# More fair play in an ultimatum game after resettlement in Zimbabwe: A field experiment and a structural model

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# More fair play in an ultimatum game after resettlement in Zimbabwe: A field experiment and a structural model

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**Abstract**

Zimbabwean villagers of distinct background have resettled in government organized land reforms for more than three decades. Against this backdrop, I assess the level of social cohesion in some of the newly established communities by estimating average preferences for fairness in a structural model of bounded rationality. The estimations are based on behavioral data from an ultimatum game field experiment played by 234 randomly selected households in six traditional and 14 resettled villages almost two decades after resettlement. In two out of three distinct resettlement schemes studied, the resettled villagers exhibit significantly higher degrees of fairness ($p \leq 0.11$) and rationality ($p \leq 0.04$) than those who live in traditional villages. Overall, villagers are similarly rational ($p = 0.30$) but the attitude toward fairness is significantly stronger in resettled communities ($p \leq 0.01$). These findings are consistent with the idea of a raised need for cooperation required in recommencement.

*Keywords:* Africa, behavioral economics, inequality aversion, land reform, impact evaluation, social change, social development, social preferences, structural estimation, quantal response model

*JEL classifications:* C11, C72, C91, C93, D03, O12, O13, O18, Q15, Z13

## 1 Introduction

Since gaining independence in 1980, the government of Zimbabwe has implemented land reform schemes to address inequalities in land ownership. In consequence, numerous Zimbabwean households have resettled in government organized land reform programs in the past, and resettlement continues to affect the life of people. The government's land policy can be divided into two periods:

A controversial *fast-track* land redistribution began by president Mugabe in 2000. This land reform has been criticized for its socioeconomic consequences: "Mr. Mugabe's chaotic land redistribution campaign [...] caused an exodus of white farmers, crippled the economy, and ushered in widespread shortages of basic commodities" (Voice of America 2009). Yet, it is also argued that ten years after large areas of Zimbabwe's commercial farm land were compulsorily transferred without compensation, a new rural economy has developed: "A wide range of activities contribute to highly differentiated livelihoods in [some of] the new resettlements" (Scoones et al. 2010). In February 2009, president Mugabe accepted to share power, but declared to continue the *fast-track* land redistribution.

*July 24, 2012. Institute for Social Medicine, Epidemiology and Health Economics, Charité University Medical Center, Free University and Humboldt University of Berlin, Germany; *Email:* stefan.kohler@charite.de, *Homepage:* http://epidemiologie.charite.de. I am grateful to Abigail Barr for generously sharing experimental data she collected in Zimbabwe. In my research based on this data, I have greatly benefited from helpful and constructive comments by Abigail Barr, Jordi Brandts, Pascal Courty, Simon Gächter, Karl Schlag and anonymous reviewers.

Before the *fast-track* land reform, a *willing-buyer and willing-seller* land reform program existed for two decades, in which donors assisted the Zimbabwean government to finance the purchase of land. Until 1997 this scheme resettled over 70,000 indigenous households on farms previously owned by white commercial farmers. The scheme targeted individual households of displaced people, the landless and those with insufficient land to sustain themselves and their families. The beneficiaries were allocated 5 hectares of arable land for cultivation in a resettlement site and remaining area was devoted to communal grazing land. Households were also allocated a residential plot within newly planned villages. As the majority of households resettled on an individual basis, resettled villagers, unlike traditional villagers, started to live largely amongst unrelated households instead of their kin (Barr 2004a; Dekker 2004a; Owens et al. 2003).

Given the challenge to restart along with unfamiliar people that resettled people face, the Zimbabwean land reform poses the question whether villagers in new communities lost social capital and in the long run suffer from the eradication of social ties brought about by resettlement, or if they can achieve their development anew: Does social cohesion emerge amongst former strangers after resettlement, in some instances, and if so, how much? To address this question, I study if different social preferences are present in some of the communities of the early Zimbabwean land reform period and their non-resettled counterparts almost two decades after once unfamiliar households became neighbors through resettling.[1] I measure social cohesion roughly by estimating the relative strengths of self-interest in relation to interest in fairness, defined as an aversion toward inequality between own and other's well-being. Since social cohesion supports cooperation, it can be conducive to the chances of reestablishing functioning communities.

I explore the levels of social cohesion in three resettlement schemes (Mupfurudzi, Mutanda, Sengezi) and geographically close by traditional communities. Data stem from an ultimatum game field experiment preceding this study (Barr 2004b) and were also part of a large scale study of cross-cultural variation in behavior (Henrich et al. 2001, 2005). The given ultimatum game choice problem was to be solved anonymously by randomly matched pairs of villagers within 14 resettled and six traditional communities. The decision task in the ultimatum game experiment mimics the common aspect of bargaining situations that two parties have to reach an agreement to realize a mutually beneficial outcome. Novel is the approach of applying a structural decision model to this field experimental data in order to disentangle self-interested, fairness and rationality as competing explanations for the variations in experimental behavior that were observed across regions and resettlement status. The structural model correctly specified allows to extrapolate the parameters estimated in these villages to other settings than the experiment. A quantal response equilibrium is applied to estimate the relative strength of fairness in relation to self-interested. It is a game theoretic solution concept, which combines an equilibrium notion that accounts for strategic optimizing behavior with bounded rationality (McKelvey & Palfrey 1995; Mckelvey & Palfrey 1998). Players are assumed to make random errors in choosing which pure strategy to play, but the probability of any particular strategy being chosen increases in its payoff such that more costly errors are less likely.

[1] The *fast-track* land reform began in 2000 seized white-owned farms. Its legality and constitutionality have been challenged in the Zimbabwean High and Supreme Courts. The *fast-track* and *willing-buyer-willing-seller* land reform took place in a different macroeconomic and political context with distinct resettlement practices. The robustness of the presented results across different land reform modalities remains subject to further research.

The introduced randomness transforms the deterministic in a stochastic model that allows for maximum-likelihood estimation of the model's parameters.

The estimation results indicate significant degrees of fairness and bounded rationality in addition to self-interest for all of the three different areas studied. Overall ($p \leq 0.01$), in the Sengezi ($p < 0.01$) area and arguably in the Mutanda ($p \leq 0.11$) area, resettled villagers show significantly higher degrees of fairness than their traditional village counterparts. The pooled data of all areas does not reject the hypothesis that resettled and traditional villagers are, on average, equally rational ($p = 0.30$). For the Mutanda and Sengezi areas, the assumption of common rationality is rejected ($p \leq 0.04$) and significantly higher degrees of rationality are estimated for their resettled villagers. Also in Mupfurudzi, higher degrees of fairness and rationality are estimated for resettled villagers, but the difference from the preferences and rationality of traditional villagers is insignificant. The positive correlation between fairness and rationality is consistent with the idea that social cohesion comes along with villagers' experience in cooperative interaction with unrelated households that, presumably, occurred more frequently in resettled villages.

