Theft, Gift-Giving, and Trustworthiness: Honesty is Its Own Reward in Rural Paraguay*

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Abstract

Rural areas of developing countries often lack effective legal enforcement. However, villagers who know each other well and interact repeatedly may use implicit contracts to minimize crime. I construct a dynamic limited-commitment model, in which a thief cannot credibly commit to forego stealing from his fellow villagers, but may be induced to limit his stealing by the promise of future gifts from his potential victim. Using a unique survey from rural Paraguay which combines traditional data on production with information on theft, gifts, and trust, as well as with experiments measuring risk aversion and trustworthiness, I test whether the data is consistent with predictions from the dynamic model. The results provide evidence that farmers do implicitly contract

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with one another to limit theft. Farmers who have more close family members in their village give fewer gifts, and farmers with plots which are more difficult to steal from give fewer gifts and experience less theft. Both of these categories of farmer also trust more, relative to other farmers within their village. Giving increases when trust is lower and the threat of theft is greater.

1 Introduction

Due to a lack of legal enforcement in rural areas around the world, theft between farmers is a common occurrence.[1] Fifty percent of survey respondents in rural Paraguay[2] reported that some item was stolen from them in the past year. Among those from whom something was stolen, median theft accounted for a loss of two percent of annual income. Not only is theft large, it also affects investment decisions, as forty-two percent of respondents said there was at least one crop they didn't plant because of fear of theft. More unusually, forty-two percent of households admit to giving gifts to a person who they believe to be a thief in the hopes that this untrustworthy person will limit the amount he steals from them. Thus, honest people may receive few gifts, while untrustworthy people benefit.

Becker (1968) models a rational anonymous thief who weighs the benefits of stealing against the costs of possible punishment. This one-period model predicts there will be more theft when the potential gains are greater and the probability of punishment is smaller. A large literature on anonymous property crime (Levitt 2004, Gould et al. 2002) has grown from this seminal research. Becker's model can explain why some crops are more vulnerable to theft. But, only in a multiperiod model in which non-anonymous individuals interact repeatedly, can gift-giving play a role in theft prevention.

Farmers in rural areas have extensive knowledge of each other's actions, interact with

[1] Anthropologists have discussed theft between fellow villagers in the context of Mexico (Foster 1965), Vietnam (Paige 1975), Italy (Banfield 1958), and Malaysia (Scott 1985).

[2] The survey covered 223 households in rural Paraguay in 2002.

each other on a daily basis, and contract over many aspects of their lives (Platteau & Nugent 1992, Udry 1994). Given the lack of anonymity and the long-term nature of relationships that characterize life in rural Paraguay, villagers should be able to use informal contracts[3] with one another to prevent excessive theft as well. I construct a dynamic limited-commitment model in which the formal judicial system is ineffective. An agent cannot credibly commit to refrain from stealing from another agent, and so must be induced to limit his theft by the promise of future gifts. The model presented here is novel in the economic literature on crime, as most other papers do not consider interactions between thieves and their victims.[4]

Economists often think of gift giving as something one does on the holidays, a symbolic gesture, a form of charity, a means of trade, or a means of reciprocal exchange. The dynamic limited-commitment model shows gifts can also be given to potential thieves to deter theft. This model yields predictions contrary to those from fairness models in which agents reward actors with good intentions (Rabin 1993) or give gifts to reduce inequality (Fehr & Schmidt 1999), as well as mutual insurance models in which households give gifts to those households with whom they have fewer enforcement problems (Coate & Ravallion 1993). Of course, households give gifts for a myriad of reasons: a preference for fairness, a form of mutual insurance, and a desire to appease potential thieves. This last reason for gift-giving, while not the only reason, has been generally ignored in the economic literature.

Camerer (1988) and Carmichael & MacLeod (1997) explain the use of gifts (and particularly impractical gifts) in modern society as signals representing willingness to enter into a relationship. This is different from the transfers described in this paper, which are

[3]Informal contracts refer to the unwritten system of sanctions and rewards.

[4]Economists have modeled thieves interacting with other thieves, teaching each other methods or exerting peer pressure (Glaeser et al. 1996), or victims interacting in neighborhood watch programs (Huck & Kosfeld 2004). However, there are few models in which victims interact with thieves, and there are no empirical papers that I know of on the topic. In the theoretical paper by Mui (1995), one farmer sabotages a second farmer out of envy, and the second farmer can limit this sabotage by giving gifts. The act of sabotage gives no monetary benefits, only serving to reduce the saboteur's envy. In the envy model thieves must be poorer than their victims, and gift-giving will occur even in a one-shot game.

between villagers who are forced into relationships with one another due to geographic proximity. Mauss (1967) and Posner (1981) emphasize the exchange nature of gifts in 'primitive societies,' "which are in theory voluntary, disinterested and spontaneous, but are in fact obligatory and interested" (Mauss 1967, 1). In that case, gifts are more similar to loans which must be repaid in the future.

Using data from rural Paraguay, I test for evidence of contracting between thieves and their victims. Researchers in Paraguay and at the University of Wisconsin collected panel data from over 200 households in sixteen randomly selected villages of rural Paraguay at three points in time throughout the 1990's (Carter & Olinto 2003). I conducted a fourth round of data collection in 2002, adding detailed questions on theft experienced by a household, gifts they gave, and survey data on their level of trust to the original, more standard, questions on production. I also ran a series of economic experiments measuring trust, trustworthiness, and risk aversion with the same households which responded to the survey. While the main limitation of the dataset is the relatively small sample size, the advantage is that it combines real-world decisions made by the household, survey measures of trust, and experimental data on risk aversion and trustworthiness.

To empirically test the predictions of the model, I estimate a system of three equations with theft experienced, gifts given, and trust as the left hand side variables. Evidence is provided that farmers do contract with each other to limit theft. Households whose fields are less vulnerable to theft experience less theft, give fewer gifts, and have a greater level of trust (relative to other farmers within their village) in their fellow villagers. Households which live in the same village with more of their close family members give fewer gifts. At first this result seems surprising, given findings that relatives in rural areas of developing countries transfer more to each other than other households (Ben-Porath 1980, Posner 1981, Foster & Rosenzweig 2001). However, these results are in accord with the predictions of the limited-commitment model if family members are either more trustworthy when acting with one another or if they monitor each other's fields more. This shows the importance of gift-giving to limit theft.

Although gift-giving may be a form of charity or of progressive taxation, the results suggest this is not the main underlying cause. A social planner would prefer that the richest people redistributed wealth to the poorest, while a model of charitable giving would suggest that altruistic farmers give more. Instead, I find that farmers who live in the same village with more close family members give fewer gifts, and that farmers with fields which no one pases give fewer gifts and experience less theft. This suggests that it is not necessarily the richest nor the most altruistic who are giving, but rather the most vulnerable to theft. In addition, farmers with more trustworthy neighbors plant more stealable crops. This suggests it is not necessarily the poorest who are receiving, but rather the less trustworthy.

The remainder of this paper is organized as follows. Section 2 lists eight stylized facts about theft in rural Paraguay. In Section 3, I lay out the dynamic limited-commitment model and its implications. Section 4 describes the survey data and experiments, while Section 5 uses the data to test the implications of the model. Section 6 concludes.

2 Stylized Facts about Theft

Anthropologists discuss different reasons for sharing, including trade, altruism, reciprocity, and 'tolerated theft'. Tolerated theft occurs when, due to diminishing marginal returns, it does not pay the owner of a stock of food to defend it against a hungry village-mate who will be willing to fight harder for it (Blurton-Jones 1987, Hawkes 1993, Bliege-Bird & Bird 1997). Food taken under the guise of tolerated theft may be taken through force, or it may be passively transferred in an attempt to avoid force. Scott (1985) proposes another view of theft as an "everyday form of peasant resistance." In Malaysia, the victims of theft tended to be the peasants who had mechanized their farms rather than employing poorer peasants to do the same work. The threat of theft was used to ensure a continued stream of work.

Below, I list stylized facts about theft in rural Paraguay and give supporting evidence from the data.

1. *The people who steal 'smaller' items have a different relationship with their victims than do people who steal 'larger' items.* Small items include crops, small animals, and small tools. Large items include large animals and large tools. Of those items for which the thief's identity was known, 70 percent of smaller items were stolen by a neighbor or a relative while only 18 percent of larger items were stolen by a neighbor (and none by relatives). Sixty-six percent of the known thieves of small items were given gifts, lent money, or hired by the victim before the theft while only 36 percent of the known thieves of large items were given these transfers. While only four percent of known thieves of small items were reported to the police, 64 percent of thieves of large items were reported. The word theft in the rest of this paper refers only to the theft of smaller items.

2. *Theft is common and economically important.* Forty-three percent of households had some small item stolen from them in the past year.[5] The median value stolen, conditional on being stolen from, was around $17 which is a one percent loss of median household income.[6]

3. *Victims know who is stealing from them.* Forty-seven percent of those who experienced theft knew or suspected the identity of the thief of at least one of the items stolen from them in the past year.

[5] In the Encuesta Integrada de Hogares carried out by the national statistical bureau of Paraguay (DGEEC), 8.3 percent of rural households claimed to have experienced some theft in 2000. In my sample 50.2 percent of households experienced some theft while only 14.4 percent experienced the theft of a large item. Given that respondents to the national survey may only mention larger items stolen and not petty theft, and that there may be more underreporting in a large national survey, these numbers seem quite comparable.

[6] Theft of large and small items is two percent of median household income.

4. *It is believed that some people receive less psychic disutility from thieving than others.* Seventy percent of the victims who knew or suspected the identity of the thief said the thief committed the crime because of poverty, two percent because of revenge, and four percent because of envy. Twenty-five percent added in their own option of either habit or 'no shame' (*sin vergüenza*). One might think that even more victims would have chosen 'no shame' if it had been an option on the list. In Malaysia, farmers "think they know who is to blame for most thefts. Three names are most frequently mentioned" and those three people are "members of the 'undeserving,' 'disreputable' poor"(Scott 1985, page 270-271). Casual conversation suggests that, in Paraguay as well, each village has only a few thieves.

