

Market Integration, Reciprocity, and Fairness in Rural Papua New Guinea

Results from a Two-Village Ultimatum Game Experiment

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As one digs deeper into the national character of the Americans, one sees that they have sought the value of everything in this world only in the answer to this single question: how much money will it bring in?

de Tocqueville, 1831 (in de Tocqueville *et al.* 1985)

What French political commentator and statesman Alexis de Tocqueville regarded in his 1831 letter to be a fundamental character trait of Americans, many contemporary economists and evolutionarily oriented students of human behavior now regard as a basic part of the *human* behavioral repertoire. According to most economists, human behaviors are designed to maximize utility, the usefulness or satisfaction provided to an individual by some preferred good, activity, or balance thereof. In modern industrialized societies, where access to individuals' preferred goods and activities is facilitated largely through monetary transactions, individuals in these societies might be expected to behave as self-interested money maximizers. For social and behavioral scientists guided by the logic and expectations of evolutionary theory, behavior is designed to maximize *fitness*, which can be defined alternately as the propensity of an individual to survive and reproduce in a particular environment (Mills and Beatty 1984; Smith and Winterhalder 1992) or an individuals' proportional contribution of alleles or genotypes to succeeding generations (Price 1996). Among females, fitness maximization is achieved by gaining access to and consumption of the resources necessary to sustain the energetically costly physiological states of pregnancy and lactation (Daly and Wilson 1983; Tracer 1996). For males, it is achieved by maximizing mating opportunities, but in higher primate species such as chimpanzees (Stanford

1996) and humans (Kaplan and Hill 1985), access to females has itself been demonstrated on numerous occasions to be a function of male resource holdings. For both evolutionarily oriented behavioral scientists and many economists then, humans are expected to act as self-interested resource maximizers in the service of utility and fitness maximization, respectively. The view of humans as rational, self-interested utility maximizers has sometimes been referred to in the economics literature as the '*Homo oeconomicus*' model (Fehr and Gächter 1998).

Although the predictions of the social sciences for human behavior have often been clear enough, there has been less agreement about what methods might best be used to profitably test them. Economists, sociologists, and anthropologists have historically studied human behavior in a 'natural' milieu. For economists, this has meant studying human behavior in markets (Davis and Holt 1993); for sociologists and anthropologists human behavior has been studied by conducting survey or ethnographic research among societies or cultural groups. Moreover, individuals in these disciplines have historically shunned the use of experimental manipulation of their subjects due in part to concerns about the applicability of such results to real world situations. Recently, however, economists have with increasing frequency employed experimental tools that aim to measure such behavioral propensities as risk aversion, altruism, selfishness, and reciprocity in ways that are minimally invasive (Camerer 2003). They may also shed light on individuals' propensities to be risk averse, altruistic, selfish, and trusting in situations that are more controlled than 'real world' situations. Presumably the results of such experiments give insight into players' endogenous working models of these behaviors in the absence of multiple, complicating, and varying social factors, though, certainly, variables such as the players' gender, ethnicity, and socioeconomic status, as well as effects created by the researchers themselves may still affect the results.

One of the simplest games among those employed by experimental economists is the ultimatum game (for a detailed description of the game see Camerer and Fehr, Chapter 3, this volume). The results of the Ultimatum Game performed in the industrialized cities of Pittsburgh (USA), Tokyo (Japan), Ljubljana (the former Yugoslavia), and Jerusalem (Israel) deviated significantly from the expectation that humans should behave as self-interested

maximizers (Roth *et al.* 1991). In contrast to the results obtained in relatively industrialized settings, Henrich (2000) conducted a one-shot Ultimatum Game among twenty-one pairs of Machiguenga swidden horticulturalists in the Peruvian Amazon and obtained results that more nearly approached the equilibrium predictions of game theory. The contrast between Henrich's results and those of Roth *et al.* (1991) have indicated the possibility that culture and/or ecology may play a profound role in determining the course of reciprocity, bargaining, and social interactions in general. The populations studied by Roth *et al.* occupy a cultural-ecological niche that is evolutionarily novel in many salient respects including its degree of monetarization, literacy, extensive extralocal governmental structure, and probable shift from extensive extended kin networks to a focus on nuclear family structure. The Machiguenga by contrast, while certainly not unaffected by cultural diffusion from outside sources, likely live more nearly in an environment approximating that inhabited by the human species for much of its evolutionary history than do the populations of Pittsburgh, Tokyo, Ljubljana, or Jerusalem. Moreover, this is precisely true with regard to those domains just mentioned—degree of monetarization, literacy, extralocal government structure, and kin networks. It is just possible, therefore, that the tendency to act as rational, self-regarding utility maximizers, as predicted by the *Homo oeconomicus* model, might be more evident among less monetarized and westernized populations than among individuals living in the radically novel environments of the urban industrialized world.

In order to test the proposition that performance in bargaining experiments is significantly affected by degree of monetarization, Market Integration, and relative westernization, a one-shot Ultimatum Game was conducted during the months of June and July 1998 in two villages in a rural region of Papua New Guinea. Although the villages, Anguganak and Bogasip, are located in close proximity to one another and are relatively homogeneous culturally, as is demonstrated below, they are distinguished by their average degree of exposure to and integration in a cash-based economy, as well as their degree of education. In the sections that follow, I present an ethnographic account of the two villages followed by a description of the experimental methods employed, results, and a discussion of the implications of the

results for understanding factors that may affect participants' decisions in bargaining experiments.

ANGUGANAK AND BOGASIP: AN ETHNOGRAPHIC ACCOUNT

The physical environment

New Guinea, the world's second largest island, is situated in the Pacific Ocean just a few degrees north of the continent of Australia. The island is composed of two nearly equal-sized political entities. Its western half, once under Dutch administrative control, became a province of Indonesia in 1963 called 'Irian Jaya' (and more recently, 'West Papua'). The eastern half of the island, once composed of two distinct German- and British-administered areas, the Territory of New Guinea and the Territory of Papua, passed into Australian administrative control and then achieved independence in 1975 becoming the independent nation of Papua New Guinea.

The two villages that participated in this study, Anguganak and Bogasip, are situated at approximately 3° 30' south of the Equator in Sandaun Province, the northwestern-most of Papua New Guinea's nineteen provinces. The villages are located in the southern foothills of the Torricelli Mountains, a rugged range located only 50 or so kilometers inland from the north coast. The villages of Anguganak and Bogasip are located on the tops of cleared mudstone ridges at an altitude of about 700 meters.