The paper has six sections. Section 2 reviews related literature. Section 3 describes the ultimatum game and data. Section 4 introduces the model. Section 5 presents the model fit and estimation results. It also discusses limitations of the analysis. Section 6 concludes.

## 2 Related literature

Some scholars argue that there is diversity in the strength of social preferences, which capture forms of (conditional) altruism in addition to self-interest, across societies and individuals. Barr et al. (2009) investigate to what extent behavioral variations observed in three bargaining games that were played in 15 distinct societies ranging from US undergraduates to Amazonian, Arctic, and African hunter-gatherers could be attributed to differences along a single dimension, namely the value placed on equality. Testing a number of predictions implied by a utility function, which captures the same notion of quadratic inequality aversion as employed in this paper, they conclude that "inequality aversion is the principle motivating factor [in all societies] and variations in behavior across societies and across individuals within societies do, in large part, result from differences in the value placed upon equality." Bellemare et al. (2008) use data from ultimatum and dictator games played online by a large representative Dutch population sample to estimate nonlinear preferences for equity combined with limited rationality. Heterogeneous equity preferences together with subjective expectations predict their observed decisions well. In addition, research suggests that models of social preferences reproduce observed behavior consistently when estimated in a quantal response equilibrium of different experimental games. Bounded rationality and significant degrees of altruism reproduce behavior in public goods games (Anderson et al. 1998; Offerman et al. 1998); linear or quadratic fairness and decision error predict the patterns of positive offers and rejections in as well as across bargaining games (De Bruyn & Bolton 2008; Goeree & Holt 2000).

Other scholars argue that the combined use of randomized controlled trials and structural models can improve the study of politics (Wantchekon & Guardado R. 2011). The study at hand follows a similar line of research by fitting a model of quadratic fairness to data from an ultimatum game field experiment that was played by Zimbabwean villagers, of which some experienced a fundamental change in their environment that may have affected preferences. The same methodology and Zimbabwean ultimatum game data were used previously. Estimating social preferences on the study population level, Kohler (2008) finds no evidence for gender-related differences in the Zimbabwean villagers' preferences, a result that could be due to the small sample size, but that resettlement status impacts the value villagers place on equality significantly. This finding was robust in a limited test of the model specification, which suggested that a model of symmetric inequality aversion fits the aggregate ultimatum game data better than a model of aversion merely to disadvantageous situations. The study also compared estimates from ultimatum games played in small-scale societies and industrialized countries, and it argues that higher levels of decision error are estimated for small-scale societies even when correcting for the different purchasing power of the money at stake in games. In the new analyses of the paper at hand, I employ Kohler (2008)'s model specification with symmetric inequality aversion that fitted the data better to trace the observed difference in social preferences after resettlement on the regional level.

In a complementary analysis of social consequences of the Zimbabwean land reform, Barr (2003) studied Trust Game behavior in the same resettlement schemes. She concluded that altruistic motivations matter less while motivations relating to a desire to community-built matter more in resettled communities. This insight is supported by the estimated fairness attitudes put forward in this study because fairness concerns, a form of conditional altruism, provide one plausible explanation for cooperativeness. More recently, field experiments were also used in the study of social cohesion in other contexts, for instance, to address the question as to whether brief foreign-funded efforts to build local institutions have positive effects on social cohesion in post-conflict Liberia. In a randomized rollout of a community-driven reconstruction program, Fearon et al. (2009) compare villagers that participated in a public goods game. The villagers exposed to the reconstruction program exhibited higher levels of cooperation than the control group, as measured by their average contributions in the public goods game. Bellows & Miguel (2009) find that people more exposed to violence during the civil war in Sierra Leone participate more in local collective action. Similar findings are reported in Uganda (Blattman 2009). More war exposure predicts more sharing with neighbors in Burundi (Voors et al. 2012) and more in-group inequality aversion in Georgia and Sierra Leone (Bauer et al. 2012). For an overview of the range of field experiments that study the political economy of development see, for instance, Humphreys & Weinstein (2009).

## 3 Data

Data were generated in 1999 observing behavior in an ultimatum game (UG) field experiment conducted by Barr (2004b) in Zimbabwe. Her sample covers 234 households (117 matched pairs) in 14 newly established villages, which were all among the first resettled villages created in 1982, within three resettlement schemes and six geographically nearby traditional communities. Each resettlement scheme's area represents one of Zimbabwe's three agriculturally most important agroclimatic zones that correspond to regions of moderately high, moderate and restricted agricultural potential: Mupfurudzi in Mashonaland Central Province, Mutanda in Manicaland Province, and Sengezi in Mashonaland East Province (Owen et al. 2003). While the traditional villages exist since the 1940s and 1950s, the inhabitants' ancestors lived together before, giving the social structure a longer tradition that differs from the resettled communities (see, for instance, Dekker 2004a,b). Within villages, participants for the UG experiment were recruited by inviting each household to send a member above the age of 14. The headman was asked to oversee that between forty and sixty percent of the volunteers were women. Play in the games was anonymous, non-recurring and for stakes between a half and two day's local casual labor wage. The stakes in the administered UG were Zim$ 50 and the smallest unit to offer was Zim$ 5. Since the subject pool was small and experimentees knew they were playing with someone from their village, observed play was seen to be likely to reflect experiences from the day-to-day communal interaction (Barr 2004b).[2]

The UG itself is a strategic situation, in which two players are allotted a sum of money (the stakes) and then bargain about its division. The first player, called proposer, makes an offer, which the second player, the responder, can accept or reject. If the responder accepts then the stakes are divided according to the proposed split. If the responder rejects, both receive nothing. Subgame perfect equilibrium and own money maximization predict that proposers should offer the smallest non-zero amount and responders should always accept because they face a choice between zero and something. In contrast, as observed in numerous prior UG experiments (see, for instance, Oosterbeek et al. 2004), the behavior within the UG experiments in all Zimbabwean villages substantially deviated from narrow self-interest: Firstly, offers are positive averaging 38 to 48 percent of the stakes and the unique mode for all but Mupfurudzi's traditional proposers is fair division. Secondly, offers below 30 percent of the stakes were rejected by 33 to 57 percent of responders in all but Sengezi's traditional villages, in which still 17 percent of the responders reject such low offers (table 1, rows 1-4).

Comparing behavior of traditional and resettled villagers (table 1, rows 5-12) shows that mean offers in villages of the three resettlement schemes are between 45 and 48 percent as compared to 38 to 43 percent in geographically close traditional communities. While all average offers are larger in resettled villages, a two-sided $t$-test indicates that the difference is significant only in the pooled and in the Sengezi sample at the 5 and 10 percent level, respectively. A Mann-Whitney Wilcoxon test further indicates a difference in the overall offer distribution at the 5 percent level. Chi-square and Fisher's exact tests show no statistical evidence for difference in the overall rejection rate of the observed offers, but for differences in the average rejection rate of low offers below 50 and 30 percent in the pooled sample as well as for the rejection rate of offers below 30 percent in Sengezi at the 10 and 16 percent level, respectively. An equal partition of the money at stake is proposed most frequently in 69 and 55 percent of all play in resettled and traditional villages, respectively. The most generous offer of 60 percent of the stakes is observed three times in two resettled villages of the Mupfurudzi area.