5. *Victims do not report thieves to the police or punish them physically.* Only 14 percent of households which suspected or knew the identity of the thief yelled at him, 29 percent stopped drinking terere (a tea which is drunk socially in Paraguay) with him, and only four percent reported him to the authorities. Perhaps victims in the survey punish thieves so lightly due to a prohibitive social cost to physically harming a neighbor who has lived nearby for generations.[7]

6. *Some plots of land are more vulnerable to theft than others.* More of a crop is stolen when it is planted on a plot along a footpath. I compare crops (red, white, and fresh corn, yucca, banana, melon, and watermelon) planted on plots which no non-household member and one or more non-household member walks past per week.[8] For each crop, more is stolen from fields which more people walk past. Fifty-six percent of households claimed to avoid planting more desirable crops in plots adjoining popular footpaths,

[7]From anecdotal evidence, even if a farmer catches a thief red-handed he does not physically harm him, although he does reclaim the stolen object.

[8]This question was asked towards the beginning of the survey in the land tenure section, before the questions on theft. People were encouraged to think about whether people walked *past* their field on the way to the bus stop, the school, or their work. They should not be thinking yet about theft and about people who might walk *to* their field for the express purpose of stealing.

although only households which cultivate at least one such plot can use this strategy.

7. *Households give transfers to thieving households to avoid being stolen from.* Households were given a list of actions they might undertake to avoid theft, such as monitoring their fields at night or planting more desirable crops further from footpaths. One option was: "If you know someone is a thief, do you give him gifts to avoid getting stolen from?" Forty-two percent of households answered yes. [9]

   In general, victims are on friendly terms with thieves. Sixty-six percent of the suspected thieves received gifts, work, or loans from their victim before the theft, while 82 percent were from the same village as the victim. In fact, the thieves are often close neighbors (54 percent) or relatives (16 percent) of the victim.

8. *Investment decisions are distorted due to the potential of theft.* The survey asked each household if there was a crop they wanted to plant but didn't because of fear of theft. Forty-two percent of respondents said there was a crop, and eight percent said there was an animal, they were discouraged from planting or raising because of fear of theft.

The giving which this paper focuses on does not include Christmas or birthday presents, only the giving of agricultural products or livestock. Thus this gift, or transfer, refers literally to something that is given, and is not a present as we may think of it. Casual conversation suggests that the three most common ways this giving takes place are a) a household decides to give some of a crop to another household and so sends one of its younger members to bring the gift to the receiving household b) a villager goes to visit another household after work or on the weekend and, although the visitor did not request anything, the household sends him home with a bit of produce and c) a villager goes to visit another household with the express purpose of requesting a bit of some crop output.

[9] There is anecdotal evidence that, if a farmer stops giving transfers to the thief, he may begin stealing larger quantities of 'small items' from the farmer although he will not steal 'large items' such as cows.

3 Dynamic Limited-Commitment Model

The stylized facts above suggest that both gift-giving and theft occur in equilibrium, while current gift-giving and the promise of future gift-giving is used to limit theft. I construct a dynamic model in which potential thieves cannot commit to refrain from stealing but can be convinced not to steal more than some tolerated amount by strategic gift-giving.[10] The model is similar to those designed by Kocherlakota (1996), Kletzer & Wright (2000), and Ligon et al. (2002). The dynamic limited-commitment model is commonly used as a basis for empirical work on informal contracts in developing countries, between villagers who know each other well and interact repeatedly, but do not have access to many formal institutions (Foster & Rosenzweig 2001, Albarran & Attanasio 2003, Dubois et al. 2005).

3.1 Layout of Model

The farmer can give two types of transfers to the thief: gifts and prescribed theft (the level of theft the farmer is willing to put up with). The timing of the model is as follows. 1) The farmer sets the level of prescribed theft and the size of the gift he will give at the end of the period. 2) The thief decides how much to steal (and steals that amount). 3) The farmer observes how much the thief stole and decides whether or not to give him the gift. Backwards induction shows that in the one-shot version of this game the farmer will never give the gift. Knowing this, the thief will steal the amount which maximizes his momentary utility (and is in general greater than the prescribed amount).

In the infinitely repeated game, gift-giving can be used to prevent stealing. In such a game, if theft is costly, while giving is not, then there will not be any theft in equilibrium. The farmer will give a gift just large enough so as to prevent all theft.[11] Thus, in the simple

[10] Udry (1994) finds that the inability to commit is more important than informational constraints in determining contracts in rural Nigeria.

[11] If neither theft nor giving are costly, then there may be both theft and gift-giving in equilibrium. In this case, the size of the two will only be defined up to their sum.

finite horizon game, there will be theft but no gift-giving. On the other hand, in the simple infinite horizon game there will be gift-giving but no theft.

As we have seen in the previous section, both theft and gift-giving persist in equilibrium. This means that there must be something preventing the farmer from fully compensating the thief for refraining from stealing. Agatha Christie claimed criminals must have means, motive, and opportunity. The model sketched thus far is missing that last item.

Opportunity changes in each period, and I incorporate that by stating that the cost of stealing (to the thief) is different in each state of nature. Before each period there is uncertainty as to what that cost will be. For example, a farmer may be home eating a snack or waiting out a rain when a potential thief walks past his field. If that is the case, the thief can more easily pick a few watermelons as he walks by. On the other hand, the farmer may be working in the field when the potential thief walks past, and then it will be quite difficult to steal. When the farmer decides on the size of the gift, he is uncertain as to the state of nature and so he cannot fully compensate the thief. When the state is realized, if it is one in which the cost of stealing is low, then the farmer will expect the thief to steal more than he would have if the cost of stealing were higher.

Putting this sketch of a model into equations, the farmer and thief have sure income y^1 and y^2. If income were risky, theft would serve as insurance, but here I assume no output uncertainty.[12] The farmer transfers a 'gift' of ω to the thief and prescribes a permissible (p) amount of theft (or **r**obbery) r_s^p which may differ depending on how difficult it is to steal in each state (s) of nature. The farmer's momentary utility from consumption is $v(y^1 - \omega - r_s^p)$ and that of the thief is $u(y^2 + \omega + r_s^p)$. The Inada conditions hold, with $\lim_{y \to 0} u'(y) = \infty$, $\lim_{y \to \infty} u'(y) = 0$, $u'(\cdot) \geq 0$, and $u''(\cdot) < 0$ (and likewise for $v(\cdot)$). In addition to consumption utility, the thief also suffers the cost of stealing, $c(s, r_s)$, which is different in each state of

[12]Fafchamps & Minten (2006) show that crop theft does increase with transitory poverty. On the other hand, in results not shown here, I find that households which experienced more illness in the past year experience *more* theft, not less.

nature s. This cost increases in the amount stolen at a non-decreasing rate, i.e. $c'(s, \cdot) > 0$ and $c''(s, \cdot) \geq 0$ for all s.

The thief cannot commit to steal only the prescribed quantity. If he deviates, stealing an amount r_s^d greater than the prescribed amount r_s^p, he experiences psychic trustworthiness disutility akin to his feeling of guilt or pride.[13] This trustworthiness disutility is by no means necessary for the coherence of the model, but it does lead to testable predictions. It is the sense of guilt a person is born with and does not change depending on his experiences. The more disutility an agent gets from stealing, the more 'trustworthy' he is. This disutility from stealing is $t(r_s^d)$ and it increases in the amount stolen at a non-decreasing rate (i.e., $t'(\cdot) > 0$ and $t''(\cdot) \geq 0$). Note that all theft is costly (denoted $c(s, r_s)$), but only theft when deviating yields psychic disutility ($t(r_s^d)$).

The thief prefers his transfer as a gift so as not to incur the costs of theft. The farmer thus also prefers giving the transfer as a gift, because he can transfer less while maintaining the thief's utility level. If the gift were allowed to be state-contingent, and the farmer could give a larger gift when the cost of stealing was lower, theft would be eliminated in equilibrium. Given that we see theft in equilibrium, the assumption that gifts not be state contingent is necessary. One can imagine a similar but more complex model in which gifts can only be given in certain periods (on weekends or after work) while theft can occur at any time. In this case, even if the gift could be state-contingent, a risk averse thief would steal based on the cost of stealing at each moment. The gift given after a series of such moments would not directly depend on the state at any given moment. The model used here, in which theft is state-contingent while the gift is not, is a simplification of the model in which theft can take place at any time while gifts can only be given occasionally.

[13] Andreoni & Miller (2002) and Fehr & Gächter (2000) used experiments to show that individuals have heterogeneous preferences, some being selfish and others altruistic or reciprocating. Posner (1998) uses "moral pride" as an explanation for non-self interested behavior (i.e., some people do not like to think of themselves as thieves).

In this infinitely repeated game, an equilibrium with no stealing above the prescribed amount is enforceable with the threat of punishment. Abreu (1988) proves that all perfect equilibria can be found using the worst perfect equilibria for each player as punishment when that player deviates. If the thief deviates, his punishment is reversion to the Nash equilibrium of the one-shot game with continuation utility D^2. If the farmer deviates, a punishment strategy (with continuation utility D^1) would be for the thief to steal more than he would optimally in the one-shot game for a few periods. After that he steals the amount he would have in the one-shot game in addition to receiving a gift from the farmer. If the farmer doesn't give this gift, he is punished again by the extra-high level of theft. I assume that after deviating the thief receives trustworthiness disutility for whatever he steals.