The climate of the study area is extremely hot, wet, and humid and supports a luxuriant lowland rainforest vegetation consisting of hardwoods and palms with a variety of mosses, trailing lianas, and orchids abounding throughout the understory. The lowest regions of the Torricelli range act as drainage beds for the upland areas and contain numerous standing freshwater pools and swamps. These areas are home to dense stands of sago palm (*Metroxylon* sp.) from which the primary dietary staple of the local population is derived. At the highest elevations in the Torricelli Mountains, the lowland rainforest is replaced by lower montane forest. At all elevations, an abundance of mammalian, avian, reptilian, and amphibian wildlife is supported.

Papua New Guinea is the most linguistically diverse country in the world. Current estimates are that Papua New Guinea is home to more than 800 distinct languages, and although the villages that participated in this study, Anguganak and Bogasip, are located only about 1.5 kilometers from one another, they speak two different languages; Au and Gnau, respectively. Though many Gnau speakers tend to understand Au and vice-versa, few individuals are fully conversant in both languages. The villagers of Anguganak and Bogasip, like most other Papua New Guineans, are also conversant in Neo-Melanesian (*Tok Pisin*), the *lingua franca* of Papua New Guinea, and the language that was employed predominantly in carrying out this study.

Like many villages in the area, Anguganak and Bogasip are built atop cleared mudstone bluffs. Each village is not a single entity, but rather, is composed of hamlets located within a 15–20 minute trek from one another and connected by bush roads. Bogasip is composed of two main hamlets plus a scattering of solitary dwellings on the fringes of the hamlets. Anguganak is composed of four main hamlets plus additional fringe habitation sites. Traditionally, all hamlets contain a central men's spirit house in which all men and most boys (beginning at about the age of 10 or 11) sleep and individual women's houses occupied by village women, their daughters, and immature sons. Hamlets also contain smaller men's meeting houses. Women are prohibited from entering either the men's spirit or meeting houses. All of these structures are constructed with walls of sago palm midribs, posts of tree fern and bamboo, and a thatch of sago palm leaves lashed together with rattan. As opportunities for engaging in the cash economy and wage income have entered the area, some individuals have begun to build houses using corrugated metal sheeting in place of a sago thatch and the presence or absence of metal roofs in the villages has essentially become a locally recognized marker of socioeconomic differentials. At the time of this study, roughly 20 percent of the houses in Anguganak village had corrugated metal roofs. Houses in Bogasip had exclusively thatched roofs.

The spatial layout of Au and Gnau villages and, in particular, the separation of male from female dwellings and core areas, is reflective also of general male and female social relationships. Men try to

maintain a distance from women and believe that spending too much time around women and, especially, engaging in sexual activity, saps their energy, leads to illness, and diminishes their hunting ability. Women are regarded as particularly dangerous to men during menstruation and immediately after childbirth (Lewis 1975, 1980). Despite the distinctive separation between men and women, polygynous marriage is allowed, though uncommon. For both monogamously and polygynously married men, it is considered shameful to have more than four children with any one wife. Residence is patrilineal and virilocal.

The people of Anguganak and Bogasip subsist by practicing a mixture of foraging and horticulture. Their principle dietary staple is starch extracted from semi-wild stands of sago palm. The starch is most often mixed with boiling water and consumed as a gelatinous pudding, but it is also sometimes eaten, particularly by those in mourning, in a dry roasted form. Sago starch is generally consumed with a stew of leaves boiled in coconut cream. The leaves are derived from foraging as well as from gardens and if available, the stew will also contain meat or insect larvae derived from hunting and collecting, respectively. Organized daytime hunts for large game (pigs and cassowaries) as well as night hunts for nocturnal mammalian prey are conducted solely by men, while women act as opportunistic hunters, procuring animals encountered by chance during their daily foraging rounds. Meat hunted by men is distributed between the hunter's family and his extended kin, however, both the Au and Gnau have a strict taboo against hunters consuming any part of their own kill. This taboo is part of a larger prohibition against 'consuming one's own body' that extends into many areas of everyday life. In the domain of hunting, because animals are shot with arrows that have been carried by the hunter next to his body, it is believed that some of the hunter's sweat and bodily 'dirt' is injected into the animal when it is shot. The hunter is thus prohibited from consuming the animal as it contains 'his own body', and is instead required to distribute it to others.

In addition to hunting, the Au and Gnau also practice pig husbandry. Pigs are an important source of wealth and prestige and are only killed infrequently for ceremonial occasions. When killed, a pig may not be consumed by members of the family that raised it, since it was likely given food pre-masticated for it by its owners. It thus

falls under the taboo of 'consuming one's own body'. Women observe a brief mourning period when their pigs are killed.

The Au and Gnau also make small gardens averaging 1/10 ha from which they derive their secondary staples, roots, and tubers such as taro, yams, and sweet potatoes, as well as bananas, papaya, pandanus, pitpit (*Saccharum edule*), squash, and beans. The gardens also yield stimulants, most notably tobacco and betel nut, which are smoked and chewed habitually by most adults. A wide variety of other wild fruits and nuts are procured from foraging in the rain-forest. More recently, the people of the region have begun cash cropping cocoa, which grows quite well in the hot, humid climate.

There are no chiefs in either Au or Gnau society and neither does there exist in these societies a true 'big man complex' as has been described in other Melanesian populations (Sillitoe 1998). Au and Gnau males can acquire prestige as they age through personal charisma and oratory skills, fierceness in interactions with members of other villages (when appropriate), and especially, success in pig hunting. Men frequently hang the mandibles of wild pigs that they have shot outside their houses to advertise hunting success and this advertisement does bring them prestige, but it is by no means a foregone conclusion that such individuals can coerce other individuals, particularly those outside of their clan or lineage, to do anything they do not wish to. Important village decisions are commonly debated in the evenings around a fire in the men's meeting houses, and while the words of the best orators, warriors, and hunters are given special consideration and weight, final decisions on important matters are negotiated among all present. Another basis upon which certain individual's views may be accorded special weight has to do with what is locally referred to as the individual's 'story'. In local lore, Anguganak and Bogasip were originally settled by immigrants from other areas fleeing warfare and/or sorcery. In each village, there is a hierarchy of lineages that is based upon their order of arrival. The views of persons belonging to earlier arriving lineages tend to have 'preferred' status (though again these individuals are far from being able to completely dictate decisions to others in the village).

One element common to both Au and Gnau society that is undoubtedly relevant to the current study on bargaining, reciprocity, and fairness is their elaborate system of exchange relationships. Some of these relationships are obligatory and quite standardized

with regard to who gives what to whom, while others are to some degree optional and less standardized. Many of these exchange relationships are described by Lewis (1975) in his ethnography of the Gnau. Although an ethnography of the Au has not been published, field work among the Au by the author over the last 12 years has revealed identical patterns of exchange, obligation, and indebtedness.