Due to optimizing behavior, in the form of strategic anticipation of the other's incentives, and the abstract experimental context, it is in question how to interpret the differences detected in the descriptive statistics of the UG behavior (for the aggregate data denoted first by Barr 2004b) and how to learn from these differences beyond the context of the game?[3] In the

[2]The proportion of households sampled in the experiments varied between 0.31 and 0.59 or was 1. Average earnings were between half a day's and a day's casual wage. The exchange rate at the time of the experiment was Zim$ 37.95 per US$.

[3]Higher proposals in the ultimatum game may not only result from social cohesion or fairness considerations. In particular, also greater uncertainty about the responder's rejection behavior may cause self-interested precautionary high proposals.

remainder of the paper, I resolve both questions by linking the behavior that is observed in the UG to underlying incentives and the degree of rationality of the experiment participants, which then rather than observed action are compared. Unlike the UG experiment, the quantal response equilibrium model of social preferences can be used to forecast behavior in other contexts than the UG after its parameters are estimated.

# 4 Model

Positive average offers and rejection of small proposals in the UG resemble typical experimental behavior that has been studied extensively. This behavioral pattern is predicted, for instance, by models, which assume that players care about fairness in addition to self-interest (Bolton & Ockenfels 2000; Fehr & Schmidt 1999). Suchlike models of social preferences trigger positive offers in the UG through inequality averse enough responders $R$, who reject small offers. Independently of triggered positive offers, non-zero offers will also be made by proposers $P$ who are themselves substantially inequality averse.

Adopting the functional representation of concern for fairness proposed by Bolton & Ockenfels (2000), I estimate the coefficient of a quadratic loss function by which deviations from payoff equity diminish the utility gained from the own payoff:

$$u_i(x_i, x_{-i}) = \begin{cases} c\left(\omega_i - \frac{b}{2}\left(\omega_i - \frac{1}{2}\right)^2\right) & \text{if} \quad x_i, x_{-i} \neq 0 \\ 0 & \text{if} \quad x_i, x_{-i} = 0 \end{cases}$$

Surplus $c = x_i + x_{-i}$ is the sum of individual payoffs and $\omega_i = \frac{x_i}{c}$ is the proportion of the surplus player $i \in \{P, R\}$ gets. Parameter $b$ measures the importance of relative gains in comparison to own monetary payoff. It is interpreted as fairness and assumed common to a population. For $b > 0$, ceteris paribus, utility decreases if there is an inequality in payoffs regardless whether it is to a player's advantage or disadvantage. This effect is the stronger the larger an inequality. In the UG, such utility implies that the responder rejects unequal proposals if $b > 2\omega_R\left(\omega_R - 0.5\right)^{-2}$. The proposer, intrinsically or together with anticipation of a fair-minded responder's rejection of small or large offers, may offer higher amounts than implied by pure self-interest. As the degree of fairness $b$ co-determines behavior in the subgame perfect equilibrium of the UG, variations therein give a rationale for the varying degree of sharing behavior observed between resettled and traditional villagers in the Zimbabwean UG field experiment.

To capture variation in the optimal play of individuals who share one and the same preferences, an anticipated random shock shall add to the expected utility and cause players to not always choose their best strategy given their beliefs. Each player knows that the other player does so as well and anticipates the preferences and decision error of other. As a consequence, all strategies of a player can be observed with some probability. For a given error structure the equilibrium is defined as a fixed point of this process with mutual correct anticipation. McKelvey & Palfrey (1995) and Mckelvey & Palfrey (1998) established the existence of this quantal response equilibrium (QRE) under the assumptions that players maximize utility and estimate expected payoffs in an unbiased way.[4]

[4]The original QRE is based on a game's normal-form, which disregards that, in the UG, the responder can

In the UG played in the Zimbabwean villages, the proposer $P$ chooses a strategy $s \in S_P$ in his discrete strategy set $S_P = \{0, 0.1, 0.2, ..., 1\}$ of eleven possible offers, in which the stakes of Zim$ 50 are normalized to one. The portion $s$ denotes how much the proposer offers to the responder $R$ and $(1 - s)$ is what he would like to keep for himself. The behavioral strategy $r(s) \in S_R$ of the responder is a function that maps each possible offer into his dichotomous strategy set $S_R = \{Accept, Reject\}$. Assuming the best response functions follow a logit distribution, the resulting QRE is often called a logit equilibrium, in which players' optimal mixed strategies are determined by the pair of probabilities that solve:

$$p_R(s) = \frac{\exp(\lambda u(s, 1-s))}{1+\exp(\lambda u(s, 1-s))} \quad \text{and} \quad p_P(s) = \frac{\exp(\lambda p_R(s) u(1-s, s))}{\sum_{\tilde{s} \in S_P} \exp(\lambda p_R(\tilde{s}) u(1-\tilde{s}, \tilde{s}))}$$

The numerators are exponential functions of the expected payoffs that result from the UG behavior. The denominators are normalizing factors that force the probabilities to sum to one.[5] The distribution parameter $\lambda$ is a common measure of rationality, which implies that each strategy is chosen with equal probability if $\lambda \to 0$ and that the expected utility maximizing strategy is chosen with certainty if $\lambda \to \infty$. The logit response functions $p_P(s)$ and $p_R(s)$ also define the logit equilibrium for the UG. They imply that strategies with higher expected payoffs are chosen with higher probability. The logit equilibrium approaches a subset of Nash equilibria as rationality increases, i.e. decision errors decrease (McKelvey & Palfrey 1995; Yi 2005). As the random utility shocks in the model cause different experienced utility at identical behavior, one interpretation of the QRE framework is that it represents heterogeneity between individuals, which is not covered by the preference parameter $b$.

# 5 Estimation

The stochastic equilibrium prediction of the logit equilibrium, in contrast to the deterministic Nash equilibrium, allows to obtain maximum likelihood estimates of the strength of fairness $b$ relative to self-interest and the degree of rationality $\lambda$. As the joint density of $k \in \{1, ..., K\}$ independent and identically distributed observations is given by multiplying the probabilities to observe each individual outcome, the log-likelihood of observing a particular sample of $k$ observations in the UG is given by:

$$\ln L(\lambda) = \sum_k d_k \ln [p_P(s) \cdot p_R(s)] + \sum_k (1 - d_k) \ln [p_P(s) \cdot (1 - p_R(s))]$$

Dummy $d_k$ assumes unity for acceptance and naught for rejection of $s$. The identification of parameters $b$ and $\lambda$ in the likelihood function is warranted through the functional form of the employed utility function. The degree of rationality $\lambda$ is affected proportionally and inequality aversion $b$ disproportionately high by payoff variations.

make his choice between accepting and rejecting, given the offer. McKelvey and Palfrey later extended the QRE to extensive-form games, proposing an agent QRE. The agent QRE is defined similar to the normal-form QRE, but for the agent normal-form of an extensive-form game, in which different information sets of a given player are assumed to be played independently by different agents, who share the same payoff function. This paper applies the agent QRE.

