses that followed the pattern described above. Our findings were negative on all counts, although we make no strong claims as the status variable is highly non-normal, with most people having an in-degree of zero. We analyzed 'betweenness' in a similar fashion. Betweeness is meant to capture how central a person is in a network. It measures the proportion of all possible paths between all individuals that the particular individual is on (Wasserman and Faust 1994). For all of the experimental-behavioral variables our findings were similarly negative, with the same caveat as above.

Market Integration

To assess the affect of market integration on experimental behavior, we used the five standard measures of market integration gathered at each site—Table 7 lists these variables, and a detailed explanation of the variables can be found in Chapter 1. Data on all five market integration variables were collected in Fiji. Since purchased food as a percent of total calories (MI1) has substantial day-to-day variation, we did not use it to examine individual variation, although it does appear in the group-level analysis. Below, we summarize our findings from our analyses of income (MI2), frequency of wage labor in last month (MI3), trips to market in last 7 days (MI4), and frequency of trading goods/resale in last month (MI5). Only two of the five market integration variables show very much variation (Figure 8).

Before running regressions, we examined our market integration variables for intercorrelations and ran a Principle Components Analysis to look for an underlying variable structure. We did this because, conceptually, the

Table 7. Our Five Market Integration Variables

Var	Description of Market Integration Variable
MI1	Percent of daily calories from purchased foods (based on 1 day sample)
MI2	Income from wages, rentals and trade
MI3	Frequency of wage labor in last month
MI4	Trips to markets in last 7 days
MI5	Frequency of trading goods/resale last month

[10] We also normalized the data so that everyone made an equal contribution to the overall in-degree scores—otherwise individuals who named more people would have a greater effect on the scores.

MI variables may represent a single underlying dimension or cultural evolutionary process—of course, alternatively, one could decompose 'market integration' into a variety of independent aspects. Table 8 provides the Pearson correlation coefficients and the sample sizes (in parentheses) on the right side, and the principle components analysis on the left. Both sets of analyses suggest that no underlying unidimenional factor structure exists, although factor 1 does capture 44% of the variation. Based on these results, we used each of our market integration variables individually.

We regressed DG offers, UG offers, 3PPG offers, MAO, and MAO3PPG on each of the MI variables, and then with any other of our demographic variables that had previously been shown to be significant. Beyond this, we also put all of the MI variables into a backward stepwise regression, and allowed the computer to come up with the best set of predictors. None of the MI variables have any consistent effects on any of the dependent variables, except when 3PPG offers were regressed on MI4. When Offers in the 3PPG are regressed on MI4 (and a constant), a standard deviation increase in MI4 predicts about half of a standard deviation *decrease* in 3PPG offer ($\beta_{std} = -0.43$, $p = 0.023$). This regression is robust to our checks, although it is in the opposite direction to that predicted by the MI hypothesis in Chapter 1.

Table 8. Correlation Coefficients for MI

	MI2	MI3	MI4	PCA Factor Loadings F1	PCA Factor Loadings F2
MI2	1.00	---	---	0.92	0.19
MI3	0.74 (103)	1.00	---	0.86	-0.23
MI4	0.14 (94)	0.04 (94)	1.000	0.40	-0.16
MI5	0.24 (103)	0.05 (103)	-0.041 (94)	0.093	0.98
Percent of Variance explained by Factors →				45%	26%

Interestingly, if the village codes are included along with MI4 and a constant in the regression, the coefficient on MI4 drops to near zero (-0.40, with standard error of 0.28), while the village effect does not move much from that seen in Model 7 and 8 on Table 5. Thus, the MI4 finding is actually capturing a village effect.

