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Culture sometimes matters: intra-cultural variation in pro-social behavior among Tsimane Amerindians

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Abstract

Agent-centered models usually consider only individual-level variables in calculations of economic costs and benefits. There has been little consideration of social or cultural history on shaping payoffs in ways that impact decisions. To examine the role of local expectations on economic behavior, we explore whether village affiliation accounts for the variation in Dictator Game offers among the Tsimane of the Bolivian Amazon independently of other factors that could confound such an effect. Our analysis shows that significant differences in altruistic giving exist among villages, village patterns are recognized by residents, and offers likely reflect variation in social expectations rather than stable differences in norms of fairness.

Keywords

experimental economics; Dictator Game; social norms; altruism; Tsimane

1. Introduction

By all accounts, the notion of *Homo economicus* in the social domain seems to be endangered, replaced by a species whose social preferences are characterized by an aversion to unequal division (Fehr and Schmidt 1999, Bolton and Ockenfels 2000), a concern for fairness and a taste for reciprocity (Rabin 1993, Bowles and Gintis 2004, Hoffman et al. 1998, Charness and Rabin 2002). Modified utility functions that trade-off selfish against other-regarding behavior can help to describe some of the growing number of discrepancies in pro-social behavior displayed in variants of common, bilateral experiments played in modern, industrialized societies, including the Ultimatum Game (UG), and Dictator Game (DG). It is often viewed that these utility functions are species-typical, even if the weightings of the components of utility functions may vary among individuals. A recent sample of UGs played in fifteen small-scale societies around the world revealed significantly more variation in pro-social behavior than typically found in industrialized societies (Henrich et al. 2001, see papers in Henrich et al. 2004). They also found that variation in mean UG offers across cultures can largely be explained by a combination of market integration and potential payoffs to cooperation within those societies. Overall differences in game behavior are thus seen as a result of ecological differences because different environments may foster variable levels of cooperation and may

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have experienced a distinct history of market transactions. Although culture, via technology, accumulated knowledge and normative rules, modulates the manner by which environment impacts pro-social behavior, there has been little attention focused on formal assessments of how "culture matters" (Henrich 2000).

Despite macro-level effects of market integration and payoffs to cooperation on mean UG offers, at the micro-level within societies few market-oriented or demographic variables consistently or reliably explain variation in game behavior among members from the same community or population. It is often implicitly assumed that unmeasured ecological or individual-level variables can account for within-group variation in game behavior, and sometimes certain easily measured variables, such as group size, do help to explain differences among groups of the same population (e.g. Marlowe 2004). However, the prospect that group membership alone may explain much variation in game behavior, and ultimately of social preferences and behavior, has not been thoroughly examined, despite the widespread awareness that behavior is socially embedded and influenced by sociological factors (Baum and Oliver 1992, Bardhan and Udry 1999). Experimental work employing a minimal group paradigm shows that in-group sentiment often leads to seemingly irrational behavior (Tajfel et al. 1971, Yamagishi et al. 1999, Brewer and Kramer 1986).

Group affiliation and social dynamics influencing norms within small groups are important for understanding how social behaviors are acquired, transmitted, maintained or change in populations. The social history of interactions among group members can impact expectations of trust and others' pro-social sentiment, which in turn affects the calculus of rational actors. To date, there is little theory that explicitly incorporates cultural identity and social history in explaining economic behavior, independent of the typical ecological factors that affect costs or benefits to giving in a rational, genetically selfish fashion. One possibility is that norms and other ideas are socially transmitted within groups, while psychological learning mechanisms act to maintain variation among groups. These mechanisms include prestige-bias (i.e. imitate actions of high prestige individuals) and frequency-dependent bias (i.e. imitate most common behavior) (Boyd and Richerson 1985, Henrich and Gil-White 2001, Henrich 2004). Thus, while members of the same ethnic group share a similar culture, social dynamics within small groups from the same population can lead to the establishment of *local culture*,

Local culture may reflect different levels of trust or trustworthiness held among small groups as a form of social capital (Coleman 1988) and the internalized norms that help foster cooperation (Fukuyama 1999). Social capital and local culture are analogous concepts because both hinge on the notion that individual-level characteristics are not sufficient for explaining social and economic decision-making. In industrialized societies, social capital has been linked to civic participation, loss of trust, frequency of tax evasion, and "pugnacity" and violent crime, and it has been shown to vary by region, independently of macro-level socioeconomic differences among regions (Putnam 2000). Experimental economists have also invoked the notion of social capital for exploring local differences in pro-social behavior. For example, in rural Zimbabwean villages, Barr (2003) showed that social identity in the form of close kinship ties in traditional villages and a desire to build community in resettled villages helped explain Trust Game behavior.

This paper therefore attempts to examine intra-cultural variation in pro-social behavior in a rigorous manner among the Tsimane of Bolivia. The Tsimane are a group of Amerindians living in the Amazonian lowlands of Bolivia. The Tsimane population is a particularly useful case for exploring the role of social norms within villages. First, they are a small, mostly endogamous population (roughly 8,000 total) and inhabit a relatively small region. Thus, Tsimane culture is well-preserved and distinct from that of other surrounding populations. Second, Tsimane reside in many small villages and thereby provide a natural experiment for

examining intra-cultural variation. Third, in previous experiments, Tsimane have shown fairly unique game behavior that is distinct from that found in many western, urban settings. For example, they displayed UG behavior closer to the rational short-term money-maximizing predictions of *Homo economicus* than observed in many other places around the world. Overall, they gave an average of 32% in the DG (Gurven 2004c) and 37% in the UG (Gurven 2004a). Moreover, no UG offers were ever rejected by proposers. A replication of these games in a different village revealed a similar pattern, with even lower mean offers in both games (Gurven in press).

Fourth, and most relevant here, UG and a Public Goods game played in five villages showed significantly variable patterns across villages that could not be adequately attributed to variation in market affiliation, education, or income (Gurven 2004a). A similar result, where adjacent groups inhabiting a similar ecology show different game behavior, has also been reported among the Shuar and Quichua of Ecuador (Patton 2004) and the Sangu of Tanzania (McElreath 2004). Often, the samples in each village are small, and there are no independent assessments of players' beliefs or expectations to interpret village-specific behavior; thus it is unclear whether significant statistical differences across villages represent real differences in social beliefs and behavior in different communities of the same ethnic group or are instead artifacts of unmeasured variables or other hidden factors (but see Ferraro and Cummings 2007). It is possible that group differences may reflect a biased sampling scheme, self-selection or different demand functions among players, or they could be the result of confounding with other unmeasured variables. As a consequence of prior results concerning differences among villages, this study was designed to explore further the existence and causality behind local variation in pro-social behavior. This paper is the first of its kind to show that local culture matters in explaining variation in pro-social behavior.

The paper is organized as follows. We first show that significant differences in pro-social behavior exist among members of different Tsimane villages. We next show that these within-village patterns are recognized by village members using the simple, but innovative Guess Game. The public nature of norms (Young 1993) requires that specific norms should be explicitly or implicitly recognizable by village members. Furthermore, we show that these patterns tend to correspond to what village members concede as the fair, moral or appropriate behavior for their community, but fairness only partially explains the effect of village membership on predicting game behavior. We strengthen the case that local culture matters by showing that differences in socio-economic condition, acculturation and immediate demand for money cannot adequately explain village differences in game behavior. We argue that local differences are not necessarily due to strong norms *per se* that vary among villages, but due to local (unmeasured) effects that push and pull villages towards more or less pro-social sentiment. Finally, we discuss why Tsimane and perhaps other people in other autarkic, non-industrialized societies may be more sensitive to these local effects than people in centralized, market-oriented populations.

2. The experiments and predictions

A simple division norm is examined in a bilateral Dictator Game (DG). This game was chosen because it is very easy to understand for mostly illiterate people who are largely unaccustomed to these kinds of tasks. We play two versions of the DG using the same players in each of nine villages: Private DG and Public DG. The Private DG is a standard DG where identities of all players are unknown to each other and where offers cannot be linked to players. Player 1 decides the amount of an endowment of 20 Bolivianos (Bs) (7.8 Bs=US $1), x, he or she wishes to allocate to an anonymous Player 2 in the group. Player 2 receives $20-x$. In each game, there are eleven possible offers, with increments of 2 Bs, or 10%, from null offers to giving everything away.

Our null prediction is that there are significant differences among the set, or a subset of villages, in the distributions of offers in this game (P1). The economic independence of Tsimane families, absence of overt conflict between villages or with other ethnic groups, and lack of any centralized institutions support this prediction. Alternatively, there are no differences among villages such that each village is like a random sample from the pool of Tsimane participants. In order for differences in village offers to represent local effects, village-wide differences should not be explained away by individual variation in socioeconomic status, acculturation, or immediate demand for money (P2). However, if differences are found, they should be predictable by members of those villages (P3). If these differences reflect village-specific norms of appropriate or expected behavior, we should find a relationship between village DG offers and moral or appropriate behavior (P4).