Some of the most well-defined exchanges and ones that occasion a succession of later exchanges are those centered around marriage. Although it is preferred that a man marry his father's father's mother's brother's son's son's daughter (roughly akin to a three-generation removed cross-cousin), in fact many marriages do not follow this pattern but are decided by the prospective groom in concert with his prospective wife's father and brothers. Occasionally, individuals now decide for themselves whom they will marry, but these are still considered by most Au and Gnau to be 'wrong' marriages. Once a marriage is agreed upon, a bride price is set, which is usually paid in installments by the groom with help primarily from his agnates, and to a lesser extent his matrilineal relatives and unrelated hamlet co-residents (Lewis 1975). Before the bride price is fully paid, the bride periodically visits the groom's hamlet and works in food production with his mother for short (1-2 week) spans of time. When it is fully paid, there is a 'sending ceremony', in which the bride's hamlet formally sends her with gifts of food and betel nut to her husband's hamlet. With this ceremony full rights over the woman are transferred to her husband signified in part by individuals in her natal hamlet smearing their faces with mud and observing a brief mourning period. Dissolution of unions is quite common prior to full payment of bride price and it is also not uncommon for unions to break up after full payment of the bride price but before the couple has produced their first child. In the latter case, the bride price is usually refunded. If the marriage is successful and a child is produced, only then is the bride price distributed among the male relatives in her natal village (i.e. her father, father's brothers, and her brothers). Subsequent events that occasion additional payments by a husband to his wife's male kin (especially her eldest brother, or in some cases, the brother who precedes her in birth order) include the birth of his first child, the child's first consumption of meat (which must be provided by the child's

maternal uncle), the child reaching puberty and undergoing initiation, the death of his wife, and the death of his first son.

Apart from formal exchange obligations between individuals and their maternal and paternal relatives, the Au and Gnau place a premium on generosity. If a co-resident of one's hamlet (and sometimes even a non-co-resident) makes a request of him or her to give the co-resident some item, it is incumbent upon that person to give the item requested. Items requested may be food, clothing, household goods, string bags, tools, or money. In Anguganak, for example, the Au request *aoto mas* (give me betel nut) is one of the most frequently heard utterances and, if the individual indeed has betel nut to give, the request must be honored. Similarly, *aoto taanik* (give me [your] string bag), *aoto hrina* (give me [your] knife), and *aoto sak nan* (give me pig meat) while less commonly heard, must also be honored. An individual who refuses to honor a request but is known to possess the item requested is shunned in the community and may not have his own requests honored, especially if he is a repeat offender. For this reason, many Au and Gnau prefer to be discreet about what they may or may not have in their possession. Nocturnal hunters, for example, who commonly hunt alone, will often sneak into the hamlet before sunrise and hide whatever quarry they may have obtained. In addition to one who does not honor requests, an individual who makes too many requests may also be shunned, talked about scathingly, or more importantly, retaliated against by having a rapid series of requests made of him. The option of making requests and having them honored is considered by the Au and Gnau to be a right, but one that must not be abused.

Individuals may also at times display generosity by giving out unsolicited items, such as meat, to others. Although the items were not requested, their acceptance does inherently bind the two individuals in a reciprocal relationship with one another. It is understood by both that a debt has been incurred and that at some future time it will be repayed either with or without a specific request being made to do so. Unsolicited offers are thus sometimes refused if the person offered the item does not wish to become indebted.

Market integration

Anguganak and Bogasip were specifically chosen for the one-shot Ultimatum Game because, despite their proximity and relative cultural homogeneity, these villages display some of the largest

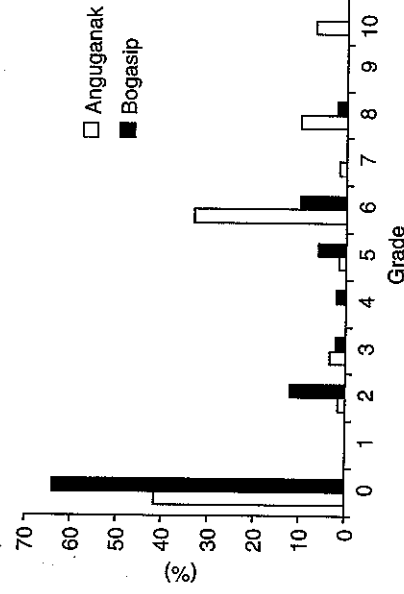


FIG. 8.1. Highest grade completed among participants at Anguganak and Bogasip ($n = 110$)

differences seen in the area in degree of Market Integration, education, and acculturation. As noted earlier, many houses at Anguganak use corrugated metal sheets for roofing, while no houses at Bogasip do. In addition, the number of years of schooling varies significantly between the two villages. Among the sixty participants from the village of Anguganak, number of years of schooling ranged from 0 to 10 with a mean of 3.8, while among the fifty participants at Bogasip number of years of schooling ranged from 0 to 8 with a mean of 1.5 ($p < 0.0001$). The distribution of the number of years of schooling completed in each of the villages is shown in Figure 8.1. At Bogasip, 64 percent of the sample had no schooling whatsoever, while at Anguganak only 42 percent of the sample had no schooling and a full 33 percent had completed 6 years of education. The average number of gardens devoted solely to the cash cropping of cocoa also varied slightly though not significantly between the two villages with a mean of 3.8 gardens per household at Anguganak and 3.3 gardens per household at Bogasip. Perhaps more interestingly however, when a subsample of households in each village was asked to recall the amount of money brought in to the household in the past month as a result of the cash cropping of cocoa, Anguganak household incomes ranged from 0 to 135 kina (K) with a mean of 38.5 K, while Bogasip incomes ranged from 0 to 14 K with a mean of 7.3 K. The difference is almost certainly due to the fact that Bogasip villagers were selling wet

cocoa beans, while Anguganak had constructed a fermentary for smoking the wet beans, and sold predominantly dry cocoa which fetches a much higher price. In fact, many Bogasip villagers reported having sold their wet beans to Anguganak, who in turn smoked them and resold them at a higher price.