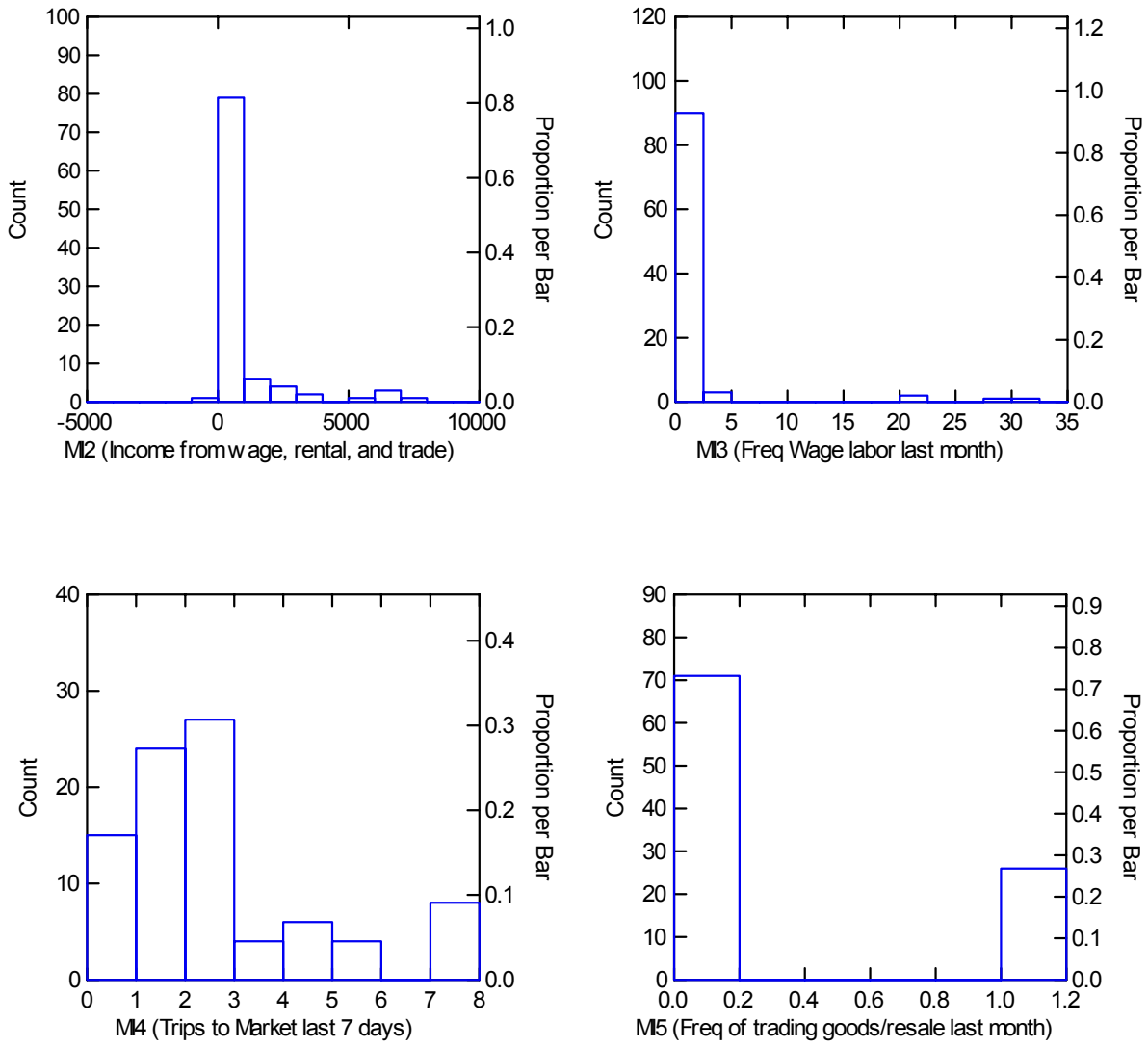


Figure 8. Histograms for Market Integration variables: MI2, MI3, MI4 and MI5.

Session and Day Effects

Because our work continued over several days (with the DG/UG separated by a few weeks from the 3PPG), there was some concern that participants who had completed the experiment may somehow have influenced the decisions of later participants. To examine this, we ran ANOVAs using our five experimental behavioral variables as dependent variables and Day (1 or 2) and Session (1 or 2) as factors. The four plots in Figure 20 illustrate the effect of Day and Session. For both the DG and UG, the first three sessions (2 sessions on Day 1 and first session on Day 2) the mean offers are indistinguishable.

However, for both games, the mean offers in Day 2, Session 2 are significantly lower than the other sessions.

While this effect deserves our attention, we do not think that it represents any of the three C's: collusion, contagion or contamination. If communication between subjects was influencing our results, it would have had its largest effect between Days 1 and 2. However, Session 1 of Day 2 is not distinguishable from either session on Day 1.

Instead, we suspect that the effect results from a sampling bias in our early sessions. We randomly selected names for invitations to the initial sessions from our demographic survey. However, if individuals declined to come, we simply sampled again and went to the next person. By the time we were recruiting for Session 2 of Day 2, we were short on participants. A combination of the village buzz about cash and the persistence of our Fijian research assistants convinced many reluctant participants to attend the last session. All four of our senior research team, as well as our Fijian research assistants, agreed that this last group was a "different crowd," who seemed less socially integrated in public life, and substantially less comfortable with outsiders.

This leaves the question of how to interpret this deviation. Interestingly, if we had been in a large village, or at a university, this segment of the local population would *never* have been sampled. It was only the shortage of participants, high stakes, and persistent persuasion of our RAs, that brought these participants into the game. Thus, we believe they are a real part of the population that is often missed in experiments.

To explore the effect of this last session alongside our previous analyses of economic and demographic variables, we repeated the analyses with a binary variable included: 1 for individuals in Day 2, Session 2, and zero for all others. For both the DG and UG, we found that including the variable does not influence the basic findings discussed above. Moreover, in the UG, that last session dummy is *not* a significant predictor, once sex and wealth per household member are taken into account (but for DG it remains significant).