[5] As surplus $c$ and the degree of rationality $\lambda$ are interchangeable in the logit response functions $p_R(s)$ and $p_P(s)$, the size of surplus affects the estimated degree of rationality. All reported estimates for $\lambda$ are based on $c =$ Zim$ 50.

### 5.1 Model fit

Figure 1 shows the observed and predicted play in resettled and traditional villages, overall and for each sample area. All curves of the predicted behavior (solid lines) show that the model resembles the observed high frequency (dashed lines) of mid-range offers along with higher rejection rates of low offers for the resettled villagers and universal decline in rejection rates for offers smaller than half. Higher degrees of rationality are reflected by a smaller spread of the offer distribution. Pronounced interest in fairness causes an incline in the forecast rejection rate for offers smaller or larger than half, but offers larger than 60 percent are not observed. Table 2a presents the distribution of observed and predicted offers by area and resettlement status. Corresponding table 2b summarizes the actual and forecast rejection rates. The estimated model correctly predicts the unique mode of equal division in the UG in all areas but Mupfurudzi and substantial low offer rejection. For all data, the forecast and actual proposer behavior result in weighted correlation coefficients of 0.73 (resettled) and 0.78 (traditional); the forecast and actual responder behavior result in correlation coefficients of 0.91 (resettled) and 0.64 (traditional).

Comparing the decisions of proposers and responders in Mupfurudzi, Mutanda and Sengezi with predicted behavior generally also indicates a good fit of the model estimated by area. The forecast and actual responder behavior result in significant correlation coefficients of 0.65 to 1 in all areas but Sengezi. For traditional Sengezi responders the model over-predicts the low offer rejection probability of the two rejected lowest offers and fails to capture its peak of 33 percent rejections at offers of 40 percent, leading to a insignificant negative correlation of -0.24 between observation and prediction.[6] A common model is reported for all villagers in the Mupfurudzi area and will later not be rejected by the data.

### 5.2 Parameter estimates

In the quantal response equilibrium of the sequential UG, the model is fitted to the data assuming the villagers' choices were mutual best responses, given the own and anticipating the other's preferences and degree of rationality. The estimated degree of fairness measures the extent to which observed offers and rejections are explained by fairness felt toward others taking into account the occurrence of decision error and rejection of low offers. Based on having assumed an appropriate model structure, the estimated model parameters therefore reflect the extent to which rejections were made because of a violation of an intrinsic fairness norm or because of decision errors. The estimated decision error is part of the model and does not reflect the model fit of the data.

Table 3 summarizes the parameter estimates of the model by resettlement status. The full sample consists of 117 pairs of observations. The estimation results are first presented for the full sample (rows A and B) and then by area (rows C and D). The table also reports the es-

[6] A single rejection of the two lowest offers instead of certain acceptance in the traditional Sengezi communities would result in a significant positive correlation between actual and forecast behavior. If the negative correlation was true, it could point to a failure in the model's structure. For instance, the model that imposes one and the same preferences on proposers and responders may not represent the decision-making of responders in Sengezi. Due to the few available observations this assumption is not tested, but I argue for its plausibility because villagers were assigned to a role in the UG randomly. If the UG itself does not affect the inert preferences, then there is no reason to expect systematic differences between proposers and responders. As the model fits the other data well, imposing the same preference structure for proposers and responders in Sengezi can be a safeguard against data mining in the small samples.

timation results for the unrestricted model $b, \lambda|r, t$, in which fairness $b$ and rationality $\lambda$ may vary across resettlement status; the restricted model $\lambda|r, t$, in which solely rationality may vary across resettlement status; the restricted model $b|r, t$, in which solely fairness may vary across resettlement status. A restricted model (not reported), in which rationality may vary across resettlement status, whereas pure self-interest is assumed, is universally rejected in favor of a reported model by likelihood-ratio tests. Standard errors are bootstrapped with 1000 repetitions. The corresponding p-values (not reported) indicate that the estimates of each model, but two traditional Sengezi specifications, are significant at the 1 percent level, confirming the presumption that decision errors and fairness are both necessary to explain the variation in play well. No interest in fairness for traditional Sengezi villagers can be rejected at the 15 and 20 percent significance level, respectively (panels D1 and D3).

Panel A1 shows that, overall, positive degrees of fairness and rationality are estimated. Splitting the sample according to resettlement status (panel B1), I find a significantly higher degree of fairness in resettled than in traditional villages (13.97 vs. 4.39). At the same time the degree of rationality is of similar magnitude (6.83 vs. 5.74) without significant difference such that, overall, a model of different fairness (14.04 vs. 3.80), but similar rationality (6.55) is accepted by the data (panel A3). Table 4 reports the corresponding likelihood ratio tests that reject the equality of both coefficients between resettled and traditional villagers, jointly and individually (tests 1-3, $p \leq 0.04$), but not an equal degree of rationality after different degrees of fairness were estimated (test 5, $p = 0.30$). In contrast, an equal degree of fairness is rejected after different degrees of rationality were estimated (test 4, $p = 0.01$).

Repeating this assessment for each of the three sampled resettlement schemes of Mupfurudzi, Mutanda and Sengezi, I do not detect statistical evidence for different fairness or rationality between resettled and traditional Mupfurudzi villagers (tests 6-10, $p \geq 0.80$). Equality of both coefficients between resettled and traditional villagers, jointly and individually, is rejected in the Mutanda and Sengezi areas (tests 11-13 and 15-18, $p \leq 0.02$).[7] For the Sengezi area, further likelihood ratio tests reject that variation in a single parameter is sufficient to explain the observed differences (tests 19-20, $p \leq 0.04$). For the Mutanda area, I reject only various degrees of fairness (test 15, $p = 0.02$). I also tentatively reject only differences in the villagers' degree of rationality with an 11 percent probability of error (test 14, $p = 0.11$). As the Mutanda area is the smallest subsample in the analyses with only 19 pairs of observations, the applied likelihood ratio test could lack power to depict the relatively large difference in estimated fairness (25.09 vs. 6.39) as significant.[8]

In the Mutanda and Sengezi resettlement schemes, the higher degree of fairness occurs jointly with a higher degree of rationality. This finding supports the idea that resettled villagers not only had a raised need of cooperativeness after their recommencement but also gained experience in cooperating in the past, which in turn is facilitated by their fairness preferences. When the model is estimated with all data, the data of villagers from three different resettlement schemes are pooled. The resulting estimates indicate a higher degree of fairness

[7]Detecting different preferences in Mutanda, for which descriptive statistics did not indicate behavioral differences, provides a salient example of the different level of analysis that is imposed by the structural equilibrium model as compared to non-equilibrium analyses of the UG data.