Differences in the degree of Market Integration and education also lead to obvious differences in the nutritional status of individuals in the two villages. Concurrent with this study the author in concert with several graduate students carried out a nutritional survey among mothers in eight villages including Anguganak and Bogasip. A roster of six standard anthropometric measurements including weight (kg), mid-upper arm circumference (cm), maximum calf circumference (cm), and skinfolds (mm) measured at the triceps, subscapula, and medial calf were taken among a sample of sixteen Anguganak and fifteen Bogasip women. The results are presented in Table 8.1. The table shows that weight, mid-upper arm circumference, maximum calf circumference, and medial calf skinfold thicknesses are all significantly higher at Anguganak (Au) compared with Bogasip (Gnau). These results are concordant with previous studies demonstrating that significant differences in indices of nutritional status including anthropometric measures (Tracer 1996), hemoglobin levels (Tracer 1997), birth weight, and growth and development of children (Tracer *et al.* 1998) among six different

TABLE 8.1. Anthropometric characteristics of Anguganak ($n = 16$) and Bogasip ($n = 15$) women

Variable	Anguganak		Bogasip	
	Mean (SD)		Mean (SD)	
Weight (kg)	48.47 (5.49)		43.77 (5.04)*	
Triceps skinfold (mm)	5.86 (1.26)		4.97 (1.76)	
Subscapular skinfold (mm)	8.65 (1.78)		9.15 (3.02)	
Medial calf skinfold (mm)	4.68 (1.44)		2.72 (0.73)***	
Mid upper arm circumference (cm)	23.58 (1.51)		22.09 (1.95)*	
Maximum calf circumference (cm)	31.41 (1.89)		29.46 (1.51)**	

Note: Difference between Anguganak and Bogasip tested using two-tailed

t-test:

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

language groups in the Torricelli foothills are indicative of differences in degree of Market Integration and participation in the local cash economy.

EXPERIMENTAL METHODS AND MATERIALS

A one-shot Ultimatum Game was conducted over the course of 1 week in June 1998 in the village of Anguganak, and over a 2-day period in July 1998 in the village of Bogasip. In order to set the stakes for the game, a brief survey of wage levels among skilled and unskilled workers in the area was conducted. The main unit of currency in Papua New Guinea is the *kina* (K). Wages ranged from highs of K270 per fortnight among 'professional' workers such as local health center workers and community school teachers, to mid-level wages of K100 per fortnight among skilled mission station workers (office workers, Church Education Secretary), K50 per fortnight among unskilled mission station workers (grass cutters), and K1–2 per fortnight among villagers selling food items at the mission station market. It was decided to set the stakes of the game at a middle per-day level among all workers, that is, at K10, but for most village dwellers (only a tiny fraction of whom engage in any wage labor (Wage Labor) at all) this is a rather large sum of money. In the field season during which the experiment was conducted, K10 could purchase one small bush knife, five 'D' batteries, three large tins of mackerel, 3–1 kg bags of rice, 4–1 kg bags of iodized salt, or 3–1 kg bags of sugar. All of these are highly desired commodities. Apart from the stakes of the game, participants were also paid a fixed sum of K3 for participating.

The people, particularly women, of both Anguganak and Bogasip are quite accustomed to participating in research conducted by the author. Most of this research, however, has been oriented around assessments of disease, nutritional status, and child growth and development. Participation in all past research, as is the case here, has always been fully voluntary. However, research among the Au and Gnau has never before involved any monetary compensation to the participants.

In order to recruit volunteers, a meeting was set up in a central location in each of the villages. At the meeting, it was announced that a new project that differed from those conducted in the past would be carried out. It was explained that participation was

completely voluntary, that participants would be compensated with the sum of K3, and that only married adult individuals could participate. To prevent the possibility of collusion, the details of the experiment were not explained at the meeting, but participants were told that the research did not involve any invasive procedures (as some had in the past), participants would be assured of anonymity, and the work entailed the possibility that participants could garner an additional K0–K10 over and above the K3 compensation fee.

At Anguganak, the experiment was performed over the course of 1 week in a variety of locations as individuals willing to participate were encountered throughout three village hamlets. In Bogasip, the experiment was performed over the course of 2 days. The author was located in a small covered meeting area in the village and individuals came one at a time to participate. In both villages, a standard script was used to explain the rules of the game (see Appendix A). Because the author speaks Au but not Gnanu, the rules of the game were presented in both villages in Neo-Melanesian (*Tok Pisin*). The Neo-Melanesian script was translated back into English by an educated Papua New Guinea national employed at the Anguganak Christian Centre, a local mission station. From this translation, the author was satisfied that the rules of the game were presented correctly and as intended and that they should be readily intelligible to most speakers of Neo-Melanesian.

After reading the script to proposers, a period of testing followed where each proposer was presented with a standardized roster of offer amounts and asked how much he/she and the responder would receive if the responder accepted or refused the offer. Responders were also tested by presenting them with the same roster of offer amounts and asking them how much they and the offerers would receive if they accepted or refused each offer. The testing often revealed lapses in participants' understanding of the experiment's rules. Indeed, on many occasions the script supplemented by additional explanation was presented twice and in several instances three times. In roughly six cases, individuals were incapable of understanding the rules of the game and were excluded from participating, though they were still paid K3. In general, the greatest amount of confusion about and (re)explanation of the experiment's rules seemed to occur among the most elderly participants. Upon satisfactorily completing testing in the experiment, each participant was given a short survey in which they were asked to report their age

(if known), the size of their sibship and birth order, number of children, number of gardens devoted to growing food, number of gardens devoted to cash cropping, whether their house had a thatch or sheet metal roof, whether they had ever been employed for wage income, and their highest grade completed in school.

The final sample consisted of 110 individuals; thirty pairs of participants at Anguganak and twenty-five pairs of participants at Bogasip. Although I had hoped to obtain an equal number of participants at each of the villages, the experiment at Bogasip was ended early after a woman carrying a knife announced that this woman was 'the work of Satan'. Villagers reported that this woman was imbued with the 'holy spirit' and given to bouts of prophecy. Strangely, this woman later in the day actually participated in the experiment, saying that her husband had convinced her to participate. Still, that afternoon, the knife-toting woman continued to linger around the periphery of the area where the experiment was being carried out, raising concerns among the author and the graduate students accompanying him about their safety.

Following participation in the experiment, individuals were instructed not to discuss the particulars of the experiment, though they could indicate that they were paid K3 for participating and that the experiment included the possibility that they might receive more. At Anguganak, the first thirty participants and at Bogasip the first twenty-five participants were all assigned the role of 'proposer', while the second thirty and twenty-five individuals at each village, respectively, were assigned the role of 'responder'. Responders in each village were paired with proposers from the same village, but completely at random with respect to offer amount, gender, and age.

RESULTS

The sample of participants at Anguganak ($n = 60$) was 52 percent male and 48 percent female, while the Bogasip sample ($n = 50$) was 54 percent male and 46 percent female. Ages in the Anguganak sample ranged from 19 to 72 years with a mean of 38.8. Ages in the Bogasip sample ranged from 18 to 69 years with a mean of 35.9. The difference in mean age between the villages was not significant.