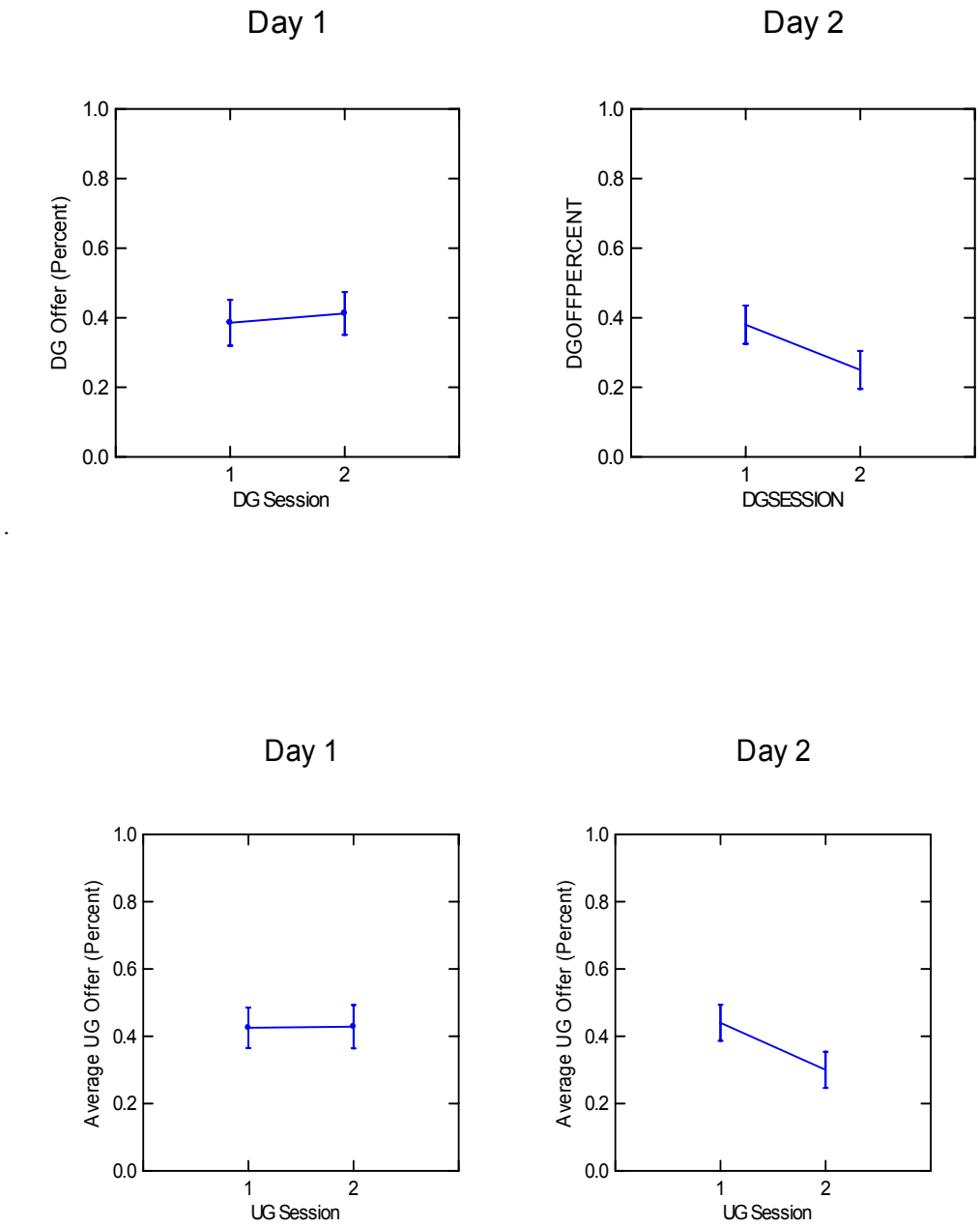


Figure 9. Plots show the average values and standard deviations for DG offers for different days and session. All are indistinguishable, except for Day 2, Session 2.

Does 'understanding' affect our results?

For each person, we used at least four examples to teach the game and test their comprehension. Table 9 shows a summary of the number of examples used in each game by players who eventually passed the test. These values provide a measure of the relative difficulty this population had in comprehending the experiments.

Table 9. Examples used in Games

No. Examples	DG	UG	3PPG
Min	4	4	4
Max	9	15	20
Mean	4.5	5.8	8.8

While all of our subjects had to pass a pre-play test that involved answering two hypothetical game problems correctly, it is possible that some individuals learned to pass the tests by seeing repeated examples without fully comprehending the game. This could influence our results in two ways. First, confused people could bias their choices in one direction. Confused individuals might tend to prefer the choices in which they seem to get more money (which they might notice in the examples), even if they don't understand the underlying logic. Because learning to 'beat the test' will require many examples, we can test for this possibility by regressing each of our five behavioral variables on the 'number of examples' each player required to pass the test. If this hypothesis is true, the coefficient should be negative and significant. This is not the case: all of our regressions produce small, non-significant coefficients for our 'number of examples' variable.

A second way that confusion might influence our results is by increasing our variance. Partially confused individuals might be more likely to behave randomly or at least in a way inconsistent with those how understood the game. To explore this, we regressed the *absolute differences* between an individual's offer (in each game) and the mean offer for that game on 'number of examples.' No significant effects were found. The offers of people who required more training examples did not deviate from the group mean any more than people who required fewer training examples. We did the same thing using the deviation from the mode and found the same negative results.

Overall, these results, along with our generally negative findings for the effect of education on game behavior, indicate that comprehension of the game was not responsible for variation in our results.

Post Game Interviews

Following the completion of all the games, we conducted post-game interviews with a subsample of players (n=19 for UG and DG, n = 20 for 3PPG).

In our post-game interviews we asked, "How much *should* Player 1 (P1) have allocated to Player 2 (P2)?" in each of the three games. In standard Fijian, the word for 'should,' *dodonu me*, captures just the right connotation for our purposes, implying 'proper' or 'appropriate' behavior for the circumstances.[11] There was near unanimity in response to this question, with all but two people saying that Player 1 *should* give 50% to Player 2 (Table 10). Even people who did not give 50% said this.

Table 10. How much *should* P1 send to P2?

%	DG	UG	3PPG
10	0	1	1
25	1	0	0
50	17	17	19

Players were also fairly consistent in how they said they would feel if Player 1 offered them zero in the UG, and how they think P2 and P3 would feel if P2 received an offer of zero in the 3PPG. There was solid agreement that the dominant emotions of P2 and P3 would be sadness and anger. During the post-game debriefing, interviewers let the respondents list as many emotions as they wanted. If the respondent did not spontaneously say 'sad' (*yalobibi*, literally 'heavy spirit') or 'angry (*cudru*),' the interviewer would probe further by asking specifically about these emotions, and often about 'happy' (*marau*). Tables 11a and b show the frequency of

Table 11a. How would you feel if you received an offer of $0 from P1 (in the UG)? ($n$ = 19)[12]

Sad	13 (4)[13]
Angry	10 (8)
OK/ Accept it	5
Dissatisfied	1
That P2 is greedy	1

Table 11b. (In 3PPG), if P1 sent $0 to P2 and kept $20, how would…

(n = 20)	P2 feel?	P3 feel?
Sad	15	4
Angry	15 (4)*	11 (2)
OK/Must accept it	2	0
That P1 is greedy	2	0
Concerned about/Sorry for P2	--	8
Want to punish P1	0	2