[8]The nine pairs of resettled Mutanda villagers' play resulted in only two outcomes involving seven equal partitions and two 40 percent offers, all of which were accepted. The low little degree of bounded rationality needed to explain these deviations causes their degree of rationality to take the highest values in the sample. For the restricted model of unique fairness, the rationality estimate $\lambda$ equals its upper bound 100.

for resettled villagers, but a similar degree of rationality for all villagers. That is consistent with the intuition that heterogeneity between individuals, which is not covered by the preference parameter $b$, converges in a larger sample, whereas the increased need for cooperation in recommencement remains an experience shared only by resettled villagers.

### 5.3 Limitations

The discussed findings are subject to limitations. Preferences were not estimated on the individual, but on the area and resettlement status level. Decision error is the way the model accounts for heterogeneity between individuals. The assumed structural form of the model was only tested against one alternative, an asymmetric specification of inequality aversion by (Kohler 2008). The model remains motivated by its success to predict this and other behavioral data. The analyses is based on a small data sample from an UG experiment in the field with 117 pairs of observations and little variation in the observed behavior. 65 percent of the proposing players offer half, 92 percent of the responding players accept. These limiting factors are exacerbated within the three regional subgroup analyses of the impact of resettlement on the preferences. In spite of these limitations, a coherent picture emerged: Average fairness is estimated higher for resettled than for traditional villages in each area. The difference is significant in Sengezi and arguably Mutanda, but insignificant in the Mupfurudzi area. Significantly higher fairness estimates are accompanied by significantly lower decision errors, potentially reflecting more experience amongst the resettled villagers with cooperation. Comparing resettled and traditional villagers across all three study areas, fairness remains the sole significant difference in the model estimates, which is consistent with the intuition that variations in the observed ultimatum game play, but not the history dependent attitudes toward fairness converge in the larger sample with data from all areas.

## 6 Conclusion

I reexamined preexisting experimental data from ultimatum games conducted in the aftermath of the Zimbabwean 1980s *willing-buyer and willing-seller* land reform. A structural model attributed observed ultimatum game behavior to its potential origins. Based on the experimental behavior of 234 resettled and traditional villagers, I estimated social preferences on the community level that incorporate a utility loss when bargaining villagers obtain other than a fair division of the money at stake in the game. The strength of the utility loss in comparison to self-interest was interpreted as concern for fairness, the assumed proxy for social cohesion. The quantal response equilibrium model used to estimate villagers' average concern for fairness introduced a notion of bounded rationality that assumes players make similar decision errors, which are negatively related to the payoff from that decision. Decision error could be interpreted as an estimate of heterogeneity in fairness between individuals. In the equilibrium, the players were assumed to maximize utility and correctly anticipate subsequent behavior. The estimates of fairness and decision error were obtained by maximizing the likelihood of observing the experimental behavior.

Significantly positive degrees of fairness and bounded rationality forecast bargaining behavior accurately for most participants of the experiments in resettled and traditional villages of the Mupfurudzi, Mutanda and Sengezi areas with correlations of 0.45 to 1 between all observed and predicted behavior. The homogeneity of resettled and traditional villagers is rejected in favor of a model that assumes higher average degrees of fairness and rationality in the resettled communities of Mutanda and Sengezi. Higher fairness and rationality are also estimated for resettled villagers in the Mupfurudzi area, but the differences in the estimates of resettled and traditional villagers are insignificant. The fewer decision errors made by resettled villagers may reflect an increased experience in cooperating with a randomly matched co-villager acquired in the past, which in turn is promoted by the more pronounced fairness preferences. In a supraregional estimation of the model, the aggregate data do not reject the hypothesis that the observed differences in bargaining behavior are explained alone by a higher degree of fairness in resettled communities.

The equal or higher degrees of fairness estimated from ultimatum game behavior for resettled villagers represent a stronger interdependence of their well-being and, thus, indicate that social cohesion amongst randomly teamed villagers might be present in the new communities to a comparable or higher degree than in traditional communities. A higher degree of interest in equal performance is less likely to be overruled by self-interest. Hence, it gives cause for more stable cooperation, for instance, in public goods provision arguably much needed to successfully manage a new start. As the land reform scheme, by which the resettled villages were created, brought together people displaced by the fighting after the end of the war of independence, who were unrelated individuals sometimes not sharing a common ethnicity and language, but faced a comparable livelihood to the traditional villagers until resettlement, the depicted differences in villagers preferences along the dimension of the land reform not only surprise, but might, to some extend, result from the need to cooperate with unfamiliar people after the resettlement process. This positive view on social development after resettlement is against the backdrop that, according to Kinsey (2004), the early years were a Golden Age for the Zimbabwean land reform program, in which beneficiaries received exceptional levels of supporting services.

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**Table 1:** Summary of ultimatum game bargaining experiment

| Area | Action | All | | | Sengezi | | | Mutanda | | | Mupfurudzi | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | MN | SD | N | MN | SD | N | MN | SD | N | MN | SD |
| All | Offer | 117 | 0,44 | 0,11 [a] | 64 | 0,44 | 0,12 | 19 | 0,45 | 0,10 | 34 | 0,44 | 0,11 [b] |
| | Rejection | 117 | 0,08 | 0,27 | 64 | 0,09 | 0,29 | 19 | 0,05 | 0,23 | 34 | 0,06 | 0,24 |
| | … if offer < 0.5 | 38 | 0,24 | 0,43 [c] | 21 | 0,29 | 0,46 | 5 | 0,20 | 0,45 | 12 | 0,17 | 0,39 |
| | … if offer < 0.3 | 13 | 0,46 | 0,52 [d] | 8 | 0,50 | 0,54 | 2 | 0,50 | 0,71 | 3 | 0,33 | 0,58 [e] |
| Resettled | Offer | 86 | 0,45 | 0,10 | 52 | 0,45 | 0,12 | 9 | 0,48 | 0,04 | 25 | 0,46 | 0,08 |
| | Rejection | 86 | 0,07 | 0,26 | 52 | 0,10 | 0,30 | 9 | 0,00 | 0,00 | 25 | 0,04 | 0,20 |
| | … if offer < 0.5 | 24 | 0,25 | 0,44 | 15 | 0,33 | 0,49 | 2 | 0,00 | 0,00 | 7 | 0,14 | 0,38 |
| | … if offer < 0.3 | 7 | 0,57 | 0,54 | 6 | 0,50 | 0,55 | 0 | | | 1 | 1,00 | |
| Traditional | Offer | 31 | 0,41 | 0,14 | 12 | 0,41 | 0,13 | 10 | 0,43 | 0,13 | 9 | 0,38 | 0,17 |
| | Rejection | 31 | 0,10 | 0,30 | 12 | 0,08 | 0,29 | 10 | 0,10 | 0,32 | 9 | 0,11 | 0,33 |
| | … if offer < 0.5 | 14 | 0,21 | 0,43 | 6 | 0,17 | 0,41 | 3 | 0,33 | 0,58 | 5 | 0,20 | 0,45 |
| | … if offer < 0.3 | 6 | 0,33 | 0,52 | 2 | 0,50 | 0,71 | 2 | 0,50 | 0,71 | 2 | 0,00 | 0,00 |