3.2 Finding the Constrained-Efficient Frontier

The farmer's maximization problem is:

$$V(U) = \max_{\omega, \{U_s, r_s^p\}_s} \sum_s \pi_s [v(y^1 - \omega - r_s^p) + \beta V(U_s)]$$

subject to the following constraints.

$$\sum_s \pi_s [u(y^2 + \omega + r_s^p) - c(s, r_s^p) + \beta U_s] \geq U \tag{1}$$

$$u(y^2 + \omega + r_s^p) - c(s, r_s^p) + \beta U_s \geq u(y^2 + r_s^d) - c(s, r_s^d) - t(r_s^d) + \beta D^2 \quad \forall s, r_s^d \tag{2}$$

$$v(y^1 - \omega - r_s^p) + \beta V(U_s) \geq v(y^1 - r_s^p) + \beta D^1 \quad \forall s \tag{3}$$

$$r_s^p \geq 0 \quad \forall s \tag{4}$$

$$\omega \geq 0 \tag{5}$$

where the value function for the continuation utility of the farmer is $V(\cdot)$, and U represents the thief's continuation utility. The probability of each state of nature is π_s and β is the discount factor. The farmer must decide the size of the gift (ω), the level of tolerated theft given each state of nature (r_s^p), and the future continuation utility he will promise the thief in each state of nature (U_s).

The first constraint (1) is the promise keeping constraint which ensures that the thief's expected utility does not go below some level. This means that the farmer cannot rescind the promise to maintain the farmer's continuation utility at U which he made in the previous period. The next two are the thief's and farmer's incentive compatibility (IC) constraints, which ensure that the agents are at least indifferent between the equilibrium strategy and deviating. In constraint (2), we see that the thief must be at least as happy stealing the prescribed amount (r_s^p) and receiving the continuation utility promised by the farmer (U_s) as he would be stealing a larger deviation amount (r_s^d), receiving psychic disutility from doing so ($t(r_s^d)$), and receiving the level of deviation continuation utility in the future (D^2). Constraint (3) shows that the farmer must be at least as happy giving the gift today as he would be refraining from giving the gift and being punished thereafter. Constraints (4) and (5) are the non-negativity constraints on theft and the gift.

If the thief deviates, he steals the amount r_s^d so that $u'(y^2 + r_s^d) < c'(s, r_s^d) + t'(r_s^d)$. Thus, both less trustworthy, as well as poorer, individuals will be more likely to steal and will steal more. Interestingly, households for which $u'(y^2) < c'(s, 0) + t'(0)$ for every possible state s have such high trustworthiness disutility that they will never steal more than prescribed. Thus, the farmer will have no reason to prescribe a positive level of theft to such a household. Stylized Fact 4 suggested that there are only a few thieves in each village. The fact that, in the model and perhaps in reality, there are households with such high trustworthiness disutility that they never steal, is good motivation for focusing on two agents, one who is a potential thief and one who is not.

The first-order condition for U_s simplifies to

$$V'(U_s) = -\frac{\lambda + \mu_s}{1 + \nu_s}. \tag{6}$$

where λ is the multiplier on the promise keeping constraint (1), $\mu_s \pi_s$ on the thief's IC constraints (2), $\nu_s \pi_s$ on the farmer's IC constraints (3), and $\phi_s \pi_s$ on the theft non-negativity constraints (4). The envelope theorem implies

$$V'(U) = -\lambda. \tag{7}$$

The first order condition with respect to r_s^p is

$$\frac{v'(y^1 - \omega - r_s^p)}{u'(y^2 + \omega + r_s^p) - c'(s, r_s^p)} - \frac{(\phi_s + \nu_s v'(y^1 - r_s^p))}{(1 + \nu_s)(u'(y^2 + \omega + r_s^p) - c'(s, r_s^p))} = \frac{\lambda + \mu_s}{1 + \nu_s}. \tag{8}$$

These equations show that λ equals the ratio of marginal utilities of the two individuals in the current period and in the previous period if neither agent's constraint binds and prescribed theft is positive. It is possible to prove a proposition similar to one found in Ligon et al. (2002).

Proposition 1. *Let the history of states $h_t = (s_1, s_2, \ldots, s_t)$ be given and let s be the state which occurs at time t. Any constrained-efficient contract can be characterized as follows: there exist S state dependent intervals $[\underline{\lambda}_s, \overline{\lambda}_s]$ such that $\lambda(h_t)$ evolves according to the following rule*

$$\lambda(h_t) = \begin{cases} \underline{\lambda}_s & \text{if } \lambda(h_{t-1}) < \underline{\lambda}_s \\ \lambda(h_{t-1}) & \text{if } \lambda(h_{t-1}) \in [\underline{\lambda}_s, \overline{\lambda}_s] \\ \overline{\lambda}_s & \text{if } \lambda(h_{t-1}) > \overline{\lambda}_s \end{cases} \tag{9}$$

where $\underline{\lambda}_s = -V'(\underline{U}_s)$, and $\overline{\lambda}_s = -V'(\overline{U}_s)$. I define $\underline{U}_s$ as the lowest sustainable continuation *payoff that the thief could receive in state s so as to just satisfy his IC constraint (2). Likewise* $\overline{U}_s$ *is the highest sustainable continuation payoff that the thief could receive in state s so as to just satisfy the farmer's IC constraint (3). This completely characterizes the contract once an initial value for* $\lambda(h_{t-1})$ *is given.*

Thus, if possible, the transfers are fixed so as to keep the ratio of marginal utilities $(\frac{v'(y^1-\omega-r_s^p)}{u'(y^2+\omega+r_s^p)-c'(s,r_s^p)})$ constant over time and over states. If some constraint is binding, the ratio will be changed by the minimum possible to satisfy the constraints. I move forward by deriving comparative statics which can be tested empirically in a reduced form estimation.

3.3 Comparative Statics

I derive comparative statics for the effects of changes in exogenous features such as a) the cost of stealing ($c(s, r_s)$), b) trustworthiness ($t(r_s)$), and c) risk aversion on endogenous variables such as i) gifts given (ω) ii) prescribed theft (r_s^p) and iii) trust. I consider trust an endogenous variable (while trustworthiness is exogenous).[14,15] Hardin (2002) emphasizes that trust is relational, i.e., two people's levels of trust depend on their ongoing interaction. He defines trust as "encapsulated interest." One agent (the farmer) trusts a second agent (the thief) because he knows the thief values the continuation of the relationship, and so he will take the interests of the farmer into account. Levi (2001) claims that distrust raises the 'transaction costs' of cooperation.

In accord, I measure (lack of) trust as the sum of the multipliers on the thief's IC constraints (2) ($\sum_s \pi_s \mu_s$) given some reference utility U for the thief. This measures how the farmer's expected utility reacts to a slight relaxation of the thief's IC constraints. If the

[14]Some literature assumes trust is endogenous (Alesina & LaFerrara 2002) or determined by culture (Fukuyama 1995), while other work assumes trust is exogenous and looks at its effects (Narayan & Pritchett 1999, Knack & Keefer 1997). Fisman & Khanna (1999) summarize the literature making those different assumptions.

[15]One could argue that trustworthiness is endogenous in the long run as norms are set. I assume these norms are fixed for relatively long periods of time, and it is beyond the scope of this paper to model that process.

thief's IC constraints never bind, so that he would never steal more than prescribed, then the multiplier equals zero and the farmer has complete trust in the thief. As the thief becomes more willing to steal and more costly to convince not to steal, the multiplier increases and the farmer trusts him less. This corresponds with Hardin's definition of trust, in that, as the thief's utility after deviating increases he cares less about the continuation of the gift-giving relationship with the farmer. He then becomes more costly to convince not to steal and the farmer trusts him less.

Looking at Equations (6) and (8), one finds that when $\phi_s = 0$ (prescribed theft is greater than zero) and $\nu_s = 0$ (the farmer's IC constraint does not bind), then U_s (the thief's continuation utility) is a non-decreasing function of $\omega + r_s^p$ (the transfer from the farmer to the thief in the current period). If the thief's IC constraint is binding, then as his trustworthiness decreases (i.e., as $t(\cdot)$ falls for all theft levels) he must have both higher consumption and higher continuation utility. Thus, contrary to what one might expect, *ceteris paribus*, more trustworthy agents consume less and have lower utility.[16] Because this less trustworthy agent has a higher continuation utility (U_s), his utility must be higher in the next period as well. As theft is costly while gifts are not, most of this higher consumption will come in the form of a higher gift. When a farmer has a less trustworthy neighbor, his trust decreases as well. Because $V'(U_s) = -\frac{\lambda+\mu_s}{1+\nu_s}$, the higher U obtained by a less trustworthy agent when his IC constraint binds (and the farmer's does not, so that $\nu_s = 0$) implies that μ_s is higher as well. Thus, a less trustworthy thief causes the farmer to be less trusting.[17]

The effects of a change in the cost structure of stealing are similar to the effects of a change in trustworthiness. If the thief's IC constraint binds and the marginal cost of theft in

[16]I assume that villagers know each other's levels of trustworthiness, so a thief cannot misrepresent himself as being untrustworthy in order to receive more gifts.

[17]The comparative statics would not change if the farmer could impose some punishment on the thief (such as social sanctions or physical punishment) in addition to cutting him off from future gifts, though the level of gift-giving would be lower. This externally imposed punishment would function in a similar manner to the internal trustworthiness disutility suffered by the thief.

that state decreases, both sides of the thief's IC constraint will increase, although the right-hand side will increase more than the left. Thus the thief's utility in equilibrium (on the left-hand side) must be increased to compensate and so the transfer ($\omega + r_s^p$) and continuation utility (U_s) must both increase. A decrease in the marginal cost of stealing in all states will cause an increase in the size of the gift, similar to the case of a decrease in trustworthiness. An increase in the variance of the marginal cost of stealing, on the other hand, will cause an increase in theft in the states in which theft is easiest. As the marginal cost in a state decreases, U_s increases, causing μ_s to increase, which means that the farmer's level of trust is lower when it is easier to steal.