Figure 8.2 shows the distribution of offers in the one-shot ultimatum experiment as well as rejection and acceptance rates in Anguganak and Bogasip combined ($n = 55$ offers). There were no

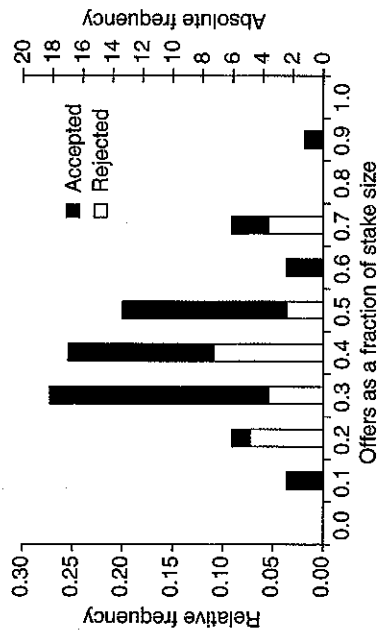


FIG. 8.2. Distribution of accepted and rejected offers at Anguganak and Bogasip combined ($n = 55$)

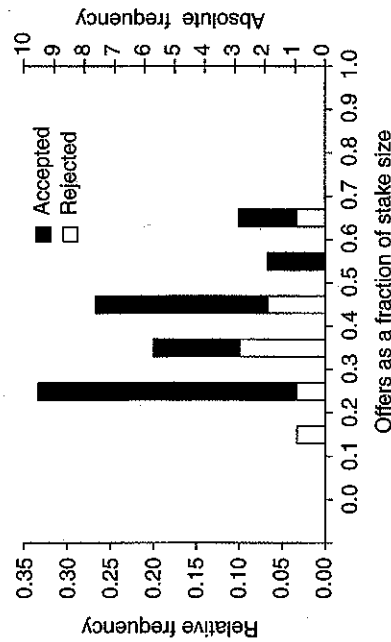


FIG. 8.3. Distribution of accepted and rejected offers at Anguganak ($n = 30$)

offers of K0, K8, or K10 and the modal offer, totaling 27.3 percent of all offers, was K3 or 30 percent of the stakes. The mean offer was 40.7 percent. The overall rejection rate for all offers was an astonishingly high 32.8 percent. This included rejection of: 80 percent of offers of K2 (four of five), 20 percent of offers of K3 (three of fifteen), 42.9 percent of offers of K4 (six of fourteen), 18.2 percent of offers of K5 (two of eleven), and most intriguingly, 60 percent of offers of K7 (three of five).

Figure 8.3 shows the distribution of offers as well as rejection and acceptance rates in Anguganak ($n = 30$ offers). There were no offers made either below K2 or above K7 in this village, and the modal

offer, totaling 33.3 percent of all offers, was K3 or 30 percent of the stakes. The overall rejection rate at Anguganak was 26.6 percent.

Figure 8.4 shows the distribution of offers as well as rejection and acceptance rates in Bogasip ($n = 25$ offers). There were no offers of K0, K6, K8, or K10 made, and the modal offer, totaling 32 percent of all offers, was K4 or 40 percent of the stakes. The overall rejection rate at Bogasip was almost 15 percent higher than that at Anguganak at 40.0 percent. An Eps-Singleton test comparing the distribution of offers at Anguganak and Bogasip was not, however, significant ($p = 0.23$).

Figure 8.5 shows a pairwise comparison of acceptance rates for Anguganak and Bogasip at each level for which at least two or more

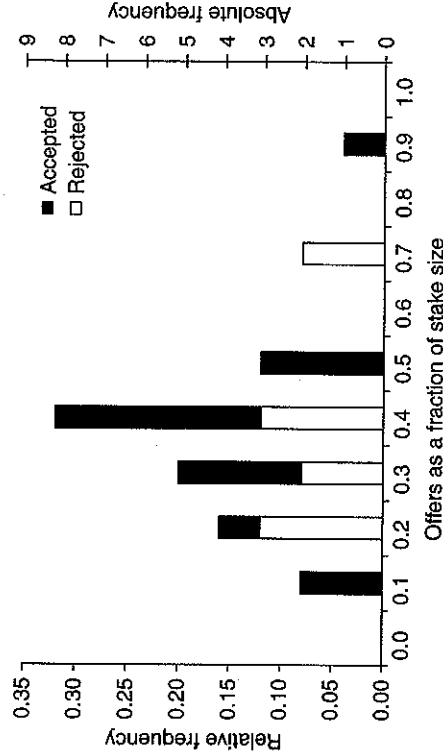


FIG. 8.4. Distribution of accepted and rejected offers at Bogasip ($n = 25$)

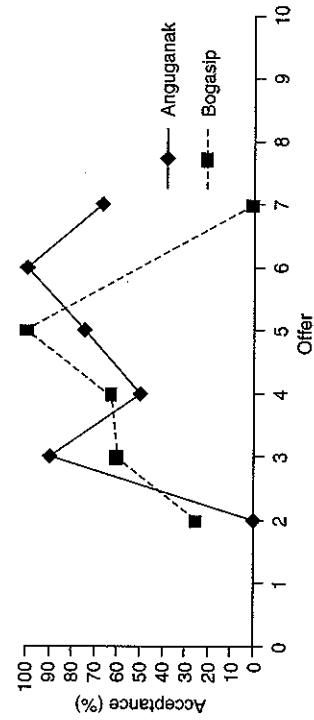


FIG. 8.5. Pairwise comparison of acceptance rates at Anguganak and Bogasip

Figure 8.7 shows a pairwise comparison of offer acceptance rates for males and females for each level at which two or more offers were made. From the graph it appears that male responders are much more likely than female responders to accept both high and low offers (i.e. above K5 and below K3). At mid-level offers of K3–K5, male and female acceptance rates appear to be roughly equal.

The number of gardens devoted to the cash cropping of cocoa among the sample of proposers ($n = 52$; three missing cases) ranged from zero to ten with a mean of 3.6. Although the average monthly income generated from cash cropping is probably a better measure of involvement in the cash economy than is number of gardens (especially since as noted above, some individuals sell predominantly wet beans while others sell the much more valuable dried beans), these data were difficult to obtain and are also likely to suffer from significant recall bias. For this reason, the distribution of offers, and the modal offer among those having fewer than ($n = 29$) and equal to or more than ($n = 23$), the mean number of cocoa gardens was explored. These distributions are shown in Figure 8.8. The figure shows that the distribution of offers among those having four or more cocoa gardens appears roughly normal, with a mode of K4. The distribution of offers among proposers having fewer than four cocoa gardens is right-skewed, with a mode at K3. The modal offers among individuals that reported a history of Wage Labor versus those who were exclusively subsistence forager-horticulturalists followed a similar pattern. The modal offer among those with a history of wage employment was K4, while the modal offer among those never employed was K3.