In the Public DG, all players are told prior to play that the identities and offers of proposers will be announced publicly *after* everyone has played the game. The motivation for the Public DG is to examine whether the increased saliency of public exposure elicits a community-wide social norm that is less susceptible to individual state variables than in the Private game. Thus, when players make their offers, they know that their choices will soon become public knowledge. We preferred this method of public exposure rather than one where players make their offers in public during play to prevent any imitation or autocorrelation in the chronological sequence of offers. Norm violation in a public forum may be viewed as more risky, especially because gossip, ostracism, and other forms of social distancing occur as a result of public information about negatively viewed behaviors. Thus, one prediction is that any village differences that exist in the Private DG should disappear in the Public DG (P5). We also predict that the increased public salience should lead to less variation and more consensus in Public DG offers than in the Private DG (P6). This would be expected when the public forum flushes variation in the private game due to whimsy or more straightforward ego-centered benefits. Alternatively, a strong local social norm that is internalized among group members should instead result in similar Private and Public DG distributions within each village (P7).

As very few offers were rejected in several renditions of the UG and of a Third Party Punishment Game[1] played previously among the Tsimane, there is little *a priori* evidence to suggest that punishment, public disclosure or social desirability are significant influences on game behavior. Therefore, we predict that there should be little difference between Private and Public DG distributions. The lack of any relevant norm leads to the same prediction that Private and Public DG distributions should again be similar, but among and within villages. However, we recognize that public disclosure also presents an opportunity to display generosity to others, so an alternative prediction is that Public DG offers should be greater than Private DG offers (P8).

These eight predictions are summarized in Table 1.

3. Methods

3.1. Study population

Roughly 8,000 Tsimane live in over sixty villages dispersed along the Maniqui River and in the interfluvial areas near smaller rivers in the Beni region of Bolivia. Most of the food the Tsimane consume derives from agriculture, fishing, hunting, and gathering. They cultivate plantains, rice, corn, and sweet manioc in small swiddens and regularly fish and hunt for meat.

[1]The Third Party Punishment Game is a DG with the addition of a third player who has the option to punish Player 1. In the version played among the Tsimane, the third player receives an endowment of 10 Bolivanos (Bs) and every 1 Bs spent on punishment removes 3 Bs from Player 1.

Fish, game, and gathered foods comprise about a quarter of the diet, although this may vary depending on the season and local abundance.

There is a strong sense of economic independence at the level of the nuclear family and extended Tsimane household. Each family maintains its own fields, and sometimes individuals within families have ownership of specific fields. Over 70% of the diet comes from fields and house gardens. Men within a household will perform the clearing and burning of unused primary or secondary forest to create new fields during the dry season, while both men and women harvest and weed fields throughout the year. Occasionally male relatives or affines will collaborate in some of these activities. Single-day hunting and fishing activities are mostly solitary or with up to two male partners, usually siblings, sons, in-laws, or friends. Kills are usually shared among participating hunters (and helpers), and subsequent sharing is up to the discretion of the hunter, his spouse, and to some extent, resident parents or in-laws. There are thus no normative rules governing the sharing of meat. Though people eat communally in smaller villages, few people go out of their way to invite others to partake in their meals. In fact, Tsimane often turn their backs to others when they eat. There is some evidence that the lack of extensive sharing in daily life is mirrored during difficult times as well. In a study of risk management in two Tsimane villages, only 5% of households reported that kin or neighbors helped them cope with a misfortune such as illness or crop loss (Godoy personal communication).

The exception to solitary production are group fishing events, where groups of families, and sometimes entire villages, use plant poisons to stun fish in closed-off sections of rivers, streams, and lagoons. During these events, several men perform all of the work (acquiring the plant poisons, closing off the body of water, pounding the poison), and many more individuals, including women and children, harvest the fish with bow and arrow, machete, or knife.

Tsimane villages vary in their degree of market access and interaction with outsiders. The domain of acculturation occurs in several ways: visits to the main market town San Borja (population: ~19,000), wage labor by men with loggers or as farm hands, debt peonage with river merchants, and attendance at schools that exist in over 2/3rd of all Tsimane villages (see Gurven 2004a). Market items that are highly valued by the Tsimane include clothing, aluminum pots, salt, sugar, kerosene, utensils and school supplies. Schools have existed anywhere from two to twenty years in different villages. Since the 1970s, Tsimane have come into greater contact with outsiders as new roads were built, inviting a burst of logging, trading, and encroachment by lowland and highland colonists (Ellis 1996, Chicchón 1992). Traditionally, Tsimane did not live in permanent, organized villages with designated chiefs, but rather lived in dispersed clusters of extended families. The election of chiefs is a recent phenomenon, motivated mostly by the need to negotiate outside interests. Chiefs often have very little authority within their communities.

Many members of extant villages have long historical ties to the region, while others are migrants from other parts of the Tsimane territory. Tsimane are classified as semi-sedentary because of their traditional emphasis on extended visitation and migration. Although visitation may be less common than in the past, migration still frequently occurs after marriage, deaths in the family, periods of resource scarcity and social strife.

3.2. Sample villages

Games were played in nine Tsimane communities: Tacuaral de Mato, Jamanchi, San Miguel, La Cruz, Jerusalem, San Antonio, Campo Bello, Chacal and Cedral. All of these communities are within several hours travel by road or river from the town of San Borja (population ~19,000). However, seasonal rains can often make roads completely impassable. Table 2 shows the sample size for each game. Tacuaral de Mato and Jamanchi are nearly adjacent communities

located along the same logging road. Jerusalem, La Cruz, and San Miguel are also located in close proximity to each other along a logging road following the Rio Maniqui upstream from San Borja. The remaining four are adjacent communities along the Maniqui River downstream from San Borja inside the Beni Biological Reserve. No economic games had previously been played in any of these villages. A lack of familiarity with these villages prevented us from making any *a priori* predictions about the ranking of DG offers among villages.

3.3. Procedure

We used the same protocol in all study communities. Upon arrival in a community, a group meeting was held to publicize the gaming event scheduled for the following morning. It was announced that we needed a minimum of forty individuals composed of men and women at least eighteen years of age. Overall, 55% of our sample was female (range: 48% to 64%, s.d.=6%). After approval was given, we announced that two games were to be played and that all people interested in participating needed to play both games. The Private DG was played first, and the Public DG second in all villages. We gave a show-up fee of 5 Bs for participation in each game that people played.

On game day, groups of adults gathered together in a common location, usually a school or empty house. Instructions were read in Spanish by Schniter and in Tsimane by Marcelino Moye Vilche, a bilingual Tsimane assistant fully trained in game administration. The Tsimane protocol was translated from Spanish and orally back-translated with the help of several bilingual Tsimane who had experience assisting in the administration of prior games played in 2002–03[2].

The first game played was the Private DG[3]. It was explained to all present with the help of a visual demonstration using real coins. Players proceeded one by one to a private location to play the game that was set apart from the common waiting area. Apart from the player, only Schniter and Moye were present in the private room. Individuals had to answer correctly a series of questions about the rules of the game to insure understanding. There were three test questions: 1) With how many people will you be playing? [one other community participant present today], 2) How much money does each pair receive? [20 Bs], 3) What will you do if you are Player 1? [allocate amount between Player 1 and Player 2], and 4) What will you do if you are Player 2? [receive an offer from Player 1]. The game was re-explained to individuals who answered test questions incorrectly. After answering all questions correctly, the participant was told whether they were Player 1 or Player 2. Player 1 had to allocate 20 Bs (in increments of 2 Bs) between him/herself and Player 2. The coins were placed on a dividing line of masking tape, where the space closer to the player was designated for Player 1, and the other side of the tape designated for Player 2. If the participant was Player 2, he or she was interviewed about any expectations of the modal offer in the same game (see Guess Game below). This was done so that, on average, Players 2 were inside the private room for the same amount of time as Players 1. Players 2 were not informed of the offers made to them until payment time at the end of the day. The first game took 3–4 hours to play[4].

The second game was faster due to its similarity to the first game. No one was told that the second game was a public version of the first game. After the first game was finished we described the second game as being very similar to the first one, except for the fact that the names and respective offers of Players 1 in this second game would be announced after

[2]These instructions are available upon request.

[3]While there are no guarantees about players' beliefs that game behavior remains private information, we emphasized the confidentiality of responses and the anonymity of roles to prevent concerns about information leakage.

[4]Several hours might seem like a long time to play a simple DG with approximately twenty pairs of individuals, although such lengthy sessions are typical for game play in relatively unacculturated field settings with mostly non-literate people.

everyone had finished playing. This description of the new rules for the second game often provoked laughs and nods. The same procedure described above was employed for the Public DG, except that we included additional test questions to insure that players understood the public nature of the game. We intentionally assigned players to the same role in both game, although this was never mentioned and never questioned by any participants. As in the first game, players did not know with whom they were partnered. The second game took about 1½–2 hours to play.