As the farmer's risk aversion increases, his utility from deviating decreases. This is because his consumption varies more when deviating than it does in equilibrium. As this relaxes his IC constraint, the total transfer he gives will increase. Because he is more risk averse and because theft is costly, he must give a higher (state-independent) gift. This relaxes the thief's IC constraint, which means that future prescribed theft will be lowered to compensate.

I have assumed perfect information about the identity of the thief, the amount stolen, and the state of nature. Stylized Fact 3 showed that although almost half of the time the victim claims to know who stole how much, half of the time he does not. In a game of moral hazard, complete information is essentially equivalent to receiving complete information with positive probability (Holmström 1979). A similar argument shows that if the farmer has complete information with positive probability then the contract would be quite similar to that with perfect information. The thief could be induced to report accurately, knowing that there is a random chance that the farmer will find out. The resulting equilibrium and comparative statics would not change qualitatively.[18]

[18]The model would get quite a bit more complicated if one incorporated costly monitoring as a choice made by the farmer.

3.4 An Extension with Crop Choice

Now imagine modifying the model so that a farmer chooses between planting a more 'stealable' crop (e.g. watermelon) with a higher value per handful but a lower quantity output, and a less 'stealable' crop (e.g. cotton) with a lower value per handful but a higher quantity output.[19] In a world with no theft, it might be the case that the more stealable crop would be more profitable. If fear of theft discourages a farmer from planting a more profitable crop, there will be a decrease in efficiency due to the lack of enforcement.

In this modified model, the farmer would choose the level of the gift and prescribed theft he would tolerate for each of the two crops. He would use backwards induction to decide which crop to plant given the profitability of the two crops on his land and the size of the transfers he would have to give for each of the two crops. Conditional on crop choice the comparative statics derived thus far will still hold. For example, as a thief becomes less trustworthy he will be transferred a higher gift, as long as the farmer continues to plant the same crop. If the thief becomes so untrustworthy that the farmer switches to planting a less stealable crop, then a less trustworthy thief will actually receive a lower value gift.

Consider two farmers who are similar in every respect (the trustworthiness of their neighbors, the cost of stealing from them, etc.) except that one farmer's land is better suited to planting the more stealable crop. The farmer who plants the more stealable crop will have to give more gifts than the farmer who plants the less stealable crop in order to discourage the thief from stealing. The comparative static for the effect of crop choice on trust depends on how we define trust. If it is measured using the multipliers on the thief's IC constraints for the crop the farmer chose to plant, then the farmer who plants the more stealable crop will end up trusting less. If one uses the multipliers over both crops weighted equally then

[19]The stealability of a crop differs from the cost of stealing. The latter measures the difficulty of stealing from a farmer, irrespective of the crop. The stealability of a crop refers to how valuable a crop is to a thief. Crops which are more valuable per handful and can be used immediately rather than being sold in bulk (like cotton) or dried for hours (like peanuts) are more stealable.

the farmer who trusts more will plant the more stealable crop.[20]

3.5 Model Synthesis

The limited-commitment model predicts that as the cost of stealing goes up a farmer will a) give a lower total value of gifts and b) trust more, and that as the variance of the cost of stealing goes down he will c) experience less theft. As the farmer becomes more risk averse he will a) give more gifts and b) experience less theft. A farmer with less trustworthy neighbors will a) give more gifts and b) trust less. In addition, all else equal, if a farmer plants more stealable crops he will a) give more gifts.

4 Data

In 2002 I collected data in rural Paraguay combining traditional survey data on production with non-standard questions measuring economic variables such as theft experienced and agricultural giving. Respondents were also asked their level of trust. To complement the survey data, I ran experiments measuring the trust, trustworthiness, and risk aversion of the respondents.

In 1991, the Land Tenure Center at the University of Wisconsin in Madison and the Centro Paraguayo de Estudios Sociológicos in Asunción worked together in the design and implementation of the original survey of 300 rural Paraguayan households in sixteen villages in three departments (comparable to states) across the country. This was a random sample, stratified by land-holdings. The original survey was followed up by subsequent rounds of data collection in 1994, 1999, and, most recently, I collected the last round in 2002. All rounds include detailed information on production and income, and in 2002 I added questions on

[20]A farmer who chooses to plant the more stealable crop might trust more originally (weighting all multipliers equally), but as his experience with the crop he has chosen becomes more salient he may weight the multipliers for the crop he has chosen more heavily, and thus he may begin to trust less.

theft, trust, and gifts. Although the data set is rather small, with only 223 households interviewed in 2002, it is quite detailed, reducing potential omitted variable problems.[21]

Theft experienced and gifts given were measured as defined by the respondents themselves. For every crop which the household planted in the last year, they were asked the total amount they produced. Then they were asked how much of that was sold, consumed within the household, fed to animals, given away, stolen, and still in storage. A similar procedure was used for livestock, their derivates (e.g., eggs and milk), and extractives (e.g., firewood and coal). Households were also asked what tools were stolen from them in the last year, and to list any other items stolen from them. Summary statistics can be found in Table 1. Note that gifts given are approximately three times the size of theft (of small items) experienced. In the limited-commitment model on the equilibrium path, it would be efficient for gifts to be larger than theft. In addition, the measure of gifts includes both gifts given to limit theft and those given for other reasons.

I measure trust with the World Values Survey question "What share of your fellow villagers would try to take advantage of you if they had the opportunity?" where the answers are 1-all, 2-more than half, 3-half, 4-less than half, and 5-none.[22] In this setting the survey measure of trust is more appropriate than the experimental measure. This is because the survey question measures the respondent's trust in his fellow villagers given the system of rewards and sanctions he can impose. Trust as measured by the experiment is anonymous when no rewards or sanctions are possible.

In each period, the equilibrium level of gift-giving, theft in every state, and the continuation utility in every state are all functions of one another as well as of the exogenous

[21] Comparing this data set with the national census I find that my sample is slightly older, which makes sense given it was randomly chosen 11 years earlier. The households in this survey are also slightly more educated and wealthier than the average rural household, probably due to the oversampling of households with larger land-holdings.

[22] The correct cardinality is probably 1, .75, .50, .25, and 0. As this is just a linear transformation of the 1-5 scale, I have left the variable in its original form.

variables. The level of trust, the negative of the Lagrange multiplier on the thief's IC constraint, depends on the equilibrium values of all the choice variables as well. If the level of the gift went down slightly, the level of theft in at least one state of nature would have to go up to compensate the thief. As discussed in Section 3.1, relying on theft rather than on gifts to make transfers to the thief is more costly for the farmer, and so his level of trust will be lower. Likewise, if the level of theft went up in all states, the gift would go down to compensate.

The data collected measures total theft experienced and gifts given over the course of a year, the equivalent of multiple periods in the model. Total theft experienced is a function of the exogenous variables (neighbor trustworthiness, the cost of stealing, etc.) and total gifts given. The same can be said for the total gifts given. The *ceteris paribus* arguments made above suggest that one might want to estimate a more structural model. One would include the level of theft in the gift regression, the level of giving in the theft regression, and both theft and gifts in the trust regression (in addition to the other exogenous variables in all three). All else equal, we would expect a negative correlation between theft and gift giving, a positive correlation between gift-giving and trust, and a negative correlation between theft and trust.

In order to estimate such a structural model one would need to have data on at least one variable which affected gifts but not theft, and at least one variable which affected theft but not gifts. It is difficult to even conceptualize what such a variable might be. Due to the lack of such variables, I will focus instead on testing the comparative statics derived from the model. These comparative statics do not state, for example, that *conditional* on the level of theft, as a farmer becomes more risk averse he will give more gifts. They state that, as he becomes more risk averse, he will both give more gifts and experience less theft.

Nevertheless, the correlation coefficients between the three endogenous variables under consideration are of interest. These three variables are measured as the log of one plus the value of theft experienced, the log of one plus the value of gifts given, and the answer to the World Values Survey question above. These correlations can be found in Table 2.

As Table 2 does not control for any explanatory variables, I cannot rely on *ceteris paribus* arguments. A farmer who lives near a thief will give more gifts, experience more theft, and trust less than a farmer whose neighbors are all completely trustworthy. This suggests a positive correlation between theft and gift-giving (rather than the negative correlation suggested by the *ceteris paribus* analysis), and a negative correlation between trust and theft, as well as trust and gift-giving.[23] The correlations in Table 2 are in line with these hypotheses. Although the correlation between trust and giving is not significant, the fact that it is negative yields more suggestive evidence that transfers are not solely given as a form of reciprocal exchange, but that they are also used to limit theft.

In order to measure the exogenous variables, I carried out two economic experiments, one measuring trust and trustworthiness, and the other measuring risk aversion. A more detailed description of the games can be found in Schechter (2006), but I will describe them briefly here. After surveying each village, the enumerators invited a player from each household which had participated in the survey to play the games. 188 of the 223 families surveyed sent a family member to participate in the experiments.[24] The players won an average of two days' wages.

The risk game was played first. The investor was given a sum of money (equivalent to two-thirds of one day's wages) and chose how much (if any) to invest. The experimenter then rolled a die to determine the payoffs. After that I ran the trust game originally described in Berg et al. (1995).[25] The trustor was given a sum of money. In the first move, the

[23]There is the second order consideration that a farmer who is more risk averse will give more gifts and experience less theft than a less risk averse farmer. This suggests a negative correlation between theft and trust, although one would suspect this effect is of smaller magnitude than that predicting a positive correlation as discussed above.

[24]Households that did not send players were wealthier and had younger household heads.