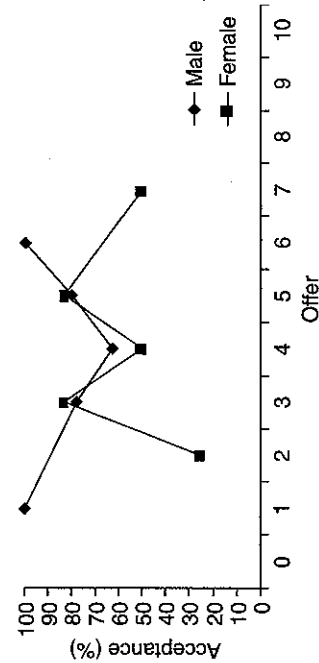


FIG. 8.7. Pairwise comparison of acceptance rates by gender

offers was made. At most offer levels, Bogasip shows a tendency to have higher acceptance rates than Anguganak. Both villages show a sharp decline in acceptance of offers above K5, though the decline is more pronounced for Bogasip.

Although there were no houses with sheet metal roofing at Bogasip, of the thirty participants at Anguganak designated to be 'proposers', twenty-six lived in a dwelling with thatched roofing and four lived in a dwelling with sheet metal roofing. Although the sample sizes are small, the modal offer among individuals living in each type of dwelling at Anguganak was explored in order to lend insight into possible effects of socioeconomic status on the level of offers. Among those twenty-six individuals living in thatched dwellings, the modal offer was K3, while among those four individuals living in dwellings with sheet metal roofing, the modal offer was K5.

The relationship of offer amounts and acceptance and rejection rates with gender was also explored. As illustrated in Figure 8.6, there was more than one modal offer among both males and females. The modes for males were at K4 and K5, while those for females were at K3 and K4. Despite the higher male modes, however, the distribution of male offers tended to be skewed toward lower offers while that of females tended to be skewed toward higher offers. As a result, the mean offer among female proposers was higher, K4.4, while among male proposers it was K3.9. The difference in offer distributions by gender did not, however, reach the level of statistical significance (Eps-Singleton Test, $p = 0.21$).

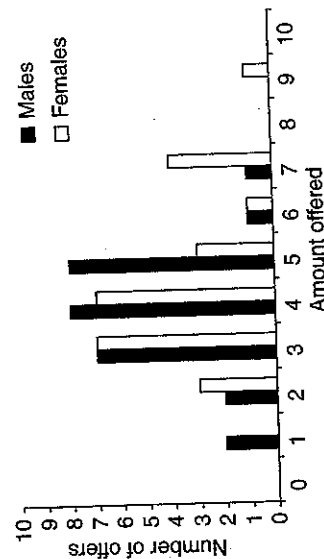


FIG. 8.6. Distribution of offers by gender in Anguganak and Bogasip combined ($n = 55$)

TABLE 8.2. Regression analysis of the effect of proposer's sex, age, number of children, number of food gardens, number of cocoa gardens, work history, and highest grade completed on offer amounts at Anguganak (Au)

Variable	Standardized coefficient	Significant values
Sex	-0.259	0.225
Age	-0.225	0.472
No. of children	-0.119	0.670
No. of food gardens	0.458	0.038
No. of cocoa gardens	-0.172	0.414
Ever worked?	-0.044	0.823
Education	0.113	0.625

TABLE 8.3. Regression analysis of the effect of proposer's sex, age, number of children, number of food gardens, number of cocoa gardens, and highest grade completed on offer amounts at Bogasip (Gnau)

Variable	Standardized coefficient	Significant values
Sex	0.268	0.352
Age	-0.120	0.704
No. of children	0.012	0.972
No. of food gardens	-0.051	0.861
No. of cocoa gardens	-0.128	0.635
Education	0.138	0.650

of children rejected these low offers only 14.3 percent of the time (one of seven).

Tables 8.2 and 8.3 show the results of multiple linear regressions of proposers' sex, age, number of children, number of food gardens, number of cocoa gardens, work history,¹ and highest grade completed on the amount offered at Anguganak and Bogasip, respectively. These analyses show that offer amounts are directly correlated with number of food gardens (standardized $\beta = 0.458$; $p = 0.038$) at Anguganak but not at Bogasip. None of the other variables, however, are significantly associated with offer amounts

Work history is a dichotomous variable denoting whether the individual ever worked for a wage. This variable is not included in the regression analysis at Bogasip since none of the individuals in that village reported working for wages.

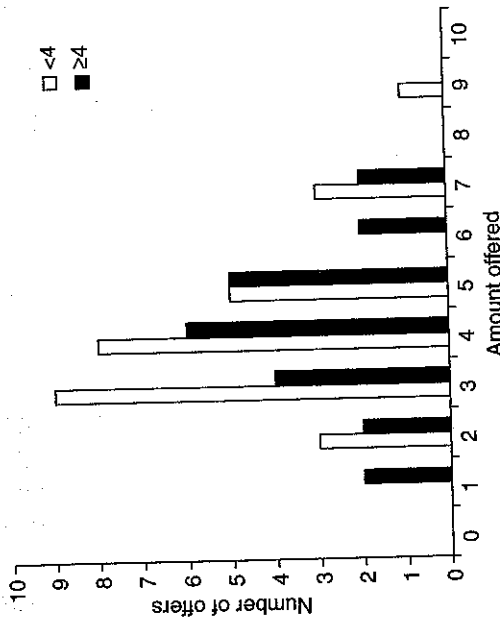


FIG. 8.8. Distribution of offers by number of cocoa gardens (mean = 3.6)

Number of children living in the proposer's household varied in the sample from zero to nine with a mean of 3.6. Like number of cocoa gardens and history of wage employment, it is possible that number of children might also be a proxy for socioeconomic status with those having more children being of higher than average status. Therefore, an examination of offers among individuals having fewer than the mean number of children (i.e. <4) versus those with four or more children in the household was conducted. Individuals having four or more children ($n = 25$) exhibited a modal offer of K3 with a mean of 3.8 while those with fewer than four children ($n = 30$) had a modal offer of K4 with a mean of 4.4. This pattern, of those having more children actually offering less, may suggest that rather than being indicative of greater wealth, having more children might actually tax family resources more and lead to a greater economization of those resources (i.e. a tendency toward thriftiness). For this reason, an examination of the rejection rate of low offers (K1-K3) was examined in these groups with the expectation that individuals with above average numbers of children and taxed family resources might be willing to accept low offers more frequently than those with fewer than average numbers of children. In fact, however, individuals with higher than average numbers of children rejected offers of K1-K3 37.5 percent of the time (six of sixteen) while individuals with fewer than average numbers

in either of the two villages. Finally, a logistic regression examining factors that might predict offer rejection including sex, age, number of children, number of food and cocoa gardens, educational attainment and work history did not yield any significant results.