Zanolini interviewed all participants after game play. To address the issue of social norms regarding resource division more directly, we examine village differences in participant responses to the question: "What is the (morally) correct offer to give in this [Private DG] game?"[5] While there is no Tsimane word for "moral" or "fair", the word *ruijsis* expresses the concept of appropriate behavior or action and was clearly understood by participants. Additional interview questions focused on age, number of children, and length of time resident in the study community (0=less than a year, 1=less than seven years, 2=majority of life but born elsewhere, 3=all life), Spanish speaking and literacy ability (separately assessed as 0=none, 1=little, 2=fluent), and number of years of formal education. Market variables include quantities (in units of arrobas or ~12 kg) of rice and corn sold in the market in the previous year, frequency of visits over the past two months to San Borja or Yucumo, the two nearest market towns. Immediate demand for money was queried by asking participants what they would purchase with the money. Most common items mentioned were clothes and food. We identified the desire to purchase medicines, clothes, food and household supplies as an "urgent" category of spending while no clear or immediate desire to buy anything was placed in a "trivial" category. Zanolini also insured that people did not discuss the game until after the games were over. Due to the lengthy game sessions, movies were shown to the assembled group of waiting participants using a portable computer, solar panel and truck battery. Movies are mostly a rarity in the jungle, so interest was quite high and generated discussion far removed from the experiments. Food was also served to help keep participants quiet and content.

Participants were paid in private after both games were played. Before payment occurred, we asked all players about their best guess of the most popular (modal) offer in each of the two games (*"What do you think the majority of players 1 will offer?"*). We refer to this hereafter as the Guess Game. The Guess Game was designed to detect whether village-specific patterns are recognizable by village members. For each correct response, players were paid an additional 5 Bs. The range of total potential payoffs was therefore 10–60 Bs. In 2004, one day's wage labor was roughly 25 Bs.

4. Results

4.1. Differences among communities: P1

The overall mean, median and modal offers for the pooled sample in the Private DG were 41.2%. 40%, and 50%, respectively (n=211). Table 2 shows the mean, median and modal offers for the Private DG for each village, and Figure 1 displays the offer distributions. There is substantial variation in offers within and across villages. Mean offers range from 28% to 51%. There appear to be several modal patterns. One hovers around the 50–50 split, and the other around an offering of one fourth to a third of the endowment. Both modal patterns are present in each village, but to varying degrees.

There are significant differences in Private DG offers across villages. A Kruskal-Wallis test shows that community is a significant predictor of Private DG offers (Chi^2=26.65, df=8,

[5]Unfortunately, this question was not asked in Jamanchi, and the sample of people asked in Tacuaral de Mato was small (n=13), due to time constraints and logistical difficulties.

p=0.0008). Pairwise comparisons of village means shows that 14 of 36, or 39% of total possible pairings are significantly different. Ten of these pairwise comparisons remain significant even when we check for differences in the offer distributions using the Kilmogorov-Smirnov (KS) test. Several villages account for much of this community effect. Chacal, Jerusalem, and La Cruz are each significantly different from five other villages at the 5% level. Based on the pairwise comparisons, two clusters emerge. At the high end are Cedral (mean offer 47%) La Cruz (50%) and Chacal (51%). At the lower end are Jerusalem (28%), Tacuaral (36%), Campo Bello (36%), San Antonio (38%) and Jamanchi (39%). Although Cedral resides in the high offer group, statistically it overlaps with Jamanchi and San Antonio (but not using the KS test). San Miguel (43%) is intermediate, overlapping with every other village except Jerusalem. We therefore cannot reject P1 and conclude that significant differences in Private DG offers exist among Tsimane communities.

4.2. Are village effects artifacts of other confounding variables?: P2

We consider three groups of variables that could be independently associated with game behavior and potentially eliminate the apparent differences among villages. We examine the effects of standard demographic variables, acculturation and market integration and immediate demand for money. Demographic variables include age, sex, marital status and length of time resident in the study community. The latter should be important if village-specific behavior takes a long time to learn or if longer time spent in residence creates a greater commitment to other group members. Acculturation variables include the number of arrobas (~12 kg) of rice and corn sold in the past year, years of formal schooling, combined Spanish literacy and speaking ability (range 0–6), and the number of days spent in two nearby market towns during the previous two months. Predictions based on similar variables are discussed at length in Gurven (2004b, 2004c). Here we are only interested in whether or not these variables confound the village effect. Demand variables include the number of children living in the household and whether there was an expressed urgent need to make a purchase with money earned from the game. Access to money is highly variable across and within villages, so all else equal, a greater demand for money should lead to lower offers.

Table 3 reports the results from a series of interval regression analyses on Player 1 offers at the individual level. We use interval regression because offers are discrete (increments of 10%) and truncated although results are very similar to standard ordinary least squares (OLS) regression (Long 1997). The baseline regression examines only the effect of village dummies on Private DG offers. Six of the village dummies are statistically significant from the baseline village, Jerusalem. The village dummies together explain 10% of the variation in DG offers[6].

Additional analyses shown in Table 3 report results from multiple regressions of demographic, acculturation, demand, and all variables combined on Private DG offers. For each of these regression analyses, village effects remain significant. Together, all of the independent variables explain 13% of the variation in offers. Removing the village dummies from the full model leaves 7% of the variation explained. The village effects therefore account for over half of the explained variation in offers.

In the full model, sex, marital status and Spanish ability are significant predictors of offers. Men give about 8% more than women, married individuals 9% less than single, and the most fluent and literate in Spanish give 17% (−2.78*6) less than those who know no Spanish. Notice that when urgency is dichotomized, it is marginally significant (p=0.10), but in the direction

[6]Interval regression analysis does not usually employ adjusted R^2 as a summary model diagnostic. Instead we present R^2 from equivalent OLS regressions as those shown in Table 3. Results are almost identical for both sets of regressions.

opposite to that predicted! On average, urgency leads to an additional 5% given away. Upon closer inspection, the only categories of goods that lead to more stinginess are ammunition (for shotgun hunting), shoes, cutlery, and bicycles. Medicines, soap, and other household goods actually lead to more generosity in the DG. In all models displayed in Table 3, the effect of community remains highly significant.

Two additional approaches support the community effect. First, we perform a backward stepwise regression model on the large suite of our independent variables. This regression analysis shows that the reduced model includes four village dummy variables, sex and Spanish ability. Second, instead of focusing on the conditional mean functions used by ordinary-least squares, we also perform quantile regressions on median and third decile using the same village dummies and covariates as in the stepwise regression. Quantile regressions are useful robusticity tests for distributions where extremes (e.g. low offers) are important (Koenker and Bassett 1978). We find that over half of the village dummies are significantly different from the baseline. Pairwise comparisons of Private DG behavior based on village medians and third deciles reveals a similar clustering of villages such as that mentioned in section 4.1 based on means, even after controlling for the other covariates.

4.3. Guesses of village-specific offers: P2

We assess the ability of village members to identify their own village behavior in several ways. Figure 1 displays the distribution of guesses about the most popular offer for each village. We assess the fit of these to the distributions of offers in the Private DG.[7] We conservatively restrict our attention of guesses to those made by Players 2 to avoid the possibility that Players 1 may have chosen the modal offer as the one they just made in the Private DG. Wilcoxon two-sample tests of the two distributions by village show significant differences at the 5% level for five villages: Tacuaral p=0.01, San Miguel p=0.04, La Cruz p=0.001, Campo Bello p=0.005, and Chacal p=0.03. The remaining four villages show no differences between guessed modes and actual offers in the Private DG. We also use the KS and Epps Singleton (ES) tests for comparing DG and Guess Game distributions. Forsythe et al. (1994) consider the ES test to be the most appropriate for game data because it corrects for small samples and does not require the distribution to be continuous. Guess Game and Private DG offer distributions are similar for all villages according to the ES test, while only Campo Bello differs at the 5% level for the KS test.

Even though guesses from about half of the villages seem to correspond with actual DG offers, we make a stronger test and ask whether guesses by players from village Y_i fit the DG offer distribution from their own village better than they fit DG offer distributions from other communities. If individuals from community Y_i are bad at guessing their own village pattern, *does their prediction at least explain their own village behavior better than it does that of other villages*? We answer this question by first calculating the squared difference between the percentage of players from village Y_i guessing offer x from the percentage of players from village Y_i giving offer x. We then sum this squared difference over all eleven possible offers. This sum yields an estimate of how well village Y_i guesses its own Private DG behavior. The better the fit between any two distributions, the smaller the sum. Next, we make the same calculation, except now we sum the squared differences between the percentage of players from village Y_i guessing offer x and the percentage of players from village $Y_j(\neq Y_i)$ giving x in the DG. This sum tells us how well village Y_i guesses about its own DG behavior matches the Private DG behavior of other villages. If village Y_i is better at predicting its own game behavior,

[7]The guesses are of modal DG offers, so the interpretation of our comparison of the distribution of DG offers with a distribution of modes is not straightforward.

the first sum should be smaller (and hence the fit better between guesses and offers) than the sums based on comparisons with offer distributions from other villages.