[25]As is common with games played in rural villages, the games were not double blind (Barr 2003, Karlan 2005). This is due to the importance of making sure players understand the games and difficulties in running

trustor decided how much, if any, to send to an anonymous trustee.[26] Any money sent to the trustee was tripled. The trustee made the second move, deciding how much money to return to the trustor. Money sent by the trustor is commonly used to measure his trust that the anonymous trustee will return his money. Money returned by the trustee is used to measure his trustworthiness.

To measure trustworthiness for every household, I had each player play the role of trustor first and then the role of trustee. Burks et al. (2003) find that playing both roles decreases the amount sent and the share returned. They hypothesize that playing both roles reduces the player's sense of responsibility for the well-being of his partner. If this is the case, playing both roles decreases correlation between the measure of trustworthiness and altruism, allowing trustworthiness to be measured more purely.

5 Empirics

Because of the difficulties involved in identifying the structural equations which arise in the model, I must estimate reduced form equations. In this section I test the comparative statics which hold in equilibrium.

5.1 Estimation Before Controlling for Crop Choice

In Section 3.3 of this paper I derived comparative statics for the three endogenous variables: gifts given, theft experienced, and trust, with regards to exogenous changes in the cost of stealing, the risk aversion of the farmer, and the trustworthiness of his neighbors. I estimate

experiments in a village setting.

[26]As the villagers all played together, they knew the pool from which their partner was drawn, although they did not know with whom they were paired.

the system of equations

$$y_1 = x\beta_1 + u_1$$

$$y_2 = x\beta_2 + u_2$$

$$y_3 = x\beta_3 + u_3$$

where y_1 is theft experienced, y_2 is gifts given, and y_3 is trust. Before controlling for crop choice, the regressors are all exogenous. As the xs do not differ across equations, the analysis simplifies to equation by equation OLS. This will no longer be the case in Section 5.2 after controlling for crop choice.

The exogenous regressors common to all three equations include variables representing risk aversion, the cost of stealing, and the trustworthiness of neighbors. The amount the household bet in the risk experiment is included as a measure of (lack of) risk aversion, as the more they bet, the less risk averse they are. For those households which did not participate in the experiments, the value of the bet is set to 0, and an indicator variable for households which did not participate in the experiments is included. Thus, the sample size remains 223 although only 188 households participated in the experiments.

Household size (in adult equivalents) is included to represent the cost of stealing. It may be more difficult to steal from a larger household, as some household member will be in the fields more often. I include a variable indicating if any non-household member walks past the family's main plot in any given week, which effects the cost of stealing as well. If no non-household member walks past a field then people do not know what crop is in the field or when it will be ripe, and will look more out of place if they are seen walking past the field. Fields on commonly used footpaths are easier to steal from. I also include the number of households within 250 meters of the surveyed household, so that the indicator for no-one walking past the field is not just proxying for a household having few neighbors, but actually represents a characteristic of the plot in which crops are planted.

In the model, the cost of stealing differs in each state while the variables above do not. Household size and whether or not people walk past the field affect the probability that a potential thief finds himself in a state in which the cost of stealing is low. Thus, these variables proxy for the distribution of the cost of stealing.

I also include variables representing the trustworthiness of neighbors. I have GPS data on each household in the survey (latitude, longitude, and elevation) and the measure of trustworthiness from the experiment. I combine these, measuring neighbor trustworthiness as the level of trustworthiness of the least trustworthy of the household's three closest neighbors. I focus on the level of trustworthiness of the least trustworthy neighbor because the model predicts that it is the least trustworthy people who must be contracted with to reduce theft. I focus on close neighbors because the evidence presented in Stylized Fact #7 suggested that close neighbors are often the culprits. As the experiment is anonymous, trustees should not decide how much to return based on past experiences with the other players. I assume play by the trustees is exogenous and determined by their innate sense of moral pride.[27]

A last proxy for trustworthiness is the number of households in the village with members who are close relatives of the surveyed household. Close relatives include parents, children, or siblings of the household head and his wife. They do not include cousins or other extended family members. A potential thief may experience a larger trustworthiness disutility when stealing from his own relative. Note that if close family members monitor each other's fields, then living near more close family members could also make it more difficult for thieves to approach. Thus this variable could effect both the cost of stealing as well as trustworthiness.

The log of household wealth, the number of years the household has lived in the village,

[27]Note that for the endogenous measure of trust I use the answer to the survey question, while for the exogenous measure of trustworthiness I use play by the trustee in the experiment. This is because I want a proxy for trustworthiness measuring intrinsic trustworthiness in anonymous situations, while I want to measure trust in non-anonymous situations given the system of rewards and sanctions in the village.

the distance between the house and the nearest police station, and a dummy for the Japanese village are also included as controls.

5.1.1 Implementation

When not controlling for crop choice I estimate the system of equations using equation by equation OLS.[28] I do not control for village fixed effects in the analysis in the main text to preserve precious degrees of freedom, though I have accounted for clustering in the standard errors.[29] Given the omission of crop choice, the results in Table 3 may be biased but they give an interesting overview.

Larger households do not experience any less theft, and they actually give more gifts. If it is more difficult to steal from larger households then this result is in contradiction with the predictions of the model. Keep in mind that I have not yet controlled for crop choice.

'No-one passes field' represents an increase in the cost of stealing. Households with fields which non-household members do not walk past give a significantly lower total value of gifts and experience significantly less theft. In fact, a household which does not possess a plot which no-one walks past experiences approximately 60 percent more theft and gives 82 percent more gifts than a household which has such a plot. One might think that the reason households with fields which no-one walks past give fewer gifts and experience less theft is that people who live on the outskirts of town have no neighbors to whom to give gifts. But, this result holds even when including the number of households in a 250 meter radius of that household as an explanatory variable. Thus, this result is not caused by certain households having fewer neighbors, but is directly related to the number of people walking past the field. In terms of plots located on popular footpaths, the limited-commitment model is supported,

[28]As many households experience no theft or give no gifts, I have also tried estimating those equations using a tobit regression. The qualitative results are the same either way, so I use linear regression techniques to facilitate comparisons with Section 5.2 in which I estimate the three equations as a linear system.

[29]The standard errors are robust to heteroskedasticity, and allow for intra-village correlation which differs between villages but is the same within each village.

as both gifts given and theft experienced increase when the cost of stealing goes down.

At first glance, the results on trustworthiness do not show evidence that gift-giving is used to limit theft. As his least trustworthy neighbor becomes more trustworthy, a farmer gives more gifts (and there is no effect on theft or trust). The limited-commitment model predicted farmers with more trustworthy neighbors would trust more and give fewer gifts.

However, a different measure of trustworthiness, the number of close family members living in the same village, shows effects consistent with the limited-commitment model. Households with *more* close family members give significantly *fewer* gifts. For every additional family member living in their village, a household gives approximately ten percent fewer gifts. This is contrary to the expectation that households with more close family members give more gifts, not less. This result fits directly with the limited-commitment model's predictions that, as trustworthiness increases, gifts given decrease and trust increases (although, in this regression, the effect on trust is not significant).

The coefficients on risk aversion are all insignificant, perhaps because risk aversion was measured for one member of the household and not for the family as a whole. Households in the Japanese village experience less theft, give fewer gifts, and trust more. This result should not hastily be used to conclude that the Japanese are more trustworthy, as I have not yet controlled for crop choice and Japanese farmers plant quite different crops than do farmers of South American heritage.[30] Wealthier households give significantly more gifts but do not experience more theft than poorer households. This effect is not as large economically as one might expect. A household that is ten percent wealthier gives less than three percent more gifts. This implies that, although wealthier households do give a higher total value of gifts, they give a smaller proportion of their wealth than do poorer households. The relatively small coefficient on wealth suggests that models in which gifts are given out of altruism or

[30] Results when excluding the Japanese altogether are quite similar.

inequality aversion or in order to mitigate envy are not driving the results.[31,32]

Table 3 as well as the other tables in the main text do not control for village fixed effects. Appendix A shows the corresponding results including village fixed effects. As can be seen in the appendix, the main results do not change much. One interesting change is that the coefficients in the trust regression on 'no one passes field' and 'close relatives in village' are both significant after controlling for village fixed effects, while not before. This suggests that these farmers who are more difficult to steal from or have more relatives as neighbors trust more than other farmers within their village.

5.2 Estimation Controlling for Crop Choice

Crop choice is an endogenous decision made by the farmer, so in this section I use an instrumental variables approach. Instead of using OLS I now estimate the system of equations using GMM. In the implementation I will use more instruments than endogenous variables, which means that the equations are over-identified. Thus, there is now an efficiency gain to estimating the three equations as a system. The system of equations estimated is

$$y_1 = x\beta_1 + v\gamma_1 + u_1$$

$$y_2 = x\beta_2 + v\gamma_2 + u_2$$

$$y_3 = x\beta_3 + v\gamma_3 + u_3$$

[31] I conduct a robustness test including income rather than wealth as a regressor. Although income is endogenous, as both crop choice and theft experienced effect income, most of the results remain the same. The main difference is that the coefficient on '# Close Relatives in Village' in the giving regression remains negative but loses significance. This could be because villagers who live in the same village with many relatives experience slightly less theft and so have slightly higher income. Thus, the effect of living near close relatives on giving could be picked up by the endogenous income variable, lowering the coefficient on relatives.

[32] As another robustness check, I use the answer to the question "if you know someone is a thief, do you give him gifts to avoid getting stolen from?" rather than the value of gifts given as the left-hand side variable. This is the only variable I have which hints at the motivation behind the gift giving. The main results still hold, with households living in the same village with more of their close relatives, or with fields which no one passes, being less likely to claim to give gifts to prevent theft.

where x are the exogenous regressors and v is crop choice. The instrument set z includes all the elements of x, as well as instruments for crop choice. The moment conditions require that $\mathrm{E}(z'u_g) = 0$ for every equation g.