[11] In Fijian villages it is difficult to find a clear distinction between 'appropriate' and 'morally correct.'
[12] The number of responses adds to more than the number of respondents because people could list more than one feeling.
[13] Number in brackets indicates number of people who agreed that they would have this emotion when explicitly asked about it. The interviews did not restrict their suggestions to 'angry' and 'sad', but also asked about 'happy.' Not a single person agreed with the 'happy' suggestion, showing that respondents aren't just agreeing or going along with the interviewer.

the different emotions expressed, with the number in parentheses indicating the number of people who agreed that they would feel sad or angry when this was suggested by the interviewer. When asked about the feelings of P2 and P3 in the 3PPG, 'sad' and 'angry' were the dominant emotions, and people less frequently reported several other emotions. These other emotions, when they were elicited, were always negative, indicating that very low offers elicit the kind of negative affect associated with norm violations. Also of note is that most people did not think that P3, unlike P2, would feel sadness (although 'concern' was suggested by some), but the same number felt P2 and P3 would feel anger. This negative emotion does not translate into a desire to punish—lots of people mentioned anger, but few thought this led to a desire to punish (this was probed directly). Moreover, several players said that they did not think that any negative emotion would be experienced, and twenty-six percent of respondents said that in the UG, P2 would need to accept the fact that he got a low offer or would be okay with it. This is consistent with the relatively low rate of punishment (compared to Emory students).

In the post-game interviews, players were also asked what each of the games reminded them of. Table 12 shows that the most common reply was that the game did not remind them of anything. The second most common reply was a rather vague association with sharing, either with relatives or non-relatives. Combined with the findings about negative emotion, this suggests that the game may have tapped a rather *generalized* norm or preferences related to fairness, sharing and equity in social interactions.

Table 12. What does this game remind you of?

Person mentions	DG (n = 20)	UG (n = 20)	3PPG (n =25)
Could not think of anything	11	15	16
Sharing with relatives	4	4	4
Sharing (with or w/o relatives)	6	4	4
Fighting over something	0	1	1
Giving money to church	1	0	0

Between us, we have now done such post game interviews with university students, Machiguenga, Mapuche (Henrich 2000; Henrich and Smith 2001), Chaldeans in Detroit (Henrich and Henrich 2004) and Fijians. The results indicate that sometimes people link the game to a specific context or set of contexts (as did many Chaldeans), but most of the time no explicit link can be stated.

Discussion

Our major findings can be summarized as follows. At the group-level, *offers* in our Fijian sample are generally consistent with the findings from our 'standard' student-subjects, except perhaps in the 3PPG. The Fijian villagers show substantial contributions in all three games, with modal offers at equity (50%). The highest mean offer occurs in the UG, then the DG, and finally the 3PPG. Emory students show a similar pattern across games, although their increase in the means in moving from the DG to the UG is about double that observed in Fiji. Moreover, the students' mean offer in the 3PPG is well below both their DG offer, and the 3PPG offers of the Fijians—students have a mode at zero in contrast to 50% in Fiji. On the punishment side, Fijian responders and 3rd parties reveal very little willingness to punish low offers, in both absolute terms and compared to students, although the difference between these populations is strongest in the UG. The IMO in the Fijian UG is 10%, while among students it is 30%. In the 3PPG, the IMO is 0% among Fijians and 10% among students.

At the individual-level, consistent with a myriad of similar findings (Camerer 2003; Henrich et al. 2004), economic and demographic variables explain little of the variation in game behavior. The variables we tested were sex, age, education, income, wealth, status, network centrality, and household size. We also examined the average degree of relatedness of a player to both the *yavusa* and to others in the game session and obtained only negative results. Interestingly, when DG offers are combined with age and sex, we can predict 90% of the variance in UG offers.

Proximate Motivations and the Patterns

In considering how different motivations might have influenced our experimental results, it makes sense to use income-maximization as a benchmark, especially since proposer behavior among Americans in the UG appears at least roughly consistent with income-maximizing in the game, given the likelihood of rejections across offers (Roth et al. 1991). This appears to be true for both students and older adults in the U.S. (Ensminger, this volume; Henrich & Henrich 2003: Chapter 6). In contrast, UG offers in Fiji do not appear, in any way, consistent with an income maximizing strategy (see Figure 10). Only

11% of offers fall on the IMO (10% offer) or on the second-ranked IMO (0%). Meanwhile, over 45% of offers fall on the 50/50 split, which ranks 6th in expected income, and generates 27% less income than the IMO. The mean offer is about 30% greater than the IMO.

While not as sharp as the non-student adult findings (Ensminger, this volume), the behavior of the Emory sample is much more consistent with an effort to maximize income. Figure 10 shows that 90% of Emory offers fall along the income maximizing plateau,[14] between 20% and 50%. The mean offer is only about 10% greater than the IMO of 30%. In terms of motivations, a variety of additions to pure income maximization can explain why most students tended to offer more than the IMO. These include aversions to variance in income, ambiguity, and inequality. If students tended to prefer (even weakly) choices with a low variance in outcome or less ambiguity (Camerer 1995; Camerer and Weber 1992) in payoffs, they would tend to pick offers of 50%. If students prefer more equitable outcomes (Fehr and Schmidt 1998), in addition to their own self-interest, then they may also gravitate toward the offers of 40% and 50%.