For six of the villages, members' predictions fit their own village better than it does the DG offers of the majority of the other communities. La Cruz and San Miguel show the worst fit, with their Guess distribution fitting the DG distribution of five other communities better than their own. Tacuaral's Guess distribution fits three other communities better than it does itself. The remaining communities have Guess Game distributions that fit their own DG offers better than all or all but one community. Two communities, Campo Bello and Chacal, that showed significant differences between Guess Game and DG offer distributions in the analyses based on the Wilcoxon test, made guesses which were better fits to their own communities than to most others. Only Tacuaral, San Miguel, and La Cruz made poor guesses about DG offers in their communities, and their poor guesses actually fit many other communities better than their own.

In eight of the nine villages, people guessed that proposers would give less than they actually did. Overall, proposers gave 7% more than Players 2 thought they would give, although the percentage ranges from 2–18% across communities. Only in Jerusalem did people give less than predicted (Table 2). These same results hold if we examine the guesses of proposers instead of receivers, although to a lesser degree (average difference of 4% between DG offers and guesses of proposers). If Players 2 were more cynical about how much they thought they would be offered, proposers also underestimated the amount to be given away in the DG. Indeed, Players 2 in all nine villages predicted lower DG offers than did proposers (a difference of 0.2–13%).

4.4. Does the notion of a "fair" offer vary among villages?: P3

Despite the results above that show some ability for participants to specify the pattern of DG offers in their home villages, we acknowledge that fits between DG and Guess Game distributions may represent successful predictions of actual behavior but without reflecting real differences in social norms among villages. Figure 1 shows the distribution of fair or morally appropriate offers made by Players 2 for each village[8]. Pairwise comparisons of village means in moral offers show that 17 of 28 or 61% of the village comparisons are significantly different at the 5% level. Based on the KS distributional test, we find that 8 are significantly different. The villages sort into three clusters that vary in the overall level of morally appropriate giving: high (Chacal, mean 63%), intermediate (Campo Bello, Cedral and San Antonio, mean 41%) and low (Tacuaral, San Miguel, Jerusalem, La Cruz, mean 31%).

We run a similar set of multiple interval regression analyses on fair offers as done in section 4.2 with the Private DG. Table 4 shows that fewer than half of the village dummies are significant in all regressions. Village dummies account for 21% of the variation in fair offers, while the full model that includes demographic, acculturation and demand covariates explains 22% of the variation. Removing the village dummies reduces the adjusted R^2 to 5%. The village dummies therefore are responsible for the majority of the explainable variation in Fair offers. This level of variation attributed to village dummies is higher than that found in Private DG and in Public DG (see section 4.5). Residency and sex are positive predictors of reported fair offers. Players who have been permanent residents in the study village say that fair offers should be 12% greater than the fair offers according to new residents. Men say that a fair offer should be about 5% higher than what women say.

[8]Again, we report choices of moral offers made by Players 2 rather than Players 1.

Do players within villages allocate offers based on village-specific notions of what is appropriate? We again use both Wilcoxon two-sample analysis and the KS test to compare distributions of Private DG offers and moral offers within villages. We find similar results to those found in the comparison between Private DG offers and guesses. For all villages except Chacal, Jerusalem and La Cruz, there are no statistically significant differences between actual offers and morally correct offers. In two of the three villages where a significant difference is found (La Cruz and Chacal), actual offers tend to be higher than those deemed morally correct. Additionally, there are no significant differences within villages between distributions of morally correct offers and DG guesses, except in Chacal, where people guessed proposers would offer significantly lower than what they perceived as appropriate. Together, these results suggest that in the majority of villages, people guess that proposers will give the moral or fair offer, and proposers either give these fair offers or give somewhat more (Figure 3). The exceptions are Campo Bello and Chacal, where people guess that offers will be low when the morally appropriate action is to give higher, and proposers give somewhere inbetween the cynically low and morally high range of offers.

4.5. Do village differences disappear in Public DG?: P5

Figure 2 compares Private and Public DG distributions by village, and summary information is given in Table 2. The overall mean, median and modal offers for the pooled sample in the Public DG is 45.3%, 50%, and 50%, respectively (n=207). The mean and median here are higher than in the Private DG. Public DG distributions differ among villages (chi^2=19.2, p=0.01, df=8, Kruskal-Wallis test). Out of the 36 possible pairwise mean comparisons, 8 or 22% showed significant differences across villages. Using the KS test, 7 pairwise comparisons are significantly different at the 5% level. Pairwise mean comparison and KS tests both show that there are only about half as many significantly distinct pairs for the Public DG as compared to the Private DG. The villages do not cluster cleanly, but instead consist of overlapping groups. Jerusalem and Tacuaral, both on the low end of offers (37% and 35%, respectively), are the most distinct from other villages. Thus, while differences among several communities exist in the Public DG, these differences are less profound than those found in the Private DG.

We run a similar set of multiple interval regression analyses on Public DG offers as done in section 4.2 with the Private DG. As in the Private DG, Table 5 shows that half of the village dummies are significant in all regressions. Village dummies account for 5% of the variation in Public DG offers, while the full model that includes demographic, acculturation and demand covariates explains 9% of the variation. Removing the village dummies reduces the adjusted R^2 to 5%. The village dummies therefore are responsible for roughly half of the explainable variation in Public DG offers. In the public DG version, age and urgency both are positive predictors of offers. Ten years of age associates with 3% more given away, while an urgent need to buy something predicts 8% more given away. A marginally significant effect is sex. Men offer about 5% more than women.

4.6. Less variation in Public DG than Private DG offers: P6

We compare standard deviations from Private and Public DG distributions because our prediction was that public disclosure should reduce the range of (low) offers in the latter game. Tests of homogeneity of variance show no significant differences at the 5% level in the variances of Private and Public DG offers for any of the nine study communities. There is also no reduction in the range of offers in the public game. Additionally, the variance in perceived morally appropriate offers was also similar to the variance in the private and public games. Thus, we find no evidence that the public nature of the Public DG reduces the variation in offers, nor is there only a narrow range of morally acceptable offers.

4.7. Village comparisons of Public and Private DG: P7 and P8

Figure 2 compares distributions of Private and Public DG offers by village. Overall, mean Public offers are 4% greater than Private offers, although this difference varies from 0 to 10% among villages. Forty-one percent of players gave more in the Public DG than in the Private, 27% gave more in the Private and the remaining 31% gave the same in both games. Only in La Cruz and Cedral are Public DG offers less than in the Private (Table 2). The entire distribution of Public DG offers for all villages combined is significantly different from the Private DG distribution (p=0.04, Wilcoxon). However, comparison of Private and Public DG distributions within villages reveals that only Campo Bello shows a marginally significant difference (p=0.08, Wilcoxon). A one-tailed version of this test, examining only whether Public DG offers are greater than Private DG offers, makes Campo Bello significant (p=0.04), and Jamanchi and Jerusalem marginally significant (p<0.09). All three of these communities showed a mean of 9–10% more given in the Public DG. Public and Private DG distributions are statistically similar for every other village. Using the KS and ES distributional tests we find no significant differences between Public and Private DG offers for any village. There is thus mixed support for P7, but the evidence leans more towards similarity than difference.

Not only are the majority of the Private and Public DG distributions similar, but the same people tend to give similar offers in both games. The correlation between Private and Public DG offers made by the same people varies from 0.42 to 0.61 in the seven communities where the relationship was significant. The slope from a linear regression of Public DG offer on Private DG offer also varies from 0.40 to 0.61 and crosses the line of unity at around 50%, suggesting that to some extent, those who gave low in the Private DG gave higher in the Public DG, and vice versa. Only Tacuaral and Jamanchi saw no significant relationship between offers by the same people in both games. The somewhat inconsistent behavior of people across games probably accounts for the fact that proposers in seven of the nine villages show no significant differences between their Public and Private DG offers when using a Wilcoxon ranked sum test for matched pairs, even though their mean Public DG offers were consistently greater than their Private DG offers. Campo Bello (p<0.01) and Jerusalem (p<0.05) both show evidence that the same people gave significantly more in the Public version. It is relevant here to note that responders in *every* community expected that proposers in the Public DG would offer more than in the Private DG (global average is 11.8%, range 8.5% to 20.8% within villages).

4.8. Explaining village effects

Although we suspect that internal social dynamics of small groups without codified, generalized norms or centralized institutions may explain why we find differences in pro-social behavior among villages, we attempt further analyses to see what insight can be gained about the direction of these village differences. As mentioned in section 3.2, our lack of familiarity with many of the study villages prevented us from making *a priori* predictions about expected behavior in specific communities. Therefore, we perform a post-hoc analysis of whether the distance to market, village population size, degree of house dispersion in the village (distance of house in kilometers to village center, based on GPS mapping of villages), and whether the village is involved in logging operations showed any relationship to village-specific Private DG and moral offers. Communities located far from San Borja, and hence less involved in market interactions with strangers, may be expected to act in a less pro-social manner, as demonstrated on a larger scale by Henrich et al. (2001). Smaller and less dispersed communities may be expected to act in a more pro-social direction due to smaller transaction costs and because less dispersion may reflect a desire for groups of families to interact cooperatively. Interactions with loggers could induce more ingroup pro-sociality if these interactions with outsiders are negative or could lead to reduced pro-sociality if deals with loggers preferentially benefit certain individuals and thereby increase levels of distrust, resentment and erosion of

community social capital. We also examine whether the average moral offers for Players 2 in each village are as a good a predictor of Private DG offers as the village dummies.