Define the matrix of regressors

$$X_i = \begin{pmatrix} x_{i1} & 0 & 0 \\ 0 & x_{i2} & 0 \\ 0 & 0 & x_{i3} \end{pmatrix}$$

for each individual i so that x_{i1} includes all of the regressors in the first equation (including both x and v), x_{i2} includes all of the regressors in the second equation, etc. The matrix X is obtained by stacking the matrices X_i for all individuals. The matrix of instruments Z has a similar structure. The matrix Y is obtained by stacking the individual vectors

$$Y_i = \begin{pmatrix} y_{i1} \\ y_{i2} \\ y_{i3} \end{pmatrix}.$$

I estimate the coefficients by first estimating an initial consistent estimator of β which I call $\widehat{\widehat{\beta}}$. For this step I use the 2SLS estimator $\widehat{\widehat{\beta}} = [X'Z(Z'Z)^{-1}Z'X]^{-1}X'Z(Z'Z)^{-1}Z'Y$. From this one obtains the residual vectors $\widehat{\widehat{u}}_i = y_i - X_i\widehat{\widehat{\beta}}$. Then I estimate the optimal weighting matrix $\widehat{W} = (N^{-1}\sum_{i=1}^{N} Z_i'\widehat{\Omega}Z_i)^{-1}$ where $\widehat{\Omega}$ is an estimate of $u_i u_i'$. This estimate uses the residuals $\widehat{\widehat{u}}_i$ found above and allows for heteroskedasticity and intra-village correlation differing between villages but the same within each village (both between equations and within equations). Using this weighting matrix, one can obtain the optimal linear GMM estimator $\widehat{\beta} = [X'Z\widehat{W}Z'X]^{-1}X'Z\widehat{W}Z'Y$.

5.2.1 Implementation

Some crops are more valuable to thieves than others. Crops such as cotton, wheat, and soy which are usually sold in bulk are not very desirable to thieves, nor are crops such as peanuts which must be dried in the sun for a day or two before eating. The crops about which farmers most often claim to worry are watermelons, melons, bananas, corn, and yucca. The dynamic limited-commitment model predicts that a household planting these crops will give more gifts and trust less. Crop choice is included as an explanatory variable indicating how many of the above listed crops the household planted. Note that crop choice is measured as the number of stealable crops planted, rather than the total value planted in these crops. This is the appropriate choice if it is the decision to plant watermelons, and not how many to plant which effects theft, i.e. if whether a farmer plants 200 watermelons or 1000, the thief steals the same amount.[33]

While conserving degrees of freedom in comparison with including a dummy for each crop, using the number of crops planted as an explanatory variable imposes linearity on the effect of crop choice. I have also tried using the square and the log of the number of commonly stolen crops planted, as well as converting the count data into an indicator variable for planting three or more of those crops and the results are not substantially different.[34]

I instrument for crop choice with the altitude of the household's main plot and potential evapotranspiration. Elevation was measured for each household with the GPS unit. Plots at different elevations belong to different micro-climates with different soil characteristics. Elevation varies from 91 to 449 meters above sea level and varies substantially even within

[33]A farmer who plants two stealable crops which make up 10% of his output is considered to plant more stealable crops than a farmer who covers half of his farm with one stealable crop. This is because a thief whose neighbor plants both watermelon and corn may want some of both, while if his neighbor plants only watermelon, then he will only want the watermelon. Since these thieves are not stealing for resale, there is only so much watermelon they will desire to steal and consume.

[34]If I include the share of total output, in terms of value, dedicated to stealable crops as a regressor, rather than the number of stealable crops, the qualitative results do not change.

villages.[35] Households at higher elevations are more likely to plant soy, wheat, and rice, while households at lower elevations are more likely to plant yucca, cotton, banana, beans, and watermelon. Evapotranspiration is the combination of water lost from the soil by evaporation and from plants by transpiration, while potential evapotranspiration is the water requirement of a reference crop. This variable does not vary within villages. Households in villages with higher evapotranspiration are less likely to plant crops of any kind.[36]

Elevation and potential evapotranspiration are both exogenous predetermined characteristics. Still, one might worry that they were correlated with the error terms ,which would be the case, if, for example, there were more roads at low altitudes, making farmers at low altitudes more susceptible to theft. Looking at the data, there are (insignificantly) more roads and bus crossings at higher altitudes, not lower, while households at lower altitudes plant more of the more stealable crops. This shows that altitude captures micro-climate rather than transportation. It is difficult to think of a similar argument as to why potential evapotranspiration might be correlated with the error terms. Since these variables are shown to be correlated with crop choice and believed to be uncorrelated with the error term, they are valid instruments.

When estimating a system of equations using GMM, there is no real first stage as in 2SLS. However, I include Table 4 with the regression of crop choice on all of the explanatory variables, similar to a 'first-stage' regression to give an idea of the correlates of crop choice. I show results both including and excluding the instruments. The F-statistic and the heteroskedasticity consistent Wald-statistic testing the joint significance of the two instruments show that the instruments are jointly significant at the 1% level.

Farmers of Japanese heritage plant fewer stealable crops. These farmers are larger scale

[35]The differences within each village between the household at the highest elevation and the household at the lowest elevation are between 25 and 150 meters.

[36]Data on evapotranspiration is from the Latin America Maize Research Atlas by D.P. Hodson, E. Martínez-Romero, J.W. White, J.D. Corbett, and M. Bänziger at CIMMYT.

farmers and tend to plant soy and wheat for export. Farmers with more trustworthy neighbors and larger households plant more stealable crops, perhaps because they worry less about theft. In the previous subsection we saw that larger households and households with more trustworthy neighbors actually give more gifts. The reason they give more gifts may be to compensate for the many stealable crops they are planting. The fact that farmers with more trustworthy neighbors plant more stealable crops suggests that the trustworthiness disutility included in the model does have an effect. Thieves do not steal only due to poverty, but also because of their level of trustworthiness.

Table 5 shows the GMM results. The first three columns estimate the system using all explanatory variables, while the last three columns use fewer regressors due to concerns of degrees of freedom. Hansen's J-statistic tests whether the instrument set is uncorrelated with the errors. The J-statistics for the two sets of explanatory variables have p-values of .22 and .98. Although this test may behave strangely with small data sets, I cannot reject the exogeneity of the instruments.

Households planting more stealable crops give significantly more gifts, although there is no effect on theft or trust.[37] A household planting one stealable crop gives a bit more than double the value of gifts that a household planting no stealable crop gives. A one-period model would predict that a farmer who plants more stealable crops will experience more theft. As gift-giving cannot discourage theft in a one period model, there would be no correlation between gift giving and crop choice. Thus, the results are in accord with the limited-commitment model but contrary to what a one-period model would suggest.

The main results which held before controlling for crop choice still hold. Households with fields no-one passes still give fewer gifts and experience less theft, while those living in the same village with more close family members continue to give fewer gifts as well. Large

[37]If farmers base their level of trust on the crop they choose, then farmers who plant more stealable crops would trust less. If they base their level of trust on both crops equally then people who plant more stealable crops trust more. If they weight the chosen crop more heavily the effect will be indeterminate.

households and households with more trustworthy neighbors no longer give significantly more gifts than other households, after controlling for the higher quantity of stealable crops they plant. As there are many reasons people give gifts, only one of which is the desire to limit theft, the fact that the number of close relatives in the village and the number of people passing the field are significant in predicting gift-giving is quite convincing.

The two variables constructed from the experimental data - the player's bet in the risk game and the trustee's play in the trust game - are not often significant in the regressions. I do not take this to mean that risk aversion and neighbor trustworthiness are unimportant, but rather that the measures delivered by the experiments may not capture them properly.

Researchers who wish to combine survey and experimental data may learn from this experience. Experimental data do tend to be correlated with real-world decisions. Karlan (2005) found that play by individuals in the trust game has strong predictive power for default rates and savings rates of those same individuals in their microfinance loans. In the current paper risk aversion is measured for one representative of the household, while the gift/theft equilibrium is decided by the family as a whole. Future work should strongly encourage the person who makes the economic decision of relevance in the survey to participate in the experiment as well.[38,39] I use play by the trustees to derive a measure of neighbor trustworthiness. Not only is the trust game played by only one individual in the household, it is not played with all households in the village, but rather a random sample. Researchers who want to use experiments to measure group-level characteristics should make sure to include as many members of the group as possible.

[38]There is a tradeoff between allowing household members who are not instrumental in the decision of interest to participate and forbidding them, leading to missing data and selection issues.

[39]Excluding bets in the risk game made by women, the coefficients are closer to significant and are in the predicted direction.

6 Conclusion

Rural theft in Paraguay is not carried out by anonymous agents. Farmers claim to know who is stealing from them, and have designed a system of informal sanctions and rewards to limit the amount of theft they experience. I have laid out a dynamic limited-commitment model in which a potential thief cannot commit to refrain from stealing. A farmer will thus give him gifts, and promise him continued gifts in the future, if he limits his level of theft. This model yields predictions which contrast with those of many models of fairness and gift exchange in which increased trust is associated with more gift-giving rather than less. In this model, honest people who would never steal will not receive gifts, while those who are untrustworthy are rewarded.

Using a new data set from rural Paraguay, I test the predictions of the model. The data set includes information on theft experienced, gifts given, and survey measures of trust, as well as GPS data on location and elevation. In addition, it includes measures of trustworthiness and risk aversion from a set of economic experiments. This experimental data provides novel controls which allow me to partially overcome omitted variable bias.

The predictions of the limited-commitment model are supported. Households with more close relatives living in the same village give fewer gifts, contrary to what one might expect. These households may give fewer gifts because they know that their family members are less likely to steal from them and more likely to help monitor their fields, and so they do not need to entice them away from theft by giving them gifts. Households from which it is more difficult to steal give fewer gifts and experience less theft. In addition, households living in the same village with more close family members and with fields which no one passes trust more relative to other farmers in their village. I conclude that farmers in Paraguay do use giving and the promise of future giving as a means of limiting theft.