These three aversion-motivations are difficult to apply to the Fijian UG situation. At the core of the issue is that Fijians show a sharp decline in expected payoff for offers greater than 10%, not a plateau as among students. This means that whatever the driving motivations are, they have to completely overpower income maximization. For ambiguity aversion, this case is difficult to make because people in these villages have known each other their entire lives, frequently work and socialize together, and share much more similar backgrounds and cultural beliefs than our collection of Emory freshman. Few, if any, of our freshman had ever met one another before they arrived at Emory. If anyone should suffer from an inability to assess the local group's IMO or likelihood of rejecting an offer, it should be the Emory

[14] The plateau in expected income, created by the taste for punishment in the Emory freshman, contrasts with the sharp peak observed in Ensminger's data at 50% from non-student adults in rural Missouri. The most likely explanation for these differences is a developmental one—university freshmen are not completely socialized. Social preferences, as measured in these experiments, continues changing with age until about age 22, where it levels out (age is not a predictors of game behavior after age 22). Moreover, UG mean offers seem to be on a somewhat different trajectory than responder rejections, with offers reaching their stable adult level before the taste for punishment (Henrich 2003).

students.[15] Moreover, as above we used 'understanding' (measured by the number of examples required for explanation) to predict the variable Offer-IMO and found no relationship.

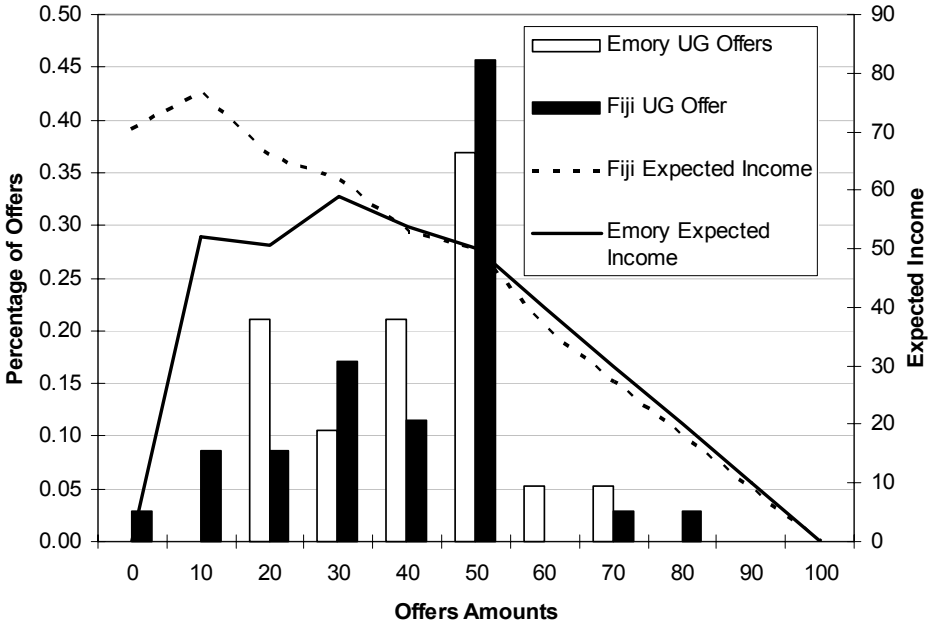


Figure 10. This plot overlay the expected income curves, which were derived from the distribution of rejections, on the distribution of offers for the Fijian and Emory games.

An aversion to the variance in outcome is also unlikely to explain Fijian behavior. Looking back at Figure 4 we observe that there is little (no statistical) difference between the probability of rejection at offers of 10%, 20%, 30%, and 40%, and yet a high percentage of offers fall in this range—if an individual cared about income and variance in income, he would still pick 10%. For the 50% offer, one could argue that over 45% of Fijians have an extreme variance aversion that overpower the IMO and drove them to the 50%. Such individuals require a utility function that weights expected income and standard deviation in income nearly equally.[16]

[15] Note that, like the Fijians, Emory students also failed to make consistent links between the game and real life situations, so there is no sense in which the game was more or less ambiguous to either group, at least based on our post-game data.

[16] If Utility = (expected income) + β*(standard deviation in income), then β has equal at least 0.86 before a Fijian would switch to offering 50% (this assumes he knows the probability of rejection). We are aware that this is a non-standard formulation of utility; it nevertheless captures the point.

Finally, a wide range of data from students suggests that inequality aversion is an important motivation (Fehr and Schmidt 1998; Fischbacher et al. 2002). However, in the UG, inequality aversion usually explains the prevalence of responder rejections, while simple income maximization takes care of proposer behavior. This is because inequality aversion is assumed to be strongest when the inequality favors the other player, and weaker when the inequality favors the decision-maker. The Fijian result does not fit this picture. First, consider the behavior of responders for offers of zero. Seventy percent of responders accept such offers. At an offer of zero, a responder's choice is determined only by the allocation the *other* person receives. If people care *at all* about inequity, everyone should reject zero (as students do). As noted earlier, if people were only concerned about income they would accept and reject at random, yielding a rejection rate of 50%.[17] Fijians, however, accept zero-offers at a rate statistically better than chance. Most Fijian are apparently more concerned, perhaps, with prosociality (total payoffs to the pair) or altruism than inequity.[18] For inequality aversion to explain proposer behavior, Fijians would have to have positive inequity motivations much greater than any observed among students—these motivation would have to them from offer 10% to 50% with no help from rejections. Given what we just discussed with negative inequality among responders, this would mean that Fijians would be characterized by massive positive inequality aversion, and no negative inequality aversion. This is not impossible, but certainly extremely different from the usual student patterns: implying that Fijians are highly motivated to be equitable to one another (following what people say they *should* do), but not motivated at all to sanction others for inequitable behavior (even when they feel anger or sadness).

In Figure 12, we superimposed the expected income curves on the distribution of offers in the 3PPG, for both Emory and Fiji. As before, among Emory students we see that the behavior of P1's in the 3PPG is largely consistent with an income maximizing strategy. In contrast, the Fijian results show that

[17] A die-hard proponent of pure self-interest might suggest that faced with indistinguishable choices, an actor might prefer to use the word that requires less energy or effort to utter. However, the Fijian words for accept (*cina*) and reject (*goma*) have the same number of syllables.