Any village-level variable will be highly, if not perfectly, correlated with village dummy variables. We therefore examine the explanatory power of our village-level variables by comparing the adjusted R^2 from OLS regressions that include just the village-level variables with those that include the village-level variables along with all of the individual-level controls used in Tables 3 through 5. Table 6 reports the results of these regressions. The most important result is that none of the village-level variables approaches the power of the village dummies for explaining variation in Private and Public DG, and moral offers. Nonetheless we do find several interesting results. First, distance to market and population size are insignificant for analyses of Private and Public DG offers. Dispersion is significantly associated only with Private DG offers, but it is a small effect and in the opposite direction predicted (r=0.19). Second. controlling for other variables, frequent interaction with loggers in a village is associated with about 7% less given in the Private DG ($p<0.04$) but does not significantly predict Public DG offers. Additionally, the moral or fair offer is 8% lower when loggers are present ($p<0.09$). Third, every 1% increase in the mean Guess Game offer for a village is significantly associated with a 0.67% increase in Private DG offers ($p<0.009$) and 0.8% in fair offers ($p<0.05$). Mean fair offers reported by Players 2 are only marginally associated with Private DG offers after controlling for individual level variables. Fourth, none of the village level variables, apart from the village dummies, significantly predicted variation in Public DG offers.

Although the analysis in Table 6 shows that mean fairness perceived by Players 2 explains very little of the variation in Private and Public DG offers, we nonetheless attempt a final analysis where we include the perceived fairness offers of Players 1 in the final regression analyses of Tables 3 and 5 to observe whether the village dummies drop out of the model. Fair offers are highly associated with Private and Public DG offers ($p<0.04$, $p<0.03$, respectively). However, the statistical significance of the village dummies does not change in analyses of Private and Public DG offers. While individual perceptions of fairness significantly influence DG offers, these alone do not adequately explain village differences. Village membership remains a highly significant and independent predictor of game play.

5. Discussion and Conclusion

We have reported several distinct patterns of altruistic giving, as measured by Dictator Games, among Tsimane villages. This supports a similar result shown with the Ultimatum Game and with a Public Goods Game in a smaller sample of five different villages played in 1999 (Gurven 2004a). Unlike previous investigations, here we attempted to make sure that village differences were genuine and not due to other factors by controlling for individual-level variables, use of the Guess Game, assessments of morally appropriate offers, and comparison of private and public versions of the Private DG. Elicitations of guesses and morally appropriate offers are methodological innovations with great potential for evaluating the internal validity of revealed experimental effects. We find that residents in a majority of the study villages are reasonably able to identify giving patterns in their home villages and that offers tend to reflect village patterns of morally appropriate or fair offers. Indeed, at the village level, private offers tend to correspond to peoples' opinions about the appropriate amounts to give other people, and guesses about actual offers hover between what is deemed appropriate, what people actually give, and a little lower (Figure 3). However, even after controlling for other factors that could, and sometimes do, correlate with DG offers, proposers' offers are still significantly and best predicted by knowing the village in which they reside. While the presence of loggers and expectations of fair offers may explain some of these village differences, village dummies still capture a much greater percentage of the variation in offers. Finally, while the Public DG did

show some evidence for an increase in offers, there were few robust differences among villages in the distribution of offers across private and public contexts. Contrary to Prediction 5, local DG patterns did not converge into a single Tsimane-wide pattern when played publicly.

Discussions of cultural differences in pro-social behavior usually focus on the extent to which individuals are socialized in individualistic or collectivist societies (Buchan et al. 2002) or differential emphasis of masculinity (Hofstede 1991). Buchan et al. (2005) also discuss cultural variability in the extent of ingroup bias, social distancing and the effect of communication in fostering pro-social sentiment. Comparisons of national samples sometimes suffer from the confounding of cultural variation with demographic and other sociological variation (see Botelho et al. 2002, Cardenas and Carpenter 2005 for discussion), as well as from experimenter, currency, and translation effects (Roth et al. 1991). Even the fairly wide range in mean UG offers found among members of fifteen small-scale societies (Tsimane included) (Henrich et al. 2001) may better reflect differences in overall levels of market integration, interaction with outsiders, and reliance on cooperation in daily subsistence activities rather than cultural differences that are independent of these features.

Our results show that even when potentially confounding effects and overall cultural milieu do not vary, micro-level differences at the community level may still be evident. Why do differences exist among villages when Tsimane villages are hardly distinct, autonomous entities? Indeed, many villages are located in close proximity to each other, connected by rivers, dirt roads or forest trails, and their size and composition are in flux. In our nine village sample, only 60% of participants lived in the study village their whole lives. Another 12% spent the majority of their lives there, but were born somewhere else, 23% had been present for less than seven years, and 5% were recent immigrants. Additionally, people frequently visit relatives, friends, and make social visits to other villages.

First, it is important to recognize that there was a significant amount of variation in each of the games, as well as in guesses about DG offers and assessments of morally correct offers. The salience of the Public DG did not significantly reduce the variance in offers. In fact, there is as much variation in Private and Public DG offers in the aggregate dataset as there is in each of the villages. The village differences should therefore not be thought of as discrete and non-overlapping, but perhaps as quantitative shifts due to the social dynamics of small groups. Social norms, of say 50–50 splits, do not overwhelm these dynamics in Tsimane society, so local effects appear in Tsimane villages. We believe that the relative economic independence of Tsimane families, the absence of overt inter-village conflict, and the absence of centralized leadership or institutions designed to direct or regulate actions and behaviors of other individuals are responsible for explaining the village effects we report in this paper and the consistency in behavior across private and public contexts. As described in section 3.1, distribution of procured goods is usually limited to extended families and other social network members, and resource acquirers often have high levels of discretion in allocation decisions. The emphasis on individual autonomy is consistent with our observations that villages frequently fail to collaborate to achieve collective outcomes such as projects designed to provide clean water, community health care, group construction and trail clearing. The authority of village leaders is often offset by an inability to direct the actions of others effectively towards public gain, especially when leaders are not specialists who exact tribute from group members, but rather are intelligent, well-respected individuals who engage in all of the same activities as residents. It is particularly difficult to organize larger villages and remote villages where families are sometimes dispersed over great distances. For these reasons, we suspect that expectations of others' commitment are often low, that trust is fairly minimal, and that informal governance is ill-equipped to help many villages realize the potential benefits of economies of scale. We believe this is why Players 2 expected to receive less than they did.

While low offers were a disappointment, there was rarely vocal disapproval or negative judgments of anonymous or known others who offered low.

Our results using game data are supported by a recently published study of actual gift-giving and labor contributions made to members of other households from 37 Tsimane communities (Reyes-Garcia et al. 2006). After performing regression analyses that examined the simultaneous effects of individual-level and group-level variables, they found that village dummies alone explained 21% of the variation in pro-social behavior whereas individual-level variables explained only 8%. While this level of explained variation is similar to what we found for assessments of moral offers, it is provocative that the fixed village effects explain a greater proportion of the total variation of non-game behavior than in our example based on experimental measures of pro-sociality. The village effects were strongly correlated with negative opinions concerning visitation by Tsimane outsiders, the level of contributions made by other households in the village and village monetary income inequality; these are all factors related to local culture and social capital.

Because Tsimane villages have no strong social norms governing a specific form or level of resource distribution, one extension of our argument is that some of the behavioral differences in experimental and observational behavior reported among the Tsimane may instead reflect current “moods” of small groups of people who interact frequently rather than distinct, stable sub-group conventions or norms. The fact that significance of the village dummies remains unchanged after controlling for perceived fair offers in Private and Public DGs is consistent with this view. One could further speculate that these moods may be in temporal or spatial flux and that repeat games in our sample might show as much difference within villages over time as among villages at a slice in time. This possibility remains to be tested, although a Dictator Game played in the same Tsimane community two years apart revealed an insignificant relationship between offers made in the two time periods (Gurven in press). The sample composition was not identical in the two time periods, but whether or not a participant had played the game before had no predictive effect on subsequent game play.

A key question is why differences in private behavior are found at such a micro-level when relatively few differences in pro-social behavior are found in within-country samples or even in urban samples across countries such as in the U.S., Japan, China, Netherlands, Spain and Israel (e.g. Brandts et al. 2004, Roth et al. 1991, Buchan et al. 2006) using other one-shot games such as the Ultimatum Game, Trust Game, and Public Goods Game. We consider several possibilities for the novel patterns observed here.