Throughout the paper I assume the only way a farmer can avoid theft is through crop choice and strategic gift-giving. Much economic literature on crime has focused on other forms of self-protection victims may employ (Ehrlich & Becker 1972). Farmers may choose to monitor their fields, giving potential thieves less opportunity to steal. A useful avenue for further research would be to incorporate the fact that farmers can choose actions which affect the cost of stealing for the potential thief.

A Appendix: Using Village Fixed Effects

In the analysis up to now village fixed effects were excluded, but it is of interest to see if the results change when including them. In this appendix, I carry out the same analysis as in the text but include village fixed effects. Before controlling for crop choice, I include the same explanatory variable as in Table 3. When controlling for crop choice and including village fixed effects, I can no longer use evapotranspiration as an instrument since it does not vary within a village. As altitude alone is not a strong instrument, I use both altitude and past crop choice as instruments, and I include the same explanatory variables as in the right hand side columns of Table 5.

The results in Table A-1 which do not control for crop choice, and those in A-2 which do control for crop choice are quite similar to those in the main text. The results are a bit weaker than before. As there are 16 villages this uses up 15 degrees of freedom in Table A-1 and 45 valuable degrees of freedom in Table A-2 when the equations are estimated as a system. This is a lot for such a small data set.

Even after including village fixed effects, households with fields off of main footpaths experience significantly less theft and give significantly fewer gifts; households with more close relatives living in their village give significantly fewer gifts; and households planting more easily stealable crops give significantly more gifts. This is reassuring evidence that the findings in the main text of this paper are not due to unobserved village effects.

After controlling for crop choice and village fixed effects, larger households experience less theft. In addition, after controlling for village fixed effects two new results regarding trust arise. Farmers with fields which no one passes and who live in the same village with more of their close relatives trust significantly more. These results were predicted by the model, but were not found before controlling for village fixed effects. This suggests these farmers trust more relative to other farmers within their village, but not relative to farmers throughout the country.

References

Abreu, D. (1988), 'On the theory of infinitely repeated games with discounting', *Econometrica* **56**(2), 383–396.

Albarran, P. & Attanasio, O. P. (2003), 'Limited commitment and crowding out of private transfers: Evidence from a randomised experiment', *Economic Journal* **113**(486), 77–85.

Alesina, A. & LaFerrara, E. (2002), 'Who trusts others', *Journal of Public Economics* **85**(2), 207–234.

Andreoni, J. & Miller, J. (2002), 'Giving according to GARP: An experimental test of the consistency of preferences for altruism', *Econometrica* **70**(2), 737–753.

Banfield, E. C. (1958), *The Moral Basis of a Backward Society*, The Free Press.

Barr, A. (2003), 'Trust and expected trustworthiness: Experimental evidence from Zimbabwean villages', *The Economic Journal* **113**(489), 614–630.

Becker, G. S. (1968), 'Crime and punishment: An economic approach', *The Journal of Political Economy* **76**(2), 169–217.

Ben-Porath, Y. (1980), 'The F-connection: Families, friends, and firms and the organization of exchange', *Population and Development Review* **6**(1), 1–30.

Berg, J., Dickhaut, J. & McCabe, K. (1995), 'Trust, reciprocity, and social history', *Games and Economic Behavior* **10**(1), 122–142.

Bliege-Bird, R. L. & Bird, D. W. (1997), 'Delayed reciprocity and tolerated theft: The behavioral ecology of food-sharing strategies', *Current Anthropology* **38**(1), 49–78.

Blurton-Jones, N. G. (1987), 'Tolerated theft: Suggestions about the ecology and evolution of sharing, hoarding, and scrounging', *Social Science Information* **26**, 31–54.

Burks, S. V., Carpenter, J. P. & Verhoogen, E. (2003), 'Playing both roles in the trust game', *Journal of Economic Behavior and Organization* **51**, 195–216.

Camerer, C. (1988), 'Gifts as economic signals and social symbols', *American Journal of Sociology* **94**, 180–214.

Carmichael, H. L. & MacLeod, W. B. (1997), 'Gift giving and the evolution of cooperation', *International Economic Review* **38**(3), 485–509.

Carter, M. R. & Olinto, P. (2003), 'Getting institutions "right" for whom?: Credit constraints and the impact of property rights on the quantity and composition of investment', *American Journal of Agricultural Economics* **85**(1), 173–186.

Coate, S. & Ravallion, M. (1993), 'Reciprocity without commitment: Characterization and performance of informal insurance agreements', *Journal of Development Economics* **40**(1), 1–24.

Dubois, P., Jullien, B. & Magnac, T. (2005), Formal and informal risk sharing in LDCs: Theory and empirical evidence. Unpublished Manuscript.

Ehrlich, I. & Becker, G. S. (1972), 'Market insurance, self-insurance and self-protection', *Journal of Political Economy* **80**(4), 623–648.

Fafchamps, M. & Minten, B. (2006), 'Crime, transitory poverty, and isolation: Evidence from Madagascar', *Economic Development and Cultural Change* . Forthcoming.

Fehr, E. & Gächter, S. (2000), 'Fairness and retaliation: The economics of reciprocity', *Journal of Economic Perspectives* **14**(3), 159–181.

Fehr, E. & Schmidt, K. M. (1999), 'A theory of fairness, competition, and cooperation', *Quarterly Journal of Economics* **114**(3), 817–868.

Fisman, R. & Khanna, T. (1999), 'Is trust a historical residue? Information flows and trust levels', *Journal of Economic Behavior and Organization* **38**(1), 79–92.

Foster, A. D. & Rosenzweig, M. R. (2001), 'Imperfect commitment, altruism, and the family: Evidence from transfer behavior in low-income rural areas', *Review of Economics and Statistics* **83**(3), 389–407.

Foster, G. M. (1965), 'Peasant society and the image of limited good', *American Anthropologist* **67**(2), 293–315.

Fukuyama, F. (1995), *Trust: The Social Virtues and the Creation of Prosperity*, The Free Press.

Glaeser, E. L., Sacerdote, B. & Scheinkman, J. A. (1996), 'Crime and social interactions', *Quarterly Journal of Economics* **111**(2), 507–548.

Gould, E. D., Weinberg, B. A. & Mustard, D. B. (2002), 'Crime rates and local labor market opportunities in the United States: 1979-1997', *Review of Economics and Statistics* **84**(1), 45–61.

Hardin, R. (2002), *Trust and Trustworthiness*, Russell Sage Foundation.

Hawkes, K. (1993), 'Reply [to K. Hill and H. Kaplan]: On why male foragers hunt and share food', *Current Anthropology* **34**, 701–709.

Holmström, B. (1979), 'Moral hazard and observability', *Bell Journal of Economics* **10**(1), 74–91.

Huck, S. & Kosfeld, M. (2004), The dynamics of neighbourhood watch and norm enforcement, Working Paper 199, Institute for Empirical Research in Economics.

Karlan, D. S. (2005), 'Using experimental economics to measure social capital and predict financial decisions', *American Economic Review* . Forthcoming.

Kletzer, K. M. & Wright, B. D. (2000), 'Sovereign debt as intertemporal barter', *American Economic Review* **90**(3), 621–639.

Knack, S. & Keefer, P. (1997), 'Does social capital have an economic payoff: A cross-country investigation', *Quarterly Journal of Economics* **112**, 1251–1288.

Kocherlakota, N. R. (1996), 'Implications of efficient risk sharing without commitment', *Review of Economic Studies* **63**(4), 595–609.

Levi, M. (2001), When good defenses make good neighbors: A transaction cost approach to trust and distrust, *in* C. Ménard, ed., 'Institutions, Contracts, and Organizations: Perspectives from New Institutional Economics', Edward Elgar, pp. 137–157.

Levitt, S. D. (2004), 'Understanding why crime fell in the 1990s: Four factors that explain the decline and six that do not', *Journal of Economic Perspectives* **18**(1), 163–190.

Ligon, E., Thomas, J. P. & Worrall, T. (2002), 'Informal insurance arrangements with limited commitment: Theory and evidence from village economies', *Review of Economic Studies* **69**, 209–244.

Mauss, M. (1967), *The Gift: Forms and Functions of Exchange in Archaic Societies*, New York: W W Norton & Company. Translated from the French by I. Cunnison.

Mui, V.-L. (1995), 'The economics of envy', *Journal of Economic Behavior and Organization* **26**, 311–336.

Narayan, D. & Pritchett, L. (1999), 'Cents and sociability: Household income and social capital in rural Tanzania', *Economic Development and Cultural Change* **47**(4), 871–897.

Paige, J. (1975), *Agrarian Revolution*, The Free Press.

Platteau, J.-P. & Nugent, J. (1992), 'Share contracts and their rationale: Lessons from marine fishing', *Journal of Development Studies* **28**(3), 386–422.

Posner, R. A. (1981), *The Economics of Justice*, Cambridge: Harvard University Press.

Posner, R. A. (1998), 'Social norms, social meaning, and economic analysis of law: A comment', *The Journal of Legal Studies* **27**(2), 553–565.

Rabin, M. (1993), 'Incorporating fairness into game theory and economics', *American Economic Review* **86**(5), 1281–1302.

Schechter, L. (2006), 'Traditional trust measurement and the risk confound: An experiment in rural Paraguay', *Journal of Economic Behavior and Organization* . Forthcoming.

Scott, J. C. (1985), *Weapons of the Weak: Everyday Forms of Peasant Resistance*, Yale University Press.

Udry, C. (1994), 'Risk and insurance in a rural credit market: An empirical investigation in northern Nigeria', *Review of Economic Studies* **61**(3), 495–526.