[18] Outside the game, in village life Fijians do not share money widely. They share food and labor extensively, but not cash. Participants have no reason to suspect that they'd get some of the unrejected money later. The difference between money and other things is stark. Even mothers and daughters sometimes keep separate accounts.

less than 25% of the sample is making the income maximizing offer, while 33% made offers of 50%, very far from the income maximizing offer, with the mean in-between at 27%. Over half of the sample offered *substantially* more than the IMO. For the same reasons described above, we don't think that variance or ambiguity aversions are likely explanations. Many third parties are willing to make the 'right' offer—that is the offer that our post-game interviews said people *should* make—but they are not willing to sanction those who don't. Emory student are more willing to sanction, but many fewer are intrinsically motivated to fairness—these students results parallel those obtained by Fehr & Fischbacher (2003) among Swiss students in a more complex version of the 3PPG.[19]

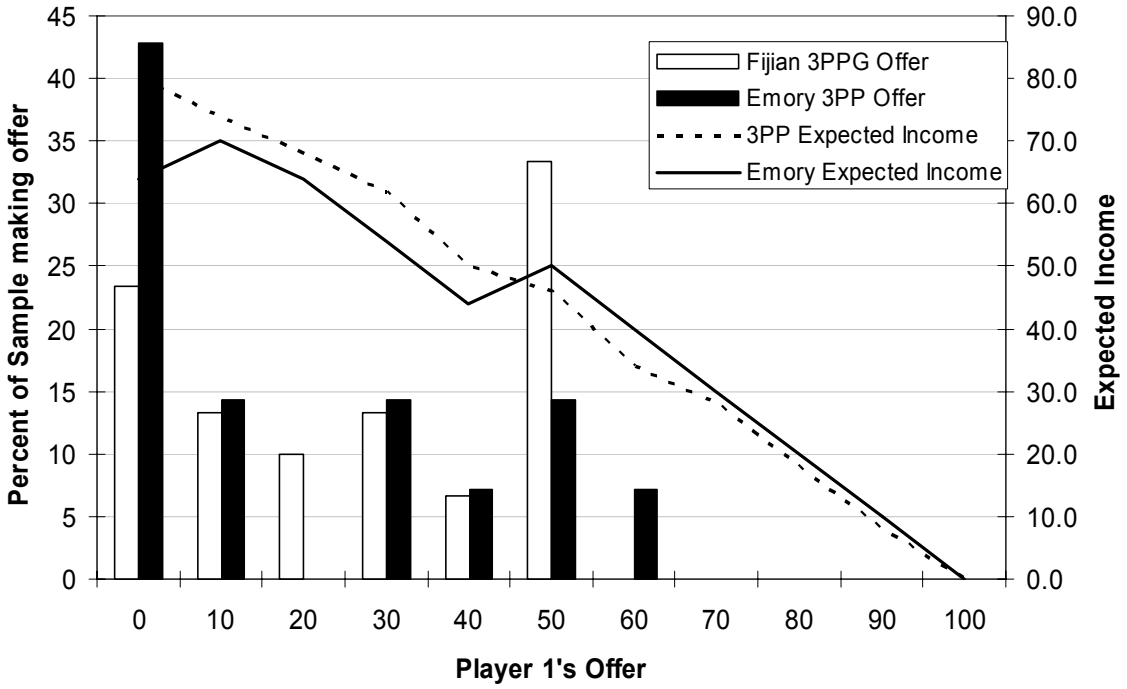


Figure 12. The expected income curves for Emory and Fiji are superimposed over the distribution of offers in the 3PPG.

Both the Emory and Fijian experiments hint at the possibility that adding punishment to the game drives out altruistic preferences. We see this in comparing the DG and 3PPG offers. Among Fijians, the

[19] One brief ethnographic observation is warranted here. Both experimenters observed that many Fijian third parties seem to want to either (a) give some of their money to poor player 2, or (b) transfer money from player 1 to player 2. In teaching people the game, these were the two most common ways that people misunderstood the game. Both seemed more sensible and natural to their way of thinking. Had these been options, we strongly suspect that third parties would have been much more active.

mean offer drops from 35% to 27%, while among the Emory students the mean drops from 32% to 18%. If altruistic tastes are driven out in some fashion, it is difficult to explain the drops without some notion of context-dependent preferences or motivation. Elsewhere we've shown how, when the DG was interpreted as 'charity' while the UG was seen as 'competition' (Henrich and Henrich 2004: Chapter 6), one can get DG offers that are greater than the those in the UG.[20]

Where do social preferences come from?

Such experimental data can be explained by positing different kinds of social motivations, beyond self-interest, or what economists call social preferences. As we've shown, non-social preferences (e.g., variance aversion) don't fare very well in explaining game behavior in Fiji or among student punishers. These data suggest that basic other-regarding motivations or social preferences, however they are conceived, probably vary in important ways across populations. This naturally leads to the question of where social preferences come from. To address this, we will first briefly consider what is known about the acquisition of the social preferences that govern game play among American subjects. Then, we will examine the social and cooperative patterns of life in the Fijian villages where we worked, which we think both reflect and transmit the social preferences that emerged in our experiments. Finally, we will bring the social learning aspects of our theory together with insights from cultural evolutionary game theory.

Research on the development of social preferences comparing Americans of different ages suggest that social preferences develop gradually over the first two decades of life, and then remain relatively stable (Carpenter et al. 2002; Henrich and Henrich 2004). In the UG, this works show that second graders are pretty selfish, but by 12th grade, offers are approaching their adult plateau (Harbaugh and Krause 2000; Harbaugh et al. 2002). DG offers hit their plateau even later, with full-fledged adults

[20] Some economists have tried to suggest that offers in the DG were driven by a lack of anonymity between the experimenter and the subject. If this is the case, why would adding punishment (while leaving the experiments exactly the same) cause offers to decrease?

making substantially higher offers than college kids (Henrich 2003). In combination with what we know about the effect of social learning and imitation on the early acquisition of prosocial behavior in children (Eisenberg 1982; Eisenberg and Mussen 1989), these findings suggest that social preferences are gradually acquired over at least two decades of learning and experience in particular social environments. Thus, a sensible working hypothesis is that during the first 20 years of life people gradually acquire important aspects of their social preferences via social learning from those around them, and from direct experience in the social environment.