First, and perhaps most obvious, is that most participant samples from industrialized countries tend to be fairly homogenous (e.g. student populations) whereas a more diverse sampling across cultural, ecological and occupational domains is likely to reveal more within-country variability. Recent studies based on samples of rural and non-student populations show behavioral patterns that deviate from those most commonly reported (e.g. Cardenas and Carpenter 2005, Carpenter et al. 2004, Henrich et al. 2004). We suspect that the salience and relevance of local culture may be further elucidated with additional experimental tests across more diverse ecological and cultural contexts.

Second, learning effects in the games could reduce the apparent variation observed across communities, especially if such games are more unfamiliar for largely illiterate and relatively unacculturated people from developing countries. For example, a Dictator Game played for the second time in the village of Cosincho in 2002 saw a decrease in mean offers from 32% the first time it was played in 2000 to 26% (Gurven in press).[9] The experience in Cosincho does raise the possibility of learning effects such that repeated rounds of games, even if played years apart, may alter game behavior within villages and produce convergent behavior across

villages. While we cannot currently test this possibility, our independent assessments of village-wide behavior using the Guess Game and the assessment of moral or normative offers lend support to the notion that village differences genuinely represent different patterns of behavior. However, even if Tsimane behavior across villages converged with repeat play, the fact that one-shot behavior differs among Tsimane villages but not in many industrialized contexts around the world merits special attention.

A third and likely possibility is that widespread expectation of punishment may be necessary to stabilize behavior and significantly reduce variation. In many experimental contexts, allowing players the option to punish perceived defectors often increases cooperative behavior and reduces variability (Ostrom et al. 1992, Fehr and Gächter 2002, Fowler 2005, Henrich et al. 2006). As mentioned earlier, very little punishment was observed in two versions of the Ultimatum Game and one version of a Third Party Punishment Game (Gurven in press). The absence of punishment is also found among other neotropical South American populations, such as the Machiguenga of Peru (Henrich 2000), Achuar of Ecuador (Patton) and Ache of Paraguay (Hill and Gurven 2004). Furthermore, Tsimane Ultimatum and Dictator Game distributions were very similar when played in the same community. Where punishment is more likely, as documented among the Hadza of Tanzania (Marlowe) and Orma of Kenya (Ensminger 2004), Dictator and Ultimatum distributions tend to differ more strongly. Without the threat of punishment in the games, nor expectations of punishment outside of the games, norms may be likely to vary among villages and even in the same village over time. Thus, local variation in social norms may be most prevalent in areas or conditions where regulation, whether by punishment or reward, is absent or minimal.

Finally, most games played in industrialized societies around the world are played among “strangers”. This is certainly not the case in our sample or in any small-scale population. We found that Private DG offers were much more similar to what people reported they would give to a friend (mean 41%) than to a foe (mean 19%), suggesting that even if receivers were anonymous members of the group, their shared history with community members has a significant impact on pro-social behavior.

Few researchers replicate economics games in small, traditional communities. Rarely are multiple samples ever elicited from these communities either, and not much theoretical attention has been given to temporal dynamics of social behavior in structured populations. The “flavor” or character of specific villages based on history of past interactions is made more apparent after extensive village visits, and ethnographic experience leads us to speculate that certain events, such as community meetings, drinking parties and soccer games in some villages, often act to shift the mood in a more pro-social direction. Grievances against perceived troublemakers are likely to be voiced at these group events. These events may be the cultural equivalent of boosting contributions in repeated public goods games by reshuffling players or by allowing some punishment (Fehr et al. 2002), thereby acting to erase past grievances with known defectors and start interacting again with a higher level of cooperation (even if levels may thereafter dwindle again). The lack of strong social norms regarding distributions and lack of clear punishment of stingy behavior allow local moods or flavors to dominate social interactions, whereas these same moods or flavors may be swamped by adherence to strong social conventions in western, industrialized societies. Whether local moods become codified as social norms and whether norms in different villages are best thought of as multiple equilibria (Glaeser et al. 2002) and the result of learning biases, grouping patterns and internal dynamics

[9]These DGs in Cosincho also seem to fall on the low end of the spectrum of DGs presented in this paper. One potential reason for the overall lower offers in Cosincho is that the coins were placed in front of Player 1, instead of directly on the line dividing Players 1 and 2. Having the coins closer to Player 1 may have brought a greater sense of entitlement or made it more psychologically effortful to move coins across the divide.

is a ripe area for future theoretical and empirical research among those with converging interests in the fields of economic and evolutionary anthropology, evolutionary psychology, and experimental economics.

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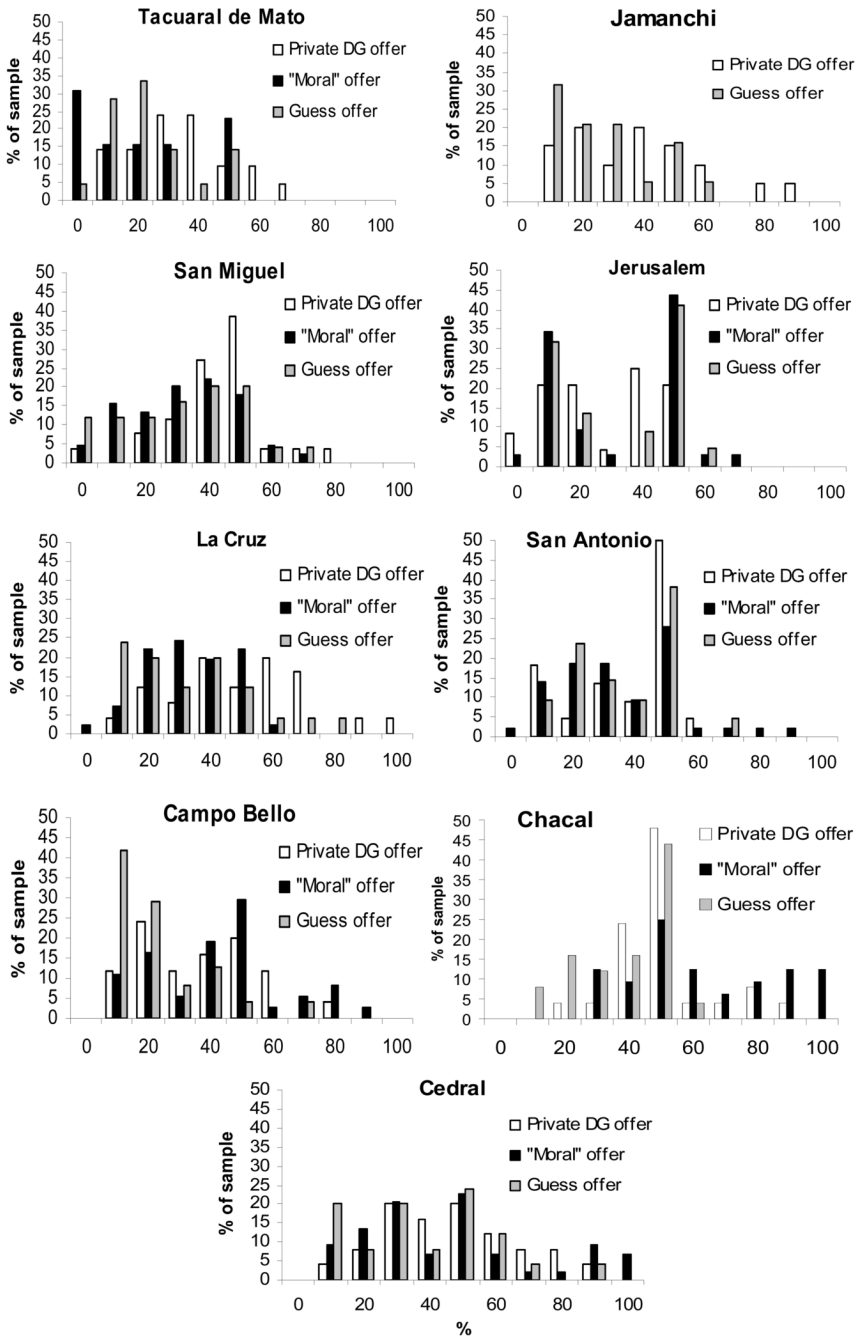

Figure 1.
Private DG, Guess Game and “Fair” or “Moral” offer distributions by village