Notes: Tests refer to differences by resettlement status: [a] *t*-test and Mann-Whitney Wilcoxon test for equality of means, 5 percent. [b] *t*-test for equality of means, 10 percent. [c] Chi-square test for equality of rejected proportions, 10 percent. [d] Fisher's exact test for equality of rejected proportions, 10 percent. [e] Fisher's exact test for equality of rejected proportions, 16 percent. Data source: Barr (2004b).

**Table 2a:** Observed and predicted offer distribution

| Offer | All b,λ \| r,t | | | | | | Mupfurudzi b,λ | | | Mutanda b,λ \| r,t | | | | | | Sengezi b,λ \| r,t | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Resettled | | | Traditional | | | All | | | Resettled | | | Traditional | | | Resettled | | | Traditional | | |
| | N | Actual | Model | N | Actual | Model | N | Actual | Model | N | Actual | Model | N | Actual | Model | N | Actual | Model | N | Actual | Model |
| 0 | 0 | 0,00 | 0,01 | 1 | 0,03 | 0,01 | 0 | 0,00 | 0,02 | 0 | 0,00 | 0,00 | 0 | 0,00 | 0,00 | 0 | 0,00 | 0,01 | 1 | 0,11 | 0,01 |
| 0,1 | 2 | 0,02 | 0,01 | 1 | 0,03 | 0,01 | 3 | 0,05 | 0,02 | 0 | 0,00 | 0,00 | 0 | 0,00 | 0,00 | 0 | 0,00 | 0,01 | 0 | 0,00 | 0,01 |
| 0,2 | 5 | 0,06 | 0,01 | 4 | 0,13 | 0,01 | 5 | 0,08 | 0,03 | 0 | 0,00 | 0,00 | 2 | 0,20 | 0,00 | 1 | 0,04 | 0,01 | 1 | 0,11 | 0,01 |
| 0,3 | 3 | 0,03 | 0,06 | 0 | 0,00 | 0,06 | 2 | 0,03 | 0,12 | 0 | 0,00 | 0,00 | 0 | 0,00 | 0,00 | 1 | 0,04 | 0,01 | 0 | 0,00 | 0,01 |
| 0,4 | 14 | 0,16 | 0,36 | 8 | 0,26 | 0,36 | 11 | 0,17 | 0,33 | 2 | 0,22 | 0,22 | 1 | 0,10 | 0,22 | 5 | 0,20 | 0,30 | 3 | 0,33 | 0,30 |
| 0,5 | 59 | 0,69 | 0,37 | 17 | 0,55 | 0,37 | 40 | 0,63 | 0,31 | 7 | 0,78 | 0,78 | 7 | 0,70 | 0,78 | 18 | 0,72 | 0,58 | 4 | 0,44 | 0,58 |
| 0,6 | 3 | 0,03 | 0,12 | 0 | 0,00 | 0,12 | 3 | 0,05 | 0,13 | 0 | 0,00 | 0,00 | 0 | 0,00 | 0,00 | 0 | 0,00 | 0,07 | 0 | 0,00 | 0,07 |
| 0,7 | 0 | 0,00 | 0,02 | 0 | 0,00 | 0,02 | 0 | 0,00 | 0,03 | 0 | 0,00 | 0,00 | 0 | 0,00 | 0,00 | 0 | 0,00 | 0,00 | 0 | 0,00 | 0,00 |
| 0,8 | 0 | 0,00 | 0,00 | 0 | 0,00 | 0,00 | 0 | 0,00 | 0,00 | 0 | 0,00 | 0,00 | 0 | 0,00 | 0,00 | 0 | 0,00 | 0,01 | 0 | 0,00 | 0,01 |
| 0,9 | 0 | 0,00 | 0,00 | 0 | 0,00 | 0,00 | 0 | 0,00 | 0,00 | 0 | 0,00 | 0,00 | 0 | 0,00 | 0,00 | 0 | 0,00 | 0,01 | 0 | 0,00 | 0,01 |
| 1 | 0 | 0,00 | 0,01 | 0 | 0,00 | 0,01 | 0 | 0,00 | 0,00 | 0 | 0,00 | 0,00 | 0 | 0,00 | 0,00 | 0 | 0,00 | 0,01 | 0 | 0,00 | 0,01 |
| Correlation$^{P}$ | | 0,73 | *** | | 0,78 | *** | | 0,68 | *** | | 1,00 | *** | | 0,96 | *** | | 0,97 | *** | | 0,98 | *** |
| Correlation$^{PR}$ | | 0,73 | *** | | 0,69 | *** | | 0,65 | *** | | 1,00 | *** | | 0,97 | *** | | 0,89 | *** | | 0,45 | * |

Notes: $|r, t$ denotes estimates that depend on resettlement status. $^{R,PR}$Correlation between observed and predicted rejections or offers plus rejections, respectively. Stars denote significance at the 10 and 1 percent level. Data source: Barr (2004b).