DISCUSSION

The level of offers seen in the combined Anguganak and Bogasip ultimatum experiment falls between those obtained among western industrialized populations and the Machiguenga horticulturalists of Peru. Roth *et al.* (1991) reported modal offers in Pittsburgh, the former Yugoslavia, and Israel of 50 percent of the stakes. Mean offers in these countries ranged from a low of 37 percent of the stakes in Israel to 47 percent of the stakes in Pittsburgh. By contrast, Henrich found a modal offer of 15 percent and a mean offer of 26 percent among the Machiguenga. Anguganak and Bogasip showed a modal offer just above that of the Machiguenga, 30 percent, but the distribution of offers was such that the mean offer, almost 41 percent, was closer to that seen in the other westernized countries studied by Roth *et al.* As discussed earlier, the Au and Gnao have both an elaborate system of formal exchange obligations and place a very high premium on generosity and fulfilling requests. In fact, the obligation to fulfill requests often results in individuals being quite secretive about what they possess. It is likely that the high virtue placed upon generosity in these societies played a role in generating the relatively high mean offer seen in this experiment.

It has been hypothesized that differences observed in the modal and mean offers between the populations studied by Roth *et al.* and the Machiguenga might have been due in large part to differences in degree of monetarization and Market Integration (Henrich 2000); that is, individuals conform more to the *Homo oeconomicus* model of utility maximization in less monetarized contexts. For this reason, the results obtained from the Ultimatum Game at Anguganak, a village with a longer history of Market Integration and cash cropping and relatively high socioeconomic status, were compared with those from Bogasip, a more typical, less acculturated Torricelli village. Taken at face value, the modal offer of 30 percent at Anguganak and 40 percent at Bogasip would seem to run contra to the hypothesis that individuals act as self-interested utility

maximizers in less acculturated or monetarized contexts. However, the distribution of offers in the two villages does lend at least some support to the hypothesis. The distribution of offers at Anguganak yielded a mean offer of 43 percent, similar to that seen among the Pittsburgh, Yugoslav, and Japanese samples studied by Roth *et al.*, while the Bogasip distribution showed a proportionately higher frequency of low offers and yielded a mean offer of 38 percent. The difference between the villages does not, however, reach the level of statistical significance, and it should be kept in mind that while Anguganak does have a greater level of Market Integration and western acculturation than Bogasip, Anguganak still resembles Bogasip more closely in these measures than it does any of the industrialized nations studied by Roth *et al.*

The relationship between a roster of additional indices of wealth and Market Integration and offer amounts were also examined. Provisional support for the hypothesis that greater Market Integration yields higher offers was seen in the comparison of modal offers among those living in thatched ($n=26$) versus metal-roofed ($n=4$) dwellings at Anguganak. Metal roofs are indices of greater wealth compared with thatched roofs. Although admittedly the sample sizes are quite small, individuals living in metal-roofed dwellings had higher modal offers (50 percent) than their more traditional counterparts (30 percent). Individuals with higher than average numbers of cocoa gardens and those with a history of Wage Labor also displayed higher modal offers than those with fewer gardens or no history of wage employment, again offering some support for a positive relationship between Market Integration and degree of deviation from the *Homo oeconomicus* model. The results of an analysis between number of children and offer sizes was less conclusive. Individuals with higher than the average number of children tended to offer less than those with fewer children. It is uncertain, however, whether having higher numbers of children is indicative of greater wealth or whether it actually results in family resources being taxed to a greater degree. My own experience with populations in the area indicates that the former tends to be true among polygynously married men while the latter is more true among those who are monogamous. All males in this study were in monogamous marriages. Finally, multiple regression analyses of influences on offer amounts in each of the two villages revealed that, at Anguganak, individuals with more resources as

measured by their having greater numbers of gardens devoted to food (but not cash crops) tended to offer significantly more than those with fewer food gardens. However, this relationship was not seen at Bogasip.

In 1998, Eckel and Grossman reported the results of a double-anonymous dictator experiment indicating that women had a tendency to be more generous and less 'individually oriented' than men. Gender-specific results of the Ultimatum Game at Anguganak and Bogasip showed that the distribution of offers by women was skewed toward higher offers while that of men was skewed toward lower offers. Men were also more likely than women to accept both low ($<K3$) and high (>5) offers. These results offer at least some corroboration, however tentative, of Eckel and Grossman's findings.

By far one of the most interesting and unique findings in this study was the very high rate of rejection of offers by responders. In both villages combined, the overall rejection rate was almost 33 percent with the highest rate of rejection seen in response to both the lowest and highest offers (80 and 60 percent, respectively). Rejection was also much more common at Bogasip, with 40 percent of all offers rejected compared with Anguganak, whose 27 percent rejection rate was closer to that of western industrialized nations. For comparison, rejection rates varied between 19 and 27 percent in the four developed nations studied by Roth *et al.* (1991).

There are a number of possibilities that could account for the very high rate of rejection seen at Anguganak and Bogasip. It is possible that there was a researcher effect—in particular, that individuals were reluctant to take money from the researcher. There are, however, several reasons that this explanation is unlikely. First, in no instance did any participant display any reluctance whatsoever to take the K3 payment offered to them for participating. Second, individuals were told that the money was not the researcher's but was a pool of money from America earmarked specifically for the project. Third, individuals have never before displayed a reluctance to make requests of the principal researcher for either money or goods, though they have always repaid such 'debts' by eventually giving the researcher unsolicited goods in return, mostly bush foods. Fourth, if the tendency to reject offers was due to a reluctance to take money from the researcher, one might expect the tendency to be stronger at Anguganak, the village

at which the researcher has lived over the past 11 years than at Bogasip. In fact, however, Bogasip villagers rejected offers at a much higher frequency than the villagers from Anguganak.

Rather than a 'researcher effect', it is much more likely that the high rejection rate is an outcome of beliefs and values about generosity and the necessity of repaying debts that players brought into the game from their daily lives, coupled with a lack of exposure to 'impersonal transactions'. As noted earlier, both the Au and Gnau at times display generosity by giving out unsolicited gifts to others and although these gifts were not explicitly requested, their acceptance does inherently bind the two individuals in a reciprocal relationship. It becomes understood by both the gift-giver and its acceptor that a debt has been incurred and that at some future time it must be repaid. Unsolicited offers are thus sometimes refused, especially if the potential acceptor does not wish to become indebted and bound in a reciprocal relationship with the giver. It is also worth noting that all transactions in Au daily life are 'personal' and conducted in a face-to-face fashion. Anonymity and 'impersonal transactions' of the kind employed here in the economic experiments are foreign to the Au and Gnau. Thus even though both proposers and responders were assured that their identities would be safeguarded, players inescapably bought the understandings, beliefs, expectations, and values that they apply to daily life into the experiment. Among these was a fear of indebtedness to proposers for their generosity. When individuals rejected offers, they commonly said such things as 'I can take the K3 I received from you, I can't take money from someone in the village'. When offered sums above K5, they often seemed genuinely afraid, and on several occasions responders remarked 'no, that's too much'. Thus, individuals seemed to react to the game using the same frames of reference and values that they apply to exchange interactions outside the game.