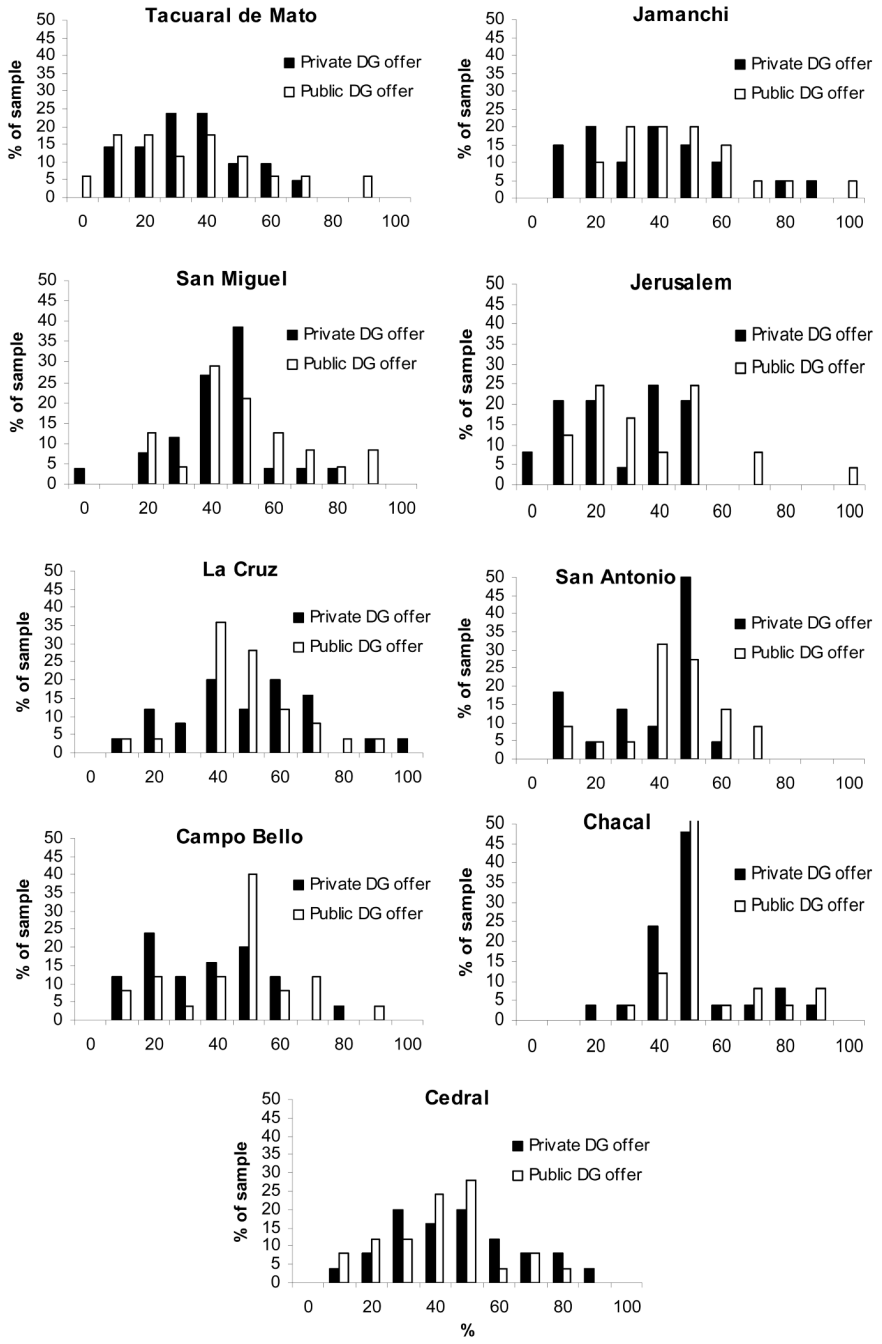

Figure 2.
Private and Public DG distributions by village

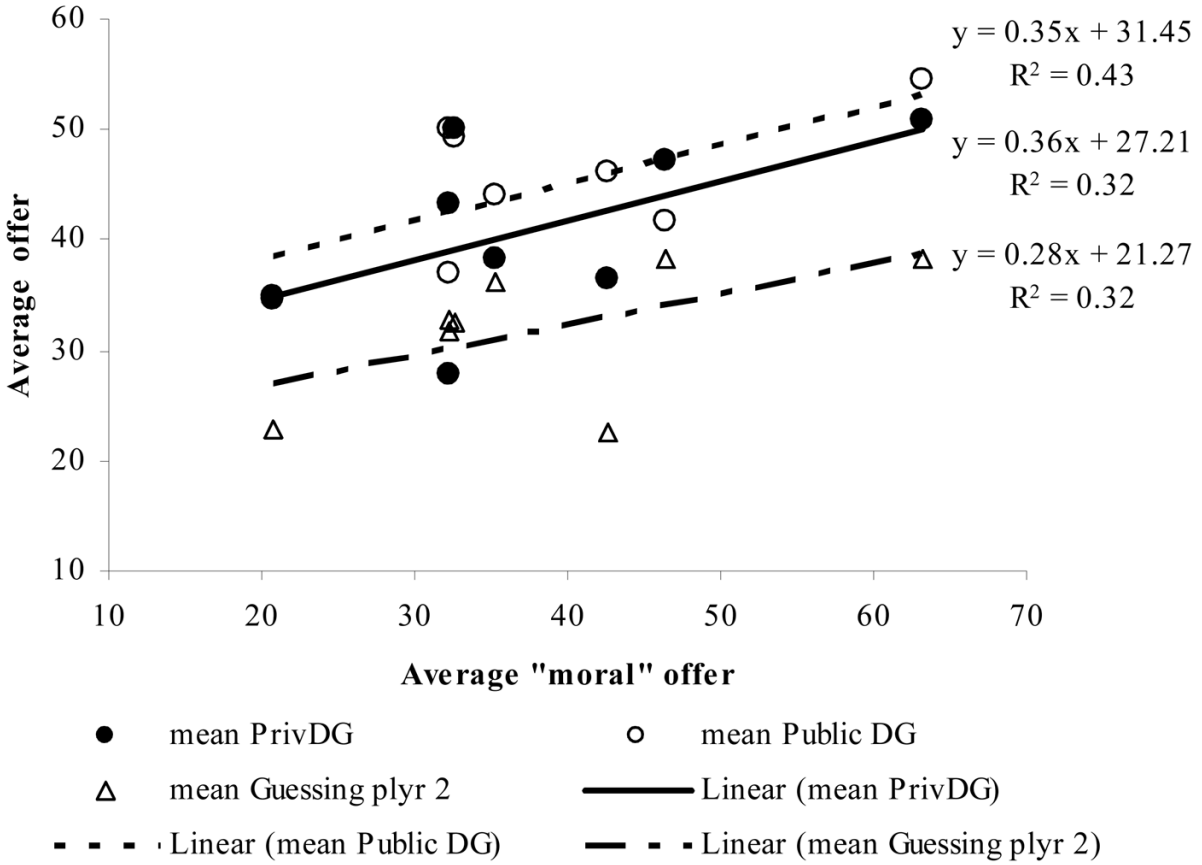

Figure 3.
Average Private DG, Public DG, and Guessing Game offers as a function of the average moral offer. Each data point refers to a single village

TABLE 1

Summary of 8 test predictions

Predictions tested in paper	Supported by current findings?
P1. Differences in village distributions of Private DG	Yes
P2. Village differences are not accountable in terms of socioeconomic differences, market acculturation, immediate demand for money	Yes
P3. Village differences in Private DG are predictable by village members	Yes
P4. Village differences in Private DG should reflect differences in moral or appropriate offers	Yes
P5. Village differences in Private DG disappear in Public DG	Mixed
P6. Less variation in offers in Public DG than in Private DG	No
P7. Village distributions for Private and Public DG should be similar	Mixed
P8. Public DG offers are greater than Private DG offers	Yes

TABLE 2

Summary statistics for economic games and study villages discussed in paper

	Private DG Offer			Public DG Offer			Guess Game	"Fair" DG Offer	*N*	*N*
Village	**Mean**	**Median**	**Mode**	**Mean**	**Median**	**Mode**	**Mean**	**Mean**	**Plyr 1**	**Plyr 2**
Tacuaral	34.8	30	30,40	34.7	30	10,20,40	22.9	20.8	20	21
Jamanchi	38.5	40	20,50	47.5	45	30,40,50	26.8	n.d.	20	19
San Miguel	43.2	50	50	50.0	50	40	31.6	32.2	25	25
Jerusalem	27.9	25	40	37.1	30	20,50	32.7	32.2	24	22
La Cruz	50.0	50	40,60	49.2	50	40	32.4	32.7	25	25
San Antonio	38.2	50	50	44.1	45	40	36.2	35.3	22	21
Campo Bello	36.4	40	20	46.0	50	50	22.5	42.7	25	25
Chacal	50.8	50	50	54.4	50	50	38.4	63.1	25	25
Cedral	47.2	50	30,50	41.6	40	50	38.4	46.4	25	25
ALL	41.2	40	50	45.3	50	50	33.8	40.3	211	208