This simple hypothesis leads to two predictions about experimental game behavior:

1. Game behavior should reflect, in a general sense, the social environment experienced by the player during ontogeny, with perhaps some modest accommodation to their current social environment, if it substantially differs from the one they grew up in. In many cases, because societal evolution moves slowly and often involves 'equilibrium selection' (see below), games will tend to reflect social life in the current society of the players.
2. Cultural learning in shared social environments means that individual economic and demographic characteristics will not predict game behavior unless they correlate with significant differences in the ontogenetic environments of the players—e.g., social class, caste and/or ethnicity may be important as these sometimes correlate with differences in the social environments of ontogeny. For example, measures like market integration won't matter unless the measure reflects difference in the ontogenetic social environments faced by learners.

Together, these two predictions mean that groups will vary because they have evolved culturally to different equilibria, but individuals within groups will not vary substantially for the same reasons (equilibria are group phenomena).

Let's consider the social world experienced by people growing up in a Fijian village. In these villages, social life is intensively cooperative. People routinely cooperate in a variety of tasks. Planting occurs either within the *itokatoka* (subclan, or extended kin group) or sometimes within the *mataqoli*. Numerous community projects, such as planting the chief's yams, house building, maintaining the village

and school, building houses and preparing feasts (which involve fishing, cooking, weaving mats and making coconut oil) for a variety of occasions (which include every marriage, 1st birthday, funeral, and the arrival and departure of every significant visitor). Table 13 summarizes the 20 most important domains of cooperative activity in Teci and Dalomo.[21] This table is based on interviews with 24 randomly selected people who were asked how often the activities occurred in the last week, month or year, how many men and women usually participate, and how many times they had participated themselves. We also asked if any activities were missing from the list. Table 13 shows the 20% trimmed means for the frequency of the activities (standardized to times per year), the number of female and male participants, the total number of participants, and an overall cooperation score (obtained by multiplying the total number of participants by the frequency per year). This data suggests that cooperative activities of some kind occur about 206 times per year. Moreover, both our observations and interviews suggest that Fijians love working together. People will readily tell you this, and cooperative workgroups are jovial affairs with lots of chatter, laughter and pranks.

[21] We generated the initial list by asking six subjects to freelist cooperative activities. The initial list was 18 activities. During our formal interview two additional activities arose when we asked people if any cooperative activities were missing from our list. We added these.

Table 13. Cooperative Activities in Teci

#	Cooperative activities	# per year	# male	# female	Total #	Coop score
1	Cleaning the village every Monday	48.0	19.0	11.3	30.3	1453.7
2	Working at school every Tuesday	46.3	13.4	7.9	21.2	981.9
3	Meke in Resort	48.0	9.1	6.7	15.8	757.7
4	Meke (at Dalomo)	28.3	1.1	7.8	8.9	250.5
5	Gathering Palms for Bure at Resort	12.1	20.4	0.0	20.4	246.6
6	Soli vakakoro (village fund raiser)	1.9	40.0	40.0	80.0	154.3
7	Post soli vakakoro	1.9	36.3	37.0	73.3	141.3
8	House Building	3.6	19.6	9.5	29.1	105.9
9	Post house building feast	1.8	23.1	21.9	45.0	80.4
10	Government ministers visits	2.3	18.6	14.9	33.4	76.4
11	Teacher Meeting	3.0	12.0	12.1	24.1	72.4
12	Condolences	2.1	16.2	17.3	33.5	71.7
13	Plant Yams in Chief's Farm	1.9	24.2	5.0	29.2	56.3
14	Funerals	1.0	23.9	23.3	47.2	47.2
15	Marriage (making mats, fishing)	0.9	25.6	22.8	48.4	41.5
16	1st Birthdays	0.9	17.0	16.9	33.9	31.5
17	Returning Vasu's (mats, fishing)	1.0	21.4	20.1	41.5	41.5
18	New Boat feasts	0.2	21.4	21.1	42.5	9.1
19	Other Birthdays	0.9	2.1	1.9	4.0	3.4
20	21st birthdays feasts	0.1	15.1	13.2	28.3	2.0

The ethnographically naïve might think that this level of cooperation is merely a universal part of village life in small-scale societies. This is definitely *not* the case. We've spent many months studying cooperation in both Machiguenga villages in the Peruvian Amazon (who also rely primarily on root-crop horticulture and fishing) and in small Mapuche farming communities in southern Chile Life in these locales does not even begin to approximate the intensity of social interaction or the degree of cooperation we have now observed in two Fijian villages. Both Machiguenga and Mapuche households operate as primarily independent economic and political units while Fijian villagers integrate their activities across the *yavusa* in a variety of ways. In these two South American groups we, and others, have documented a lack—or frequent failure—of many of above activities. During one of our four stays in the Machiguenga village of Camisea, the elected leader was repeatedly unable to assemble men to perform village

maintenance (cleaning, grass cutting) and to construct a new school house (also see similar observations by Johnson (2003) made twenty years earlier in a different Machiguenga community).[22] In a Fijian village of similar size, all males show up for the *exact same* activities and work for hours. Both Machiguenga and Mapuche express a distrust of communal work, and a quiet suspicion of those pushing for it. This contrasts sharply with the Fijians' joviality during cooperation, and their deep respect for the elders and the chiefly lines of village authority. Complementing our ethnographic work, we've done experimental games in all three of these places and the results clearly reflect the stark differences observed in daily life (Henrich and Smith 2004).