In sum, the data presented here suggest that variability in the level of Market Integration among populations tested may have an influence on the results of bargaining experiments. Even within this one remote region of Papua New Guinea, there was a small but direct relationship between indices of Market Integration/familiarity with the cash economy, and the degree of deviation from the predictions of the *Homo oeconomicus* model of economic behavior. The results seem to have been equally influenced by local beliefs about reciprocity and generosity. Participants seemed to bring the

cultural beliefs that they use to navigate through their daily lives into the game. In particular, beliefs and values related to reciprocity and indebtedness coupled with an unfamiliarity with 'impersonal transactions' may have played a profound role in influencing them to reject offers (especially relatively high ones) to guard against incurring reciprocal obligations.

APPENDIX A: STANDARDIZED SCRIPTS

Individuals participating in the experiment were initially given their K3 participation fee and told:

Dispela tripela kina, ol i 'tok tenkyu' bilong yu helpim mi long mekim dispela samting. Dispela K3 em i bilong yu, mi no inap kisim bek gen. Kisim na putim long sampela hap na lus tingting long em olgeta. Nau bai yumi lukluk long dispela tenpela kina.

These three kina, they are a 'thank you' for you helping me do this research (literally, 'thing'). These three kina are yours (to keep), I cannot take them back again. Take them and put them away in some (safe) place, and forget about (literally, 'clear your mind of') them completely. Now we shall focus on these ten kina.

Individuals' attention was then focused on a cloth upon which ten K1 coins were laid out in a row. The following script was then recited:

Pastaim mi makim tupela manmeri bilong wokim dispela wok wantaim. Tasol wan wan bilong dispela tupela mi bin makim, em I no inap save husat narapela. Nambawan em i no inap save husat nambatu manmeri na narapela tu em I no inap save husat tru dispela nabawan manmeri. Na behain tu em I bai stap olsem, taim dispela wok I pinis, mi no inap tokaut husat poroman bilong narapela, no kolim nem bilong husat I bin mekim dispela wok.

Orait, mi givim dispela tenpela kina long yu na em I bilong yu nau. Mi no giaman, em I tru tru. Na em I no mani bilong mi, no ken wart long kisim dispela mani. Orait, dispela tenpela kina em I bilong yu nau, yu ken salim sampela bilong em I go long nambatu manmeri mi bin makim long wokim dispela samting wan-taim yu. Em I laik bilong yu: yu ken salim K0 na holim K10 bilong yu yet, yu ken salim K1 na holim K9 yu yet, yu ken salim K2 na holim K8 . . . yu ken salim K10 olgeta na holim K0 bilong yu yet. Yu tingting liklik na klostu bai mi askim yu hamas bilong dispela tenpela kina yu laik holim bilong yu yet na hamas bai yu salim I go long nambatu manmeri.

Orait, taim yu tokim mi hamas yu laik holim na hamas bai yu salim, behain bai mi go long nambatu manmeri na tokim em olsem: mi givim pinis tenpela kina I go long narapela manmeri bilong ples (tasol mi no inap tokim em husat manmeri tru no kolim nem bilong yu). Na nau em I kina bilong en. Na mi tokim em olsem em I ken givim long yu (tasol mi no kolim nem bilong yu, mi tokim em 'narapela

manmeri' tasol) hamas kina em I gat laik, nogat olgeta I go inap olgeta tenpela, na em bai holim olgeta arapela kina bilong em yet. Na bai mi tokim em: dispela nambawan manmeri tokim mi long givim yu—kina, na em yet laik holim—kina. Na bai mi askim nambatu manmeri olsem: yu laik kisim dispela kina o nogat? Sapos em I tok 'orait,' bai mi givim em hamas kina yu bin makim long givim long en, na bai mi kam bek long yu na givim yu olgeta arapela bilong dispela tenpela kina. Tasol, sapos em I tok 'nogat,' em bai kisim nogat olgeta na yu tu bai kisim nogat olgeta.

First I have marked pairs of people to carry out this research (literally, 'work') together. But each member of the pair that I have marked cannot know who is the other. The first cannot know who is the other and the other too cannot know who is the first person. And later too, it will remain thus. When this work is finished, I will not announce who was partnered with another nor announce the names of those that participated in this work.

Ok, (pointing to the kina) I give you these ten kina and they are now yours. This is not a lie, it is really true. And it is not my money, don't worry about taking it. Ok, these ten kina that are yours now, you can give (literally, 'send') some of them to the second person that I have marked to do this work (literally, 'thing') with you. It is your decision (literally, 'desire'); you can send 0 and keep (literally, 'hold') 10 for yourself, you can send 1 and keep 9 for yourself, you can send 2 and keep 8 for yourself . . . you can send 10 and keep 0 for yourself. You think a bit and shortly I will ask you how many of these ten kina you will hold for yourself and how many you will send to the second person.

Ok, when you tell me how many you want to keep and how many you will send, after a bit I will go to the second person and speak to him/her thusly: I gave ten kina to another person of this village (but I will not say which person or utter your name). And now these kina are his/hers. And I told him/her that he/she can give to you (but I did not utter your name, I told him just 'the other person') however much he/she desired, from nothing whatsoever up to all ten, and he/she will keep all the remaining kina for him/herself. And then I will say to him/her: this first person told me to offer (literally, 'give') you—kina, and he/she desired to keep—kina for him/herself. And then I shall ask the second person: do you want to accept these kina or not? If he/she says 'ok,' I will give to him/her the amount of kina you marked for giving to him/her, and I will return to you and give to you the remainder of this ten kina. But, if he or she says 'no,' he/she will be given nothing at all and you too will receive nothing at all.

Individuals designated to be 'proposers' in the ultimatum experiment were read the entire script, while those designated as 'responders' were read the relevant section of the third paragraph. A cloth with 10 one kina coins lined up was also placed in front of the recipients, and when the section 'this first person told me to offer you . . . , and he/she desired to keep . . . ' was read, the lineup of ten kina was divided such that the offered amount was pushed

slightly to one side of the cloth and the kept amount to the other side. Following the script reading, individuals were given an opportunity to ask questions and clarify any 'rules' that were unclear to them.

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