TABLE 3

Multiple regression analysis of Private DG offers

	Private DG Offer				
Variables	***Village dummies only***	***Demographic Variables***	***Acculturation Variables***	***Demand Variables***	***All***
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Villlage 1: Tacuaral	6.845 (5.440)	11.758 (6.135)$^{+}$	8.749 (6.347)	8.587 (6.026)	12.577 (6.816)$^{+}$
Village 2: Jamanchi	10.583 (5.512)$^{+}$	13.883 (5.703)*	10.119 (6.107)$^{+}$	8.070 (5.782)	8.572 (6.297)
Village 3: San Miguel	14.883 (5.203)**	14.292 (5.103)**	14.877 (5.232)**	12.189 (5.294)*	12.487 (5.144)*
Village 4: La Cruz	22.083 (5.203)**	20.712 (5.116)**	20.157 (5.554)**	18.463 (5.501)**	17.995 (5.487)**
Village 5: San Antonio	10.265 (5.374)$^{+}$	12.907 (5.328)*	10.049 (5.650)$^{+}$	9.315 (5.458)$^{+}$	11.865 (5.713)*
Village 6: Campo Bello	8.483 (5.203)	9.081 (5.056)$^{+}$	8.027 (5.515)	6.122 (5.351)	5.242 (5.484)
Village 7: Chacal	22.883 (5.203)**	25.435 (5.202)**	22.619 (5.651)**	21.645 (5.445)**	20.713 (5.745)**
Village 8: Cedral	19.283 (5.203)**	23.833 (5.669)**	20.591 (5.535)**	17.076 (5.705)**	17.141 (6.090)**
Village 9: Jersusalem	baseline	baseline	baseline	baseline	baseline
Age		0.190 (0.095)*			0.132 (0.132)
Sex (1=male, 0=female)		4.713 (2.566)$^{+}$			8.367 (2.822)**
Residency:					
1–7 years		5.436 (5.942)			4.930 (5.881)
majority of life		7.210 (6.241)			7.239 (6.206)
always lived there		7.658 (5.520)			6.029 (5.464)

	Private DG Offer				
Variables	***Village dummies only***	***Demographic Variables***	***Acculturation Variables***	***Demand Variables***	***All***
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
<1 year		-			-
Marital Status (1=married)		−6.285 (4.091)			−8.975 (4.331)*
Quantity of rice and corn sold			0.017 (0.021)		0.016 (0.021)
Spanish proficiency			−1.032 (1.279)		−2.781 (1.355)*
Years of school			−0.033 (0.545)		0.658 (0.569)
Days Spent in Town			0.011 (0.564)		−0.258 (0.548)
Number of Children				0.505 (0.411)	0.216 (0.603)
Urgency to make purchase				4.920 (2.905)+	4.866 (3.019)
Constant	27.917 (3.716)**	16.877 (7.050)*	29.254 (4.962)**	29.857 (4.642)**	27.437 (8.377)**
Observations	212	197	193	194	188

Standard errors in parentheses

+ significant at 10%;

* significant at 5%;

** significant at 1%

TABLE 4

Multiple regression analysis of Fair offers

	"Fair" to Give in Private DG				
Variables	***Village dummies only***	***Demographic Variables***	***Acculturation Variables***	***Demand Variables***	***All***
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Village 1: Tacuaral	−11.418 (6.706)$^{+}$	−8.089 (7.352)	−3.025 (7.613)	−8.803 (7.123)	−5.486 (7.746)
Village 2: San Miguel	0.035 (4.715)	0.732 (4.772)	1.260 (4.726)	−0.144 (4.812)	0.804 (4.899)
Village 3: La Cruz	0.495 (4.810)	0.843 (4.910)	1.155 (4.908)	0.133 (4.955)	0.188 (5.235)
Village 4: San Antonio	3.161 (4.760)	2.139 (4.968)	1.717 (4.935)	0.997 (4.851)	2.359 (5.340)
Village 5: Campo Bello	10.515 (4.922)*	11.322 (4.955)*	10.816 (5.054)*	9.847 (5.031)$^{+}$	10.640 (5.342)*
Village 6: Chacal	30.938 (5.098)**	32.226 (5.223)**	33.220 (5.295)**	31.455 (5.272)**	32.178 (5.658)**
Village 7: Cedral	14.176 (4.737)**	15.496 (5.166)**	14.190 (4.906)**	12.705 (5.125)*	14.712 (5.549)**
Village 8: Jerusalem	baseline	baseline	baseline	baseline	baseline
Age		−0.072 (0.076)			−0.101 (0.109)
Sex (1=male, 0=female)		5.113 (2.476)*			4.841 (2.660)$^{+}$
Residency:					
1–7 years		10.954 (7.162)			10.686 (7.207)
majority of life		9.677 (7.609)			10.271 (7.676)
always lived there		11.916 (6.986)$^{+}$			12.221 (7.038)$^{+}$
< 1 year		-			-

	"Fair" to Give in Private DG				
Variables	***Village dummies only***	***Demographic Variables***	***Acculturation Variables***	***Demand Variables***	***All***
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Marital Status (1=married)		−2.459 (3.600)			−2.285 (3.992)
Quantity of rice and corn sold.			−0.022 (0.020)		−0.023 (0.021)
Spanish proficiency			−0.170 (0.604)		−0.412 (0.633)
Years of school			0.446 (0.440)		0.428 (0.495)
Days spent in market town			0.620 (0.534)		0.480 (0.548)
Number of children				−0.255 (0.387)	0.365 (0.555)
Urgency to make purchase				1.533 (2.795)	1.201 (2.927)
Constant	32.188 (3.605)**	22.836 (8.032)**	30.298 (4.373)**	34.181 (4.329)**	22.592 (9.228)*
Observations	287	273	272	272	268

Standard errors in parentheses

+ significant at 10%;

* significant at 5%;

** significant at 1%

TABLE 5

Multiple regression analysis of Public DG offers

	Public DG Offer				
Variables	***Village dummies only***	***Demographic Variables***	***Acculturation Variables***	***Demand Variables***	***All***
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Villlage 1: Tacuaral	−2.377 (5.911)	6.103 (6.652)	−1.109 (6.798)	−3.349 (6.140)	−0.283 (7.120)
Village 2: Jamanchi	10.417 (5.645)$^{+}$	10.702 (5.921)$^{+}$	9.129 (6.381)	9.783 (5.782)$^{+}$	7.648 (6.406)
Village 3: San Miguel	12.917 (5.382)*	12.218 (5.350)*	13.847 (5.511)*	12.707 (5.358)*	12.351 (5.280)*
Village 4: LaCruz	12.117 (5.328)*	12.508 (5.312)*	14.380 (5.803)*	13.650 (5.502)*	13.469 (5.578)*
Village 5: San Antonio	7.008 (5.503)	8.116 (5.532)	7.629 (5.901)	9.039 (5.457)$^{+}$	10.128 (5.814)$^{+}$
Village 5: San Antonio	8.917 (5.328)$^{+}$	8.507 (5.249)	8.637 (5.762)	9.103 (5.351)$^{+}$	6.287 (5.577)
Village 6: Campo Bello	17.317 (5.328)**	16.969 (5.401)**	14.917 (5.904)*	16.378 (5.446)**	15.338 (5.848)**
Village 7: Cedral	4.517 (5.328)	4.883 (5.886)	4.352 (5.782)	2.632 (5.709)	−0.379 (6.195)
Village 8: Jerusalem	baseline	baseline	baseline	baseline	baseline
Age		0.280 (0.099)**			0.294 (0.134)*
Sex (1=male, 0=female)		3.238 (2.683)			5.243 (2.884)$^{+}$
Residency:					
1–7 years		−0.969 (6.169)			−1.082 (5.979)
majority of life		−2.818 (6.480)			−4.730 (6.309)
always lived there		−1.559 (5.731)			−2.584 (5.555)

	Public DG Offer				
Variables	***Village dummies only***	***Demographic Variables***	***Acculturation Variables***	***Demand Variables***	***All***
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
<1 year		-			-
Marital Status (1=married)		−3.344 (4.255)			−5.976 (4.427)
Quantity of rice and corn sold			0.012 (0.022)		−0.008 (0.021)
Spanish proficiency			−1.745 (1.338)		−2.165 (1.378)
Years of school			0.208 (0.570)		0.959 (0.581)$^{+}$
Days spent in town			−0.091 (0.590)		−0.475 (0.557)
Number of children				0.501 (0.412)	0.137 (0.614)
Urgency to make purchase				6.901 (2.930)*	8.490 (3.095)**
Constant	37.083 (3.806)**	29.958 (7.322)**	39.075 (5.192)**	37.044 (4.648)**	37.786 (8.522)**
Observations	207	194	191	192	186

Standard errors in parentheses

$^{+}$significant at 10%;

*significant at 5%;

**significant at 1%

TABLE 6

Analysis of explained variation in Private DG, Public DG, and Fair (Private DG) offers

	Individual-level controls	Village dummies	Loggers dummy	Mean residential dispersion of village	Distance to market	Population Size	Mean Guess Game Offer (Plyr 2)	Mean Fair Offer (Plyr 2)
Adjusted R squared	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Dep. var: Private DG offer								
only individual control var.	0.069							
only village-level variables		0.104	0.043	0.036	−0.002	0.003	0.034	0.029
Individual and village level		0.134	0.087	0.118	0.066	0.079	0.099	0.083
Dep. var: Public DG offer								
only individual control var.	0.053							
only village-level variables		0.052	0.008	−0.007	−0.005	−0.005	0.002	0.018
Individual and village level		0.095	0.055	0.000	0.056	0.053	0.053	0.065
Dep. var: “Fair” offer								
only individual control var.	0.048							
only village-level variables		0.217	0.051	0.045	0.073	0.087	0.042	0.253
Individual and village level		0.205	0.064	0.117	0.110	0.085	0.074	0.243