How is all of this cooperation maintained? If people tend to learn from highly successful individuals—and we know they do (Henrich and Gil-White 2001)—or through adaptive forms of individual learning that favor higher payoff strategies, then theoretical work using cultural evolutionary models indicates that *n*-person cooperation should not be maintained unless non-cooperation can be punished in some fashion, either through direct punishment (Boyd et al. 2003; Boyd and Richerson 1992; Henrich and Boyd 2001) or through reputation damage that influences a person's success in other social interactions (Panchanathan and Boyd forthcoming).

To explore this, we asked people both (1) cases in which someone broke a village rule or was punished for not contributing to village affairs (not planting the chiefs yams, or assisting at the school), and (2) what would happen if someone consistently failed to contribute to village life. Several patterns were clear. First, once a pattern of neglect is recognized, the chief and council of elders will meet to decide what the village is going to do. This will be followed by a full village meeting at which anyone's view can voiced, but if 'found guilty' the offender will be publicly admonished. Officially, for non-participation in village projects, nothing further will be done; however two additional forms of punishment also occur (or are perceived to occur). First, people may apply third party punishment furtively. In one case, two norm-violators had some of their crops uprooted and water thrown on them at

[22] In the case of the latter, after a few weeks of failures the *mestizo* school teachers, in frustration, stopped holding classes and compelled the students to construct their own school.

night. Note that this only happens after the public admonishing. While a person could normally bring such treatment to the attention of village elders (who would take action), this is not a realistic option because, after an admonishing, such treatment would be considered 'justified.' We are just beginning to study this, but our sense is that the public admonishing may license others to take out old frustrations that they heretofore could not have exercised. Second, the 'anger of the chief' may lead to supernatural sanctions. Everyone believes that such violations can cause illnesses (which can last for generations in a blood line), shark attacks, and injuries (e.g., burns on children). These are effective deterrents as long as people believe in the causal connection.[23]

Punishment in Fijian villages appears to be both direct and indirect. Unlike in our society, direct punishment requires an official consensus decision by the village, in a process dominated by the Chief and the elders. Single individuals do not see themselves as norm-enforcers or punishers. We suspect, however, that much of the maintenance of prosocial behavior is by reputational effects on one's participation in the system of generalized reciprocity, and the threat of supernatural sanctions.

One way to misinterpret what we are suggesting would be to think that Fijians were equitable in the games because they anticipated damage to their reputations if they made low offers—that is, that they did not understand or believe the one-shot or anonymous nature of the games. Such an interpretation misconstrues the adaptive nature of human learning. People should learn the motivations and social preferences which allow them to survive and thrive at the current culturally-evolved equilibrium of their society. These acquired motivations should allow them to (1) rapidly make decisions in local social situations with incomplete information, (2) accurately anticipate the behavior of other ('know how they feel'), and (3) effectively protect their future reputation without endless steps of forward or backward induction (which we know humans cannot do: Camerer 2003). Evolution appears to have dealt with the multiplicity of social equilibria that cultural evolution can create by building cultural learning

[23] In the case of serious infractions such as theft, rape, etc., the accused will be tried by the elders in a village meeting. If deemed guilty by consensus, he will be beaten to the point of collapse, usually with a special stick or pipe.

mechanisms that internalize culturally-appropriate social preferences or values that create the locally adaptive forms of intrinsic motivation (Gintis 2003; Henrich 2004; Henrich and Henrich 2004).

These data also challenge another wide-spread interpretation of behavioral-economic results. Some evolutionary psychologists have argued that humans inevitably 'assume' (in some sense) that they are in a long-term repeated interaction because of our evolutionary history of living in small-scale isolated foraging bands, where—they claim—low frequency interactions were rare and not fitness relevant. The more sophisticated version of this argument holds that our evolved psychology has a 'non-zero baseline' or 'default setting' that assumes—barring cues to the contrary—that interactions will be repeated frequently. People can understand that some interactions will go on longer than others (and are sensitive to certain cues about this), but they cannot fully grasp idea that an interaction might last only one or a few rounds (or at least telling them that the game won't be repeated isn't one of the relevant cues). Thus, from this perspective, behavior in one-shot games can be explained by pure self-interest—people are purely self-interested but they mistakenly think they are in a game that repeats many times. This approach, for example, has been used to explain the tendency of responders to reject in the UG—in a repeated UG, a self-interested responder should reject low offers, at least early in the game. However, the pattern of variation in the UG in this paper does not support this argument. The Fijians, who actually live in a small-scale, face-to-face society, do not reject low offer in the UG. Emory students, who live in a society with many one-shot interactions, consistently reject low offers. The above hypothesis predicts that people from a face-to-face society should reject more, not less. One would think that people who actually live in a small-scale society might be the ones most likelihood to mistakenly think they are in repeated game context.[24]

This work suggests that high levels of fairness/equity can be maintained without the *kind* of direct and 3rd party punishment typically observed in industrialized societies. In combination with ethnographic

[24] In general, this evolved psychology hypothesis is deeply flawed (Boyd and Richerson 2002). It's conception of ancestral environments is built on popular anthropological myths (Fehr and Henrich 2003). Perhaps more problematic for this hypothesis are the student results in the 3PPG. It is not clear who some confusion about life in small-scale societies might cause students to punish in the roll of a third-party—see Fehr and Fischbacher (2003)

data on Fijian social life and from child development, the emerging picture suggests that a variety of social preferences may be acquired during ontogeny via cultural learning. At the ultimate level, this is consistent with recent evolutionary modeling showing that high levels of prosociality can be maintained without direct and 3rd party punishment *in small-scale societies* by linking it reputation effects in a system of indirect reciprocity (Panchanathan and Boyd forthcoming). Future work should focus on studying the ontogeny of social preferences across a range of small-scale societies.

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