Table 1: Summary Statistics for Sept 2001 - Sept 2002

Variable	Mean	(Std. Dev.)
Annual Theft Experienced (in $)	23	(70)
Log of Annual Theft Experienced (in 1000s of Guaranies)	2.04	(2.48)
Annual Gifts Given (in $)	64	(109)
Log of Annual Gifts Given (in 1000s of Guaranies)	4.07	(2.44)
Annual Income (in $)	5,903	(15,030)
Median Annual Income (in $)	1,885	
Wealth (in $)	50,395	(166,290)
Log of Wealth (in 1000s of Guaranies)	10.12	(2.00)
Median Wealth (in $)	4,771	
Trust from the Survey*	3.11	(1.15)
No one Passes Field	44%	
# HHs in 250 m Radius	5.8	(6.5)
Family Size	5.6	(2.4)
Close Relatives in Village (# of hhs)	3.2	(3.0)
Km to Police Station	4.06	(2.66)
Years in Village	39	(20)
Japanese Village	4%	
Didn't Participate in Games	15%	
Bet in Risk Game (in 1000's of Guaranies, 188 obs.)	3,400	2,000
Trustworthiness (Share Returned in Trust Game, 188 obs.)	0.44	0.20
Neighbor Trustworthiness***	0.28	0.16
# of Stealable Crops**	2.3	(1.1)
# of Stealable Crops in 1999	2.1	(0.9)
Altitude (in Meters)	196	(81)
Potential Evapotranspiration (in Millimeters)	465	(61)
Obs	223	

* "What share of your fellow villagers would try to take advantage of you if they had the opportunity?" 1-all, 2-more than half, 3-half, 4-less than half, and 5-none. ** The number of the following crops planted in the previous year: watermelon, melon, banana, corn, and yucca. *** (Share returned in the trust game by the least 'trustworthy' of the household's three closest neighbors who participated in the games.

Table 2: Correlation coefficients. Pearson correlations above the diagonal and Spearman correlations below.

	Log(Theft)	Log(Giving)	Trust
Log(Theft)	1.0000	0.1507**	-0.1225*
Log(Giving)	0.1405**	1.0000	-0.0657
Trust	-0.1364**	-0.1050	1.0000

*-10%, **-5%, and ***-1% significant.

Table 3: Correlates of gift giving, theft experienced, and trust before controlling for crop choice using OLS.

	Log(Theft)	Log(Giving)	Trust
Bet	0.053	−0.024	0.005
	(0.096)	(0.078)	(0.039)
Didn't Play Games	0.736	−0.003	−0.502*
	(0.644)	(0.648)	(0.305)
No One Passes Field	−0.602*	−0.824***	0.231
	(0.340)	(0.316)	(0.149)
# HHs in 250 m Radius	0.026	−0.068***	−0.002
	(0.025)	(0.022)	(0.013)
Family Size	−0.044	0.206***	−0.000
	(0.102)	(0.079)	(0.042)
# Close Relatives in Village	−0.054	−0.109**	0.031
	(0.054)	(0.054)	(0.029)
Neighbor Trustworthiness	1.350	1.718*	0.591
	(1.157)	(1.015)	(0.600)
Kilometers to Police	−0.071	0.063	−0.003
	(0.058)	(0.067)	(0.027)
Log(Wealth)	0.075	0.257***	−0.025
	(0.102)	(0.089)	(0.049)
Years in Village	0.016**	0.022**	0.009**
	(0.008)	(0.009)	(0.004)
Japanese Village	−1.685**	−4.428***	0.699**
	(0.687)	(0.594)	(0.317)
R^2	0.077	0.244	0.066
Obs.	223	223	223

Clustered heteroskedasticity-consistent standard errors in parenthesis.
*-10%, **-5%, and ***-1% significant.

Table 4: 'First stage' regression of crop choice on the exogenous variables using OLS with and without including instruments.

	# of Stealable Crops	
Bet	0.005	0.013
	(0.036)	(0.037)
Didn't Play Games	0.097	0.089
	(0.318)	(0.292)
No One Passes Field	-0.097	-0.095
	(0.139)	(0.138)
# HHs in 250 m Radius	-0.030^{***}	-0.026^{***}
	(0.009)	(0.008)
Family Size	0.144^{***}	0.112^{**}
	(0.049)	(0.045)
# Close Relatives in Village	-0.021	-0.020
	(0.023)	(0.021)
Neighbor Trustworthiness	0.884^{**}	0.948^{**}
	(0.415)	(0.395)
Kilometers to Police	0.020	0.052
	(0.041)	(0.037)
Log(Wealth)	0.018	0.016
	(0.049)	(0.048)
Years in Village	0.001	-0.003
	(0.005)	(0.005)
Japanese Village	-2.005^{***}	-1.962^{***}
	(0.313)	(0.276)
Altitude (in Dekameters)		-0.024^{**}
		(0.010)
Evaporation		-0.004^{***}
		(0.001)
R^2	0.222	0.271
Wald Test for Inst. Sig.		43.285 ($p = 0.00$)
F Test for Inst. Sig.		6.972 ($p = 0.00$)
Obs.	223	223

Clustered heteroskedasticity-consistent standard errors in parenthesis.
*-10%, **-5%, and ***-1% significant.

Table 5: Correlates of gift giving, theft experienced, and trust controlling for crop choice using GMM.

	Log(Theft)	Log(Giving)	Trust	Log(Theft)	Log(Giving)	Trust
Bet	0.064	−0.070	0.021			
	(0.092)	(0.064)	(0.040)			
Didn't Play Games	0.927	−0.245	−0.480			
	(0.627)	(0.505)	(0.306)			
No One Passes Field	−0.568*	−0.599**	0.178	−0.911***	−0.983***	0.055
	(0.328)	(0.287)	(0.153)	(0.315)	(0.276)	(0.162)
# HHs w/in 250 m	0.035	−0.031	−0.008			
	(0.031)	(0.022)	(0.014)			
Family Size	−0.086	−0.003	0.043	−0.161	0.018	0.011
	(0.127)	(0.082)	(0.048)	(0.130)	(0.087)	(0.044)
# Close Relatives in Vill	−0.038	−0.095**	0.033	−0.013	−0.075*	0.029
	(0.053)	(0.044)	(0.031)	(0.048)	(0.045)	(0.029)
Neighbor Trustworthiness	1.572	0.984	1.143*	1.759	0.960	0.455
	(1.238)	(0.975)	(0.609)	(1.226)	(0.813)	(0.515)
Km to Police	−0.078	0.034	−0.006			
	(0.060)	(0.036)	(0.025)			
Log(Wealth)	0.098	0.282***	−0.030	0.075	0.088	−0.057
	(0.101)	(0.071)	(0.048)	(0.071)	(0.066)	(0.036)
Years in Village	0.015**	0.024***	0.011***			
	(0.007)	(0.006)	(0.004)			
Japanese Village	−1.296	−2.216***	0.289			
	(1.404)	(0.818)	(0.492)			
# of Stealable Crops	0.162	1.332***	−0.243	0.377	1.214***	−0.189
	(0.562)	(0.352)	(0.172)	(0.509)	(0.337)	(0.164)
Overid. (J) Test		4.440 ($p = 0.22$)			0.178 ($p = 0.98$)	
Obs.	223	223	223	223	223	223

Clustered heteroskedasticity-consistent standard errors in parenthesis.
*-10%, **-5%, and ***-1% significant.

Table A-1: Correlates of gift giving, theft experienced, and trust using OLS with village fixed effects.

	Log(Theft)	Log(Giving)	Trust
Bet	0.067	−0.026	−0.003
	(0.094)	(0.085)	(0.039)
Didn't Play Games	0.528	−0.369	−0.459
	(0.653)	(0.622)	(0.324)
No One Passes Field	−0.604*	−0.959***	0.249
	(0.353)	(0.304)	(0.156)
# HHs in 250 m Radius	0.037	−0.058**	−0.002
	(0.027)	(0.023)	(0.012)
Family Size	−0.110	0.098	0.025
	(0.105)	(0.080)	(0.046)
# Close Relatives in Village	−0.048	−0.094*	0.058**
	(0.065)	(0.053)	(0.028)
Neighbor Trustworthiness	1.659	1.793	0.648
	(1.446)	(1.282)	(0.613)
Kilometers to Police	−0.261*	0.045	−0.016
	(0.149)	(0.112)	(0.050)
Log(Wealth)	0.185*	0.329***	−0.067
	(0.111)	(0.103)	(0.053)
Years in Village	−0.000	0.009	0.014**
	(0.012)	(0.011)	(0.006)
Japanese Village	−4.072**	−5.318***	0.867*
	(1.712)	(1.191)	(0.464)
R^2	0.180	0.317	0.174
Obs.	223	223	223

Clustered heteroskedasticity-consistent standard errors in parenthesis.
*-10%, **-5%, and ***-1% significant.

Table A-2: Correlates of gift giving, theft experienced, and trust using GMM with village fixed effects controlling for crop choice.

	Log(Theft)	Log(Giving)	Trust
No One Passes Field	-0.335	-1.119^{***}	0.365^{**}
	(0.371)	(0.370)	(0.178)
Family Size	-0.220^{*}	-0.048	0.017
	(0.123)	(0.111)	(0.048)
# Close Relatives in Village	-0.065	-0.045	0.084^{**}
	(0.064)	(0.069)	(0.033)
Neighbor Trustworthiness	2.183	-0.419	1.282
	(1.796)	(1.741)	(0.784)
Log(Wealth)	-0.012	0.173	-0.057
	(0.122)	(0.110)	(0.075)
# of Stealable Crops	0.390	2.058^{***}	-0.004
	(0.807)	(0.707)	(0.380)
Overidentification (J) Test		6.252 ($p = 0.10$)	
Obs.	177	177	177

Clustered heteroskedasticity-consistent standard errors in parenthesis.
*-10%, **-5%, and ***-1% significant.