**Table 2b:** Observed and predicted rejection rates

| Rejection of offer | All b,λ \| r,t | | | | | | Mupfurudzi b,λ | | | Mutanda b,λ \| r,t | | | | | | Sengezi b,λ \| r,t | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Resettled | | | Traditional | | | All | | | Resettled | | | Traditional | | | Resettled | | | Traditional | | |
| | N | Actual | Model | N | Actual | Model | N | Actual | Model | N | Actual | Model | N | Actual | Model | N | Actual | Model | N | Actual | Model |
| 0 | 0 | | 1,00 | 1 | 0,00 | 0,96 | 0 | | 1,00 | 0 | | 1,00 | 0 | | 0,99 | 0 | | 1,00 | 1 | 0,00 | 0,74 |
| 0,1 | 2 | 0,50 | 1,00 | 1 | 1,00 | 0,81 | 3 | 0,67 | 0,99 | 0 | | 1,00 | 0 | | 0,92 | 0 | | 1,00 | 0 | | 0,55 |
| 0,2 | 5 | 0,60 | 0,95 | 4 | 0,25 | 0,50 | 5 | 0,40 | 0,82 | 0 | | 1,00 | 2 | 0,50 | 0,63 | 1 | 1,00 | 1,00 | 1 | 0,00 | 0,36 |
| 0,3 | 3 | 0,00 | 0,47 | 0 | | 0,23 | 2 | 0,00 | 0,36 | 0 | | 1,00 | 0 | | 0,26 | 1 | 0,00 | 0,91 | 0 | | 0,21 |
| 0,4 | 14 | 0,14 | 0,09 | 8 | 0,13 | 0,10 | 11 | 0,18 | 0,11 | 2 | 0,00 | 0,00 | 1 | 0,00 | 0,10 | 5 | 0,00 | 0,09 | 3 | 0,33 | 0,13 |
| 0,5 | 59 | 0,00 | 0,03 | 17 | 0,00 | 0,05 | 40 | 0,00 | 0,05 | 7 | 0,00 | 0,00 | 7 | 0,00 | 0,05 | 18 | 0,00 | 0,01 | 4 | 0,00 | 0,08 |
| 0,6 | 3 | 0,00 | 0,03 | 0 | | 0,03 | 3 | 0,00 | 0,04 | 0 | | 0,00 | 0 | | 0,03 | 0 | | 0,02 | 0 | | 0,05 |
| 0,7 | 0 | | 0,05 | 0 | | 0,03 | 0 | | 0,05 | 0 | | 0,00 | 0 | | 0,03 | 0 | | 0,22 | 0 | | 0,04 |
| 0,8 | 0 | | 0,24 | 0 | | 0,03 | 0 | | 0,11 | 0 | | 1,00 | 0 | | 0,05 | 0 | | 0,98 | 0 | | 0,03 |
| 0,9 | 0 | | 0,82 | 0 | | 0,04 | 0 | | 0,36 | 0 | | 1,00 | 0 | | 0,09 | 0 | | 1,00 | 0 | | 0,02 |
| 1 | 0 | | 0,99 | 0 | | 0,07 | 0 | | 0,82 | 0 | | 1,00 | 0 | | 0,23 | 0 | | 1,00 | 0 | | 0,02 |
| Correlation$^{R}$ | | 0,91 *** | | | 0,64 *** | | | 0,91 *** | | | - | | | 1,00 *** | | | 0,72 *** | | | -0,24 | |
| Correlation$^{PR}$ | | 0,73 *** | | | 0,69 *** | | | 0,65 *** | | | 1,00 *** | | | 0,97 *** | | | 0,89 *** | | | 0,45 * | |

Notes: $|r, t$ denotes estimates that depend on resettlement status. $^{R,PR}$Correlation between observed and predicted rejections or offers plus rejections, respectively. Stars denote significance at the 10 and 1 percent level. Data source: Barr (2004b).

**Table 3:** Estimation results of logit equilibrium models

| | Area | Res | N | 1 b,λ \| r,t | | | | | 2 λ \| r,t | | | | | 3 b \| r,t | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | b | | λ | | –ln L | b | | λ | | –ln L | b | | λ | | –ln L |
| | | | | Coef | SE | Coef | SE | | Coef | SE | Coef | SE | | Coef | SE | Coef | SE | |
| A | All | All | 117 | 9,80 | 3,76 | 6,19 | 0,55 | 210,07 | | | | | | | | | | |
| B | All | Yes | 86 | 13,97 | 6,12 | 6,83 | 0,74 | 139,30 | 10,38 | 4,17 | 6,81 | 0,71 | 140,52 | 14,04 | 6,15 | 6,55 | 0,56 | 139,44 |
| | | No | 31 | 4,39 | 6,03 | 5,74 | 2,62 | 64,68 | | | 4,86 | 3,31 | 67,34 | 3,80 | 6,39 | | | 65,09 |
| C | Mup | All | 64 | 10,04 | 5,39 | 5,96 | 0,64 | 118,00 | | | | | | | | | | |
| | Mut | All | 19 | 17,82 | 16,19 | 7,15 | 13,23 | 28,84 | | | | | | | | | | |
| | Sen | All | 34 | 8,18 | 8,62 | 6,35 | 4,84 | 61,79 | | | | | | | | | | |
| D | Mup | Yes | 52 | 10,21 | 6,91 | 5,89 | 0,71 | 96,37 | 10,05 | 5,61 | 5,90 | 0,73 | 96,37 | 10,19 | 7,02 | 5,96 | 0,66 | 96,37 |
| | | No | 12 | 9,30 | 13,43 | 6,28 | 17,91 | 21,59 | | | 6,26 | 10,81 | 21,60 | 9,41 | 14,67 | | | 21,62 |
| | Mut | Yes | 9 | 25,09 | 16,73 | 49,03 | 15,08 | 4,77 | 22,19 | 12,44 | 100,00 | 40,36 | 4,79 | 37,58 | 22,97 | 8,45 | 15,20 | 6,47 |
| | | No | 10 | 6,39 | 29,71 | 5,93 | 16,30 | 18,86 | | | 5,37 | 24,40 | 20,10 | 3,87 | 29,69 | | | 19,69 |
| | Sen | Yes | 25 | 27,86 | 11,09 | 9,02 | 17,89 | 28,66 | 14,58 | 11,33 | 9,07 | 27,74 | 29,89 | 26,77 | 12,48 | 7,40 | 4,22 | 29,44 |
| | | No | 9 | 1,74 | 11,03 [a] | 4,90 | 12,10 | 22,23 | | | 1,85 | 10,33 | 25,99 | 1,09 | 11,92 [b] | | | 23,62 |

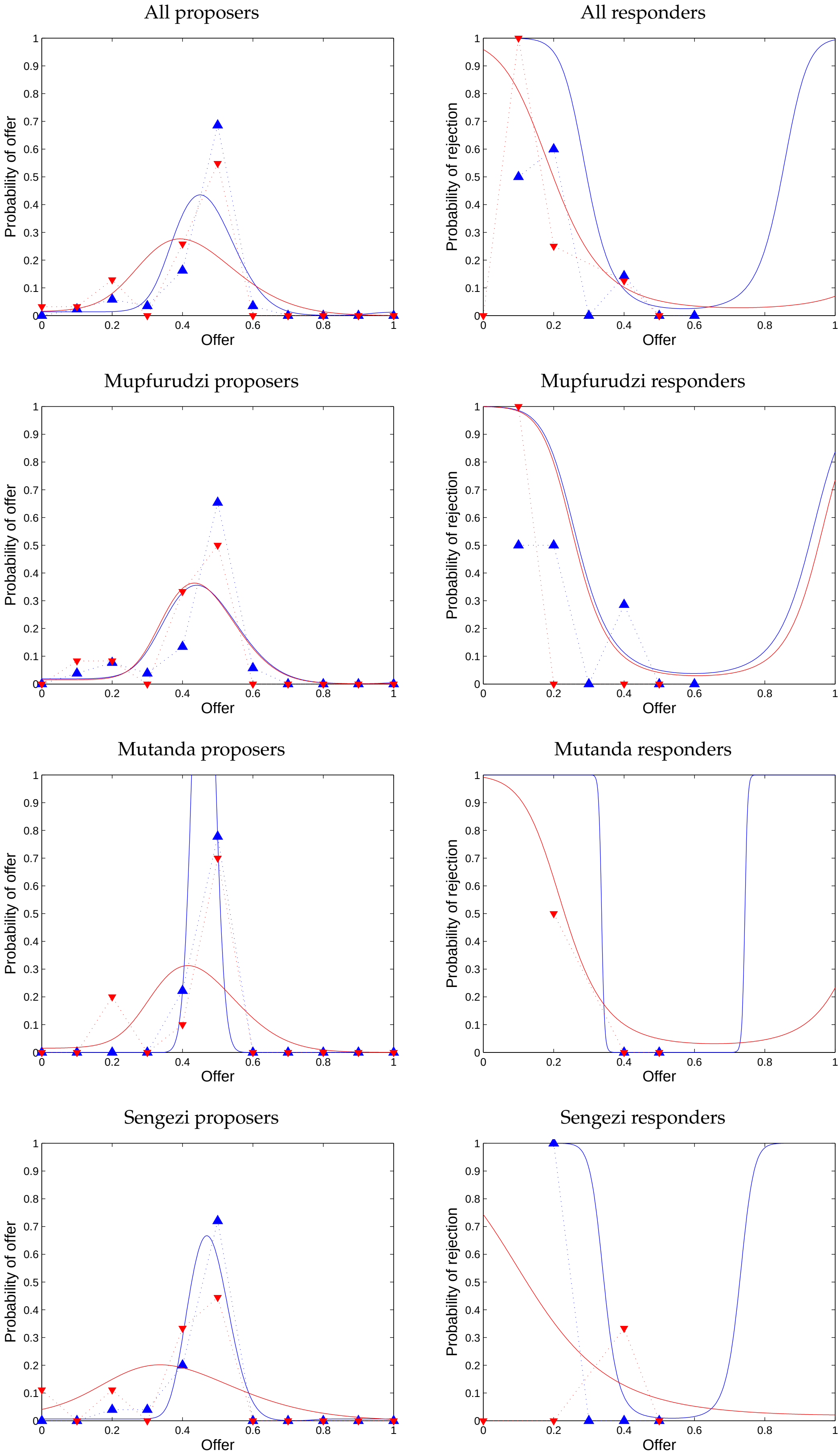
Notes: $N$ denotes the number of proposer and responder pairs. $|r, t$ denotes estimates that depend on resettlement status. $\ln L$ denotes the log-likelihood of the fitted model. Standard errors are bootstrapped with 1000 repetitions. Coefficients are significant at the 1 percent level unless marked otherwise. [a,b] Bootstrapped p-value are 0.15 and 0.20, respectively. Data source: Barr (2004b).

**Table 4:** Summary of hypotheses and tests

| Area | Hypothesis $H_0$ | Hypothesis $H_1$ | No. parameters $H_0$ | No. parameters $H_1$ | d f. | –ln L $H_0$ | –ln L $H_1$ | LR | p-Value | | Test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| All | b,λ | b,λ \| r,t | 2 | 4 | 2 | 210,07 | 203,99 | 12,16 | 0,00 | *** | 1 |
| | b,λ | λ \| r,t | 2 | 3 | 1 | 210,07 | 207,87 | 4,40 | 0,04 | ** | 2 |
| | b,λ | b \| r,t | 2 | 3 | 1 | 210,07 | 204,53 | 11,07 | 0,00 | *** | 3 |
| | λ \| r,t | b,λ \| r,t | 3 | 4 | 1 | 207,87 | 203,99 | 7,76 | 0,01 | *** | 4 |
| | b \| r,t | b,λ \| r,t | 3 | 4 | 1 | 204,53 | 203,99 | 1,09 | 0,30 | | 5 |
| Mupfurudzi | b,λ | b,λ \| r,t | 2 | 4 | 2 | 118,00 | 117,96 | 0,09 | 0,96 | | 6 |
| | b,λ | λ \| r,t | 2 | 3 | 1 | 118,00 | 117,98 | 0,06 | 0,81 | | 7 |
| | b,λ | b \| r,t | 2 | 3 | 1 | 118,00 | 117,99 | 0,02 | 0,88 | | 8 |
| | λ \| r,t | b,λ \| r,t | 3 | 4 | 1 | 117,98 | 117,96 | 0,03 | 0,86 | | 9 |
| | b \| r,t | b,λ \| r,t | 3 | 4 | 1 | 117,99 | 117,96 | 0,07 | 0,80 | | 10 |
| Mutanda | b,λ | b,λ \| r,t | 2 | 4 | 2 | 28,84 | 23,62 | 10,43 | 0,01 | *** | 11 |
| | b,λ | λ \| r,t | 2 | 3 | 1 | 28,84 | 24,88 | 7,90 | 0,00 | *** | 12 |
| | b,λ | b \| r,t | 2 | 3 | 1 | 28,84 | 26,16 | 5,36 | 0,02 | ** | 13 |
| | λ \| r,t | b,λ \| r,t | 3 | 4 | 1 | 24,88 | 23,62 | 2,52 | 0,11 | + | 14 |
| | b \| r,t | b,λ \| r,t | 3 | 4 | 1 | 26,16 | 23,62 | 5,07 | 0,02 | ** | 15 |
| Sengezi | b,λ | b,λ \| r,t | 2 | 4 | 2 | 61,79 | 50,89 | 21,79 | 0,00 | *** | 16 |
| | b,λ | λ \| r,t | 2 | 3 | 1 | 61,79 | 55,87 | 11,83 | 0,00 | *** | 17 |
| | b,λ | b \| r,t | 2 | 3 | 1 | 61,79 | 53,06 | 17,46 | 0,00 | *** | 18 |
| | λ \| r,t | b,λ \| r,t | 3 | 4 | 1 | 55,87 | 50,89 | 9,97 | 0,00 | *** | 19 |
| | b \| r,t | b,λ \| r,t | 3 | 4 | 1 | 53,06 | 50,89 | 4,34 | 0,04 | ** | 20 |

Notes: d.f. denotes degrees of freedom. $\ln L$ denotes the log-likelihood of the fitted model. $LR$ denotes the likelihood-ratio test statistic. $P$-values stem from a Chi-squared distribution. $|r, t$ denotes estimates that depend on resettlement status. Stars denote significance at the 10, 5 and 1 percent level. $+$ denotes significance at the 11 percent level. Data source: Barr (2004b).

**Figure 1:** Observed and predicted offer distribution and rejection rates




Notes: Dashed lines indicate actual play. Solid lines indicate model prediction. Blue lines and upward-pointing triangle indicate resettled villages. Red lines and downward-pointing triangle indicate traditional villages. Data source: Barr (2004b).